INFANT SOCIAL EVALUATIONS IN RESPONSE TO ANTISOCIAL BEHAVIORS OF UNEQUAL RESOURCE DISTRIBUTION

By

EVAN M. JORDAN

Bachelor of Science in Psychology
Oklahoma State University
Stillwater, Oklahoma
2012

Master of Science in Psychology
Oklahoma State University
Stillwater, Oklahoma
2016

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
May, 2018

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Dissertation Approved:

Dr. David G. Thomas

Dissertation Adviser
Dr. Jennifer Byrd-Craven

Dr. James Grice

Dr. Barbara Stoecker

ACKNOWLEDGEMENTS

First, I would like to thank my graduate advisor, Dr. David Thomas for his continuous support throughout the course of my career. He has truly been one of the most influential individuals in my life and I am fortunate to have had the opportunity to learn from him. I would also like to thank my committee, Drs. Jennifer Byrd-Craven, James Grice, and Barbra Stoecker for their time, their insight, and their suggestions. Additionally, I would like to recognize the undergraduate members of the Developmental and Psychophysiology Lab for their commitment to recruitment, data collection, coding, and data entry. Finally, I would like to acknowledge Dr. Elisabeth Ponca-Garcia for asking the question that led to the development of this study.

In addition to the academically-based support I have received, it should be mentioned that I would not have accomplished this much without the help of my family and friends. To my brother, thank you for your positive “repsonse” to my work. I am lucky to have your sharp, proofreading eye. To my mother and father, thank you not only for the unfailing emotional support, but the many hours you contributed to sewing and sawing to develop the materials for this project. I owe my sanity and my success to you. Finally, to Megan and Amy for the understanding of this process and for always being in my corner with good vibes, tunes, and dinners. Your support during this process is a true indication of how important friendship really is. THANK YOU!

Name: EVAN M. JORDAN

Date of Degree: MAY, 2018

Title of Study: INFANT SOCIAL EVALUATIONS IN RESPONSE TO ANTISOCIAL BEHAVIORS OF UNEQUAL RESOURCE DISTRIBUTION

Major Field: PSYCHOLOGY

Abstract: At the most basic level, a prosocial behavior is any voluntary behavior of which the main purpose is to benefit another individual (Eisenberg & Fabes, 1998; Krebs, 2015), but does not provide benefit to the acting individual. Healthy emotional development provides a foundation for the development of prosocial motives and their subsequent behaviors, especially those emotions specifically related to empathic responding. Empathy, an affective response involving the sharing and understanding of the emotions of another, is considered a primary motive for the emergence of prosocial behaviors. Precursors of both empathic and prosocial responding are evident within the first year and even the first months of life and continue to strengthen and increase in complexity across infancy and early childhood.

Previous research has demonstrated a preference for individuals who behave prosocially, as opposed to antisocially, in infants as young as 3 months of age (Hamlin et al., 2010). It has also been suggested that by 18 months of age infants may be evaluating the equitable and inequitable distributive actions of others as being either prosocial or antisocial behaviors, respectively (Geraci & Surian, 2011). This previous work has focused exclusively on the agents of the distributive actions. The purpose of the current study is to focus on the recipients of those actions, i.e., to determine if infants engage in social evaluations directed toward the individuals who are on the receiving end of prosocial and antisocial distributive behaviors. Specifically, this study assesses infant responses toward receivers that have been treated antisocially to determine if infants are displaying an empathically charged response toward individuals affected by antisocial actions.

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CHAPTER I

INTRODUCTION

The development of prosocial behavior – any behavior that is intended to benefit another (Eisenberg & Fabes, 1998) – is an increasingly popular topic that has gained the interest of researchers in recent years. In both research and anecdotally, antisocial behaviors (i.e. behaviors intended to harm another) are more highly publicized due to the lack of conformity to social and societal norms and to the social consequences that accompany typical antisocial behaviors such as aggression. In reality, prosocial behaviors occur far more frequently than their anti-social counterparts and are distinct from other behaviors in that a prosocial response requires one individual's ability to understand and interpret the demonstrated 'need' of another (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011). The importance of prosocial behaviors is evident across various social situations and can be seen in the quality of social interactions and relationships. In fact, social and emotional connectedness are paramount to an individual's ability to function during social interactions (Roth-Hanania, Davidov, & Zahn-Waxler, 2011), and a failure to connect with others through these mechanisms is often indicative of a variety of psychological disorders (Baron-Cohen, 2002). From an early developmental perspective,

this social and emotional connectedness allows for infants to communicate with their caregivers, create social bonds, and gain an understanding of appropriate emotional responses across a variety of social contexts.

Healthy emotional development provides a foundation for the development of prosocial motives and their subsequent behaviors, especially those emotions and behaviors specifically related to empathic responding. Empathy, an affective response involving the sharing and understanding of the emotions of another, is considered a primary motive for the emergence of cooperative and altruistic behaviors that are encompassed under the concept of prosociality. Unfortunately, much of the research that focuses on empathy and the prosocial behaviors related to this initial emotional response is conducted with child, adolescent, and adult participants and little is known about the emergence and the interaction of these behaviors in infants.

The purpose of the proposed study was to determine if infants in their second year of life prefer receivers of resources that have previously been treated prosocially by another, or receivers that have been treated antisocially, thereby demonstrating an empathic emotional response to individuals that are victims of antisocial behaviors. The following chapter will provide an overview of the developmental theories that both deny and support the ability for infants to engage in this form of complex social evaluation. Furthermore, it will provide a review of the literature that has demonstrated the potential for infants to engage in social evaluations of prosocial and antisocial responding as well as discuss some of the motives that may affect infants' likelihood to engage in these evaluations, namely empathy.

CHAPTER II

REVIEW OF LITERATURE

Prosocial Behaviors Defined

At the most primitive level, a prosocial behavior is any voluntary behavior of which the main purpose is to benefit another individual (Eisenberg & Fabes, 1998; Krebs, 2015), but does not provide benefit to the acting individual. These behaviors are often referred to as "other-oriented behaviors" (Dunfield et al., 2011) and broadly encompass a variety of behaviors including helping, cooperation, sharing and resource distribution, inequity aversion, altruism and moral reasoning (Eisenberg, Fabes, & Spinrad, 2006; Williams, Paulus, & Moore, 2014). However, it is often the topic of debate as to whether altruism and cooperation should be included in the realm of prosocial behaviors in that altruism involves a benefit to another at the *cost* of the acting individual and cooperation includes a shared goal between two individuals and may not rightfully be categorized as having a main purpose of benefiting another, but rather a main purpose of benefiting oneself (Dunfield et al., 2011). Regardless of these distinctions, this paper will focus on all behaviors encompassed under the broader concept of prosocial development in an attempt to understand the developmental trajectory, the factors that motivate these

behaviors, as well as highlight differential responding in individuals across various contexts, cultures, and ages.

Prosocial behaviors include a variety of behaviors that focus on the instrumental, emotional, or material needs of other individuals and can be classified into three subcategories, including helping behaviors, comforting behaviors, and sharing behaviors (Dunfield et al., 2011). Helping behaviors focus on the alleviation of an instrumental need of another individual and require both recognition of the receiving individual's inability to perform a specific task and the helping individual's response to assist in the completion of the task. Comforting behaviors focus on the alleviation of an emotional need and require the recognition of, and a response to, the negative emotional state of another. Finally, sharing behaviors are any behaviors that reduce the material need of another individual. These behaviors require the recognition of another's lack of, and desire for, a material item, followed by a response of providing or sharing one's own item with that individual. Often, one behavior by the prosocial actor will overlap across the three subcategories. For example, the sharing of an item (sharing behavior) may also account for the emotional need (comforting behavior) of that individual as well. The categorization of such behaviors that can account for multiple needs into one of the three subcategories is dependent on the acting individual's original intent, or which goal he/she was initially trying to address.

Socialization, cognitive development, evolutionary adaptiveness, and empathy have all been hypothesized to be mechanisms linked with prosocial behaviors and their development (Dunfield, 2014). However due to the broad definition of prosociality and the various contexts in which prosocial behaviors occur and are therefore studied, an

understanding of the developmental trajectory of prosocial behaviors is largely debated (Zahn-Waxler, Radke- Yarrow, Wagner, & Chapman, 1992). Therefore, identifying the various broad theories of prosocial development allows for a better understanding of their role in emotional development in early infancy.

Theories of Developmental Trajectories

Precursors of both empathic and prosocial responding are evident within the first year and even the first days of life when infants begin to respond to the distressed cries of their peers with their own cries of distress (Geangu, Benga, Stahl, & Striano, 2010; Martin & Clark, 1982; Simner, 1972). As they begin to develop the capacity to distinguish themselves from other individuals, and take on the role of those individuals, they subsequently begin to show concern for others through comforting and helping behaviors (Rheingold, 1982; Zahn-Waxler et al., 1992). Additionally, infants begin to develop an understanding of social rules (Emde, Biringen, Clyman, & Oppenheim, 1991), an ability to regulate their emotions and behaviors (Kopp, 1982), an understanding of others emotions, and the capability of evaluating the actions of others based on moral standards (Kohlberg, 1981; Piaget, 1932). The combination of these complexities highlights the cognitive and socio-cognitive changes that facilitate the development of prosocial behavior over time.

The understanding of prosocial development stems from a variety of theories including, cognitive development theory, psychodynamic theories, and social learning theories (Eisenberg, Fabes, & Spinrad, 2006). Each of these provides a primitive basis for understanding the developmental trajectory of this phenomenon, but none of which

provide an all-encompassing explanation as to how these behaviors develop and for what reasons.

Theories Denying Prosocial Competency in Infants

The cognitive developmental approach to prosocial behaviors focuses on children's acquisition of such behaviors as a result of both moral and cognitive development across the lifespan. Early findings in the study of prosocial development provided supporting evidence that prosocial behaviors increase in frequency and complexity with age (Handlon & Gross, 1959; Ugurel-Semin, 1952). Moral development stage theories of both Piaget (1932) and Kohlberg (1981) suggest that cognitive, moral, and prosocial development are intertwined and as children demonstrate advances in general cognitive development, their propensity for making moral judgments also begins to develop, which increases the likelihood that children will begin to engage in prosocial behaviors (see Appendix E, section 1). With this in mind, classic cognitive approaches to prosocial development would deny the ability for infants to make moral judgments due to the cognitive capacities (i.e., perspective taking and self-other differentiation; discussed below) that these behaviors require and the age in later childhood at which they develop.

Psychodynamic theories emphasize the unconscious while underscoring the role of emotion in the development of prosocial responding. Psychodynamic theories take one of two approaches to prosocial development. Classical Freudian theory (the first approach), like cognitive development theories, denies the ability for infants to engage in prosocial behaviors and instead focuses on these behaviors occurring in response to more advanced developmental processes, namely the conscience. Freud (1917) theorized that children begin to develop a conscience, or "superego", between the ages of 4 and 6 years.

When this develops, prosocial behaviors may appear as a means of reducing guilt inflicted by the conscience (Eisenberg, Fabes, & Spinrad, 2006). In other words, prosocial behaviors may develop as a defense mechanism to placate the id's irrational demands and reduce conflict between the id and the superego (Fenichel, 1945; Glover, 1968, see also Appendix E, section 2). While this classic Freudian approach also denies the ability for infants to engage in prosocial responding, other psychodynamic theories provide a basis for its occurrence in early aged infants.

Theories supporting prosocial competencies in infancy

In contrast to classical Freudian psychodynamic theory, the other psychodynamic approach focuses on the importance of early interactions between the infant and the primary caregiver and provides the basis for explanation of observations of prosocial responding in infancy (Ekstein, 1978). According to these neo-Freudian theorists, the infant-caregiver relationship is influential in the development of empathy, which is considered to be a necessary requirement for the development of prosocial behavior (discussed below). Attachment with primary caregivers provides infants with a safe environment to explore and understand their emotions (Bowlby, 1989) and infants use the information learned through attachment relationships to develop working models of social interactions that they can later use with their peers (Abraham & Kerns, 2013). In addition to links between empathy and prosocial behaviors, links between attachment security and empathy have been observed, finding that children that experience secure attachment were rated as more empathic and exhibited greater prosocial responses to distressed peers and adults (Kestenbaum, Farber, & Sroufe, 1989; van der Mark, IJzendoorn, & Bakermans-Kranenburg, 2002).

Empathic responses do not just suddenly appear in childhood, however. Evidence suggests that newborn infants are capable of some form of empathy as is indicated by their reactive crying in response to the distressed cries of their infant peers (Martin & Clark, 1982; Sagi & Hoffman, 1976), a concept known as emotional contagion (discussed in more detail below). As infants age and develop higher levels of cognitive functioning, more advanced forms of empathic responding begin to emerge (Thompson, 1987), eventually developing into mature empathy. Brownell (2016) proposes a similar argument with regard to prosocial behavior, suggesting that ″prosocial behavior emerges from human infants′ participation in a unique socioemotional environment [and these] socialization effects are not restricted to later childhood, but operate from birth to generate prosociality (p. 223).″ In other words, prosocial behaviors develop progressively across infancy through precursory forms of sharing and turn taking behaviors that infants engage in with their primary caregivers (Brownell, 2011) rather than suddenly in the second year of life. This theory is supported by recent research on infants between 6 and 15 months of age, indicating that infants understanding of fairness is (in part) governed by their ability to engage in spontaneous sharing behaviors toward primary caregivers (Ziv & sommerville, 2018). Further, these immature prosocial interactions between infants and their primary caregivers encourage the emotions, behaviors, and cognitions that are critical to the development of prosociality. Taken together this highlights the indirect, but important effects of primary caregiver attachment in prosocial development.

Finally, social learning theories focus on a combination of both cognitive and environmental influences on prosocial development. Specifically, this suggests that

prosociality is learned through the same mechanisms as any other behavior, namely reinforcement and imitation. Bandura (1977) stated that concrete and social reinforcements provide information as to which types of behavioral responses are appropriate and which are not in context-specific situations. Researchers have demonstrated the effectiveness of social reinforcements such as praise and approval on increasing prosocial tendencies in both infants and toddlers (Bryan, Redfield, & Mader, 1971; Doland & Adelberg, 1967; Eisenberg et al., 1993; Midlarsky, Bryan, & Brickman, 1973), indicating not only that social reinforcement is an important factor in prosocial development, but that it may be more influential than concrete reinforcements at encouraging children to engage in prosocial behaviors (Fabes, Fultz, Eisenberg, may-Plumlee, & Christopher, 1989; Szynal-Brown & Morgan, 1983).

Social Imitation. Research on social imitation has focused primarily on adults, but has provided a clear understanding that the imitation of facial expressions, postures, movements, and language has positive social consequences for both parties (Chartrand & Bargh, 1999; Chartrand & van Baaren, 2009). Further research on imitation in adults has found that the positive social outcomes created by imitation have adaptive benefits for prosocial behaviors as well. Individuals that have been mimicked are more likely to act prosocially toward another individual through, for example, helpful behaviors of retrieving dropped items and donating to charity following the imitating interaction (van Baaren, Holland, Kawakami, & van Knippenberg, 2004). Furthermore, this increase in prosocial tendency was not limited only to the imitator, but also increased the likelihood that the person being imitated would help third party individuals that had not been directly involved in the interaction.

Studies on infant and toddler preferences for imitation are not as extensive as the literature found for adults, but there are some relevant findings that provide evidence that infants, too, have a preference for mimickers and are likely to learn appropriate social responses from individuals that they deem to be reliable and relevant models of imitation (Koenig & Harris, 2005; Pea, 1982 Chow, Poulin-Dubois, & Lewis, 2008; Zmyj, Buttelmann, Carpenter, & Daum 2010, see also Appendix E, section 3). Research on infants between 9 and 14 months has indicated that infants can identify when they are being imitated by another and tend to look and smile more toward adults that imitate them as opposed to performing different actions, supporting the theory that even in infancy humans have a greater preference for individuals that are "like me" (Agnetta & Rochat, 2004; Mahajan & Wynn, 2012; Meltzoff, 1990; Meltzoff & Moore, 1999, see also Appendix E, section 3). In a recent study, Carpenter, Uebel, and Tomasello (2013) extended the findings of a previous study by van Baaren et al., (2004) to determine if 18-month-old infants would be more likely to perform prosocial actions after they had been mimicked by another. Van Baaren et al. (2004) found that adults were more likely to behave prosocially toward the experimenter and third-party individuals if the experimenter imitated the actions of the participant compared to if the experimenter did not imitate the participant's actions. The imitative actions in the study of van Baaren et al. (2004) were subtle and predominately unconscious, including only postural imitation. However, in order for the imitative behaviors to be detected by infants, more exaggerated actions were required in this study. Similar to the findings of van Baaren et al. (2004), 18-month-old infants behaved prosocially toward another more frequently and more quickly after they had been imitated by the experimenter than they did when the

experimenter engaged in contingent play with the infants, but did not imitate their actions. Once again in keeping with the findings of the initial study by van Baaren et al. (2004), this increase in prosocial responding was not limited solely to the imitator, but affected uninvolved, third-party individuals as well.

Literature on social imitation highlights the importance of modeling behaviors and imitation in the learning of prosocial behaviors in infancy and early childhood. Providing infants and toddlers with the opportunity to observe a model engaging in prosocial behaviors facilitates the understanding of which behaviors are appropriate in specific contexts and demonstrates to them how to initiate those behaviors. This in turn will strengthen the learned disposition and increase the likelihood that the child will engage in these behaviors during future events. Furthermore, the nature of the relationship between the model and the imitating child will, in large part, determine the prosocial responses that are carried out in other contexts.

Overall, theories of prosocial development range from the denial of ability for infants to engage in prosocial responding until early to middle childhood to the acceptance that infants can and do engage in prosocial behaviors through mechanisms of early caregiver interactions, reinforcement, and imitation. Therefore, each of the theories discussed above provides a basis for the initial understanding of how and when these behaviors develop, but none of which provide an all-encompassing explanation. Furthermore, these theories help explain the development of this phenomenon, but fail to explain what factors could motivate the occurrence of these behaviors, a necessary component to the understanding of prosociality.

Empathy as Prosocial Motivation

Nowark (2006) theorized that individuals act prosocially toward one another primarily due to kin selection. Kin selection is a Darwinian theory that supports the helping of genetically- related individuals to increase reproductive success (Hamilton, 1964). However, individuals are often observed behaving prosocially toward non-genetically-related individuals. The theories of direct and indirect reciprocity (Nowark, 2006, see also Appendix E, section 4) help account for this phenomenon, but researchers also point to empathy as a possible primary mechanism that motivates people to behave prosocially (Lockwood, Seara-Cardoso, & Viding, 2014). Empathy, the ability to share, understand and make inferences about the feelings of another individual, is thought to be associated with prosocial behavior on both an affective and cognitive level and neurophysiologists have linked empathic and prosocial responding to many similar neural circuits (see appendix E, section 5). In the last few decades, empathy has become of particular interest to psychologists, in part because of its implications for promoting prosocial actions (Eisenberg & Miller, 1987). Humans are not born as "social isolates" (Meltzoff, 2010). Rather, all of the actions of humans, including their thoughts and desires, occur in response to other individuals and due to the intensely social nature of humans it is necessary for individuals to have an understanding of not only their own emotions, but the feelings and emotions of individuals that they encounter (Batson, 1990).

According to Decety and Jackson (2004) there are three main components that define empathy. The first is characterized by an emotional response to another individual's emotional state. This is typically accompanied by the sharing of emotions

with the other person and is more recently referred to as "emotional contagion." The second component involves perspective taking, which is the ability to understand the emotional experience or condition of another person. Perspective taking is a multidimensional skill that involves perceptual, social-cognitive and affective processes. An individual must first be able to visualize the perspective of another, followed by the identification and understanding of the reasoning behind a behavior, and finally surmise the feelings and emotions that the individual has as a result of the condition and behavior. The combination of these processes allows the individual to take on the perspective of another, which is critical, but not singularly responsible for the ability of an individual to perform prosocial actions (Moore, 1990). The third and final element of the cognitive definition of empathy requires the ability to distinguish between the emotions of one's self and the emotions of another person, a process called self-other differentiation (Decety & Jackson 2004). Hoffman (1979; 1981) proposed a similar model to the one outlined by Decety and Jackson (2004) which included both an affective component and the cognitive component of self-other differentiation, but also included a final component which consists of prosocial behaviors performed with the sole intent of alleviating the distress of another individual.

The first of these processes, emotional contagion – the automatic convergence of one's emotional state with that of another individual – can be observed within the first hours of life in the form of contagious crying (Decety & Jackson, 2004; Moore, 1990). Contagious crying is an affective response that refers specifically to the distress reaction that neonates give when exposed to the cries of other infants. In early infancy the degree of intensity of responses to cries of distress varies from infant to infant. Although

contagious emotional responses vary in frequency and intensity between individuals, they can be observed in infants as early as a 24 hours after birth (Martin & Clark, 1982; Simner, 1971 see also Appendix E, section 6 for further review). While these findings provide evidence that the emotional contagion component of empathy is present within the first year of life, are infants capable of the cognitive capacities of perspective taking and self-other differentiation required for mature forms of empathy?

Perspective taking and self-other differentiation are especially important when considering the role of cognitive empathy in the development of prosocial behaviors because they require an individual to consciously evaluate the emotional behaviors of another as well as understand that the emotions they feel are not necessarily their own, but often a result of the affect of others. Both of these components require complex cognitive processing, skills that Thompson (1987) argues do not develop until approximately 18 months of age. However, recent research observing infant preferences of the prosocial and antisocial actions of third party individuals has challenged the denial of complex cognitive processing until the second half of the second year of life, suggesting that infants may be engaging in both perspective taking and self-other differentiation during paradigms depicting prosocial and antisocial behaviors.

It is intuitively obvious that the actions of others are more readily evaluated when they affect oneself as opposed to surrounding strangers. However, Hamlin, Bloom, and Wynn (2007) found that even infants as young as 6 months of age will actively assess helping and hindering individuals in a given situation, even when the infants themselves are uninvolved in the interaction and completely unaffected by the actions of either the helper or the hinderer. Specifically, infants of both 6 and 10 months of age were shown a

protagonist agent attempting to climb a hill. This protagonist was either aided in the completion of its task by the helping agent, or kept from achieving its goal by the hindering agent. Choice measures used to indicate preference toward either the helping or the hindering agent (preference was indicated by either looking times or reaching behaviors dependent upon the age) resulted in nearly 86% of the 10-month-old infants indicating a preference for the helper and 100% of the 6-month-olds indicating a preference for the helper, thus suggesting that infants of this age have the capacity to evaluate the actions of others. These findings were later extended to 3-month-old infants who demonstrated preference through looking behaviors, indicating that social evaluations occur prior to an infant's ability to show preference through reaching behaviors (Hamlin et al., 2010). A second hill climbing paradigm with slight modifications to the agents was conducted to determine if infants were making evaluations of the agents based on the positive or negative nature of the helping event, or both. After pairing both the helper and the hinderer with a neutral character in the paradigm and the choice procedure, it was found that infants looked significantly longer at the neutral character compared to the hinderer, but did not look significantly longer at the helper character compared to the neutral. This suggests that infants of this age may be averse to anti-social behaviors, but not necessarily attracted to prosocial behaviors, which suggests that negative social evaluations may be stronger, and therefore occur earlier in development than positive social evaluations. In theory, evaluations of the behaviors of acting agents when the infants are not directly involved in or affected by the interaction should provide some indication that infants are taking on the perspective of the agents directly involved in the paradigm. By responding to the actions of the agents

based on how they perceive those actions, infants are demonstrating that they understand the perspective of the affected agent and the response that this agent should be having to being treated prosocially or antisocially.

This theory is further supported in a second experiment by Hamlin et al. (2007) that assesses infant's expectations of the protagonist's behavior following it's interaction with the helper and the hinderer. Using the same infants that had already made their social evaluations of the characters, the protagonist alternately approached either the hinderer or the helper, an action that was thought to either violate the infants' expectations or did not, respectively. Interestingly, 10-month-old infants looked longer when the climber approached the hindering character, suggesting that the infants were surprised about this reaction, assuming that they expected the negatively-treated climber to show an aversion towards the character that had hindered it. Six-month-old infants demonstrated a different response and looked equally towards both events of approach to the helper and the hinderer, suggesting that even though they had preferred the helping to the hindering character, they did not attribute these attitudes to the protagonist as well. Therefore, infants may be developmentally capable of social evaluation prior to their ability to infer the evaluations of others (perspective taking), but this cognitive capability may strengthen in development between the ages of 6 and 10 months. It should be noted that these results were not replicated when the characters were inanimate objects (without distinct facial characteristics), which is consistent with the findings of Gredeback et al. (2015) that the p400 ERP, a neural component that has been linked to empathy and prosocial responding, does not activate when observing prosocial behaviors toward inanimate agents (see also appendix E, section 5). Additionally, in a hill climbing

paradigm similar to the one just discussed, it was found that older children of 3 and 5 years old will not only indicate a preference for the helper over the hinderer, but as they age they begin to take intention of a goal into account as well (Li & Tomasello, 2018). More specifically, when a helping agent attempted to aid the climber up the hill, but failed; they were more positively evaluated than a hinderer that thwarted the climbers goal., but less positively evaluated compared to the helper that was successful in aiding the climber up the hill. These findings were more robust for 5 year olds compared to 3 year olds, which provides further information as to the developmental trajectory of social evaluations.

An alternative interpretation of these findings is that infants were not responding to the agents using cognitive rationale, but rather they were responding with a conditioned response after viewing an anti-social action that was socially inappropriate. So rather than consciously understanding that the agent and its behavior they observed was either "good" or "bad", infants could be experiencing an underlying conditioned reaction that is motivating their preference, or lack of preference, for the prosocial agent or anti-social agent, respectively. This would best be characterized as classical conditioning. If the anti-social event in the various paradigms outlined above were to produce negative emotions in the infant, this could in turn affect their willingness to want to interact with or act prosocially toward the agent that evoked these negative feelings (the anti-social agent) based solely on the negative emotional valance associated with the agent rather than the cognitive evaluation of the agent. Consistent with this theory, Vondervoort and Hamlin (2016) propose that early moral evaluations in infants are emotion-based and rooted in intuition rather than cognition, which provides further

support that infants may be engaging in primitive forms of prosocial behavior that become more advanced as they develop the cognitive skills necessary to make true social evaluations.

While classical conditioning is a viable alternative to the infant cognitive capacities approach, further research by Hamlin and Wynn (2011) increased the complexity of the initial prosocial/antisocial paradigm by providing more information about the agent's previous actions and increasing the amount of information the infant would be required to retain in order to make complex social evaluations. In this paradigm infant evaluations of individuals who behaved negatively toward an antisocial individual were assessed. Five- and 8-month-old infants were shown an agent working to reach a goal of removing a toy from a closed box. In one scenario, a helper would demonstrate prosocial behavior by assisting the protagonist agent in opening the box allowing for the completion of the goal. The alternative scenario depicted a hinderer behaving anti-socially by keeping the protagonist from achieving its goal of opening the box.

Following the initial distinction of the prosocial and anti-social individuals, infant subjects were placed in one of two conditions, the Prosocial Target condition and the Anti-social target condition. In these, infants either observed a toy being taken away from a prosocial or anti-social agent by a new third-party agent, or retrieved and given back to the prosocial or antisocial agent by the third-party agent. Infants were then presented with these new "giving" and "taking" agents and provided a choice between the two agents to indicate their preference. Results indicated that both 5- and 8-month-old infants preferred the "giver" in the prosocial target condition, supporting previous findings that infants prefer to observe someone being treated prosocially. However,

results of the Anti-social target condition differed between the 5 and 8-month-old infants. Five-month-old infants still preferred the "giver" in this scenario, regardless of the fact that the target agent had previously behaved negatively toward another individual. However, 8- month-old infants demonstrated a preference for the "taker", indicating that they only prefer to see someone treated positively if they had previously acted positively themselves and preferred to see someone that had acted negatively be treated negatively in return. These findings are similar to those of Hamlin et al. (2007) in that the complexity of the social evaluations (and so cognitive capacities) may strengthen in development between 5 and 8 months of age. Furthermore, these findings also support the theory of indirect reciprocity proposed by Nowak (2006), that social reputation may be a mechanism that explains prosocial behaviors between genetically unrelated individuals.

These findings were once more expanded by Hamlin et al. (2011) to determine if the evaluations of the same social interactions conducted in the previously discussed experiments would affect the *behaviors* of older, just-verbal toddlers. Eighteen-month-old toddlers were placed in one of two conditions in which they could either give or take a treat away from the prosocial or anti-social agents. Toddlers in the "give a treat" condition distributed treats more often to the prosocial rather than the anti-social agent. Similarly, toddlers asked to "take a treat" removed the treat from the anti-social agent more often than they removed a treat from the prosocial agent, suggesting that toddlers may have the cognitive capacities to understand that these responses are thought to be socially appropriate reactions to the behaviors previously exhibited by the agents.

The literature outlined above provides evidence that an understanding of prosocial and antisocial behaviors occurs in infancy and that this understanding allows for the social evaluation of agents that engage in these behaviors and emotional and behavioral responding to their outcomes. Additionally, the literature has provided an understanding of the structured paradigms and observations that are most often used to elicit prosocial and empathic responding in infants and young children. These models have aided in informing much of what we already know about prosocial understanding and empathic responses to these behaviors. However, it should be noted that the findings of the research outlined above endow infants with a variety of cognitive capabilities that have been historically thought not to develop until late infancy and early toddlerhood (Piaget, 1932). Furthermore, a handful of replications of the previous studies have failed to find significant results. While these failures to replicate do not outweigh the number of studies that have found significant results, the importance of these studies to empathic and prosocial research cannot be overlooked.

Failures to replicate. As briefly discussed, cognitive development does not provide the only explanation as to why these prosocial behaviors are occurring as this explanation endows infants with a significant amount of cognitive capacity when these behaviors may not actually involve a rational conscious cognitive process by the infant. Given the previous findings it is evident that research regarding the social evaluations of infants and toddlers has been successful. However, a few studies have attempted the replicate the work of Hamlin and colleagues (2007; 2011) and have failed to find significant results. Specifically, a replication attempt of the Hamlin et al. (2007) hill paradigm was conducted and it was found that infants did not significantly prefer the

helping agent compared to the hindering agent (Scarf, Imuta, Colombo, and Hayne 2012). Rather, Scarf and colleagues theorized that the infants were actually responding to perceptual preferences of the paradigm rather than their social evaluations of the acting agents. For example, the original study involved a protagonist agent that attempted to make it up a hill and was either aided by a helping agent, or thwarted by a hindering agent. However, when the protagonist agent successfully reached the top of the hill it bounced to indicate its excitement for achieving its goal. In the replication by Scarf et al., it was found that across multiple conditions infants indicated preference for the agent that was associated with (and directly next to) the bouncing protagonist, regardless of whether that agent was the helper or the hinderer. Additionally, when the protagonist bounced during both the helping and hindering conditions, infants were found to prefer both the helping and hindering agents equally.

Another attempted replication of the hill climbing study was recently conducted and found less than half of the infants chose the helping agent compared to the hindering agent (Colaizzi, 2016). Lack of replication in this study could have been due to minor methodological differences. For example, Hamlin (personal communication, May 25, 2016) found that infants tend to demonstrate a preference for the color blue (one of the colors of the agents). Though the roles of the agents were counterbalanced, this (in addition to various other minor methodological deviations) could have skewed the findings in this replication study.

A third study attempting to replicate the findings of Hamlin and Wynn's (2011) toy in the box paradigm was also unsuccessful. Salvadori et al. (2015) found that only 62% of the infants in their replication paradigm demonstrated a preference for the helper

compared to the hinderer, which is inconsistent with the findings of Hamlin and Wynn (2011) that found a significant number of infants (79%) at both 5 and 8 months of age prefer the helper over the hinderer. Similar to Colaizzi (2016), Salvadori et al. (2015) attributed these differences to minor methodological dissimilarities of procedure, materials, or demographic. However, the findings of Hamlin and Wynn (2011) were robust enough that they should still be evident in the face of only *minor* dissimilarities. One methodological issue that is not addressed with the original study and then again overlooked by Salvadori and colleagues (2015) is the noise that occurs when the box lid is slammed shut by the hindering agent. Although not outlined in the publication, in a recording of the paradigm (Hewitt & Bloom, 2013) there is a clear, audible noise when the hindering agent slams the lid of the box closed. It is plausible that the infants have an aversion to a loud noise that causes them to react negatively toward the hindering agent, making it appear as though they are showing a preference toward the helping agent. This methodological issue should be addressed in further replications. Together these three studies provide evidence that the research on social evaluations and the conclusions drawn from their findings are not conclusive and remain questionable due to mixed results across this area of study.

Nevertheless, there is a substantial amount of research that points toward an infant's ability to socially evaluate the prosocial and anti-social actions of acting agents. This would support the conclusions of researchers in this area of study that infants have the capacity – cognitive or otherwise -- to engage in these social evaluations within the first year of life. Additionally, it is possible that the failed replication attempts are null results and deviations from the original findings are due to methodological differences.

However, if significant results are affected by only minor deviations from initial methodology, this calls into question the reality if the initial findings. To gain a better understanding as to what factors are motiving infant preferences toward agents in these paradigms, new methodologies will need to be implemented to accurately assess an infant's cognitive, emotional, and moral capacities. That said, environmental differences should be included as a potential motiving (or inhibiting) factor that needs to be further assessed to gain an understanding of environmental influence on prosociality.

Resource distribution

Throughout the developmental process, infants and young children will encounter many aspects central to social life that will require them to engage in complex social reasoning. A problem that will arise in these developmental periods concerns the fairness of distribution of resources. Humans, as an ultra-social species, must remain in compliance with social norms to maintain a social human society. A crucial theme to prosociality and norm compliance is fairness-based altruism. Adults, non-human primates, and even dogs have been found to display negative responses to the unequal distribution of resources, specifically when the distribution represents reward allocation (Brosnan, Schiff, & Frans, 2005; Fehr & Rockenback, 2003). However, this understanding of equitable resource distribution has been found to begin in late infancy and strengthen throughout development (Geraci & Surian 2011; Ziv & Sommerville, 2018). The question then arises, what constitutes the understanding of equitable division in children?

By the age of two and even earlier, children begin to claim ownership of property. As early as 18 months of age an infant shows signs of distress in response to

relinquishing an item that he/she has claimed as their own and this issue of exclusivity and possession increases in frequency between 24 and 36 months of age, creating frequent argument and need for justification by the toddler (Dunn, 1988). Overall, these claims of ownership are a necessary component to sharing and distributive behaviors, those of which are encouraged across a variety of cultures as children begin to enter school settings and have increased social experiences (Tobi, Wu, & Davidson, 1989). Moreover, as toddlers near the age of three, they begin gaining an understanding of social power, a concept that is then linked to their claims of ownership through bargaining, trades, and distributions amongst peers (Rochat, et al., 2009). Harbaugh, Krause, Liday, and Vesterlund (2003) observed the bargaining and distributive behaviors across a variety of early childhood and adolescent ages and found that after these cognitive and social capacities develop, the likelihood that children will engage in fair resource distribution also increases. Furthermore, these egalitarian tendencies emerged above and beyond an individual's own-self-interest in children over the age of seven. Being that these cognitive and social capacities are found to emerge in late infancy and early toddlerhood, it can be theorized that these prosocial sharing and fairness behaviors begin to develop (at least in primitive form) within the first 2 years of life.

Previous studies have reported evidence of infants under the age of 2 years forming egalitarian expectations regarding the distribution of resources. Moreover, these infants in their first and second years of life demonstrate a more positive evaluation of egalitarian distributors compared to non-egalitarian distributors. For example, Geraci and Surian (2011) examined the ability for infants to evaluate subtle moral dilemmas involving the inequity of resource distribution. Twelve- and 18-month-old infants were

shown a series of paradigms in which a distributor would allocate resources to two receivers, either with equal distributions or unequal distributions. In the former scenario, the distributor evenly dispersed colorful discs to two receiving agents. The latter scenario resulted in the uneven dispersal of discs by the distributor to the two receiving agents, thereby providing one receiver with two colorful discs and the other receiver with none. Of the younger infants, there was no significant difference in preference between the fair and unfair distributors. However, the older infants looked significantly longer at the fair distributor when compared to the unfair distributor, demonstrating infant preference for the fair distributor. This would indicate that even in subtler tasks, infants appear to be able to evaluate the fairness of the behavior of others, though this ability is dependent on the age of the participant.

Once again, however, these findings demonstrate an apparent contradiction regarding infant social evaluations when compared to the findings of Hamlin and Wynn (2011) in which both 5- and 8-month old infants were found to demonstrate a preference for prosocial agents over anti-social agents. While Geraci and Surian (2011) found this preference to occur in older infants, they were unable to replicate a similar finding in their 12-month-old infants. One major methodological difference that could explain these variations in findings is the use of a digital cartoon paradigm in the Geraci and Surian (2011) study (as opposed to puppets). It is possible that infants were not attributing social valences to digital agents in the same way that they would three-dimensional agents and that by the 18-month assessment infants had overcome their inability to do so. Once again, these differences in findings could be due to the methodologies implemented and not reflect the actual emotional, cognitive, and moral

capacities of infants. Alternatively, it could be that, as Kagan (2008) suggested, preference as indicated by looking time may be a curvilinear as opposed to linear relationship. Either way, new methodologies should be addressed in future replications to aid in the understanding of these capacities.

On the other hand, research supporting the findings of Geraci and Surian (2011) found that 15-month-old infants looked longer at the outcome of an event depicting a distribution of unequal resources compared to when they observed an event in which resources were distributed equally across agents (Schmidt & Sommerville, 2011) presumably indicating that their expectations of the event outcome had been violated. While these looking behaviors may seem to conflict with the previous studies that measured infant preferences by longer looking times, it should be noted that in preference paradigms (e.g., Geraci & Surian), looking time at the agent(s) is being evaluated, but in violation of expectation paradigms (e.g., Schmidt & Sommerville), looking time at the event outcome is evaluated. Importantly, it was found that the previous emergence of spontaneous sharing behaviors with caregivers and peers was necessary to consistently elicit a violation of expectation in the infants. According to Ziv and Sommerville (2018) infant's understanding of fairness is related to their ability to perform sharing actions, which may influence how infants perceive distributive actions and allow for the development of an expectation of fairness. More specifically, infants that had already demonstrated sharing behaviors in a naturalistic setting looked longer at the unfair distributive outcome than infants that had not yet demonstrated sharing behaviors.

Interestingly, even at a young age, both infants and toddlers appear to take external context variables into account when performing social evaluations. For example,

according to research by Olson and Spelke (2008), children as young as 3.5 years of age consider a variety of variables before distributing resources to another individual. First, children will assess the relationship between the distributer and receiver. The understanding of the degree of "closeness" between the two provides children with a context for the distribution of resources. Second, children will evaluate previous distributions to the receiver, a principle known as "direct reciprocity" (previously discussed). Finally, children will determine if the recipient has shown any positive distributive behavior toward third-party individuals, which is known as the previously discussed concept of indirect reciprocity. In more mature forms of moral reasoning with regard to equity distribution, considerations of the need and merit of distributed resources must be considered to determine if a distribution behavior is fair (McGillicuddy-DeLisi, Daly, & Neal, 2006; Shaw & Olsen, 2012; Meriosto & Surian 2013; Meristo & Surian, 2014).

The consideration of need and merit requires more complex cognitive processing, due to the fact that evaluations of fairness are no longer based on surface characteristics of “more than” or “less than”, but require the individual making the evaluations to engage in second-order mental-state representations through the consideration of previous behaviors of the receiving and distributing agents. For this reason, there are relatively few studies of this nature that have been conducted using infant participants. However, recent work by Meristo and Surian (2013; 2014) has provided evidence that 10-month-old infants are capable of making social evaluations of fairness based on previous behaviors by the receiving individuals. Meristo and Surian (2013) used a paradigm in which two distributing agents treated two identical receivers either fairly, by distributing two

strawberries equally across the two receivers, or unfairly, by distributing both strawberries to one receiver and ignoring the remaining receiver. Following this phase, a new agent entered and acted prosocially by distributing strawberries to either the unfair or fair distributor. Longer looking time in this study indicated that the infants' expectations of the event outcome had been violated. Infant looking times were significantly longer when the new agent acted prosocially toward the agent that had previously distributed an unequal number of strawberries compared to the agent that had distributed the resources equally between receivers. In other words, infants were considered to be positively evaluating the fair, prosocial distributor rather than the unfair, antisocial distributor and the distribution of resources did not match their expectations based on the previous antisocial actions of the receiver that was provided more resources. These findings are further supported by a recent study conducted by Surian and Franchin (2017). This study, conducted with 15- and 20-month-old infants, indicated that by 20 months of age infants preferred to see agents of equal merit to receive equal distributions and children and agents of unequal merit to receive distributions proportional to their relative merit. The 15-month-old infants demonstrated a similar pattern of behavior, but the results were not statistically significant. However, this indicates that by the second year of life infants may be taking merit and deservingness into account when making evaluations of fairness.

In sum, as infants develop an understanding of possession and begin to engage in spontaneous sharing behaviors (Ziv & Sommerville, 2018), they also appear to develop an understanding of equitable resource distribution and establish a preference for these equitable distribution behaviors. These preferences and their subsequent behaviors of

prosocial sharing and fairness appear within the second half of the first year of life and continue to strengthen over the course of development (Merios & Surian, 2013). Once again in preference paradigms, looking time at the agent(s) is being evaluated, but in violation of expectation paradigms, looking time at the event outcome is evaluated. That said, contrasting results investigating the socio-moral competence of infants have been found across several studies following the violation of expectation paradigm. Longer looking times were recorded in events where the third-party agent approached the helper rather than the hinderer (Hamlin, Wynn, & Bloom, 2007), when resources were distributed unfairly between equal participants (Sloane, Baillargeon, & Premack, 2012), and when unfair agents received rewards rather than fair agents (Meristo & Surian, 2013). However, longer looking times toward third-party agents that approached (Kuhlmeier, Wynn, & Bloom, 2003) or stood near (Geraci and Surian, 2011) the helper rather than the hinderer have also been recorded. While there may be plausible explanations for these differences, the interpretation of longer looking times in more than one way within either the preference paradigms or the violation of expectation paradigms would lead to non-falsifiable hypotheses and therefore, non-scientific measures of preference or aversion.

Overall, infants have been observed displaying differential responding toward equitable and inequitable resource distribution paradigms. While various measures have been used in these paradigms, each has attempted to demonstrate that infants recognize differences in equitable and inequitable resource distribution and each has attempted to demonstrate that infants have an aversion toward inequitable distribution or a preference for equitable distribution. While it can be theorized that infants are making these

complex social evaluations based on learned reactions from social interactions, namely cognitive and/or affective components of empathy, a greater understanding of infant responding in these paradigms is required to more fully understand why infants are indicating a preference for equitable distribution and an aversion toward inequitable distribution.

Present Study

Evidence supports that infants may have the emotional and cognitive capacity to interpret interactions between animate agents and evaluate these actions as either prosocial or antisocial behaviors. Furthermore, infants appear to use this information about the behaviors of others to make determinations as to whether to interact with these individuals in future situations in a prosocial or antisocial way. However, there is still a need to better understand the multi-directionality surrounding prosocial responding in order to further explore the developmental trends in the various forms of prosocial behaviors. Evolutionary adaptiveness, cognitive and social developmental theories, as well as neurobiological findings provide explanations as to infants' abilities to engage in these other-oriented behaviors at an early age. Therefore, explanations of the emergence of these behaviors could be characterized as either an innate capacity to make conceptual representations of emotional and psychological states of others, or as being a motivation to share perceptions and emotions of others which could combine with gained social understanding to generate prosocial responses. These alternative theories are often singularly provided in an attempt to explain prosocial development, but they need not be mutually exclusive and a combination of these theories provides a more well-rounded

explanation as to the development of prosociality and the differences in the trajectory of the various forms that they are displayed in.

After a thorough review of the literature to date it is clear that there are various gaps in this particular area of study. Research observing the development of prosocial tendencies, inequity aversion, and preference for resource equality has been conducted across a variety of age groups (Hamlin et al., 2007; Kuhlmeier, Wynn & Bloom, 2003; Scola et al.,2015; Hamlin & Wynn, 2011; Hamlin et al., 2011; Geraci & Surian, 2011; Shaw & Olsen, 2012). However, to our knowledge, all of the previous research has focused either on the responses of infants and toddlers toward the agent acting in a prosocial or antisocial manner, or has been based on the distributive or helping behaviors of infant participants. While this research provides an understanding of early moral and social development and its effects on prosocial responding, little is known about infant evaluations of individuals on the *receiving* end of prosocial and antisocial behaviors by means of unequal resource distribution.

Additionally, few studies observing reactions to prosocial and antisocial behaviors have included non-social entities as either active or passive agents to allow for a behavioral comparison of infant responding to anti-social events directed toward inanimate, non-social (lacking facial features) agents. By comparing any behavioral differences that occur toward both social and non-social entities, we can gain a clearer understanding of the factors that are driving empathic and prosocial responses from infants.

The purpose of the current study was to determine if infants in their second year of life prefer receiving individuals that have previously been treated prosocially by

another, or receivers that have been treated antisocially, thereby demonstrating an empathic emotional response to individuals that are victims of antisocial behaviors. This was achieved through the behavioral observation of infants that were exposed to a paradigm of prosocial and antisocial resource distribution. The resource distribution paradigm consisted of unequal distribution trials that used both animate and inanimate agents on the receiving end of either prosocial or antisocial resource distribution. With the aforementioned literature in mind, it was hypothesized that infants would demonstrate a greater preference for receiving agents that are provided with fewer resources compared to the alternate receiver due to an affective empathic response by the infant observer. Furthermore, it was hypothesized that when the receiving agents were inanimate the infant would show a greater preference for the agent that was distributed a greater number of resources.

CHAPTER III

METHODOLOGY

Participants

Participants were 27 infants (9 males and 18 females) and their caregivers observed in the Developmental and Psychophysiology laboratory at Oklahoma State University. A two-tailed, *a priori* statistical power analysis was carried out (GPower 3.1) in order to estimate sample size. This was based on data from studies that assessed infant preference for equitable resource distribution at 12 and 16 months of age (Geraci & Surian, 2013; Sommerville & Schmidt, 2012). These studies had effect sizes (ES) ranging from .25 to .56 (*d*) depending on the specific constructs being measured within each experiment, which are small to medium ES according to Cohen's conventions (1988). With this in mind the average estimated sample size needed for the current study was approximately N = 23 for this within-group comparison. One infant did not complete all six trials and the procedure was aborted at the request of the caregiver due to excessive distress, and one infant's responses were unable to be code due to equipment malfunction, so a final sample size of 25 infants was analyzed. All infants were full-term and healthy (8 caesarian sections and 17 natural births). Participants were assessed between the ages of 16 and 20 months (M = 79.68 weeks, *SD* = 4.96). Maternal ages ranged between 24 and 48 years (*M* = 34.35). Maternal ethnicity was reported with 80%

being Caucasian, 4% Asian, and 16% claiming multiple ethnicities. Paternal ethnicity was also reported with 68% being Caucasian, 12% African American, 4% Native American, 4% Asian, and 12% claiming multiple ethnicities. Sixty-eighty percent of the caregivers were married, 4% were separated, 8% were not married, 4% were divorced, and 12% were remarried. Reports of maternal education level indicated that 28% had completed post-graduate work, an additional 56% were college graduates, 8% had completed some college courses, 4% were votech graduates, and 4% had completed some vo-tech courses. Reports of paternal education level indicated that 32% had completed post-graduate work, 24% were college graduates, 28% completed some college, 8% were vo-tech graduates, 4% completed some votech, and 4% had graduated high school. Just over half of caregivers (56%) had a monthly income over $4000, with 32% claiming to receive some form of state or federal financial assistance.

Sample age justifications. The age of 18 months was chosen in response to the findings of similar studies in this area of research. In their study on the social evaluation capabilities of 3, 6, and 10-month-old infants Hamlin and colleagues (2007) found that 10-month-old infants looked longer when the climber approached the hindering character, suggesting that the infants were surprised about this reaction, assuming that they expected the negatively-treated climber to show an aversion towards the character that had hindered it. Six-month-old infants demonstrated a different response and looked equally towards both events of approach to the helper and the hinderer, suggesting that even though they had preferred the helping to the hindering character, they did not attribute these attitudes to the protagonist as well. Therefore, infants may be developmentally capable of social evaluation prior to their ability to infer the evaluations

of others. In other words, due to increased cognitive complexity infants may not begin to attribute their own social evaluations to the affected third party (protagonist) until approximately 10 months of age. Additionally, Geraci and Surian (2011) examined the ability for 12 and 18-month-old infants to evaluate subtle moral dilemmas involving the inequity of resource distribution finding that only the older age group indicated a preference for the fair distributor. The combination of (a) the cognitive development required for the complex social evaluations required for the current study that were not found to occur until 10 months of age and (b) the previous findings of preference that did not occur until 18 months of age provide the rationale for the age chosen for the current study.

Recruitment. Participants were recruited through the use of flyers distributed across the university campus, local childcare facilities, and other infant/caregiver organizations located in and around Stillwater, OK. Social media advertisements describing the study were used in order to increase awareness. Participants of this study were treated in accordance with the regulations of the Institutional Review Board of Oklahoma State University (see Appendix F).

Measures and Materials

Demographic questionnaire. Primary caregivers were administered a demographic questionnaire in order to collect general information regarding the infants and the members of their immediate families. Information on income level, marital status, number of siblings, birth order, household language (i.e. monolingual vs. bilingual), and parental education level was gathered (see Appendix C).

Distribution display. All events in the distribution paradigm occurred in a custom wooden display (48" L X 34" H X 22" D) that emulated a "black box theatre" space (see Figures 1-6). Two receiving agents were placed on either side of the "stage" (20 in. apart). A stationary wooden peg was permanently situated in front of each of the receiving agents, which secured the distributed resources in place during the test phase of the procedure. A cut-out in the rear wall of the display allowed for the distributing agent to enter and distribute the resources to the receivers on either side of the stage. The experimenter operating the distributing agent was hidden from the view of the participants by a black, floor-length dividing curtain. Additionally, a small curtain covering only the front of the stage was raised during the test phase and lowered between each of the six test trials (discussed below) to prevent the infants from becoming distracted by changes taking place between trials).

Agents. The animate distributing and receiving agents consisted of 7 different plush stuffed animals of various colors. All were Ty brand to allow for consistency in the style across each of the 7 agents and the "hands" of the agents were sewn together to conceal the experimenter's gloved hand. The inanimate receiving agents consisted of 6 plush geometric shapes (7 x 7 in) of various colors. The size and fabric of the animate agents was taken into account when creating the inanimate agents to ensure as much consistency as possible between the two types of agents. An animate agent was still used as the distributor in the inanimate conditions, which explains the discrepancy between the numbers of animate to inanimate agents (see Appendix D for agent key).

Procedure

General Procedure

The study took place in a small, sound reducing room, while researchers conducted the distribution paradigm from an adjoining experimenter room. The room contained a stationary adult chair and the distribution display. Upon arrival to the lab, primary caregivers were asked to complete the demographic questionnaire and then encouraged to engage in free play with their infant for approximately 10 minutes in order to acclimate the infant to the environment, decreasing distraction and anxiety during testing. At the conclusion of the acclimation phase, the caregiver was presented with a sample of the resource distributed to agents in the testing phase. The caregiver was instructed, upon receiving the sample resource, to become excited, attempt to share the resource with their infant and try to elicit the same excitement in their infant to help establish that it is a desirable resource. The experimenter provided caregivers with short scripts to be used in order to maintain as much consistency as possible in the level of enthusiasm portrayed by the caregivers. Following the acclimation phase, the infant was seated on the caregiver's lap facing the distribution display at which time they watched 6 distribution trials (3 animate and 3 inanimate), each followed by a choice phase. The caregiver was instructed to remain neutral and not attempt to elicit a choice from the infant or influence the infant in any way.

Distribution Phase

The test phase began when the curtain opened to reveal two agents positioned on either side of the display with empty wooden pegs in front of each of them. A third agent emerged from the cut out in the back of the stage and distributed resources to the

receiving agents. Using exaggerated movements, the distributor allocated the resources in a 5:1 distribution ratio. The resources were similar to the one provided to the caregiver during the acclimation phase, but included a variety of colors to stimulate attention of the infant and ensure that the infant could distinguish the resources as individual from one another from a distance. After the distributing agent dispersed all six resources to the receiving agents, it disappeared through the cut out in the back of the display and the experimenter closed the front curtain, hiding the receiving agents from view.

Counterbalancing. To control for infant preference of color or animal type of the animate agents, each animate agent needed to be equally likely to be used as the distributing agent. This created a total of 7 possible conditions, which were randomized across the 25 participants. Under each condition the pairing of agents for each trial was randomized, creating as many unique combinations of agents as possible. Within each condition the order of the six trials was randomized to counterbalance the animate and inanimate trials. The position of the rich receiver and poor receiver was also randomized across trials to prevent habituation. Finally, the order in which the resources were distributed between agents was also counterbalanced. Resources were distributed in groups of 1, 2, and 3. To reduce participant bias, each receiver was approached twice during each trial by the distributor, with the rich receiver getting resources distributed in groups of 2 or 3 and the poor receiver getting one resource and being approached a second time, but not awarded a resource.

Choice Phase

Following each of the six trials, a second experimenter, blind to whether the receiving agents were treated prosocially or antisocially, emerged from behind the curtain

and administered a forced choice procedure by presenting both of the receiving agents at an equal distance from the infant. Experimenters were instructed to look directly at the infant and encourage the infant to choose between the two receivers by asking "which one do you like?" and "can you pick one?" Infants were prompted until they reached for one of the agents. If infants did not make a manual response for 2 minutes it was counted as "no choice". Following the manual response, infants were allowed to play with their chosen receiving agent for a short period of time before moving on to the next distribution trial. Reaching and grasping behavior were measured to indicate preference toward the agents, but only when the behavior was preceded by a look toward that same agent. Coding for reaches differed for that of grasps in that the infant would have to take hold of the agent and remove it from the experimenter's hand to be coded as a grasp and signify the end of the trial. Additionally, the total duration of infant looking toward each of the agents was recorded. Caregiver interference was also coded on a 3 point Likert scale as subtle movements or encouragements to choose from the caregiver may have introduced a bias (see Appendix D). These behavioral measures were video recorded using a GoPro camera and chest mount harness to be coded offline at a later time. Using a GoPro camera attached to the experimenter allowed for minor adjustments to be made to the angle of the camera view, ensuring that the camera was always pointed directly toward the infant regardless of infant movement and allowing for subtle eye movements and reaches in infant responses to be captured.

CHAPTER IV

FINDINGS

The purpose of this study was exploratory in nature as research on the social evaluations of *receiving* agents has, to our knowledge, not yet been conducted. It was hypothesized that infants would look toward and reach for the animate receiver that was given fewer resources by the distributing agent significantly more than they would reach for and look toward the animate receiver that was given a greater number of resources by the distributing agent. Additionally, it was hypothesized that these behaviors would be influenced when social context was removed from the distribution paradigm. More specifically, when animate social features were removed from the receiving agents, infants would reach for the inanimate receiver that was given a greater number of resources by the distributing agent significantly more than they would reach for or look toward the inanimate receiver that was given a smaller number of resources by the distributing agent.

Observation Oriented Modeling (OOM; Grice, 2011; Grice et al., 2012) was used to analyze the data. OOM allows for the comparison of the actual manual choices and looking times made by each infant during each trial with expected patterns of outcomes and these results were summarized using accuracy indices. Depending on the statistical test, traditional null hypothesis testing (NHST) relies on a variety of assumptions, such as

homogeneity and normality of population distributions, whereas OOM utilizes randomization tests that are free of such assumptions. Many of our agent preference measures violated these assumptions, but because OOM is similar to non-parametric methods, we were able to avoid the strict assumptions of NHST and focus attention on the manual choices and looking times for each agent by the individual infants in the study. An Ordinal Pattern Analysis (Grice et al., 2015) in OOM was used to test the predictions previously outlined. Specifically, the expected ordinal pattern analysis for manual reaching behavior and looking times in the animate agent condition was as follows: agent receiving fewer resources > agent receiving greater resources. The expected ordinal pattern analysis for manual reaching behavior in the inanimate agent condition was: agent receiving greater resources > agent receiving fewer resources.

In addition to OOM, NHST was also used, where appropriate, to analyze the data. For this within-subjects design, dependent samples *t*-tests were conducted to determine if there were significant differences in agent preference toward the rich versus the poor receiver on measures of total number of looks per unit of time, total duration of looks per unit of time, and the total sum of grasps. Due to the variability in trial times both between- and within-subjects, the total number of looks and duration of looks were scaled by dividing the scores from each trial by the number of seconds each trial lasted. The sum of the three animate and inanimate trials was then used for analysis.

OOM Findings

Hypothesis 1

The primary purpose of the present study was to determine if infants would make social evaluations of animate receiving agents that had been distributed resources

unequally. More specifically, it was predicted that infants would indicate a preference for an agent that had received a smaller number of resources in the distribution paradigm compared to an agent that had received a larger number of resources.

With regard to the number of looks per unit of time toward the animate receivers of resources, the expected ordinal pattern for each infant was as follows: animate poor > animate rich. Results indicated that 14 of the 25 infants matched this pattern with respect to the number of looks toward animate agents. This frequency can be converted to a percentage (56.00%) which is referred to as the Percent Correctly Classified (PCC) in an Ordinal Pattern Analysis. A simple randomization test was then used to assign a probability statistic, referred to as the chance value (or *c*-value), to the PCC. Based on 1000 random trials for number of looks per unit of time, the c-value was .14 indicating that a PCC of at least 56% was likely to occur by chance 14% of the time for the current data and expected ordinal pattern.

For the duration of looks per unit of time toward the animate receivers of resources, the overall ordinal pattern (animate poor > animate rich) was again examined and results indicated that 14 of the 25 infants (PCC = 56.00, *c*-value = .32) matched the expected pattern and looked more frequently toward the animate poor receiver compared to the animate rich receiver. Additionally, an ordinal pattern analysis (animate poor > animate rich) of the sum of grasps indicated that only 10 of 25 infants (PCC= 40.00, *c*-value = .68) chose the animate poor receiver over the animate rich receiver. Two infants did not complete a grasp to either agent. When the infants that did not make a manual choice were removed from the analysis 10 of 23 infants (PCC = 43.48, *c*-value = .65) choose the animate poor receiver over the animate rich receiver (see Table 1).

Hypothesis 2

An identical set of Ordinal Pattern Analyses was conducted for the responses to the *inanimate* receiving agent. The expected ordinal pattern outcome for inanimate trials was as follows: inanimate rich > inanimate poor. With respect to the total number of looks per unit of time, results indicated that 16 of the 25 infants (PCC = 64.00, *c*-value = .02) matched the ordinal pattern and looked more frequently toward the inanimate rich receiver compared to the inanimate poor receiver, which was consistent with the original hypothesis for inanimate agent preference. Similarly, 13 of 25 infants (PCC = 52.00, *c*-value = .41) yielded longer durations to the inanimate rich receiver compared to the inanimate poor receiver. However, similar to the manual choices in the animate trials, only 7 of 25 infants (PCC = 28.00, *c*-value = .81) completed grasps to the rich receiver compared to the poor receiver. Three infants did not complete a grasp to either agent. When the infants that did not make a manual choice were removed from the analysis this ratio increased to 7 out of 22 (PCC = 31.82, *c*-value = .81) infants choosing completed grasps to the rich compared to the poor receiver (see Table 1).

NHST Findings

Hypothesis 1.

To determine if infants indicate a preference for an *animate* rich receiver that had received a greater number of resources in the distribution paradigm compared to an *animate* poor receiver that had received a smaller number of resources, paired samples *t*-tests were conducted to analyze whether there were significant mean differences in total number of looks per unit of time, total duration of looks per unit of time, and sum of grasps toward the poor and rich receiver in the animate condition. Using Bonferroni

adjustment to protect against a type I error, a more conservative family-wise error rate of $p < .025$ was used (Hays, 1988). Results indicated that there was not a significant difference in the total number of looks toward the poor ($M = .651$, $SD = .381$) and rich ($M = .531$, $SD = .269$) receivers; t (23) = 1.706, $p = .101$. In keeping with these findings, there was also not a significant difference (t[22] = .741, $p = .466$) between the total duration of looks per unit of time toward the poor ($M = .972$, $SD = .455$) and rich receivers ($M = .905$, $SD = .419$), nor was there a significant difference (t[24] = .137, $p = .892$) in the sum of grasps toward the poor ($M = 1.36$ $SD = 1.036$) and rich receivers ($M = 1.32$, $SD = .988$) (see Table 2).

Hypothesis 2.

An identical set of paired samples *t*-tests (using the same family-wise error rate of $p < .025$) was run for *inanimate* receiving agents which also indicated that there were no significant differences for total number of looks per unit of time (t [23] = -1.35, $p = .190$) toward the poor ($M = .467$, $SD = .217$) or rich ($M = .530$, $SD = .283$) receiver, no significant differences for total duration of looks per unit of time (t[24] = .398, $p = .694$) toward the poor ($M = .820$, $SD = .543$) or rich ($M = .766$, $SD = .418$) receiver, and no significant differences for sum of grasps (t[24] = 1.413, $p = .170$) toward the poor ($M = 1.52$, $SD = 1.09$) or rich ($M = 1.08$, $SD = 1.08$) receiver (see Table 2).

Exploratory Analyses.

Financial Assistance. Research by Paulus (2015) indicates that a lack of resources may be influential enough to overcome the negative behavior associated with unequal resource distribution. In other words, a lack of resources in a community may increase the tendency to distribute unevenly in order to reduce the tendency of wasting valuable

resources. Additionally, it was found that in preschool children, low socioeconomic status increased the likelihood that children engaged in prosocial behavior compared to high socioeconomic status ((Gunote, Cotzia, Sandhu, & Siwa, 2017). With this in mind, in addition to testing our original hypotheses, exploratory analyses were conducted to determine if there were any preferential differences between the poor and rich receivers for children whose parents were not recipients of some level of government financial assistance and children whose parents were recipients of government financial assistance.

A set of Ordinal Pattern Analyses was conducted for the responses to the *animate* receiving agent (see Table 3). The expected ordinal pattern outcome for both financial assistance and non-financial assistance was identical to that of the initial hypothesis: animate poor > animate rich. In the group that received financial assistance, 5 of 8 infants (PCC = 62.50, *c*-value = .21) looked more frequently toward the animate poor receiver compared to the animate rich receiver, 5 of 8 infants (PCC = 62.50, *c*-value = .35) looked longer to the animate poor receiver compared to the animate rich receiver, and 7 of 8 infants (PCC = 87.50, *c*-value = .01) completed grasps to the poor receiver compared to the rich receiver. In the group that did not receive financial assistance 9 of 17 (PCC = 52.94, *c*-value = .31), looked more frequently toward the animate poor compared to the animate rich, 9 of 17 (PCC = 52.94, *c*-value = .51) looked longer to the animate poor compared to the animate rich, and only 3 of 17 (PCC = 17.65, *c*-value = .99) completed grasps to the poor receiver compared to the rich receiver.

Ordinal Pattern Analyses were conducted for the responses to the *inanimate* receiving agent (see Table 4). The expected ordinal pattern outcome for both financial assistance and non-financial assistance was again identical that of the initial hypothesis:

inanimate rich > inanimate poor. In the group that received financial assistance, 2 of 8 infants (PCC = 25.00, *c*-value = .77) looked more frequently toward the inanimate rich receiver compared to the inanimate poor receiver, 3 of 8 infants (PCC = 37.00, *c*-value = .72) looked longer to the inanimate rich receiver compared to the inanimate poor receiver, and 1 of 8 infants (PCC = 12.50, *c*-value = .97) completed grasps to the rich receiver compared to the poor receiver. In the group that did not receive financial assistance 14 of 17 (PCC = 82.35, *c*-value = .002), looked more frequently toward the inanimate rich compared to the inanimate poor, 10 of 17 (PCC = 58.82, *c*-value = .29) looked longer to the inanimate rich compared to the inanimate poor, and only 6 of 17 (PCC = 35.29, *c*-value = .58) completed grasps to the rich receiver compared to the poor receiver.

In addition to OOM analyses, NHST was also analyzed using paired samples *t*-tests. Again, to protect against a type I error, a family-wise error was maintained by using a significance level of $p = .025$ (Hays, 1988). These analyses indicated that there were no significant differences for total number of looks per unit of time, total duration of looks per unit of time and sum of grasps between the animate poor receiver and the animate rich receiver for children of parents who were not recipients of financial or government assistance (see Table 5). With regard to the results of these same analyses comparing the *inanimate* poor receiver and the *inanimate* rich receiver, analyses indicated that children of parents who were not recipients of financial or government assistance looked significantly more often per unit of time ($t[16] = .-3.223$, $p = .005$) toward the rich ($M = .581$, $SD = .299$) than the poor receiver ($M = .449$, $SD = .209$). Significant differences

were not found for duration or sum of grasps in the inanimate condition for the NO financial assistance group (see Table 5).

An identical set of paired *t*-tests was conducted for the group that *did* receive financial assistance. With regard to total number of looks per unit of time and total duration of looks per unit of time in the *animate* trials, no significant differences were found, although duration of looks per unit of time was approaching significance ($t[6] = 2.670$, $p = .037$) at $p < .025$ (see Table 6). In addition, there were significantly more grasps of the animate poor receiver ($M = 2.00$, $SD = .926$) than the animate rich receiver ($M = .75$, $SD = .463$) in this financial/government assistance group ($t[7] = 3.989$, $p = .005$). Finally, no significant differences were found in preference measure toward the inanimate receiver for the financial assistance group (see Table 6).

Sibship. Research by Ziv and Sommerville (2016) found that the presence of siblings led to increased looking behavior toward unfair and unequal outcomes in a violation of expectation paradigm. To determine if the presence or absence of siblings in the home had an effect on measures of agent preference, sets of ordinal pattern analyses were conducted (see Table 7). For the *animate* trials, the expected ordinal pattern outcome for both siblings and only children was identical to that of the initial hypothesis: animate poor > animate rich. In the group that had siblings, 5 of 13 infants (PCC = 38.46, *c*-value = .58) looked more frequently toward the animate poor receiver compared to the animate rich receiver, 9 of 13 infants (PCC = 69.23, *c*-value = .15) looked longer to the animate poor receiver compared to the animate rich receiver, and 7 of 13 infants (PCC = 53.85, *c*-value = .52) completed grasps to the poor receiver compared to the rich receiver. In the group without siblings, 9 of 12 (PCC = 75.00, *c*-value = .08), looked more

frequently toward the animate poor compared to the animate rich, 5 of 12 (PCC = 41.67, *c*-value = .82) looked longer to the animate poor compared to the animate rich, and only 3 of 12 (PCC = 25.00, *c*-value = .87) completed grasps to the poor receiver compared to the rich receiver.

For the *inanimate* receiving trials, the expected ordinal pattern outcome for infants both with and without siblings was again identical that of the initial hypothesis: inanimate rich > inanimate poor (see Table 8). In the group that had siblings, 8 of 13 infants (PCC = 61.54, *c*-value = .18) looked more frequently toward the inanimate rich receiver compared to the inanimate poor receiver, 6 of 13 infants (PCC = 46.15, *c*-value = .70) looked longer to the inanimate rich receiver compared to the inanimate poor receiver, and 4 of 13 infants (PCC = 30.77, *c*-value = .88) completed grasps to the rich receiver compared to the poor receiver. In the group without siblings, 8 of 12 (PCC = 66.67, *c*-value = .06), looked more frequently toward the inanimate rich compared to the inanimate poor, 7 of 12 (PCC = 58.33, *c*-value = .25) looked longer to the inanimate rich compared to the inanimate poor, and only 3 of 12 (PCC = 25.00, *c*-value = .65) completed grasps to the rich receiver compared to the poor receiver.

To analyze using NHST, sets of paired samples t-tests were conducted. Again, to protect against a type I error, a family-wise error was maintained by using a significance level of $p = .025$ (Hays, 1988). Regardless of group (siblings versus no siblings), there were no significant mean differences between the poor and rich receiver for any of the preference measures (see Tables 9 & 10).

Gender Comparisons. It is widely accepted across psychological research that there are small, but distinct gender differences in emotional capabilities that, even in

infancy, favor females (Brody, 2000; Chaplin & Aldao, 2013). To determine if gender had an effect on measures of agent preference, sets of ordinal pattern analyses were conducted (see Table 11). For the *animate* trials, the expected ordinal pattern outcome for both males and females was identical to that of the initial hypothesis: animate poor > animate rich. Consistent with our hypothesized pattern, in the male group, 6 of 8 infants (PCC = 75.00, *c*-value = .14) looked more frequently toward the animate poor receiver compared to the animate rich receiver, but for duration of looks (PCC = 37.50, *c*-value = .86) and sum of grasps (PCC = 25.00, *c*-value = .83) a majority of infants did not follow the hypothesized pattern. In the female group, 11 of 17 (PCC = 64.71, *c*-value = .17), looked for longer durations toward the animate poor compared to the animate rich, but only a minority of female infants looked more frequently (PCC = 47.06, *c*-value = .42) or completed grasps (PCC = 47.06, *c*-value = .59) to the poor receiver compared to the rich receiver.

For the *inanimate* receiving trials, the expected ordinal pattern outcome for both male and female infants was again identical to that of the initial hypothesis: inanimate rich > inanimate poor (see Table 12). In the male group, 6 of 8 infants (PCC = 75.00, *c*-value = .07) looked more frequently toward the inanimate rich receiver compared to the inanimate poor receiver, but this pattern once again did not extend to duration of looks (PCC = 50.00, *c*-value = .65) or completed grasps (PCC = 37.50, *c*-value = .65) to the rich receiver compared to the poor receiver. In the female group, 10 of 17 (PCC = 58.82, *c*-value = .15), looked more frequently toward the inanimate rich compared to the inanimate poor and 9 of 17 (PCC = 52.94, *c*-value = .38) looked longer to the inanimate

rich compared to the inanimate poor, but only 4 of 17 (PCC = 23.53, *c*-value = .88) completed grasps to the rich receiver compared to the poor receiver.

To analyze each gender's responses using NHST, sets of paired samples *t*-tests were conducted. Again, to protect against a type I error, a family-wise error was maintained by using a significance level of $p = .025$ (Hays, 1988). Regardless of group (male versus female), there were no significant mean differences between the poor and rich receiver for any of the preference measures (see Tables 13 & 14).

Age Comparisons. Infants make many advances in their second year of life and the ability to evaluate the effects of negative actions on passive receivers requires perspective taking, a process which some suggest does not emerge until 18 months of age (Thompson, 1987). To determine if infants 18 months and older differed in their agent preference, sets of ordinal pattern analyses were conducted (see Table 15). For the *animate* trials, the expected ordinal pattern outcome for both ages was again identical to that of the initial hypothesis: animate poor > animate rich. In the infants 18 months and older, 9 of 16 infants (PCC = 56.25, *c*-value = .33) looked more frequently, and exactly half of the infants (8 of 16) looked longer (PCC = 50.00, *c*-value = .60) or completed grasps (PCC = 50.00, *c*-value = .39) to the poor receiver compared to the rich receiver. Infants younger than 18 months, 5 of 9 (PCC = 55.56, *c*-value = .23), looked more frequently and 6 of 9 (PCC = 66.67, *c*-value = .27) infants looked for longer durations, but only 2 of 9 (PCC = 22.22, *c*-value = .94) completed grasps toward the animate poor compared to the animate rich.

For the *inanimate* receiving trials, the expected ordinal pattern outcome for both age groups of infants was again: inanimate rich > inanimate poor (see Table 16). In the

18 months and older group, fewer than half of the infants looked more frequently (PCC = 43.75, *c*-value = .31), looked for longer durations (PCC = 25.00, *c*-value = .87) or completed grasps to the rich receiver compared to the poor receiver, which is inconsistent with the hypothesized pattern. In the infants younger than 18 months of age, 8 of 9 (PCC = 89.89, *c*-value = .01) looked more frequently toward the inanimate rich compared to the inanimate poor and 7 of 9 (PCC = 77.78, *c*-value = .08) looked longer to the inanimate rich compared to the inanimate poor, but only 3 of 9 (PCC = 33.33, *c*-value = .66) completed grasps to the rich receiver compared to the poor receiver.

To analyze using NHST, sets of paired samples *t*-tests were conducted. Again, to protect against a type I error, a family-wise error rate was maintained by using a significance level of $p = .025$ (Hays, 1988). Regardless of age, there were no significant mean differences between the poor and rich receiver for any of the preference measures (see Tables 17 & 18).

Side Preferences. A study published while the present study was taking place indicated that infants may be exhibiting a side preference during the choice phase when social evaluations are being assessed (Nighbor, Kohn, Normand, & Schlinger, 2017). To assess whether or not infants were responding to a side preference as opposed to making a social evaluation, paired samples *t*-tests were conducted. There were no significant mean differences between the left and the right side when presenting infants with the agents (see Table 23).

Condition Order. As previously mentioned, the trial orders in this study were counterbalanced to control for order effects and agent color preference. There were a total of seven different conditions of various trial orders that were randomly assigned to each

participant. To assess the effectiveness of this randomization, the primary results from the various analyses above were examined for each infant. Specifically, a one-way repeated subjects ANOVA was conducted. Results indicated that condition orders did not have an effect on any measures of agent preference (see Table 24). This indicates that trial order was not responsible for differences (or lack thereof) in agent preference by the infant.

CHAPTER V

DISCUSSION

Research observing the development of prosocial tendencies and preference for resource equality has been conducted across a variety of age groups (Hamlin et al., 2007; Kuhlmeier, Wynn & Bloom, 2003; Scola et al., 2015; Hamlin & Wynn, 2011; Hamlin et al., 2011; Geraci & Surian, 2011; Shaw & Olsen, 2012). However, to our knowledge, all of the previous research has focused either on the responses of infants and toddlers toward the agent acting in a prosocial or antisocial manner, or has been based on the distributive or helping behaviors of infant participants. While this research provides an understanding of early moral and social development and its effects on prosocial responding, little is known about infant evaluations of individuals on the *receiving* end of prosocial and antisocial behaviors by means of unequal resource distribution. The purpose of the current study was to determine whether infants prefer receiving individuals that have previously been distributed a greater number of resources by another, or receivers that were distributed fewer resources by another. By observing how infants react to the receivers of unequal resource distribution, we can gain a better understanding of primitive empathic responding, providing a clearer picture of how early empathic behaviors develop, and allow researchers to draw parallels between primitive empathy and more mature forms of empathy found in older children and adults.

Hypothesis 1

The purpose of Hypothesis 1 was to determine if infants showed a preference toward a poor recipient of resources compared to a rich recipient of resources, thereby supporting the contention that infants have the capacity to make social evaluations toward individuals that are treated unfairly and potentially responding empathically toward recipients of fewer resources. While previous research (Geraci & Surian, 2016) has found that infants of similar age to our participants engage in social evaluation toward an *acting* distributing agent, the present study focused on the social evaluation of *passive* receiving agents. In the animate trials, more infants were found to look more frequently and for longer durations toward the receiving agent that was distributed fewer resources, namely, the poor receiver. While these findings are consistent with our hypothesis, only a small majority (56.00%) of the infants followed our hypothesized pattern. Mean differences of number of looks and duration of looks between the poor and rich receivers were not significant when analyzed using NHST. When infants made a manual choice between the two receivers, (i.e., attempted to grasp), a greater number of infants either chose evenly between poor and rich receivers or chose the rich receiver more often and again, mean differences in manual choice of receivers were not significant. Though a majority of infants did follow the expected pattern with regard to the number (56.00%) and duration (56.00%) of looks, these numbers were just over half for both measures, which does not provide substantial evidence that infants are being motivated by social evaluation to choose one receiver over the other. Additionally, only a minority of infants (40.00%) made a manual choice toward the poor animate receiver, which is inconsistent with our hypothesized pattern. These findings suggest that while a small majority of infants may

be capable of socially evaluating a passive receiving agent, it may also be fundamentally different from their evaluations of an acting distributing agent as these findings were weak, relative to those previously discussed that provided a basis for this study. Alternatively, there could be components of our methodology that are influencing infant behaviors.

Research indicates that when making social evaluations based on equity distributions, infants as young as 10 months of age take social contexts such as deservingness and merit into consideration (Meristo & Surian, 2013). Further, these expectations are found to increase across infancy as infants become capable of more complex cognitive processes (Surian & Franchin, 2017). In the present study, the infants were not provided any information regarding the previous behaviors of the passive receiving agents. It is plausible that the inconsistencies in preference measures are due to infants of this age attempting to determine merit of the receiving agents. As the distribution paradigm in the present study did not provide any social context that would allow for the appraisal of deservingness or merit, it is possible that the conflicting findings between looking behaviors and manual choice is being influenced by the lack of social context. Similarly, receiving agents remained static during the distribution paradigm, giving no indication that the receivers were "excited" by being recipients of a greater number of resources or were ″disappointed″ by being recipients of fewer resources. A lack of response by the receiving agents may have been interpreted by the infants as indifference toward the allocated resources, either toward the resources themselves, or toward the inequitable distribution. If this is the case, it cannot be

expected that infants would empathize with the poor agent, as empathy is a response to positive or negative emotions, but not neutral.

The lack of response by the receivers was a result of a direct methodological choice to reduce perceptual bias in response differences. In the hill climbing paradigm used by Hamlin and colleagues (2007), the protagonist 'climber' bounced after being helped up the hill by a 'helping' agent. The findings were robust, but were challenged by Scarf and colleagues (2012) when they demonstrated that the infants may not have been responding based on their social evaluations, but their perceptual biases of the bouncing agent. Specifically, infants chose the helping agent when the protagonist bounced after being helped up the hill, but chose the hindering agent when the protagonist bounced after being 'pushed' down the hill. When the protagonist bounced in both the helping and the hindering trials, the infants showed no significant differences in preference and chose both equally. Therefore, while the inclusion of an 'emotional' response by the receiving agents may have increased clarity of how these agents *should* feel in response to inequitable resource distribution, it may also have introduced a confounding perceptual bias.

Hypothesis 2

The purpose of the second hypothesis was to determine if there were behavioral differences in preference toward the receiving agents when resources were distributed unevenly between two non-social entities, or inanimate receiving agents. Once again, previous research (Meristo, Strid, Surian, 2016) has evaluated differences in preference between animate and inanimate distributing agents, but the present study focuses on the differences in preference toward passive receiving agents. Consistent with our

hypothesis, a majority of infants (64.00%) looked more frequently toward the inanimate rich receiver compared to the inanimate poor receiver. More infants (52.00%) were also found to look for longer durations toward the rich versus the poor receiver, but similar to the animate trials, this number was just over half. Finally, these preference behaviors did not extend to the manual choice measure, with a minority of infants (40.00%) choosing the rich over the poor receiver, and again there were not significant mean differences for any of the measures of agent preference when analyzed through NHST.

Based on basic evolutionary theory and natural selection (Darwin, 1965), humans are motivated to seek out the best possible source for resources that aid in survival and reproduction. Therefore, we hypothesized that in the absence of social entities (i.e. agents with animate facial features), infants would be more likely to demonstrate a preference toward the rich inanimate receiver, thereby indicating a preference for aligning with the best possible outcome for survival. Though a greater number of infants (56.00%) looked more frequently and longer at the rich receiving agent with more resources to potentially "share", their grasps did not follow this same pattern. Previous research using inanimate receiving agents found that infants do not place similar expectations of equitable resource distribution on the distributing agent when allocating resources to inanimate agents and infants look equally between the fair and unfair distributor (Sloan et al., 2012). This is further supported by Gredeback, et al. (2015) who found that neural responses in the p400 ERP, a component of the brain that has been previously linked to empathy and prosocial responding, only occurred when the agents in the paradigm were animate (i.e. had eyes), suggesting that when the social valence is removed from the paradigm, the action is no longer interpreted by the infant as being goal-related (see also appendix E,

section 5). Again, Sloan et al. (2012) and those using similar paradigms are still making claims regarding infant evaluation between fair and unfair animate distributing agents that had distributed to inanimate objects. Thus, they are still evaluating the social actor as being either prosocial or antisocial. In the present study, the distributing agent is still animate even in the inanimate trials, but the infants are only making social evaluations directed toward the passive receiving inanimate agents. In other words, the direction of their social evaluation in the present paradigm is toward inanimate objects, which differs from the previously conducted research. Non-significant differences in NHST results would indicate that in the absence of defining facial features that provide a social context, infants are not likely to indicate a preference. However, a greater number of infants did look more frequently (64.00%) and longer (52.00%) at the inanimate agent with greater resources, which could be an indicator that infants do have an interest in a greater number of resources when issues of morality are minimized.

Overall, the findings of this study were not as robust as those of previous studies using similar paradigms (Geraci & Surian, 2011; Hamlin & Wynn, 2011; Schmidt & Sommerville, 2011). Hamlin et al. (2007) found that infants preferred a prosocial helping agent over an antisocial hindering agent, but did not attribute their own attitudes to the protagonist that had been helped or hindered. In other words, infants may be capable of evaluating the actions of others before there are capable of evaluating the effects of those actions on passive receivers, a process that requires perspective taking, which some suggest is emerging around 18 months of age (Thompson, 1987), the average age of our sample. If perspective taking is just emerging at this time, it would be reasonable to suggest that this cognitive skill may not be developed enough to attribute actions to

passive receivers that are either lacking facial features or lacking previous behavior that would provide a social context for the infant to take on the perspective of.

Exploratory Findings

Financial Assistance. In addition to the proposed analyses, the data were explored to determine if socioeconomic status influenced the outcome of behaviors toward the rich versus the poor receivers in either the animate or the inanimate trials. Socioeconomic status was operationalized based on whether or not the parents were recipients of some form of government financial assistance. OOM analyses indicated that, in the animate trials, the presence or absence of financial assistance may be influencing infants′ social evaluations. Specifically, in the *animate* trials, a majority of the infants that were recipients of financial assistance looked more frequently (62.50%), for longer durations (62.50%), and manually chose (87.50%) the poor agent compared to the rich agent. However, just over half of the infants that do not receive financial assistance looked more frequently and for longer durations at the poor compared to the rich agent. Further, a minority of the non-financial assistance infants actually chose the poor agent over the rich. Traditional NHST analyses provided some support for the OOM findings in that infants whose parents were recipients of financial assistance were significantly more likely to make a manual choice of the animate poor receiver compared to the animate rich receiver, which is in keeping with our hypothesis. In the *inanimate* trials this effect disappeared for infants on financial assistance with significantly fewer than half of the infants looking more frequently (25.00%), for longer durations (37.00%) and manually choosing (12.50%) the rich agent over the poor agent, which is inconsistent with our hypothesis. However, the infants that did not receive financial assistance did fit

the originally hypothesized pattern with a majority of the infants looking more frequently (82.35%) and for longer durations (58.82%) at the rich agent versus the poor agents. However, inconsistent with our hypothesis, a minority (35.29%) of non-financial assistance infants actually made a manual choice of the rich agent compared to the poor agent.

One explanation of these findings is that humans, in general, prefer others who are similar to themselves and are more likely to engage in cooperative or prosocial actions toward similar others compared to dissimilar others. Further, humans often dislike or attempt to avoid individuals who do not appear to be similar. This is not only true for adults, but also holds true for preverbal infants as well (Mahajan & Wynn, 2011). Based on this theory, it is plausible that infants on financial assistance were indicating a preference for the poor receiver versus the rich receiver because the lack of resources indicated more of a similarity to themselves.

Alternatively, early forms of empathy may be responsible for infants from low socioeconomic households preferring receiving agents that are also lacking in resources. As discussed in the literature above, empathy encompasses both affective and cognitive components. Thompson (1987) suggests the cognitive component of perspective taking, a key component to mature empathy, emerges at approximately 18 months of age, similar to the age of our sample. Based on the theories of empathy and prosocial responding in infancy, it is plausible to suggest that infants that have, compared to their peers, experienced unequal resource distribution due to low socioeconomic status in the home may be more capable of (1) taking on the perspective of the animate poor receiver, (2)

understanding how the receiver feels, (3) experiencing that feeling themselves, and (4) being motivated by their empathic response to engage with the poor animate receiver.

Sibship. Recent research by Ziv and Sommerville (2016) found that the presence of siblings led to increased looking behavior toward unfair and unequal outcomes in a violation of expectation paradigm. Descriptive statistics (see Table 22) regarding sibship indicated that families on financial assistance had an average of 1.5 children that lived in the home full time and .75 stepchildren or half-siblings that lived in the home part-time and these two variables were significantly related (see Table 26). In contrast, families not on financial assistance averaged .5 children that lived in the home full time and .29 stepchildren or half-siblings that lived in the home part-time. Using NHST analyses there was not a significant effect of financial assistance on measures of preference when controlling for sibship, nor was there a significant effect of sibship on measures of preference when controlling for financial assistance (see Tables 19 & 20). With this in mind, it may be necessary to consider the influences of financial assistance and sibship separately, as opposed to cumulatively.

OOM analyses indicated that in the animate trials, infants with siblings showed preference for the poor receiver in two of the three preference measures. Though only a slight majority (53.58%) made a manual choice of the poor receiver compared to the rich, a large majority (69.23%) looked at the poor receiver for a longer period of time. Infants without siblings only showed a preference for the poor animate receiver in one of the three measures. In the inanimate trials infants that had siblings preferred the rich receiver in one of three measures of preference, but infants without siblings showed a preference for the rich receiver in two of three measures, with a moderate to large majority looking

more frequently (66.67%) and for longer durations (58.33%) at the rich receiver. While there were no significant differences when analyzed using NHST, OOM results does provide evidence that the presence of siblings may be causing infants to prefer poor receivers more than the rich receivers regardless of whether the agent is animate or inanimate. Similarly, the absence of siblings may be influencing infants to prefer the rich receiver over the poor regardless of agent type.

The increased presence of siblings, stepsiblings, and half-siblings may require infants to engage in sharing and cooperative interactions and observe both fair and unfair resource allocation more frequently. This could promote expectations of fairness in these larger families, thereby influencing infant preferences toward the receiver allocated fewer resources.

Gender. Ordinal pattern analyses did indicate some gender differences with regard to looking behaviors. Specifically, a majority of males looked more frequently (75.00%) at the animate poor compared to the rich, but a majority (64.71%) of females looked for longer durations toward the animate poor. However, both groups only had a minority (< 37.50%) of infants make a manual grasp toward the poor, animate agent. These results are not necessarily contradictory. Both males and females show a looking preference for the animate poor character, with the males looking more *frequently* and the females looking for *longer* durations. In the inanimate trials the male group still indicated a majority (75.00%) were looking more frequently toward the inanimate rich and in the female group a majority (58.82%) looked more frequently and a small majority (52.94%) looked for longer durations toward the inanimate rich, which is consistent with our hypothesized pattern. These differences in looking behaviors between males and females

may be contributing to a lack of robust findings for our original hypotheses when the group is not divided by gender.

Age. Inconsistent with our expectations, only a small majority (56.25%) of infants 18 months and older looked more frequently toward the poor animate agent and this pattern did not extend to the other two preference measures. However, in the group younger than 18 months of age, a majority of infants looked more frequently (55.56%) and for longer durations (66.67%) toward the poor animate receiver compared to the rich. Similarly, in the inanimate trials, the older infants did not fit the expected pattern for any of the preference measures, but a large majority of the younger infants looked more frequently (88.89%) and for longer durations (77.78%) toward the inanimate rich compared to the inanimate poor.

Implications

To summarize, based on our findings it is plausible to suggest that infant's social evaluations of a passive receiving agent differ from their evaluations of an acting distributing agent. While they may be engaging in social evaluation toward both parties, the evidence of social evaluations toward agents making the choice to distribute evenly or unevenly is much stronger than the evidence provided by the current study that infants evaluate the passive recipients of unequal distribution. However, our findings suggest that socioeconomic status, number of siblings present in the home, gender, and age may have an effect on infants' social evaluations of the passive agent. Research focusing specifically on these exploratory findings should be conducted on a wider range of socioeconomic status.

Previous research in this area has aided in informing much of what we already know about prosocial understanding, inequitable resource distribution, and empathic responses to these behaviors. However, in order to gain traction in this area of research and learn more about the developmental trajectories of the various forms of prosocial behaviors we must expand on the current research and supplement the field with new means for the identification of prosociality. Empathy and prosociality are core components to an effective social species, and an understanding of their development (both singularly and collaboratively) is crucial to having a well-rounded understanding of the socialization process of humans.

Limitations and Future Directions

One way that future research can help to clarify the outcome of this study is to provide an opportunity for infants to either distribute or reallocate resources between the rich and poor receivers. Hamlin et al. (2011) found that when given the option to either give or take a treat away from prosocial or anti-social agents, toddlers in the "give a treat" condition distributed treats more often to the prosocial rather than the anti-social agent. Similarly, toddlers asked to "take a treat" removed the treat from the anti-social agent more often than they removed a treat from the prosocial agent. If infants are making social evaluations toward receivers similar to their evaluations of distributors, they would likely be inclined to reallocate resources evenly if given the opportunity, or to distribute additional resources to the poor receiver in an attempt to achieve fairness.

As mentioned previously, neither the poor nor the rich agent responded upon receiving resources. This was purposeful to prevent preference based on any perceptual biases that agent response may have elicited. However, modifying the paradigm to

include some indication that the receivers are happy or unhappy with their allotted resources may be necessary. If having the protagonist 'bounce' upon receiving help leads to preference of the agent nearest the bouncing protagonist as it was found to do in the study by Scarf and colleagues (2012), then it may be necessary to include a different indicator that the agents are interested in the resources. Specifically providing a familiarization trial in which the agents interact with the resources and indicate excitement toward the resources, may be enough to solidify to the infants that receiving more resources would excite them and receiving fewer resources would disappoint them.

Another modification that could be included in a future study would be the inclusion of a parental self-report on the sharing behaviors of their infants in other social situations. Background information on the infants understanding of sharing and fairness would be beneficial and could provide some insight as to how their environment and their interactions with caregivers and peers influence their tendency to make social evaluations regarding unequal resource distribution.

Finally, the sample size and the homogeneity of the participants for the current study may have resulted in a lack of significance in NHST analyses. First, though the sample size was small, it was based on a G*Power analyses from the study by Geraci and Surian (2011), which provided the theoretical basis for this study and did find significant effects. However, as the social evaluation of the current study's design may have been more complex than that of Geraci and Surian (2011) due to the agent in which the social evaluation was directed, a larger sample size may have been required to find an effect. Second, participants from the current study were recruited from a small city in the midwestern United States. This convenience sample, the size of which was further

reduced when grouped by either financial assistance or sibship, did not provide a significant level of variability in ethnicity, socioeconomic status, or education level of the caregivers. The significant differences in responding when comparing infants of parents that receive government assistance to infants of parents who do not should be further explored. Additionally, there was not a significant effect of sibship on measures of agent preference when controlling for financial assistance, nor was there a significant effect of financial assistance when controlling for sibship (see Tables 19 & 20), but families on financial assistance tended to have more children. Obtaining more information on the intertwining effects of number of siblings, age gap between siblings, and measures of socioeconomic status would be a beneficial contribution to this area of research. Further, cultural comparisons should be made with infants from less industrialized countries. The tendency for infants and toddlers to exhibit prosocial behaviors is a product of their environment and socialization experiences (Eisenberg & Fabes, 1998). The observation of an alternative culture to determine if the responses found in the current sample are universal responses that can be found in societies that lack an abundance of resources would also be a positive contribution to this area of study.

Conclusion

The purpose of the present study was to examine a gap in the existing literature on resource distribution and social evaluations in infants. Due to the fact that this study was exploratory in nature we hypothesized that inequitable resource distribution toward passive animate receivers would elicit an empathically related response, motiving infants to choose to interact with the recipient of fewer resources. Additionally, we hypothesized that in the absence of social context when empathic responses are irrelevant, that infants

would be motivated to interact with the recipient of greater resources in an attempt to align themselves with resources that may aide in their survival.

Overall, our findings were not as robust as previous research in this area, but did provide some support for the original hypothesis of infants exhibiting a preference for a poor animate receiver compared to a rich animate receiver, and for infants preferring a rich inanimate receiver. Measures of total number of looks, total duration of looks, and manual choice provided some mixed results, and when the expected ordinal pattern was met, it was often only met by a small majority of infants, and many of the mean differences in between the agents were not significant.

Exploratory analyses indicated that the socio-economic status (SES) of the family may have an effect on the infants' responding. Specifically, low SES infants may be more motivated to choose the poor receiver over the rich receiver in the animate conditions, due to greater similarities and a preference for individuals that are "like them". Further research with larger sample sizes and greater variability in SES would provide more insight into these differences.

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APPENDICES

APPENDIX A
Figures

Figure 1.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

APPENDIX B
Tables

Table 1
Ordinal Pattern Analysis for Measures Agent Preference for Animate and Inanimate Trials

Ordinal Pattern Tested			
Measure	*n*	PCC	*c*-value
Animate: Poor > Rich			
Number of Looks	(14)25	56.00	.14
Duration of Looks	(14)25	56.00	.32
Sum of Grasps	(10)25	40.00	.68
Manual Choosers Only	(10)23	43.48	.65
Inanimate: Rich>Poor			
Number of Looks	(16)25	64.00	.02
Duration of Looks	(13)25	52.00	.41
Sum of Grasps	(7)25	28.00	.81
Manual Choosers Only	(7)22	31.28	.81

Note. Manual Choosers row is an additional Sum of Grasps analysis but includes only the participants that made a manual choice and includes only 22 infants; n indicates (number of infants correctly classified) with total number of cases

Table 2
Paired Samples t-tests for Measures of Agent Preference

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.531(.269)	.651(.381)	1.706	23	.101	-.321
Duration of Looks	.905(.419)	.972(.455)	.741	22	.466	-.153
Sum of Grasps	1.32(.988)	1.36(1.04)	.137	24	.892	-.037
Inanimate						
Number of Looks	.530(.283)	.467(.217)	-1.35	23	.190	.250
Duration of Looks	.766(.418)	.820(.543)	.398	24	.694	-.111
Sum of Grasps	1.08(1.08)	1.52(1.09)	1.413	24	.170	-.406

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 3
Ordinal Pattern Analysis for Measures of Animate Agent by Group – Financial Assistance

Ordinal Pattern Tested – Poor > Rich			
Measure	*n*	PCC	*c*-value
No Financial Assistance			
Number of Looks	(9)17	52.94	.31
Duration of Looks	(9)17	52.94	.51
Sum of Grasps	(3)17	17.65	.99
Receive Financial Assistance			
Number of Looks	(5)8	62.50	.21
Duration of Looks	(5)8	62.50	.35
Sum of Grasps	(7)8	87.50	.01

Note. indicates (number of infants correctly classified) with total number of cases

Table 4
Ordinal Pattern Analysis for Measures of Inanimate Agent by Group – Financial Assistance

Ordinal Pattern Tested – Rich > Poor			
Measure	*n*	PCC	*c*-value
No Financial Assistance			
Number of Looks	(14)17	82.35	.002
Duration of Looks	(10)17	58.82	.29
Sum of Grasps	(6)17	35.29	.58
Receive Financial Assistance			
Number of Looks	(2)8	25.00	.77
Duration of Looks	(3)8	37.00	.72
Sum of Grasps	(1)8	12.50	.97

Note. n indicates (number of infants correctly classified) with total number of cases

Table 5

Paired Samples t-tests for Measures of Agent Preference by Group No Financial Assistance

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.56(.29)	.67(.33)	1.374	15	.190	-.35
Duration of Looks	.94(.44)	.95(.47)	.051	15	.960	-.02
Sum of Grasps	1.59(1.06)	1.06(.97)	-1.643	16	.120	.52
Inanimate						
Number of Looks	.58(.30)	.45(.21)	-3.223	16	.005	.50
Duration of Looks	.80(.46)	.70(.40)	-.588	16	.565	.23
Sum of Grasps	1.12(1.11)	1.35(1.06)	.606	16	.553	-.21

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 6

Paired Samples t-tests for Measures of Agent Preference by Group Financial Assistance

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.47(.22)	.61(.49)	.963	7	.368	-.37
Duration of Looks	.82(.34)	1.03(.45)	2.670	6	.037	-.53
Sum of Grasps	.75(.46)	2.00(.93)	3.989	7	.005	-1.70
Inanimate						
Number of Looks	.41(.21)	.51(.25)	1.022	6	.346	-.43
Duration of Looks	.72(.24)	1.08(.72)	1.482	7	.182	.39
Sum of Grasps	1.00(1.07)	1.88(1.15)	1.698	7	.133	-.79

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 7

Ordinal Pattern Analysis for Measures of Animate Agent by Group – Sibship

Ordinal Pattern Tested – Poor > Rich			
Measure	*n*	PCC	*c*-value
Only Child			
Number of Looks	(9)12	75.00	.08
Duration of Looks	(5)12	41.67	.82
Sum of Grasps	(3)12	25.00	.87
Siblings			
Number of Looks	(5)13	38.46	.58
Duration of Looks	(9)13	69.23	.15
Sum of Grasps	(7)13	53.85	.52

Note. n indicates (number of infants correctly classified) with total number of cases

Table 8

Ordinal Pattern Analysis for Measures of Inanimate Agent by Group – Sibship

Ordinal Pattern Tested – Rich > Poor			
Measure	*n*	PCC	*c*-value
Only Child			
Number of Looks	(8)12	66.67	.06
Duration of Looks	(7)12	58.33	.25
Sum of Grasps	(3)12	25.00	.65
Siblings			
Number of Looks	(8)13	61.54	.18
Duration of Looks	(6)13	46.15	.70
Sum of Grasps	(4)13	30.77	.88

Note. n indicates (number of infants correctly classified) with total number of cases

Table 9

Paired Samples t-tests for Measures of Agent Preference by Group Siblings

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	d
Animate						
Number of Looks	.56(.19)	.64(.38)	.761	11	.463	-.27
Duration of Looks	1.01(.43)	1.10(.38)	.887	11	.394	-.22
Sum of Grasps	1.38(.77)	1.46(1.05)	.163	12	.874	-.07
Inanimate						
Number of Looks	.54(.21)	.50(.19)	-.486	11	.637	.20
Duration of Looks	.82(.30)	1.01(.53)	1.010	12	.332	-.44
Sum of Grasps	.92(.86)	1.77(.97.)	1.821	12	.094	-.93

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; animate looks and duration is complete for only 12 participants due to outliers; inanimate looks is complete for only 12 participants due to outliers; significant at the $p < .025$ level.

Table 10

Paired Samples t-tests for Measures of Agent Preference by Group Only Children

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.50(.34)	.67(.39)	1.615	11	.463	-.46
Duration of Looks	.81(.41)	.83(.50)	.174	10	.394	-.04
Sum of Grasps	1.25(1.23)	1.25(1.06)	.001	11	1.00	.01
Inanimate						
Number of Looks	.52(.35)	.43(.24)	1.615	11	.637	.01
Duration of Looks	.70(.52)	.62(.50)	.174	11	.332	.30
Sum of Grasps	1.25(1.29)	1.25(1.22)	.001	11	1.00	.01

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; animate duration of looks is complete for only 11 participants due to outliers; significant at the $p < .025$ level.

Table 11
Ordinal Pattern Analysis for Measures of Animate Agent by Group – Gender

Ordinal Pattern Tested – Poor > Rich			
Measure	*n*	PCC	*c*-value
Males			
Number of Looks	(6)8	75.00	.14
Duration of Looks	(3)8	37.50	.86
Sum of Grasps	(2)8	25.00	.83
Females			
Number of Looks	(8)17	47.06	.42
Duration of Looks	(11)17	64.71	.17
Sum of Grasps	(8)17	47.06	.59

Note. n indicates (number of infants correctly classified) with total number of cases

Table 12
Ordinal Pattern Analysis for Measures of Inanimate Agent by Group – Gender

Ordinal Pattern Tested – Poor > Rich			
Measure	*n*	PCC	*c*-value
Males			
Number of Looks	(6)8	75.00	.07
Duration of Looks	(4)8	50.00	.65
Sum of Grasps	(3)8	37.50	.65
Females			
Number of Looks	(10)17	58.82	.15
Duration of Looks	(9)17	52.94	.38
Sum of Grasps	(4)17	23.53	.88

Note. n indicates (number of infants correctly classified) with total number of cases

Table 13

Paired Samples t-tests for Measures of Agent Preference by Group Males

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.49(.34)	.55(.35)	1.018	7	.343	-.17
Duration of Looks	.78(.45)	.80(.46)	.131	7	.899	-.04
Sum of Grasps	1.13(1.13)	.88(1.13)	-.475	7	.649	.22
Inanimate						
Number of Looks	.53(.35)	.44(.27)	-1.415	7	.200	.29
Duration of Looks	.72(.41)	.77(.65)	.211	7	.839	-.09
Sum of Grasps	1.00(1.07)	1.00(1.20)	.001	7	1.00	.00

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 14

Paired Samples t-tests for Measures of Agent Preference by Group Females

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.60(.31)	.71(.38)	.992	16	.336	-.32
Duration of Looks	1.02(.57)	1.21(.59)	1.206	16	.245	-.33
Sum of Grasps	1.41(.94)	1.59(.94)	.496	16	.627	-.19
Inanimate						
Number of Looks	.54(.25)	.51(.23)	- .521	16	.609	.12
Duration of Looks	.79(.43)	.85(.50)	.329	16	.747	-.13
Sum of Grasps	1.12(1.11)	1.76(.97)	1.833	16	.085	-.61

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 15
Ordinal Pattern Analysis for Measures of Animate Agent by Group – Age

Ordinal Pattern Tested – Poor > Rich			
Measure	*n*	PCC	*c*-value
18 months +			
Number of Looks	(9)16	56.25	.33
Duration of Looks	(8)16	50.00	.60
Sum of Grasps	(8)16	50.00	.39
< 18 months			
Number of Looks	(5)9	55.56	.23
Duration of Looks	(6)9	66.67	.27
Sum of Grasps	(2)9	22.22	.94

Note. n indicates (number of infants correctly classified) with total number of cases

Table 16
Ordinal Pattern Analysis for Measures of Inanimate Agent by Group – Age

Ordinal Pattern Tested – Poor > Rich			
Measure	*n*	PCC	*c*-value
18 months +			
Number of Looks	(7)16	43.75	.31
Duration of Looks	(6)16	37.50	.86
Sum of Grasps	(4)16	25.00	.87
< 18 months			
Number of Looks	(8)9	88.89	.01
Duration of Looks	(7)9	77.78	.08
Sum of Grasps	(3)9	33.33	.66

Note. n indicates (number of infants correctly classified) with total number of cases

Table 17

Paired Samples t-tests for Measures of Agent Preference by Group 18+ months

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.63(.36)	.73(.39)	.905	15	.374	-.27
Duration of Looks	.97(.58)	1.14(.62)	1.038	15	.316	-.28
Sum of Grasps	1.38(1.09)	1.63(.96)	.637	15	.543	-.24
Inanimate						
Number of Looks	.55(.30)	.54(.26)	-.201	15	.843	.04
Duration of Looks	.74(.41)	.88(.59)	.758	15	.460	-.28
Sum of Grasps	1.25(1.13)	1.69(1.08)	1.100	15	.289	-.40

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 18

Paired Samples t-tests for Measures of Agent Preference by Group < 18 months

	Rich	*Poor*				
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*	*d*
Animate						
Number of Looks	.45(.19)	.53(.32)	.969	8	.361	-.30
Duration of Looks	.90(.49)	.98(.51)	.532	8	.609	-.16
Sum of Grasps	1.22(.83)	.89(1.05)	-.816	8	.438	.35
Inanimate						
Number of Looks	.52(.26)	.40(.18)	-1.961	8	.086	.54
Duration of Looks	.81(.46)	.71(.45)	-.464	8	.655	.45
Sum of Grasps	.78(.97)	1.22(1.09)	.839	8	.426	-.43

Note. Number of looks is the average number per unit of time (1 second); duration of looks is the average length of look per unit of time (1 second); sum of grasps is the sum across three animate trials and the sum across three inanimate trials; significant at the $p < .025$ level.

Table 19
Predictive power of SibShip when controlling for Financial Assistance

Measure	R^2	R^2 change	β	*t*	*p*
Animate					
Number of Looks Rich	.000	-.045	.163	.638	.531
Duration of Looks Rich	.013	-.031	.210	.926	.365
Sum of Grasps Rich	.001	-.043	.214	.955	.350
Number of Looks Poor	.010	-.033	.161	.661	.515
Duration of Looks Poor	.039	-.007	.242	1.036	.313
Sum of Grasps Poor	.042	.000	.087	.368	.717
Inanimate					
Number of Looks Rich	.005	-.038	.256	1.101	.283
Duration of Looks Rich	.031	-.011	.266	1.110	.279
Sum of Grasps Rich	.042	.001	-.215	-.893	.381
Number of Looks Poor	.097	.056	.312	1.393	.178
Duration of Looks Poor	.231	.197	.513	2.378	.027
Sum of Grasps Poor	.084	.045	.348	1.485	.152

Table 20
Predictive power of Financial Assistance when controlling for SibShip

Measure	R^2	R^2 change	β	*t*	*p*
Animate					
Number of Looks Rich	.028	-.016	-.256	-1.006	.326
Duration of Looks Rich	.030	-.014	-.252	-1.107	.281
Sum of Grasps Rich	.142	.104	-.483	-2.161	.042
Number of Looks Poor	.002	-.042	-.122	-.501	.621
Duration of Looks Poor	.001	-.046	-.124	-.533	.600
Sum of Grasps Poor	.078	.038	.236	1.00	.328
Inanimate					
Number of Looks Rich	.005	-.038	-.365	1.101	.283
Duration of Looks Rich	.002	-.041	-.179	-.745	.464
Sum of Grasps Rich	.008	-.035	.019	.079	.938
Number of Looks Poor	.014	-.031	-.001	-.003	.998
Duration of Looks Poor	.037	-.005	-.065	-.301	.767
Sum of Grasps Poor	.004	-.040	-.115	-.490	.629

Table 21

Correlation of Financial Assistance and Sibship

Variables	Financial Assistance	SibShip
Financial Assistance	--	.423*

*. Correlation is significant at the 0.05 level (2-tailed).

Table 22

Descriptive Statistics of Sibship and Financial Assistance

	Siblings	
Measure	N	*M (SD)*
No Financial Assistance	17	.53 (.72)
Financial Assistance	8	1.50 (.89)

Note. All values represent raw, unstandardized scores.

Table 23

Paired Samples t-tests for Side Preferences

	Left	*Right*			
Measure	*M(SD)*	*M(SD)*	*t*	*df*	*p*
Animate					
Number of Looks	1.09(.530)	1.25(.802)	-1.248	24	.224
Duration of Looks	1.66(.849)	1.87(1.09)	-.809	24	.427
Sum of Grasps	2.68(2.10)	2.60(1.96)	.133	24	.895

Table 24

Descriptive Statistics of Condition Order for Animate Agents

		Number of Looks		Duration of Looks		Sum of Grasp	
		Rich	*Poor*	*Rich*	*Poor*	*Rich*	*Poor*
Measure	N	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Condition 1	4	.67 (.52)	.53 (.27)	.73 (.33)	.68 (.36)	1.25 (.96)	.75 (.96)
Condition 2	3	.37 (.22)	.42 (.46)	.70 (.40)	.91 (.60)	.67 (.58)	1.33 (1.16)
Condition 3	2	.15 (.06)	.65 (.63)	.55 (.40)	1.23 (1.47)	1.00 (1.41)	2.00 (1.41)
Condition 4	3	.70 (.15)	1.07 (.45)	1.59 (1.03)	1.61 (.71)	1.00 (1.00)	1.33 (.58)
Condition 5	2	.64 (.20)	.95 (.43)	.96 (.05)	1.22 (.58)	2.50 (.71)	.50 (.71)
Condition 6	6	.49 (.30)	.51 (.29)	.77 (.31)	1.07 (.47)	1.3 (.82)	1.33 (1.03)
Condition 7	5	.75 (.21)	.73 (.25)	1.25 (.51)	1.09 (.40)	1.80 (1.10)	1.80 (1.10)

Note. Results are based on preference measures for animate agents

APPENDIX C

Demographic Information Questionnaire

Child Information

What is your relationship to the baby? Example: mother, father, stepmother.

_____

Gender of baby _____ Male _____ Female

Birth date of baby _____

Month Day Year

Birth weight of baby ___ lbs ___oz

Date of expected birth (due date) _____

Month Day Year

Was the baby born by c-section? YES NO

Maternal Information

Birth date _____

Month Day Year

Your marital status (check one)

___ Married, first time ___ Single, never married

___ Single, separated ___ Single, divorced

___ Single, widowed ___ Remarried

___ Other, please specify: _____

Your own ethnic group (please check) _

__ Native American Nation: _____

___ African American

___ Hispanic

___ Asian

__ White

__ Multiethnic Describe:_____

___ _Other

Please place a check mark next to the highest grade you completed in school.

____ 6th grade ____ 11th grade

____ 7th grade ____ 12th grade

____ 8th grade ____ some vo-tech

____ 9th grade ____ some college courses

____ 10th grade ____ vo-tech graduate

____ college graduate

____ post-graduate work

Please place a check mark next to the highest grade your spouse/partner completed in school.

____ 6th grade ____ 11th grade

____ 7th grade ____ 12th grade

____ 8th grade ____ some vo-tech

____ 9th grade ____ some college courses

____ 10th grade

____ vo-tech graduate
____ college graduate
____ post-graduate work

Your current household income per month before taxes (please check one)

___ $ 0 - 100
___ $ 100 - 499
___ $ 500 - 999
___ $ 1000 - 1499
___ $ 1500 - 1999
___ $ 2000 - 2499
___ $ 2500 - 2999
___ $ 3000 - 3499
___ $ 3500 - 3999
___ $ 4000 plus

Is your current spouse/partner the father of the baby (check one)

___ yes ___ no

Ethnic group of the biological father of the baby. (please check)

___ Native American Nation: _____
___ African American
___ Hispanic
___ Asian
___ White
___ Multiethnic Describe: _____
___ Other

Do you currently receive state or federal financial assistance? (check as many as apply)

___ WIC
___ TANF
___ School lunch/breakfast
___ Food Stamps
___ Indian Health Services
___ Unemployment benefits
___ Energy assistance
___ Social Security/SSI
___ Medicaid

For how many years have you received such assistance? (check one)

___ five or more years
___ four years
___ three years
___ two years
___ one year
___ less than one year

My child seems to be less healthy than other children I know.

____ strongly agree
____ agree
____ do not agree or disagree
____ disagree
____ strongly disagree

My child has never been seriously ill.

____ agree
____ disagree

Is English the primary language of the household?

____ yes
____ no

Is your household bilingual?

____ yes

____ no

If yes, what other languages are spoken in your household on a regular basis?

Number of siblings living in the same household (excluding your participating infant).

List the ages of all of the children living in your household.

Number of step or half siblings not living in the same household (excluding your participating infant).

APPENDIX D

RESOURCE DISTRIBUTION CODING MANUAL
10.5.17

- The focus of coding will be reaching preceded by a look, i.e., any discernible reach in the direction toward an agent, most notably if they touch or grasp the agent, however, looking behaviors and other "agent directed" movements will also be recorded.
- Each individual video will vary minutes in length, but will only be coded during the time in which the experimenter is kneeling in front of the infant with the agents in the corner of the frame for a total of 6 coding sessions.
- **Only code** when there is AT LEAST part of each agent present in the frame.
- **Variables to be coded:**
  - ➢ Baseline state: The child's state prior to the beginning of a trial (measure baseline state during "resource introduction period"):
    - 1= tired/drowsy.
    - 2= alert/calm.
    - 3= alert/active. (engages with the resource)
    - 4= fussy.
    - 5= crying.
  - ➢ Agent Preference: each of the following variables should be coded for both the right (Roger) and left (Lucy) agents (right and left are from the experimenter's point of view)
      - Note: code one trial at a time; watch the entire trial through before going back and recording specific times
    - Latency to first look toward the agents.
    - Latency to first reach toward the agents.
    - Latency to first touch of an agent
    - Latency to first look AND reach toward the agent
    - Total duration of look prior to reach.
    - Did they grasp the agent (take from experimenter)?

- Parent behavior: Coded within each of the 6 trials. Interference could be touching, holding hand, attempts to focus the infant's attention on the stimulus, or encouraging the infant to reach.
    - 0= Not interfering; neutral.
    - 1= Mild interference; verbal encouragement for choice or attention
    - 2= Interfering; generally disrupting.; (e.g. holding infant hands, physical encouragement toward agent, touching of agent

Agent Key:

A1 = Cream cat
A2 = purple lamb
A3 = Green rabbit
A4 = brown dog
A5 = (light) blue elephant
A6 = (light) purple hippo
A7 = yellow raccoon

B1 = orange hexagon
B2 = purple octagon
B3 = green circle
B4 = yellow triangle
B5 = blue trapezoid
B6 = red square

APPENDIX E

Supplementary Information

Section 1. Moral Development and Prosocial behavior. Theories of moral development provide possible explanations as to why prosociality tends to increase with age. Piaget (1932) suggested that as children demonstrate advances in general cognitive development, their propensity for making moral judgments also begins to develop, with the basis of moral judgment shifting from a hedonistic position to a position that puts a greater emphasis on social approval. Prior to more advanced cognitive functioning in children, they engage in a stage of moral development that Piaget termed moral realism. During this time, the child complies with rules and regulations that have been outlined by an external authority figure, judging how moral or immoral an act may be solely on the basis of the consequences that the behavior evokes. Therefore, during this stage, children engage in prosocial behaviors when they perceive the behavior as a requirement enforced by their authority figure (usually a primary caregiver).

As children develop more advanced cognitive skills, their egocentric tendencies diminish, allowing for an ability to better empathize with other individuals (Decety & Jackson, 2004; Thompson, 1987), which has been positively linked to prosocial tendencies. With this cognitive increase comes the second stage of Piaget's proposed moral developmental trajectory, autonomous morality. In this stage, children begin to understand that the rules and regulations previously set forth by their authority figures are formed through negotiation. Children learn that rules can be context dependent, that they may have more than one correct answer, and therefore can be changed accordingly. In other words, there is a shift from an emphasis on equality,

where all good and bad actions should receive the same rewards or consequences accordingly, to an emphasis on equity, where good and bad actions should be rewarded or punished based on consideration of the circumstances surrounding the behavior.

Section 2. Psychodynamic theory of prosociality. The primary focus of Freud's psychodynamic theory highlights the underlying impact of sexual and aggressive drives directed specifically toward achieving self-gratification by means of satisfying the "id". As children age, they begin to develop a conscience, or "superego", between the ages of 4 and 6 years.-This conscience is responsible for controlling the automatic impulses of the id, therefore creating a conflict between an individual's desires and his/her fear of social discord. In other words, the superego mediates an individual's underlying social urges (namely sex and aggression) with regulations set forth by society. The superego is driven by the principle of morality (also known as the "idealistic principle"), and Freud suggested that when this develops, prosocial behaviors may appear as a means of reducing guilt inflicted by the conscience (Eisenberg, Fabes, & Spinrad, 2006). Variations of psychoanalytic theories (Fenichel, 1945; Glover, 1968) have also suggested that altruism and prosocial tendencies are driven by guilt, self-destructive tendencies, as well as sexual and aggressive urges, and that these prosocial behaviors are a defense mechanism employed by the ego to placate the id's irrational demands.

Section 3. Infant imitation preferences. In addition to understanding *what* infants are learning through the imitation of their models, it is important to consider *whom* infants are learning from as well. Some of the individuals that we interact with are positive influences and worthy models of imitation as they have an appropriate understanding of cultural practices and positive intentions. However, not all individuals should be imitated

by infants and young children seeking a greater understanding of their surrounding world. The most adaptive mechanism that can accompany learning through imitation is the ability to discriminate the value of information being provided by outside sources and distinguish models that are providing accurate, objectively true information from those that are not. It has been found that pre-school children are sensitive to models providing false information and have been shown to not only identify, but in some cases correct, the false statements of others (Koenig & Harris, 2005; Pea, 1982). Importantly, the assessment of the knowledge of the source of information will determine how infants use the information they receive from that source. Koenig and Woodward (2010) found that 16-month-old infants are less likely to learn a new word from an individual who previously labeled objects inaccurately. Similar research was conducted on just-verbal infants of 14-months of age, and it was found that even at this age, infants will not imitate the actions of an individual that had previously modeled unreliable behavior (Chow, Poulin-Dubois, & Lewis, 2008; Zmyj, Buttelmann, Carpenter, & Daum 2010). While accuracy is seemingly the most adaptive and efficient way to determine which models to learn from and which to discredit, the past accuracy of others is not always available. Therefore, an understanding of a source's potential accuracy would be the next best strategy to implement in a learning situation, without previous information about the model.

In addition to the determining the accuracy of the individual, it is also necessary to evaluate how relevant certain information is to the learner. Tool use, language, and food sources differ across cultures and much of the information relevant to one culture, may not pertain to the next. It is therefore necessary to distinguish models of culturally

relevant information from models demonstrating knowledge and actions better suited to other groups and cultures. This can be difficult to discern, especially for young infants and toddlers that benefit most from this information to further their understanding of social and societal norms. Therefore, sources that are similar to the learner and share a similar social group are likely to be more reliable models of behavior.

It was previously mentioned that, in the broader sense, infants prefer to learn from individuals that are "like them" and have demonstrated similarity in their actions (Goswami, 2011; Hamlin & Wynn, 2012; Mahajan & Wynn, 2012; Meltzoff, 1999). This similarity preference can also refer to a shared native language (Kinzler et al., 2009), chronological age or cohort (Ryalls, Ryalls, & Gijl, n.d.), and overall familiarity to the individual (Corriveau & Harris, 2009). Preference for general familiarity is clearly demonstrated in infant's social referencing of the primary caregiver as infants in the first year of life will begin to examine the emotional expressions of their mothers and use that information to make decisions on how to respond emotionally in a given situation (Hutman & Dapretto, 2009). However, another important variable is not just whether the source is "like them", but whether the source is liked at all.

In a recent study, Hamlin and Wynn (2012) demonstrated a link between social evaluations of others and the likelihood that infants would gain and later implement the information provided by those social sources. A paradigm of a previous study conducted by Hamlin and colleagues (Hamlin & Wynn, 2011; Hamlin, Wynn, Bloom, & Majana, 2011; discussed below), was used, during which agents (potential information sources) acted prosocially or antisocially depending on the condition. Sixteen-month-old infants were given the choice between a food type that an acting agent had displayed a

preference for and a food type they had not, and the extent to which infants chose a food that matched or differed from the agent was observed. Infants in the prosocial source condition chose the food for which the agent demonstrated a preference significantly more than the food for which the agent demonstrated distaste. Infants in the antisocial source condition chose liked and disliked food an equal number of times, suggesting that they did not take into account the preference of the anti-social individual when choosing their food preference. Taken together, these results suggest that the positive evaluation of another will increase the likelihood that infants will learn from an individual and negative evaluations of another may result in the infant choosing to ignore the information being provided by the source, leading them to respond based on other relevant variables. Finally, as demonstrated in the novel source condition, in which the agent was unfamiliar to the infant having not been previously present in the paradigm, the lack of opportunity to evaluate the source prior to them providing information may also increase the likelihood that they will find the information relevant and respond accordingly, in this case by choosing the food type that the Novel Source demonstrated preference for significantly more than the alternative food type.

Section 4. Evolutionary theories of prosociality. Nowak (2006) proposed possible mechanisms that may have contributed to the establishment of a truly prosocial species, including kin selection, direct, and indirect reciprocity. Kin selection theory, a mid-level theory proposed by Hamilton (1964), states that individuals that are genetically related will favor the reproductive success and continuation of the genetic line, often at the cost of the individuals own reproductive success (Hamilton, 1964; Nowak, 2006). This evolutionary drive often termed kin altruism came to be known as″Hamilton'sHamilton′s

Rule″. However, reproductive success is still an underlying goal for the acting individual and should he/she help a genetically related individual to succeed in that goal, thereby continuing his/her own genetic line. However, both individuals are benefiting in some way, which does not support the definition of prosociality most often used (Schmidt & Sommerville, 2011) and does not explain the cooperative behaviors frequently observed among non-related individuals.

Direct reciprocity is a strategy of mutual cooperation that takes place between two individuals that are not genetically related during a single exchange (Trivers, 1971). This behavior can be demonstrated in the repeated Prisoner's Dilemma. The framework of the repeated Prisoner's Dilemma is based on the choices of cooperation or defection between two acting individuals, and it highlights the idea that one individual will help another at his/her own cost now, keeping in mind that this may lead to a returned benefit from the current receiver at a later time. In other words, helping behaviors directed toward social group members that are not genetically related increase the likelihood that assistance by those members will be provided in the future, which in turn would increase the chance of overall survival of the genetic line. This is supported by computational modeling methods that have demonstrated that social groups with a tendency to act prosocially are found to have greater population growth compared to groups that lack a genetic basis for prosocial responding (Sober & Wilson, 1998). However, this outcome relies on an agreement by both individuals that the other will return the prosocial action in the future. Direct reciprocity only facilitates prosociality if the cost-to-benefit ratio of the initial prosocial action is exceeded by the probability that a second encounter will occur between the two individuals (Nowak, 2006; Trivers, 1971). Often, however, additional encounters may not

occur between two individuals, in which case, the occurrence of prosociality must be accounted for by an alternative mechanism.

While direct reciprocity can account for prosocial behaviors with non-genetically related individuals, two individuals must repeatedly engage with one another socially in order for it to be a strong enough mechanism to support continuous prosocial actions across the lifespan. Additionally, direct reciprocity relies on the likelihood that both individuals will be *capable* of providing help upon each future encounter. Indirect reciprocity on the other hand involves a reciprocal act of cooperation or prosociality from a third party that was not involved in the initial interaction. Schematically speaking, individual A acts prosocially towards individual B, which is observed by individual C, improving the reputation of individual A and promoting the likelihood that individual C will act prosocially toward individual A (Meristo & Surian, 2013; Nowak, 2006). Therefore, it is the social reputation that an individual builds that supports the evolution of cooperative and prosocial behavior. Primitive examples of indirect reciprocity can be seen in various strategies of natural selection and social hierarchies (Bshary & Grutter, 2006). Howeverhowever, humans require advanced cognitive capabilities in order for this to occur. First, they must remember not only their own actions, but also observe and remember the actions of other individuals around them. Second, language is required for the spread of information regarding the actions of other individuals (i.e. their reputation). Therefore, it was originally thought that indirect reciprocity could not occur until more complex cognitive thinking had developed. However, more recent findings (Kenward & Dahl, 2011; Meristo & Surian, 2013; Olson & Spelke, 2008) found that 3.5 and 4.5-year-old toddlers and infants as young as 10 months of age have the capacity to identify

prosocial acts of indirect reciprocity. These findings will be discussed in more detail below.

Cohen (1972) would negate any theory that suggests humans have an innate biological tendency to behave prosocially, suggesting that humans are innately motivated to pursue their own self-interest and they can only achieve prosocial responding through sociocultural, rather than genetic, evolution and certain cultural conditions must be met before prosocial behavior can occur. However, Olson and Spelke (2008) found evidence to support the three principles of kin selection, direct reciprocity and indirect reciprocity, finding that children of preschool age are more likely to 1) favor (and therefore distribute desirable resources) agents that are more similar to themselves, 2) favor individuals that have previously acted prosocially toward themselves, and 3) favor others that have acted prosocially toward other people.

Section 5. Neural Correlates of empathic and prosocial behaviors. There have been several proposed interpretations that account for infants' ability to evaluate the social valence of another's actions, including components of theory of mind development and perspective taking (discussed below) that mediate infant preference for prosocial behavior. Neurophysiologists have linked emotional responding, and subsequently empathic and prosocial behaviors, to a variety of neural components. Recent research has attempted to demonstrate a link between recently discovered mirror neurons (Pfeifer, Iacoboni, Mazziotta, & Dapretto, 2008), the dorsal anterior cingulate cortex (dACC), and the anterior insula (AI) (Jackson, Meltzoff, & Decety, 2005; Singer, 2004), to empathy responding; the amygdala, orbitofrontal cortex and the insula to general emotional responding (Decety & Chaminade, 2003); and the dorsal premotor cortex and inferior

parietal lobe to the perspective taking of others (Ruby & Decety, 2001), an important cognitive component in empathic and prosocial responses (Decety & Jackson, 2004; Moore, 1990). Each of these neural regions is important to processes underlying prosocial responding, but none of which has been directly linked to prosocial responding itself.

The majority of previous research on neural correlates of empathic responding has focused on empathy evoked by physical pain rather than negative or positive social experiences, finding that the dACC and AI as well as the mirror neuron system (MNS) may be specific only to affective congruence with another's pain rather than broad empathic experiences (Davis, 2000; Eisenberger, 2003; Peyron, Laurent, Garcia-Larrea, 2000; Rainville, 2002). More recent research has identified separate regions that activate when humans experience empathy for social pain rather than for the physical pain of others (Singer, 2006). Thus, affective empathy (the unconscious emotional response to emotions of another), and cognitive empathy (the ability to take on the perspective of another and understand their emotional response) may rely on distinct neural networks (Decety & Meyer, 2008; Shamay-Tsoory, Aharon-Peretz, Perry, 2009). Observations of negative social experiences, such as social exclusion, occur frequently throughout the course of an individual's day, but behavioral data alone are not sufficient to differentiate between the two forms of empathic responses, so the exploration of how neural activity is related to these experiences is necessary in order to understand how empathy responding is related to prosocial behaviors induced by empathy.

The cognitive component of empathy differs from the affective not only in terms of different neural circuits, but also in that the neural components associated with cognitive empathy, which include the ventromedial, medial and dorsomedial prefrontal

cortices, the posterior superior temporal sulcus, the temporal poles, the posterior cingulate cortex and the recuneus (VMpFC,; MPFC; DMPFC; pSTS; PCC) and are often referred to as the "mentalizing system" (Morelli, Rameson, & Lieberman, 2012) as they have been linked to cognitive perspective taking (Masten, Morelli, & Eiseberger, 2011). A study by Masten, et al. (2010) provided further support that neural regions associated with empathy differed during the observation of social versus physical pain, indicating that the previously- mentioned regions associated with cognitive empathy and mentalizing are more active during the observation of negative social events. Additionally, this study evaluated the relationship between all empathy-related neural components (affective and cognitive) and prosocial behavior, and found that greater levels of activity in the MPFC and AI increased the likelihood that prosocial responding would occur toward the individuals in the negative social event. Supporting research in this area highlighted the importance of the mirror neuron system in empathizing events that are not context specific (unambiguous physical pain), but not with events in which contextual information is required for empathic responding, which were found to be more closely associated with activation of the mentalizing system (Morelli, et al., 2012). Therefore, it can be concluded that neural circuits associated with cognitive and affective empathy are, to some degree, associated with the facilitation of prosocial responding, but that the mentalizing system has a more robust relationship to prosocial behavior.

The aforementioned research underlines the neural components linked to empathy that may lead to prosocial motivation through the use of positively and negatively toned events, but do not directly address neural activation of observed prosocial versus antisocial behaviors in terms of goal directed behaviors, also known as instrumental

helping. It has been suggested that 10-month-old infants can infer that the goal of one animate agent is related to the intention of another animate agent, indicating that their preferences involve the use of "second-order mental-state representations" (Hamlin, Ullman, Tenenbaum, Goodman, Baker, 2013). The temporal parietal junction and the pre-frontal cortex are most often associated with second-order mental-state representations. However, the superior temporal sulcus (STS), is found to activate when individuals observe an intentional, goal related behavior (Castelli, Happe, Frith, Frith, 2000), when intentional harm is directed at an animate agent (Decety, 2011), and in the presence of emotional facial expressions (Allison, Puce, McCarthy, 2000). Superior temporal sulcus activity in infants is thought to be indexed by the P400 ERP component. Therefore, Gredeback, et al. (2015) hypothesized that infant P400 ERP component indexes processing of actions' social valence. Using the paradigm of a previously conducted study by Hamlin, Wynn, and Bloom (2007) observing infant preferences for prosocial behaviors over antisocial behaviors , Gredeback et al. (2015) found that there was differential processing in infants when observing prosocial and antisocial actions. Specifically, increased activity in the P400 ERP component was observed when the infant observed a prosocial action (i.e., an animate agent helping another agent accomplish a goal) compared to when the infants observed an antisocial action (i.e. an agent hindering another agent from accomplishing a goal). Importantly, this neural response only occurred when the agents in the paradigm were animate (i.e. had eyes), suggesting that when the social valence is removed from the paradigm, the action is no longer interpreted by the infant as being goal-related. Previous behavioral research in this area (discussed in greater detail below) documented overt infant preference for prosocial

over antisocial agents as measured by looking times and preferential reaching (Hamlin et al., 2007; Hamlin et al., 2010). As the stimuli from these studies were very closely replicated in the Gredeback et al. study, it is "likely that the neural correlates of social valence processing demonstrated [in this study] represent the first stages of the neural process leading to infants' expression of prosocial preferences" (Gredeback et al., 2015, p. 111). This neural evidence supports the theory that infants younger than 1 year old have the capacity to make social evaluations of prosocial actions and actors.

Additional research focuses on the neural correlates of older infants engaging in, as opposed to just observing, prosocial actions in the form of instrumental helping. Specifically, the relationship between the frontal and temporal asymmetric brain activation was investigated during infant helping and comforting behaviors (Paulus, Kuhn-Popp, Licata, Sodian, Meinhardt, 2013). By comparing resting state brain activity of infants at 14 months of age with their neural activity during instrumental helping at 18 months and comforting behavior at 24 months, Paulus et al. found temporal activation asymmetry and instrumental helping to be significantly correlated at 18 months and activation in the frontal asymmetry to be significantly correlated with comforting tasks at 24 months.

Collectively, this provides further evidence as to the neural underpinnings involved in the development of early prosocial behaviors and suggests that multiple neurocognitive mechanisms, as opposed to a unitary brain circuit, are involved in prosocial responding and may be specific to different types of prosocial behaviors (Panksepp, 1986). Finally, the biological factors contributing to prosocial responding likely play a role in individual differences of response. However, it is difficult to

ascertain whether these neurological correlates of prosocial action and response are causal or consequences of prosociality.

Section 6. Research on contagious crying in infants. A study by Simner (1971) examined the differences in response to different auditory stimuli on newborns of an average age of 70 hours. The auditory stimuli in the first experiment included cries of a 5 ½ - month-old female infant, white noise and a control of no noise. Simner (1971) found that infants exposed to the infant cries produced a cry response significantly more than the conditions in which white noise was played or no noise was present. A second experiment implemented the addition of a synthetic, computer generated cry and the cry of a newborn baby and the participant's own-recorded cry. These auditory stimuli resulted in infants crying significantly more to their own cries than the cries of another newborn, the cries of the 5 ½-month-old infant and the synthetic cries, respectively. This indicates that infants were able to distinguish the difference between cries of an older infant and an infant more similar in age to themselves. Simner (1971) conducted an additional study on infants of an average of 34 hours old using the same audiotapes. This observation yielded similar results, and in these findings Simner (1971) noted a trend in the data that suggested that infants would cry more to stimuli that was more congruent with an infant's own cries, but further research would indicate an entirely different response of an infant exposed to its own crying stimulus.

Martin and Clark (1982) extended the aforementioned findings to determine if responses to the crying stimuli were peer- and species-specific in addition to substituting a different audio recording to determine if the effect found in the previous studies would still occur. When exposed to the cries of another infant, Martin and Clark replicated the

significant main effect in neonates of an average age of 18 hours old. Interestingly, they found that when infants were exposed to recordings of their own distress cries, they responded with fewer instances of crying, providing evidence that infants are able to make the distinction between their own distress and the distress of a peer of similar age. Furthermore, infants who were crying prior to the start of their own crying stimulus would cease their distressed behavior. Additional auditory cues of older 11-month-old infant cries and the cries of infant primates did not elicit a distress response in the subjects. This suggests that there are vocal cues present in the cries of infants similar in age to the neonate subjects that prompt a distress response, but that these same cues are not present in non-peer infants and infants of non-human species.

Oklahoma State University Institutional Review Board

Date	Wednesday, January 3, 2018	**Protocol Expires:**	**1/2/2019**
IRB Application No:	AS176		
Proposal Title:	Infant social evaluations toward antisocial behaviors of unequal resource distribution		
Reviewed and Processed as:	Expedited **Continuation**		
Status Recommended by Reviewer(s)	**Approved**		

Principal Investigator(s)

Evan Jordan
116 N Murray
Stillwater, OK 74078

David Thomas
116 N. Murray
Stillwater, OK 74078

Approvals are valid until the expiration date, after which time a request for continuation must be submitted. Any modifications to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

☐ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

New subject enrollment still in progress. No new changes. No change in risks/benefits, reportable events, withdrawals, complaints or new/additional funding.

Signature :

Hugh Crethar, Chair, Institutional Review Board

Wednesday, January 3, 2018
Date

VITA

Evan M. Jordan

Candidate for the Degree of

Doctor of Philosophy

Thesis: INFANT SOCIAL EVALUATIONS IN RESPONSE TO ANTISOCIAL BEHAVIORS OF UNEQUAL RESOURCE DISTRIBUTION
Major Field: Experimental Psychology

Biographical:

Education

Oklahoma State University, Stillwater, OK

- Doctoral Student, Psychology
  - Expected graduation: Spring 2018
  - Area of specialization: Infant development
- M.S., Psychology, July 2016
  - Thesis: The occurrence of positive emotional contagion in infancy
    Advisor: David Thomas, Ph.D.
- B.S., Psychology, May 2012

Experience

Instructor Positions

2016 - Present	Psychology of Human Sexuality, Oklahoma State University
2015 - 2016	Developmental Psychology, Oklahoma State University
2014 - 2016	Introduction to Psychology, Oklahoma State University
2013 - 2014	Experimental Methods in Psychology (lab instructor), Oklahoma State University

Laboratory Positions

2013 - Present	Graduate Research Assistant, Developmental and Psychophysiology Lab, Oklahoma State University