Are Infants Discriminatory Learners and Helpers? The Influence of a Model's Reliability on Infants' Selective Trust

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Are Infants Discriminatory Learners and Helpers? The Influence of a Model's Reliability on Infants' Selective Trust

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The objective of the present dissertation was to examine infants' selective trust as influenced by different aspects of a model's reliability. The first study examined whether eighteen-month-old infants would behave differently towards a speaker as a function of how accurately she labeled familiar objects. The behavioral markers of trust examined were whether infants learned a novel word, imitated the speaker's irrational actions, and helped the speaker obtain an out-of-reach object. In contrast to infants exposed to an accurate speaker, those who interacted with an inaccurate speaker performed more poorly on a word learning task and were less likely to imitate. All infants demonstrated high rates of instrumental helping.

The second study aimed to tease apart the effects of a model's intent (benevolence or malevolence) and verbal competence (knowledge or ignorance of familiar object labels) on 18-month-olds' selective trust when both factors were simultaneously presented but independently manipulated. Infants' non-verbal behaviors indicated that they became impatient with the malevolent experimenter. Infants also, though more modestly, modified their selective learning; while they were less likely to learn a novel word from either an ignorant and malevolent model, they were more likely to imitate the competent but malevolent model. In addition, while none of the infants modified their strong willingness to help, all infants tended to look longer at a neutral image of the experimenter in comparison to that of a stranger.

Finally, the third study examined how 24-month-olds' selective trust would be affected by the emotional reliability of a familiar model, such as the level of sensitivity of a primary caregiver (coded during a 10-min period of interaction between the dyad). Infants learned novel words better from an emotionally reliable primary caregiver. In addition, higher parental responsiveness and availability predicted better imitation in older children and higher levels of helping in girls. Taken together, these findings are the first to demonstrate that infants consider a model's verbal, intentional, and emotional reliability when deciding whether to learn but not when deciding to help. Thus, infants' selective trust appears to be motivated by epistemic and emotional factors.

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CONTRIBUTIONS OF AUTHORS

This Ph.D. consists of three manuscripts.

Study 1 (See Chapter 2)

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Study 2 (See Chapter 3)

Brooker, I., & Poulin-Dubois, D. (2013). *"Competent but malevolent" or ignorant but benevolent": What aspects of a model's behavior influence infants' learning and prosocial behaviors?* Manuscript submitted for publication.

Study 3 (See Chapter 4)

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Relative Contributions

I proposed the overall research topic and in collaboration with Dr. Poulin-Dubois, the thesis supervisor, we determined the focus of each study. This entailed us working closely together in conceptualizing the method and design as well as selecting experimental stimuli. Prior to testing, I helped prepare and send recruitment letters to participants, with the assistance of the current research assistant (Alexandra Polonia for Studies 1 and 2, Katherine Gittins for Studies 1 and 3).

Two outside members of the lab were in charge of placing recruitment calls for all three studies, while I and/or Alexandra or Katherine called and followed-up with participants, as needed. In preparation for testing, I produced detailed scripts for all tasks. With respect to data collection, I was the primary experimenter for the English-speaking participants of all three studies, and secondary experimenter for French-speaking participants. For Study 1, Jessica Shea, an Honours student, and Katherine Gittins helped with data collection, as part of Jessica Shea's Honours thesis. For Study 2, Alexandra Polonia and Effie Andreadakis, an Honours student and a volunteer in the lab, helped with data collection. For Study 3, Michaela Wells, an Honours student, Alessia Gasparini, a Science College student, and Katherine Gittins helped with data collection, as part of Michaela's Honours thesis and Alessia's summer research project. I coded 80% of infants' responses in Study 1 and 100% of infants' responses for the other two studies, with the exception of the parental sensitivity task in Study 3. For that task, Célia Matte-Gagné was hired to train me on the items of the Maternal Behavior Q-Sort (MBQS) and coded 25% of the sample on this measure. Following completion of the studies, I was responsible for data entry, statistical analyses, interpretation of the data, and preparation of the manuscripts. For each manuscript, I wrote the first draft and Dr. Poulin-Dubois provided feedback. After each study, I summarized the findings that were then sent to the families of the participants via our laboratory's newsletter to thank them for their participation.

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Chapter 1

Introduction

Young children have traditionally been depicted as autonomous learners. Piaget (1964) believed that children acquire knowledge about the world by exploring their surroundings and verifying their knowledge with their own direct experience. However, although regarded as "little scientists" (Clément, 2010; Gopnik & Wellman, 1992; Gopnik & Meltzoff, 1998), children certainly cannot learn everything on their own and must therefore be reliant on others to in order to learn about novel or complex facts that they would not otherwise be able to directly experience or interpret. Vygotsky (1978) believed in children's guided participation, in that children gain information from a knowledgeable adult who provides guidance and coaching within the child's *zone of proximal development*. Children also seek out knowledgeable adults when confronted with unknown sources or when presented with dangerous situations, engaging in what is called social referencing (Feinman, 1992; Sorce, Emde, Campos, & Klinnert, 1985; Baldwin & Moses, 1996). Relying on whether a familiar caregiver demonstrates positive or negative emotional expressions, infants by 12 months of age will modify whether they approach or avoid a visual cliff (Campos, 1980; Sorce, et al., 1985), a novel object (Mumme, Ferald, & Herrera, 1996), or even a stranger (Feinman & Lewis, 1983). Thus, social learning and cross-referencing with others is an important intermediary for young children's cognitive development and survival (Azmitia & Perlmutter, 1990; Clément, 2010; Rogoff, 1990). An unanswered question remains concerning what cues young children use to evaluate new and unfamiliar sources of information, as well as sources that are familiar such as their primary caregivers, when they are at the beginning stages of learning from their environment.

In order to examine this topic, this dissertation will first outline infants' understanding of intentional action, which includes their understanding of others as referential, goal-directed agents who utilize rational and logical means to carry out their goals (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Specific focus will be on prosocial and cognitive contexts where infants have been noted to demonstrate an understanding of others' intentional actions, namely the contexts of word learning, rational imitation, and instrumental helping. As infants become able and motivated to share the intentions of others, thus allowing them to collaborate in these joint activities, it is probable that they will evaluate the reliability or trustworthiness of the model that teaches them and therefore decide whether to interact with him or her. Thus, the background literature on preschoolers' and infants' selective trust will subsequently be reviewed, in terms of how influential different aspects of a model are on their decision to learn and help. In addition, in order to assess whether infants make global or domain-specific attributions of trustworthiness to a model, the extent to which young children have proven to generalize various aspects of a model's reliability across the prosocial and cognitive contexts will be examined. Where gaps are evident in the literature, the research goals of the current dissertation will be identified.

Understanding Intentional Action

In order to be able to evaluate external sources of information, infants first need to be able to observe and understand others. Infants' ability to understand and track others' goals and intentions is said to permit a type of flexible teaching by others known as "natural pedagogy" (Csibra & Gergely, 2006). This precursor ability is predictive of infants' later, more fully developed theory-of-mind, the knowledge that others have thoughts, intentions, and desires that are different from their own (Astington & Gopnik, 1991; Gopnik, 1993; Olineck & Poulin-Dubois, 2007; Wellman, Lopez-Duran, LaBounty, & Hamilton, 2008). In these pedagogical

interactions between adult and child, teaching is deliberate and intentional, with both parties recognizing that a joint, shared intention has been made to learn about an object, action, or practice (Frith & Frith, 2012). The ability to form a joint shared intention with others follows along a developmental trajectory that stems from infants first being able to recognize and understand animate action, which allows them to predict and understand others' goals, to then subsequently becoming able to recognize that others are intentional, goal-directed agents (Tomasello et al., 2005).

Evidence for an early understanding of animate action has been found when infants are around 6 months of age (Woodward, 1998), when they understand and expect that human agents produce actions that are goal-directed and thus should reach for objects that were once previously the target of their reach. Infants' understanding of one's pursuit towards a goal becomes more robust by the time they are 10 months old, when they show renewed interest when watching motion sequences that are disrupted at points in which an intended goal is interrupted rather than fulfilled (Baldwin, Baird, Saylor, & Clark, 2001). At around this same age, infants also understand that human agents will be persistent in their goals, such that they will consistently make efforts toward a goal and monitor their efforts in accomplishing that goal. For example, 9- to 18-months-olds are able to distinguish between someone who is unwilling to provide them with a toy (pretends to hand it over but keeps the toy to themselves) versus someone who is unable to (hands over the toy but "accidentally" drops it) and are more impatient with the person in the former scenario (Behne, Carpenter, Call, & Tomasello, 2005). Thus beginning at 9 months, and continuing until 18 months of age, infants become increasingly able to understand and evaluate others' intentions including the means by which others will commit to certain actions to fulfill their goals.

Part of how infants understand others' intentions and recognize that a teaching context is being initiated is by paying attention to the nature and contingency of others' non-verbal cues, (Baldwin & Moses, 1996; Csibra & Gergely, 2006; Tomasello, 1999). For example, at the age of 9 months, infants have been found to check an agent's facial and emotional cues, particularly when that agent is teasing him or her with a toy, in order to understand that agent's goal or intention (e.g., Carpenter, Akhtar, & Tomasello, 1998). Indeed, infants by 12 months (Moll & Tomasello, 2004) and later, by 18 months, come to understand that gaze is goal-directed (Poulin-Dubois, 1999), with the latter study finding that infants look longer when a person tries to grasp an object that was not previously the target of her gaze. Also during the period between 12 to 18 months, infants will use an agent's affect, eye-gaze, and pointing behavior to understand the referent of his or her goal and seem to appreciate and understand that the agent could only get excited over a new target as opposed to an old one (Tomasello & Haberl, 2003). The use of non-verbal cues is also bi-directional, particularly as evidenced within the context of prosocial games. For example, during cooperative games, infants between 18 and 24 months of age will try and re-engage an adult who has stopped in his or her effort to participate, and will make a communicative, ostensive gesture to restart the game (Warneken & Tomasello, 2006). In sum, infants modify their behavior and predict others' actions in accordance with these cues (Baldwin & Moses, 1996; Flom, Lee, & Muir, 2007; Woodward, 2005) and selectively attend to what they perceive as the rational and goal-directed aspects (Tomasello et al., 2005). The culmination of this understanding then enables infants to learn how to do things from others in a culturally relevant and verifiable manner.

The Context of Word Learning. The nature of a pedagogical context enhances infants' ability to learn from and decipher others' language, including their labeling of novel objects.

Several studies have demonstrated that at 18 months of age, during the time of the "language explosion" when infants are rapidly building their vocabulary and thus attending to new words spoken in their environment, infants will preferentially learn a new label for a new object when the object is part of a joint attentional context involving them and the speaker (Akhtar, Jipson, Callanan, 2001; Campbell & Namy, 2003; Baldwin, 1993; Baldwin, Markman, Bill, Desjardins, Irwin, & Tidball, 1996; Sabbagh & Baldwin, 2001). Thirteen-month-olds will even do so prior to acquiring a large receptive vocabulary (e.g., Woodward, Markman, & Fitzsimmons, 1994), suggesting that infants are attentive to a speaker's non-verbal cues in deciphering the intended referent of a labeling display. It has been proposed that because language involves sharing perspectives of cultural symbols with others, young children must learn that people can attend to things and interpret them differently (Clark, 1997; Tomasello, 1999). Indeed, infants will not learn a novel object label if the label is not actually emitted from a person but rather from a nearby monitor, regardless of the person's physical presence in the room with them and the object (Campbell & Namy, 2003). Similarly, by 18 months of age, infants understand that humans are intentional agents and thus will prefer to learn a novel label from a human speaker rather than from a non-human speaker, such as a robot (O'Connell, Poulin-Dubois, Demke, & Guay, 2009). Thus, infants by 18 months recognize that only human speakers are suitable for engaging in joint intention with, wherein they understand that the adult speaker communicates their intent to them, the listener, and that they then must reciprocate by attending to the referential cues of the speaker (Tomasello et al., 2005). Taken together, when learning a novel word, infants appear to utilize both their growing vocabulary and understanding of intentional cues to infer who is a suitable, knowledgeable agent from whom they should learn.

The Context of Imitation. Another context in which infants have been noted to rely on others' cues in order to understand their goal and intent is that of imitation. At 12 months of age, infants are able to use others' eye-gaze and reaching behavior to predict the future target of their reach (Sodian & Thoermer, 2004). Also around this time, infants become able to infer and evaluate the intentions of another, in that they will first assess a given situation (including its constraints) when deciding whether a person's actions are warranted and thus rational (Gergely, Bekkering, & Király, 2002). For example, after watching an experimenter place a toy dog inside a toy house either through the house's door or chimney, 12-month-olds will preferentially place the dog through the chimney if the door to the house was initially open as opposed to closed; this suggests that infants infer that the experimenter must have had a rational basis for placing the dog through the chimney since a more logical route (of putting it through the door) was available to them (Schwier, van Maanen, Carpenter, & Tomasello, 2006). Additionally, infants are more likely to imitate one's "rational" actions when the situation is clearly marked as a pedagogical one, wherein the person makes use of ostensive cues to engage the infant (Király, Csibra, & Gergely, 2004; Nielsen, 2006, experiment 3; Sage & Baldwin, 2011, experiment 2; Sommerville, Hildebrand, & Crane, 2008). Infants' intentional understanding further develops during the period from 14 to18 months, when they become increasingly able to recognize a person's failed but intended goal and produce what they infer to be the intended goal (Carpenter et al., 1998; Meltzoff, 1995; Olineck & Poulin-Dubois, 2005). Indeed, infants at this age can distinguish between accidental and purposeful actions (e.g., Carpenter et al., 1998) and successful and unsuccessful actions (Bellagamba & Tomasello, 1999). Thus, after the first year of life, infants understand others' goals and intent, and are more likely to learn from and imitate the actions of a source when they believe that he or she uses appropriate, logical means.

The Context of Helping. During the same developmental period, infants become able to understand another's unfulfilled goal based on his or her overt physical actions and are able to recognize that they can provide help or assistance to that person in accomplishing that goal. Starting at 9 months, infants engage in pointing and gesturing to try and reengage a partner in a joint activity, which signal their understanding of their partner's role in the joint activity and suggest that they have shared that goal (Ross & Lollis, 1987). During the period between 12 to 14 months of age, infants begin to participate in activities where both they and an adult partner engage in joint-attention and work together, in mutually supportive roles, toward a common goal (Tomasello et al., 2005). Indeed, by 14 months of age, infants coordinate roles with their partner and take over the role of their partner if he or she stops engaging in joint activity, suggesting that infants by this age have the motivation to help (Ross & Lollis, 1987). This ability to help an adult partner becomes increasingly more developed by 18 months (Carpenter et al., 2005). This is most commonly witnessed during infants' participation in various instrumental helping tasks. For example, after watching an adult drop a marker and make gestures that signal that he or she is trying to reach and pick it up, infants between 14 to 18 months of age can decipher the person's unfulfilled goal and pass the marker to the adult (Warneken & Tomasello, 2006, 2007). Also indicative of infants' growing ability to help is their willingness to point to things in their environment in order to help others find the object that they are looking for. For example, infants by 14 months of age will help another person locate an object; however they will only do so depending on whether that person had been present or not when the object's location had changed (Lizkowski, Carpenter, Striano, & Tomasello, 2006). These findings, taken together with infants' ability to learn from and understand others' actions during word learning and

imitative contexts, provide strong evidence that infants consider the normalcy and relevancy of others' responses when inferring their intentions and goals.

Motivation for Engaging in Intentional Acts

One question that arises from this work is what propels infants to learn from others. It has been suggested that infants possess a strong motivation to learn from and share with others that in turn drives their ability to understand and read others' intentions (Tomasello et al., 2005; Trevarthan & Hubley, 1978). At a very young age, infants seem to possess and develop a "mentalistic framework" or social learning mechanism which enables them to respond and distinguish between animate and inanimate action, as well as come to understand the goals, intentions, and desires of others (Lyons, Young, & Keil, 2007; Premack, 1990). This ability to join in attention with others essentially enables infants to learn from others, particularly information that is relevant in the given cultural context (Parker-Rees, 1994).

Indeed, according to a culturally "normative" stance, children learn from others because they infer that their actions reflect the dominant, generic conventional acts of their particular culture (Casler & Kelemen, 2007; Casler, Terziyan, & Greene, 2009; Kenward, Karlssson, & Persson, 2011). Conversely, there is research suggesting that sometime around 18 months of age, infants shift from having cognitive to more social motivations for learning, particularly during acts that may be interpreted as a means by which they can engage with others in social interaction (Kuhl, 2007; Nielsen, 2006; Uzgiris, 1981; Want & Harris, 2002). As an example, infants appear more likely to learn from and help a model when his or her actions during a pedagogical demonstration are coupled by, and in contingence with, the presence of warm, social cues such as eye contact and name-calling. Finally, infants likely have a motivation to learn from

others because of their early interactions with adults, such as their primary caregivers (e.g., Hobson, 2002). Specifically, when caregivers reflect back on infants' mental states by either speaking to them and treating them as an intentional agent (Fabes, Eisenberg, Nyman, & Michaelieu, 1991; Gergely, Egyed, & Király, 2007; Kaye, 1982; Lagutta & Wellman, 2001) or simply responding and mirroring back to them their own emotional states in a contingent manner (Brown & Dunn, 1996; Hobson, 2002; Gergely, 2001; Stern, 1985; Trevarthen, 1995), infants begin to construct internalized cognitive representations of themselves and of others as mentalizing agents who are separate but different - who have separate intentions but can work together in acts of joint intention (Parker-Rees, 2013; Tomasello et al., 2005). Certainly attachment theory suggests that the early interactions infants have with their caregiver will influence whether they place trust in him or her as well as in others and thus be inclined to explore the external environment and engage with others; those who have been responded to and had their needs taken care of are inclined to trust others as well as explore and learn about their surrounding environment, while those who have not learn to distrust others and be more cautious (Bowlby, 1969/1982).

A question of theoretical importance is whether by 18 months, infants can distinguish whether the host of cues presented by a model during a didactic pedagogical context are reliable or not, and thus decide whether or not to trust that model's intentions and goals in other contexts. It would be reasonable to assume that if infants were able to detect that someone is displaying unreliable cues based on their knowledge and experience of appropriate behavior, that they would decide not to subsequently learn from or associate with that person. As outlined above, infants by 18 months of age have already established some mastery in using a model's cues to help decide whether to learn novel words from, imitate, or help that person, and therefore may be

more motivated to learn from a reliable model. Indeed, while it has been proposed that young children may at first accept new information and assume an instinctive, default sense of trust in others (e.g., Burge, 1993; Fricker, 1995; Harris, 2007), it has also been proposed that they will subsequently evaluate information that has been shared with them based on the social context and when they have previous knowledge that conflicts with it (e.g., Bergstrom, Moehlmann, & Boyer, 2006; Clément, 2010; Goodman, Baker, & Tenenbaum, 2009). As linguistic or communication errors are perhaps not uncommon - some individuals may intend to deceive or are simply prone to making mistakes - it would be reasonable to assume that infants in the early stages of lexical development have established mechanisms to block or detect deceptive communication from others in order to protect their own knowledge base (Perner, 1991; Sperber, 2001).

Young Children's Selective Trust

The literature on interpersonal trust has proposed a tripartite model to explain how trust is comprised of cognitive, affective, and behavioral components (Van de Ven & Smith Ring, 2006). In this manner, cognitive or epistemic trust has been defined as expectancy or belief that another's word or action is reliable (Rotter, 1971). It is rational and logical, and based on knowledge accumulated through experience. Affective trust, also considered as emotional or benevolent trust, results from an emotional bond or connection built from felt concern and empathy, and is established in another because of this connectedness as oppose to rationality or logic (Kuhlmann, 2008; Riegelsberger, Sasse, & McCarthy, 2007). Finally, behavioral trust is the actual physical embodiment of acting towards others in a trusting way, and is achieved based on one's attributions, beliefs, and feelings that others are trustworthy (Szczésniak, Colaço, Rondón, 2012). One way to examine each of these factors within a developmental framework is to

consider factors that might influence infants to manifest each type of trust. In capturing infants' epistemic trust, we propose and hence outline how a model's verbal accuracy and competence might be influential. In measuring infants' emotional trust, we consider how a model's communicative intent and emotional bond would be influential. Finally, by outlining how infants modify their learning and helping according to a model's trustworthiness and reliability in domains where they have developed some expertise (e.g., word learning, imitation, and helping), children's behavioral trust will be taken into account.

Extensive empirical research was conducted in order to identify these three main components of selective trust within the period of early childhood and infancy (Szczésniak et al, 2012). Infants' selective trust has only been examined recently, beginning with a series of studies examining 14- to 18-month-olds. Specifically, it was found that when the accuracy of a model's communicative cues was manipulated by exposing infants to an experimenter who expressed excitement while either looking into an empty box (unreliable) or a box that contained a toy (reliable), infants were less like likely to attribute beliefs (Poulin-Dubois & Chow, 2009), imitate (Poulin-Dubois, Brooker, & Polonia, 2011), and gaze follow (Chow, Poulin-Dubois, & Lewis, 2008) the unreliable model. Before this research, the literature on selective trust had focused mostly on the preschool period. This specific area of children's social-cognitive development began garnering immense interest and popularity with its examination of whether preschool children would attend to the nature of the verbal information given by adults when deciding whether to learn a novel word from them. Language may have been the main starting point for examining selective trust at this developmental stage, as it is a domain wherein if young children did not display some type of spontaneous trust, they would not be able to join the larger, cultural linguistic community (Burge, 1993).

The Influence of a Model's Verbal Accuracy. The first set of studies to examine this topic used what later became the standard selective trust paradigm. Specifically, 3- and 4-year-olds were exposed to two informants, one who was verbally accurate in labeling familiar objects and therefore a reliable source (e.g., saying "That's a ball!" to refer to a ball), and one who was verbally inaccurate and thus unreliable (e.g., saying "That's a shoe!" to refer to a ball; Koenig, Clément, & Harris, 2004). Subsequently, preschoolers observed both sources give conflicting labels for a novel object wherein one called the object a "Mido," whereas the other one called it a "Toma." Preschoolers of both ages preferred to learn a new word from the previously reliable source, as evidenced by their asking and endorsing behavior. This suggests that within the domain of word learning, children will selectively trust and prefer to learn from someone who has demonstrated that he or she is a reliable and accurate word labeler.

A potential criticism of the design of this study and that of other studies based on a similar paradigm (e.g., Clément, Koenig, & Harris, 2004; Pasquini, Corriveau & Harris, 2007) is that it is too demanding to examine sensitivity to reliability in a younger population. Indeed, 3-year-olds appear to have difficulty assuming a naïve perspective in others when they themselves possess accurate knowledge (Birch, 2005) such that they often are unable to attenuate their word learning based on a person's previous verbal inaccuracy (Clément et al., 2004; Koenig & Harris, 2005a) and may have a hard time resisting others' verbal testimony (Clément, 2010; Jaswal et al., 2010). A forced-choice comparison requires young children to keep track of who is reliable and who is not which may tax their limited executive functioning skills, such as memory and inhibitory control, thus creating task demands which are simply too high (Pasquini, Harris, Tivnan, & Koenig, 2006). In addition, because children younger than 3 years of age have limited theory of mind skills making them less able to infer that others possess knowledge that is

different from their own, they might be more likely to assume that others operate according to the principle of conventionality and thus default towards believing that word labels are shared by all speakers of the same community (Sabbagh & Henderson, 2007). By holding this assumption and because of the infrequency by which they are exposed to these types of labeling errors, children might be less sensitive to inaccurate labels. However, young children may be especially sensitive to these errors if they do not hold the assumption of conventionality. For example, if the community in which they live is multi- or bilingual such that everyone does not share a common language, children may be less likely to assume that knowledge of word meanings extends to others (such as when hearing an English speaker say a word incorrectly in French because of a lack of proficiency in that language). Thus, it may be especially adaptive for young children living in a multicultural city to be especially sensitive to these errors given the risk of learning false information.

Indeed, when tasks demands are developmentally appropriate, such as using single-speaker as opposed to forced-choice paradigms, infants at 24 months of age are sensitive to a speaker's verbal inaccuracy and choose not to learn novel words from an inaccurate source (Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2012). It is logical to believe that when infants are 18 months of age and building their receptive and productive vocabulary (e.g., Fenson et al., 1991), as well as beginning to talk about what others think and know (Astington, 2000), that they should be able to recognize when a speaker has been verbally inaccurate and therefore modify their subsequent willingness to learn. Suggesting that this is the case, research has shown that by 16 months of age, infants will look longer at speakers who mislabel familiar objects (Koenig & Echols, 2003). Thus the first goal of the current set of studies was to examine if

infants at the age of the "vocabulary spurt," the earliest age ever examined, are sensitive to the verbal accuracy of others, as demonstrated by their selective word learning.

A potential reason for why young children might be choosing to learn from reliable as opposed to unreliable sources in the verbal domain is that they may be implementing their understanding of the "division of cognitive labor" as a learning strategy: knowing that some individuals are experts in specific domains in comparison to all people being omniscient (Danovitch & Keil, 2007; Koenig & Jaswal, 2011; Lutz & Keil, 2002; VanderBorght & Jaswal, 2009). Indeed, a model's accurate knowledge about categorization (Jaswal & Markman, 2007), object functions (Birch et al., 2008), number estimates (Einav & Robinson, 2010), causal mechanisms (Kushnir, Wellman, & Gelman, 2008), and the location of objects (Ganea, Ma, & DeLoache, 2011) has been shown to influence preschoolers' willingness to learn from that model within that particular domain. Meanwhile, research has also shown that children will attribute knowledge to an alleged expert beyond his or her domain of expertise, believing that an "animal expert" would also know about other novel facts such as how a carburetor works (Taylor, Esbensen, & Bennett, 1994). A logical extension of this literature to that of young children's trust and selective learning is to examine whether children would trust someone who was verbally accurate to be reliable only within that domain, or generalize his or her reliability to other domains as well. Evidence of this kind would suggest that children believe that a person's reliability is a global trait and that children possess a mechanism to trust others that is not limited to or entirely reliant on the domain of language and word acquisition (e.g., Clément, 2010).

Research with preschoolers has indeed demonstrated that by 3 years of age, children are more likely to learn about new object properties and relations from someone who has labeled familiar objects correctly (Clément et al., 2004; Kim, Kalish, & Harris, 2012). At this age,

children also prefer to imitate the actions of a verbally accurate source within the context of a rule-governed game and believe these actions to be the norm (Rakoczy, Warneken, & Tomasello, 2009). Additional findings also suggest that this "halo" effect may be quite broad; while 4-year-olds believe that a person who is verbally accurate is "smarter", without concluding that the person is "stronger", "nicer" or competent in other domains beyond object labeling (Fusaro, Corriveau, & Harris, 2011), 5-year-old children will form a higher impression of a person such as attributing prosocial dispositions to a person based on her prior accuracy in labeling (Brosseau-Liard & Birch, 2010). This suggests that by preschool age, children will believe that a model that is verbally accurate will also be more reliable, or possess positive attributes, in other domains. What remains to be seen in the literature is whether comparative findings would be found with a younger age group, demonstrating that infants also make generalizations about a speaker based on his or her accuracy beyond the domain of language. Thus, the second goal of this dissertation was to examine to what extent infants generalize one's verbal reliability to other domains, thus impacting their selective imitation and helping behavior.

There have been alternative explanations suggested for why children might prefer to learn from a verbally accurate source. Specifically, there is the possibility that children simply think that the verbally inaccurate person is odd rather than unreliable per say, due to his or her inaccurate labeling of familiar objects. It would seem important to rule out that hypothesis and confirm that it was the speaker's verbal reliability alone that was causing the effect on children's selective learning. One potential means is by examining children's sensitivity to speakers who either know the name of a familiar object or feign ignorance, as children are perhaps more likely to be exposed to people who are ignorant of object labels as opposed to those who say them

incorrectly. Indeed, research has examined preschoolers' sensitivity to a person's verbal knowledge or lack thereof.

The Influence of a Model's Verbal Competence. To examine the influence of a model's display of knowledge on children's learning, first within the domain of language, research with preschoolers has examined whether they prefer to learn new words for novel objects from a knowledgeable versus ignorant source (Koenig & Harris, 2005a; Sabbagh & Baldwin, 2001; Sabbagh, Wdowiack, & Ottaway, 2003). As an example, preschoolers were exposed to someone who either expressed the name of a familiar toy correctly (e.g., "I like to play with it. It's a ball") or who did not know the name of the toy (e.g., "I like to play with it. I don't know what it's called"; Koenig & Harris, 2005a, experiment 2). Preschoolers were more likely to seek out the name of a novel object from the more knowledgeable source. Extensions to these findings have shown that preschoolers will also trust and endorse the testimony of someone who uses confident versus uncertain verbal cues within the domain of category membership. Specifically, preschoolers will endorse a source's testimony that a key-like object is a spoon when the person who introduces the hybrid-object prefaces their introduction by saying, "I *know*," as opposed to the person saying, "I *think*" (Jaswal & Malone, 2007). Furthermore, preschoolers prefer to learn from someone that appears to possess special knowledge of the hybrid object such as being its inventor as opposed to just discovering it (Jaswal, 2006), as well as when the person uses seemingly credible pragmatic cues, such as "You're not going to believe this, but…" versus someone who has simply introduced the object neutrally (Jaswal, 2004). Recent research demonstrates that sensitivity to an unknowledgeable source also appears as early as 24 months of age (Krogh-Jespersen & Echols, 2012). Specifically, toddlers were less willing to learn a second label for a familiar object from a source that was previously ignorant of the

labels of several familiar objects and appeared unfamiliar when interacting with them, stating "I don't know, what's that?" Taken together, these findings suggest that as early as 24 months of age, children prefer to endorse novel information, such as the name of a novel object, from more knowledgeable, confident sources.

A model's verbal accuracy or knowledge is not the only factor children take into account when deciding whom to learn from. It has been demonstrated that social factors implicating a model's credibility appear to be influential on infants' decision, such as the approval of others (Fusaro & Harris, 2008), in addition to shared consensus from others (Corriveau, Fusaro, & Harris, 2009). Perhaps children's own observations or interactions with a model that appeared well intended and benevolent would influence their attribution of him or her as being a credible teacher and a reliable source of accurate information (Clément, 2010). Indeed, as indicated earlier, children by 9 months of age can already distinguish between someone who has benevolent versus malevolent intentions (Behne et al., 2005), and so it is possible that infants would use this information to attenuate their learning of novel words at 18 months of age.

The Influence of a Model's Communicative Intent. Examining specifically whether the nature of a model's intent influences preschoolers' selective behavior, Mascaro and Sperber (2009) exposed 3- and 4-year-old children to two puppets, one that was described as "mean" and another who was described as "kind." Afterward, both puppets made a declaration about the contents of a box; children were not given access to the boxes contents but had to rely on both puppets' testimony. All children were less willing to endorse and trust the testimony of the puppet described as "mean." This suggests that children understood the puppets intent, evaluated it for its nature (benevolent or malevolent), and used this judgment to infer whether or not to trust that puppet's claims later on. Slightly older preschoolers have been found to make similar

judgments based on their first-hand observation, in that they will prefer to trust an experimenter who displays benevolent versus malevolent intentions (Vanderbilt, Liu, & Heyman, 2011). While research has shown that even young infants distinguish between benevolent and malevolent geometric figures depicted as either helping or hindering another get up a cliff (Hamlin, Wynn, Bloom, 2007, 2010), there is no research examining whether infants would also display selective trust toward a model on the basis of his or her intent, as demonstrated by their attenuated learning.

In summary, while preschoolers' learning is affected by a model's verbal competence and malevolent intent, it remains unknown whether infants would be similarly influenced or whether they might value verbal indices of a model's reliability differently than socio-emotional indices. For early word learners, the implications of learning from someone who was incompetent or intentionally deceitful could be great. Indeed, it is not always the case that a model's reliability is easily demonstrated via verbal cues. It would therefore be beneficial for infants to be capable of detecting and discriminating models according to various aspects of their character and reliability. One mechanism used to detect children's sensitivity to various aspects of a model and to decipher whether they attend to certain characteristics over others is by presenting children with both types of information simultaneously (Reyes-Jaquez & Echols, 2013; Scofield, Gilpin, Pierucci, & Morgam, 2013). Thus a third goal of the present dissertation was to examine whether infants at the age of the "vocabulary spurt" would be more sensitive to the competence or intent of a model as exemplified by their selective word learning.

Also of theoretical importance is whether infants would generalize a model's verbal competence and communicative intent to impact their behavioral trust in domains beyond that of word learning. As the implications for trusting an unreliable source with new information can be

great, children might find it adaptive to modify their behavior more globally (Mills, 2013). Examining whether children make generalized attributions of reliability to a speaker based on his or her verbal competence, Koenig and Harris (2005a) examined 3- and 4-year-olds' willingness to learn novel object functions from a source who was previously ignorant or knowledgeable of familiar object labels. Children preferred to learn the novel object function from the previously knowledgeable source. Children as young as 24-months were also more likely to infer a property to an object based on the label a speaker gave it (even so far as treating a key-like object labeled a "spoon" as something to be used to eat with), when the speaker had previously been confident in her labeling (Jaswal & Markman, 2007; see also Birch, Akmal, & Frampton, 2010 for toddlers preferring to learn object functions from sources who demonstrate confident non-verbal cues). Furthermore, 18-month-olds also generalize perceived verbal competence to the domain of helping, and prefer to help someone who speaks the same native language (Buttelman, Zmyj, Daum, & Carpenter, 2012). On the other hand, a model's communicative intent also influences children's behavior more globally. Indeed, Dunfield and Kuhlmeier (2010) demonstrated that 21-month-olds preferentially help someone who has helped them receive a toy, even if the experimenter intended to do so but could not, but do not help someone who has malevolent intentions, such as an experimenter who removed a toy from their grasp or did not intend to give them a toy at all. In addition, 18-month-olds are more likely to imitate a model that makes use of social, ostensive cues and thus appears more friendly and helpful (Kiràly et al., 2004, Nielsen, 2006). Therefore, a fourth goal of the dissertation was to examine which characteristic of the model was more capable of generalizing to these other domains, in order to determine what feature of a model's reliability infants place more weight on.

Finally, perhaps infants might be influenced in their decision of whether to learn and help if the model was one that infants had a long history of interaction with, so that infants' internal representation of the model as trustworthy and reliable would have had time to be solidly established. Indeed, by 24 months of age, infants' evaluation of their caregiver as being emotionally reliable and dependable is said to be stable and cumulative (e.g., Xue, Moran, Pederson, & Bento, 2010), and likely to foster their desire to learn about their environment (Ainsworth, 1963; Bowlby, 1969/1982; Cassidy, 1999). Therefore, children might perceive a caregiver who is aware of their signals, accurately interprets them, and responds to them in a suitable and timely manner, to be emotionally trustworthy (Harris & Corriveau, 2011), and thus more worthy of demonstrating behavioral trust toward.

The Influence of a Model's Emotional Cues. The first set of studies to examine how the quality of the emotional relationship with an adult affected young children's selective learning examined 3-, 4-, and 5- year-olds. Specifically, Corriveau & Harris (2009) examined whether the familiarity of a preschool teacher would influence children's preference in asking about the names of novel objects as well as how to use them, when manipulating the accuracy of the teacher's previous object labeling. While all children preferred the familiar source when her accuracy was not manipulated, 4- and 5-year-olds modified their preference when the teacher was inaccurate. Interestingly, 3-year-olds did not, but instead retained solidarity with the familiar teacher. Rather than children's preference for the familiar teacher being due to repeated exposure or her epistemic knowledge, the authors suggested that the "emotional quality" of the relationship with their teacher was most likely causing the preference, with younger children favoring familiarity over accuracy when deciding whom to learn novel information from.

However, the authors could not solidly conclude that hypothesis as the level of closeness of the student-teacher relationship did not influence children's preference ratings.

Therefore, a follow-up study examined whether 4- and 5-year-olds would have a preference for their mother or a stranger when endorsing the identity of a novel animal hybrid, and whether this preference would be moderated by children's attachment status (Corriveau et al., 2009). Children's preference for their mother's claim did vary according to attachment status; while those classified as avoidant demonstrated the least reliance on their mother, securely attached children were most flexible in their reliance. Specifically, they preferred their mother when she presented an equally plausible name for an animal hybrid that was a 50/50 composition of two animals but rejected her claims when she labeled the 75/25 hybrid according to the least representative name. Perhaps preschoolers were responding to their caregiver's consistent helpful nature, as the attachment relationship can be viewed as being founded in a warm, caring, responsive environment.

Taken together, these studies provide important information regarding how young children modify their selective learning from a familiar and close source, while accounting for the closeness of the relationship as felt and experienced by the child. However, what is missing from this literature is an assessment of how the level of a model's emotional reliability and availability exerts an effect on young children's selective learning and helping. Therefore, the final goal of this dissertation was to examine whether young children would modify their learning and helping behavior from a primary caregiver as a function of his or her emotional availability and cues of responsiveness. Infants were examined at 24 months of age, as opposed to 18 months of age, in order to ensure that they were more capable of internalizing their caregiver's behavior and thus more likely impacted by the history of their interactions.

In sum, the set of studies comprising the current dissertation had several goals in mind, all of which entailed examining how different aspects of a model's reliability would affect infants' selective trust and consequently their decision to learn from, imitate, and help that model. Specifically, Study 1 set out to examine whether 18-month-olds would be impacted by the verbal accuracy of a speaker such that their decision to learn novel words, imitate, and help her would be attenuated (**Goal 1 and 2**). Thus, infants were exposed either to a speaker who labeled familiar objects correctly or incorrectly and then observed in their subsequent interactions with the speaker, who labeled a novel object with a novel label, demonstrated an "irrational" means of interacting with an object, and appeared in need of help. Study 2 examined 18-month-olds' sensitivity to a speaker's verbal competence as well as the nature of her communicative intent, while also examining for how these factors would impact infants' selective behavior (**Goal 3 and 4**). Specifically, infants were exposed to a speaker that was either verbally competent (knowledgeable about familiar object labels) and malevolent (offered a toy to the infant but then showed no intention of giving it) *or* ignorant of familiar object labels and benevolent (offered a toy to the infant and subsequently handed it over) and then examined in their interactions with the speaker, as in Study 1. Finally, Study 3 examined 24-month-olds in their interactions with their primary caregiver in order to assess how a model's emotional availability and responsiveness affects infants' selective behavior (**Goal 5**). Emotional availability was coded in the laboratory during a 10-min interaction of the dyad, and then infants' willingness to learn from the primary caregiver on similar tasks as Study 1 and 2 was examined. If the model's behaviors violate infants' prior experience and expectations of others, then infants may choose not to trust that model and accept the information he or she presents. However, infants might still default towards assuming others are trustworthy, and therefore be unaffected

in their decision to learn. Finally, different aspects of a model's reliability may also be less applicable to infants in certain pedagogical contexts. Thus the markers as well as the scope of infants' attributions of trust were examined, under various learning contexts.

Chapter 2

Is a Bird an Apple? The Effect of Speaker Labeling Accuracy on Infants' Word Learning, Imitation, and Helping Behaviors

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Is a Bird an Apple? The Effect of Speaker Labeling Accuracy on Infants' Word Learning, Imitation, and Helping Behaviors

Young infants are impressionable learners, whose main means of acquiring new knowledge is through observation and interaction with another individual (Heyes, 1994). This however can entail taking certain risks, as the information can be misleading or inappropriate. Indeed, not all individuals have accurate or relevant knowledge about a given topic - some tend to make errors whereas others may intend to deceive. This poses a unique challenge to young children who are dependent on others to learn new and culturally relevant information (Csibra & Gergely, 2009; Gergely & Csibra, 2005; 2006; Gergely, Egyed, & Király, 2007; Jaswal & Neely, 2006). One key strategy implemented by young children in selecting whom to trust and learn from is to consider a model's *epistemic* reliability (Harris & Corriveau, 2011; Mascaro & Sperber, 2009; Rendell et al., 2011; Sperber et al., 2010).

There is a growing body of literature on children's sensitivity to others' epistemic reliability demonstrating that by 3 to 4 years of age, children consider reliability as a characteristic of an individual (Einav & Robinson, 2011; Harris, 2007; Koenig, Clément, & Harris, 2004; Koenig & Harris, 2005a; Sabbagh & Baldwin, 2001; Scofield & Behrend, 2008; Sperber et al., 2010). In this research, children have been shown to attend to the nature of the verbal information given by speakers, using their confidence and certainty (Sabbagh & Baldwin, 2001), conventionality (Diesendruck, Carmel, & Markson, 2010), and accuracy in labeling a familiar object (Corriveau & Harris, 2009; Koenig et al., 2004; Scofield & Behrend, 2008), in order to identify who is a reliable source and consequently guide whom to learn novel words from (Jaswal & Neely, 2006; Koenig & Harris, 2005b; Pasquini, Corriveau, Koenig, & Harris, 2007; Scofield & Behrend, 2008; Sobel & Corriveau, 2010).

A limited body of research examining infants' sensitivity to the epistemic reliability of others also exists within the domain of language. In particular, infants have been found to be sensitive to others' linguistic mistakes, with 24-month-olds saying "no" (Pea, 1982) and 16-month-olds looking longer (Koenig & Echols, 2003) at speakers who mislabel familiar objects. Most recently, 24-month-olds have been shown to correctly distinguish between unreliable and reliable speakers when learning a new word, being less able to map a novel label to an object when tested by unreliable, inaccurate speakers (Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2012). Thus, within the domain of word learning, while infants seem to recognize the accuracy of a person's word-labeling behavior, toddlers can use this information to determine from whom it is best to learn new words. Given that infants entering their second year of life are rapidly expanding their vocabulary (Gurteen, Horne, & Erjavek, 2011; Reznick & Goldfield, 1992) and possess a fairly large receptive vocabulary by 18 months (e.g., Fenson et al., 1991), their early verbal expertise might render them sensitive to others' verbal accuracy that in turn might affect their word learning. Thus, the main goal of the current study was to add to the extant literature on the developmental origins of children's sensitivity to epistemic reliability by being the first to examine whether infants learn new words differently from accurate and inaccurate speakers.

Beyond influencing learning in the domain of language, a source's verbal reliability has been shown to exert effects on children's behavior in other closely related domains. Specifically, 3- to 4-year-old preschoolers have been found to prefer to learn new object functions (Koenig & Harris, 2005a) as well as infer object properties and relations (Clément, Koenig, & Harris, 2004; Kim, Kalish, & Harris, 2012) from a source who was more accurate in object labeling. Children at the same age also prefer to imitate the actions of a verbally accurate source within the context

of a rule-governed game and believe them to be the norm, consequently making normative protests towards those third parties who do not conform to these actions (Rakoczy, Warneken, & Tomasello, 2009). Importantly, research demonstrating the developmental origin of this effect, specifically whether a model's verbal accuracy can influence infants' learning in other domains, has yet to be explored. Thus, another aim of the current study was to determine whether infants would judge a speaker who was verbally accurate to also be a reliable source beyond the domain of language as preschoolers do.

As a culturally normative process that develops around the time of language, the domain of imitation is an area worthy of exploring this effect. Indeed, between the ages of 12 and 18 months, infants understand others' goals and intentions (e.g., Sodian & Thoermer, 2004; Tomasello, Carpenter, Behne, & Moll, 2005) and can imitate what they infer to be the person's intended (Carpenter, Akhtar, & Tomasello, 1998; Olineck & Poulin-Dubois, 2005) and rational (Gergely, Bekkering, & Kiràly, 2002; Schwier, van Maanen, Carpenter, & Tomasello, 2006) goal. In addition, by the age of 14 months, infants become selective imitators on the basis of others' epistemic reliability, taking into consideration whether a model possesses accurate knowledge about conventional object properties and functions when deciding whether or not to imitate. For example, infants of that age are more likely to imitate a model who demonstrates reliable affective and communicative cues, such as someone who expressed excitement while looking into a box that contains a toy as opposed to someone showing the same affect while looking into an empty box (Poulin-Dubois, Brooker, & Polonia, 2011). At this same age, infants are also more likely to imitate a model that has previously demonstrated appropriate usage of familiar objects, such as putting a shoe on his foot as opposed to his hand (Zmyj, Buttelmann, Carpenter, & Daum, 2010). Thus the current study aimed to examine whether infants would also

be selective imitators on the basis of whether a model demonstrated accurate knowledge about familiar object labels.

In addition, children's willingness to assign positive "halo" attributes to a model based on his or her past epistemic reliability can be quite broad in scope. For example, 4-year-old children will credit knowledge to an alleged expert beyond his or her domain of expertise, believing an "animal expert" would also know about other novel facts, such as how a carburetor works (Taylor, Esbensen, & Bennett, 1994). Furthermore, children will even attribute positive traits or dispositions to a person who has demonstrated expertise. Specifically, 4-year-olds will believe that a verbally accurate source is "smarter" than someone inaccurate, without concluding that the person is "stronger", "nicer" or competent in other domains beyond object labeling (Fusaro, Corriveau, & Harris, 2011), whereas 5-year-old children will believe a verbally accurate source is more likely to be prosocial to others than someone who was verbally inaccurate (Brosseau-Liard & Birch, 2010). Infants also make attributions to a person based on prior accuracy or reliability. For example, by 14 months of age, infants are more likely to attribute beliefs (Poulin-Dubois & Chow, 2009) and follow the gaze (Chow, Poulin-Dubois, & Lewis, 2008) of a model whose affective and communicative cues have been accurate and reliable (same reliability manipulation as Poulin-Dubois et al., 2011, described above). What has not been demonstrated is whether infants make global generalizations based on a person's record of verbal accuracy, as older children do, and believe that an accurate, as opposed to an inaccurate, source is a more worthy candidate for them to help.

Instrumental helping is an instance of prosocial behavior that develops steadily between the ages of 14 to 18 months, wherein infants use a person's communicative cues, such as pointing and verbal utterances, to interpret and consequently help fulfill his or her intended but

unmet goal (Ross & Lollis, 1987; Warneken & Tomasello, 2006, 2007, 2009). Infants' helping behavior is also affected by a person's knowledge state as revealed by one study showing that infants only help a person locate an object if that person was not present when the object's location was changed (Lizkowski, Carpenter, Striano, & Tomasello, 2006). On the other hand, infants before the age of 18 months appear to be motivated by intrinsic altruistic tendencies in that they will provide help regardless of obstacles, reward, or incentive (Warneken & Tomasello, 2009). Indeed, it has been suggested that infants only gradually learn to direct aid selectively (Hay, 2009; Hay, Caplan, Castle, & Stimson, 1991; Vaish, Carpenter & Tomasello, 2010), and that by the age of 21 months, can discriminate whom they help on the basis of a person's benevolent intent (Dunfield & Kuhlmeier, 2010). Thus, the current study also included an instrumental helping task in order to examine whether a speaker's verbal inaccuracy would exert a strong enough effect to deter infants' robust helping behavior.

Building upon recent research exploring the mechanisms that young infants use to guide their selective learning from a single source (Koenig & Woodward, 2010) as opposed to a forced-choice comparison (e.g., Birch, Vauthier, & Bloom, 2008; Corriveau & Harris, 2009; Koenig et al., 2004; Scofield & Behrend, 2008), the current study employed a between-subjects design to compare the rates at which 18-month-old infants would choose to learn a novel word as well as imitate and help an epistemically reliable versus unreliable adult. Inaccurate labels were used for familiar objects in order to test whether infants use their existing verbal knowledge to detect inaccurate labels. It was expected that 18-month-old infants would be able to use their growing vocabulary to track the verbal reliability of a speaker and thus be less willing to learn a novel label from an inaccurate source, as has been previously shown with 24-month-olds (Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2012). With regards to learning new

actions, it was expected that infants would only expect someone who seemed to possess conventional knowledge to produce actions that are efficient and reasonable (e.g., Csibra & Gergely, 2009; Poulin-Dubois et al., 2011; Rakoczy et al., 2009; Zmyj et al., 2010), and thus be less likely to imitate someone previously epistemically unreliable on a rational imitation task. Finally, considering that only older children ascribe broad positive attributes to a person based on his or her verbal accuracy (Brosseau-Liard & Birch, 2010) and that non-epistemic characteristics such as kinship, familiarity, and reciprocity appear to influence older children's prosocial behavior (Dunfield & Kuhlmeier, 2010; see Warneken & Tomsasello, 2009 for a review), it was considered unlikely that young infants would reduce their willingness to help due to a speaker's verbal inaccuracy.

Method

Participants

Forty-nine 18-month-old infants (23 males and 26 females) were tested (M = 18.19, SD = 0 .85), ranging from 16.79 to 21.0 months. Reflecting the demographics of the population of the large city from which the sample was recruited, infants' primary language was either English (n = 35) or French (n =14). As a noun bias has been reported in infants' early vocabulary for each of these languages, it was considered appropriate to group them together for the purpose of this study, given that the reliability of the speaker's knowledge for nouns was manipulated (see Katerelos, Poulin-Dubois, & Oshima-Takane, 2011 for a similar procedure). A native speaker of the target language tested all infants in their mother tongue. All participants were recruited from birth lists provided by a government health agency, and were residing in a large Canadian city. They were all born within a normal gestation period and experienced no birth complications.

Thirteen additional infants were tested, but were excluded due to fussiness (n = 9) and technical difficulties (n = 4).

Design and Procedure

Prior to starting the experiment, infants were familiarized with the testing environment while their parents were asked to complete a demographic questionnaire, a 20-word checklist indicating the words that their child understood, and a French or English version of the short-form MacArthur-Bates Communicative Development Inventory – Level II measuring infants' productive vocabulary (MCDI; Fenson et al., 2000). Productive vocabulary is commonly used in studies examining word-learning ability in similar aged infants (Jaswal, 2007; Koenig & Woodward, 2010). In addition, increases in infants' word production have been reported to occur at the same time as increases in their comprehension (e.g., Goldfield & Reznick, 1990). During testing, infants were seated in a highchair across from the experimenter or on their parent's lap if they were unwilling to sit in the highchair. Parents were instructed to refrain from prompting their child in any way. The reliability task was always administered first, with the remaining tasks counterbalanced in order.

Reliability task. Participants were randomly assigned to either a reliable (n = 24) or an unreliable (n = 25) condition. Four small plastic objects were labeled either correctly or incorrectly, depending on the condition. The list of possible objects to choose from included: a ball, banana, bird, dog, spoon, chair, and shoe. These objects were chosen, as French- and English-speaking infants of this age typically know their name (O'Connell, Poulin-Dubois, Demke, & Guay, 2009). Infants in both conditions knew the label for at least three out of the four objects chosen. The experimenter allowed the child to play with an object for a timed period of

15 s (Phase One). Afterwards, the experimenter picked up the object and manipulated it while labeling it three times in an animated manner during a period lasting no longer than 10 s (Phase Two). Infants in the reliable condition watched the experimenter correctly label the objects while infants in the unreliable condition watched the experimenter incorrectly label the objects. The spoon was always mislabeled a truck, the dog a telephone, the banana a cow, the shoe a bottle, the ball a rabbit, the bird an apple, and the chair a flower. Therefore for the unreliable condition, infants watched as the experimenter pointed to a *bird* and said, "That's an *apple*. An *apple*. Look at the *apple*," if their parents had indicated that they understood the word *bird* and thus could recognize that it had been mislabeled. The incorrect labels were made to differ from the correct label in terms of category, first phoneme, and (except in one case) number of syllables. Once the experimenter finished labeling the object, she gave it back to the infant. The infant was then allowed to play with the object for another 15 s (Phase Three). This sequence was repeated 3 times, for a total of 4 trials.

The reliability task was coded for various behaviors during Phase Two and Three. During Phase Two, the proportion of infants' total looking time at the experimenter while she was labeling the toy (in s) was computed. In Phase Three, the proportion of looking time at the experimenter, at the toy, and at the parent (in s) was coded, once the toy was placed in front of the infant. All sessions were recorded and coded by the primary experimenter. An independent observer coded a random selection of 20% (n = 10) of the videotaped sessions in order to assess inter-observer reliability in each condition. Using Pearson product-moment correlations, the mean inter-observer reliability for looking time variables in the reliability task was r = .93 (range = .85 to .97).

Word learning task. This task was adapted from the discrepant condition used by Baldwin (1993). It required that infants disengage their attention from their own toy in order to focus on the toy that the speaker was labeling. As such, it allowed for a direct comparison of infants' attentiveness to the speaker's utterances across conditions. While this procedure is challenging for very young word learners, infants at 18-months of age have been found to successfully disengage and learn novel words (Baldwin, 1993; O'Connell et al., 2009). The procedure included three phases: a warm-up phase, a training phase, and a test phase. The test phase consisted of both familiar and novel word comprehension trials. Based on infants' knowledge of the names of familiar objects (indicated on the word comprehension checklist), two object pairs not previously used in the reliability task were chosen: one pair was used exclusively for the warm-up phase and the other pair exclusively for the test phase, during the familiarization trials. The objects were (as much as possible) similar in terms of size and attractiveness, but differed in terms of category and appearance.

Warm-up phase. During the warm-up phase, the experimenter presented the infant with a box containing a pair of familiar objects and asked for one of them in order to encourage the infant to give her the requested object. Infants were praised for selecting the correct object. If infants selected the incorrect target, the experimenter asked, "Did you find it?" Once infants selected the correct target, the training phase started.

Training phase. In the training phase, the experimenter garnered the infant's attention to a pair of novel toys, a wooden nut-and-bolt toy and a blue cylindrical rattle, by modeling their function twice (the wooden toy was spun, the rattle was shaken). Subsequently, both objects were given to the infant to explore for a period of 15 s. Both the first toy being manipulated and the side in which it was placed in front of the experimenter were counterbalanced. While the

infant was attending to the non-target object, the experimenter picked up the target object and labeled it by saying, "It's a *Dax*," (or *Muron* for French speakers) four times. The same novel object was labeled four times and was always given this same label. Afterwards, the experimenter returned the target object to the infant so that both objects would be available for the infant to play with, for a period of up to 60 s.

Test phase. During the test phase, the experimenter administered two types of trials in order to examine infants' comprehension of the novel and familiar word. For each trial, the experimenter presented the infant with either one of two pairs of objects on a tray: two familiar objects or two novel objects. The same object pairs were used across all four trials. The experimenter then requested one of the objects by saying, "Where is the X? Give me the X," before sliding the tray over to the infant to choose one of the objects. In order to avoid prompting the child during this request, the experimenter only looked at the infant, and never at the tray. There were eight trials in total in which four familiar word trials were alternated with four novel word trials. The location of the objects on the tray, the novel target object, as well as which type of trial (familiar or novel) was presented first, were counterbalanced across participants.

Coding and reliability. Several behaviors were coded during the training phase. Similar to Baldwin (1993), we coded whether infants disengaged from their own toy and followed the gaze of the speaker to map the referent of the label so that infants received a proportion of disengagement score out of the total number of training trials (out of 4). We additionally coded the total proportion of time infants spent looking at the speaker during the four instances of word labeling, in order to assess whether there were differences across condition in terms of attentiveness. During the test phase, infants' word comprehension was assessed, based on which object in the pair infants chose first, according to infants' first touch. If both toys were chosen

simultaneously, the trial was repeated by asking infants to show their parent the toy (the toy infants chose during this request was coded as their selection). In addition, infants were only inferred to have understood the demands of the task if their comprehension on the familiar trials was above that expected by chance. This task therefore generated two scores measuring the proportion of trials during which infants selected the correct target, one for novel words (out of 4) and one for familiar words (out of 4). Inter-rater reliability for the proportion of correct trials for novel and familiar words was $r = .99$ (range = .89 to 1.00).

Rational imitation task. The imitation task was adapted from Schwier, van Maanen, Carpenter and Tomasello (2006). A toy dog and a small wooden house (37 x 25.5 x 22.5 cm) were used. The colorful house was comprised of a door and window in the front, a chimney in the roof, and a concealed backdoor in the rear.

Demonstration and test phases. The doghouse was placed on the table, in front of the infant, wherein the door to the doghouse was shown to be open. The experimenter drew the infant's attention by calling the infant's name, and only proceeded with the demonstration when the infant was attending. The experimenter began by tapping the open door twice and saying, "Look, the door is open!" She then started to make the dog approach the open door in an animated fashion, paused it in front of the door to make two short forward motions, and then moved the dog up and through the chimney into the house, while saying "Youpee!" Finally, the experimenter retrieved the dog through a concealed backdoor, placed both the dog and house in front of the infant, and stated, "Now it's your turn." The infant was given 30 s to respond. If the infant placed the dog in the doghouse at any point during the 30 s, the experimenter retrieved it and returned it to the infant. At the end of this response period, the experimenter repeated the entire process, including a demonstration and response period, for a second trial.

Coding and reliability. The imitation task was coded similarly to Schwier and colleagues (2006), based on whether the infant attempted to imitate the experimenter's actions on each trial. Imitation was defined as copying the experimenter's exact means of putting the dog through the chimney and coded as 1. Emulation, that is, copying the experimenter's end goal of putting the dog in the house (through the door), was coded as 0. This created a total imitation score (maximum score = 2), which was then converted to a score indicating the total proportion of successful imitation. The inter-rater reliability for success scores on the imitation task was r = .95.

Instrumental helping task. This task was adapted from one of Warneken and Tomasello's (2006) Out-of-reach tasks (the Paperball task) and thus incorporated a 30 s response period, repeated over three trials. Similar ostensive cues were used as in the rational imitation task, in that infants were called by their name at the outset of the task, with the task proceeding only if infants attended to the experimenter's demonstration.

Demonstration and test phases. The infant watched as the experimenter picked up all three colored plastic blocks on her side using a pair of child-safe tongs, placed them in a yellow plastic bucket, and then tried unsuccessfully to reach for a block on the child's side of the table. The experimenter reached for each of three blocks (placed one at a time in front of the infant) for a period of 30 s. After the experimenter alternated looks between the block and infant for the first 20s of this 30 s response period (see Warneken & Tomasello 2006, for details), the final 10s consisted of her verbally clarifying the situation for the infant, saying, "I can't reach!"

Coding and reliability. Infants were considered to help if they either moved the blocks closer to the experimenter or placed them in her tongs. Infants' performance on all three trials

was averaged together, creating a total proportion of success score (out of 3). Inter-rater reliability was in perfect agreement for infants' helping, $r = 1.00$.

Results

Preliminary Analyses

Infants did not differ with regard to the number of words in their productive vocabulary (as measured by the MCDI) across the reliable ($M = 21.83$, $SD = 17.83$) and unreliable condition ($M = 17.08$, $SD = 9.95$), $t(47) = 1.16$, $p = .25$, Cohen's $d = 0.33$. In addition, the number of words infants knew that the speaker labeled in the reliability task (out of four) in the reliable ($M = 3.80$, $SD = 0.41$) and unreliable ($M = 3.88$, $SD = 0.34$) condition did not differ, $t(47) = 1.16$, $p = .25$, Cohen's $d = 0.33$. There was no effect of these two variables on infants' performance on the main variables (novel word learning, proportion of trials infants' imitated, proportion of helping), nor was there an effect for age, gender, language, or trial order. Therefore results were collapsed across these variables. Data from one infant was removed from the analyses for the training task only because her face was out of view and therefore her looking times could not be coded. A summary of the main findings from the three experimental tasks, according to condition, can be found in Table 1.

Reliability Task

Infants from both conditions were equally attentive during the labeling of the toy, as indicated by the high proportion of time infants spent looking at the speaker when she was labeling the toys, during Phase Two (reliable: $M = 99.40$ %, $SD = 21.25$; unreliable: $M = 98.46$%, $SD = 43.34$), $t(46) = -0.94$, $p = .35$, Cohen's $d = 0.03$. A condition (reliable vs. unreliable) by target of looking (experimenter vs. parent vs. toy) mixed factorial ANOVA was

computed on infants' proportion of total looking time during Phase Three, once infants had access to the toy. There was no effect of condition, $F(2, 92) = 1.18$, $p = .28$, $\eta_p^2 = .03$, nor any significant interaction, $F(2, 92) = 1.39$, $p = .25$, $\eta_p^2 = .03$. There was a significant main effect of target, $F(2, 92) = 103.71$, $p = .00$, $\eta_p^2 = .69$, with infants spending the greatest proportion of trial time looking at the toy ($M = 47.76\%$, $SD = 15.19$) than at either the experimenter ($M = 32.63\%$, $SD = 12.01$) or their parent ($M = 6.65\%$, $SD = 9.20$). This suggests that infants from both conditions were focused on the experimenter's cues during labeling and were as likely to subsequently engage with the toy regardless of the accuracy of the labeling.

Word Learning Task

Several behaviors were coded during the training phase to insure that infants were equally attentive to the speaker across conditions. With regard to the proportion of trials (out of 4) that infants disengaged from their own toy to follow the direction of the speaker's gaze to the object being labeled, there was no difference between the reliable ($M = 87.50\%$, $SD = 18.06$) and the unreliable ($M = 92.02\%$, $SD = 11.89$) condition, $t(47) = -1.04$, $p = .30$, Cohen's $d = .30$. In addition, we coded for the total proportion of trial time infants spent looking at the speaker during object labeling. Four infants from each condition were excluded in this analysis, as their face was out of view for parts of the duration of the trial; therefore while their initial disengagement could be coded, their total looking time at the speaker could not be coded reliably. It was found that infants in the unreliable condition ($M = 49.68\%$, $SD = 21.23$) looked longer at the speaker during labeling than those in the reliable condition, ($M = 34.52\%$, $SD = 18.84$), $t(39) = -2.42$, $p = .02$, Cohen's $d = .76$. Subsequent analyses showed that the proportion of times infants disengaged ($r = .01$, $p = .93$) and the proportion of time infants spent attending to the speaker during novel object labeling ($r = -.18$, $p = .27$) were unrelated to infants' successful

selection of the target object on novel word trials. Therefore results were collapsed across these factors.

In order to examine differences in performance across conditions, a condition (reliable vs. unreliable) by trial type (familiar vs. novel) mixed factorial ANOVA was computed, with proportion of correct object choices as the dependent variable. A significant main effect was found for type of word wherein, overall, infants did worse on novel trials (M = 50.51, SD = 28.64) than on familiar trials (M = 77.88, SD = 20.41), $F(1, 47) = 29.38$, p =.00, $\eta_p^2 = .39$. Infants also did better as a function of condition, with those in the reliable group (M = 70.50, SD = 20.33) outperforming those in the unreliable group (M = 58.20, SD = 27.34), $F(1, 47) = 6.75$, p .01, $\eta_p^2 = .13$. However, the ANOVA failed to yield a significant interaction between trial type and condition, $F(1, 47) = 1.01$, $p = .32$, $\eta_p^2 = .02$, suggesting that the effect of the speaker's reliability is equivalent on infants' subsequent recognition of both familiar and novel words.

In addition, one-sample t tests were conducted to compare infants' selection of the correct target word on novel and familiar word trials to chance (50%). Overall, infants performed better than chance on familiar trials in both the reliable (M = 81.58%, SD = 17.41), t (23) = 8.89, p = .00, 95% CI [0.24, 0.39] and unreliable conditions (M = 74.32%, SD = 22.71), $t(24) = 5.36$, p = .00, 95% CI [0.15, 0.34], indicating that they understood the demands of the task. In contrast, only infants in the reliable condition performed greater than chance on novel trials (M = 59.38%, SD = 23.09), $t(23) = 1.99$, p = .05, 95% CI [-0.00, 0.19] whereas those in the unreliable condition did not (M = 42.00%, SD = 31.22), $t(24) = -1.28$, p = .21, 95% CI [-0.21, 0.05]. Nonparametric analyses using the Mann-Whitney U Test confirmed this pattern of findings (see Figure 1). Specifically, it indicated that there were differences across conditions on novel label trials, U(47)

= 204.00, z = -1.99, p = .05, r = - .29, but not on familiar label trials, $U(47)$ = 247.60, z = -1.12, p = .26, r = .16.

Rational Imitation Task

In order to compare infants' imitative behavior, the proportion of trials infants put the dog in the house was used, as some infants did not respond on both trials (5 in the unreliable condition and 2 in the reliable condition). In addition, one infant in the reliable condition did not complete the task and was not included in the analyses. All infants were found to be 100% attentive to the model's demonstration during the entirety of its duration. It was found that 16 out of 23 infants (70%) in the reliable condition put the dog in the chimney on one or both trials whereas only 12 out of 25 infants (48%) in the unreliable condition did so, $\chi^2(2, 46)= 6.71$, p = .04, ϕ = .37. A group comparison using the Mann-Whitney U test found that infants used the chimney in a greater proportion of trials in the reliable (M = 54.35%, SD = 42.41) than in the unreliable condition (M = 28.00%, SD = 32.53), $U(46)$ = 187.50, z = -2.21, p = .03, r = .33. Similar to Schwier and colleagues' (2006) finding, this result was due to differences on the second trial. Specifically, on the first trial, 12 out of 23 infants (52%) in the reliable condition compared to 9 out of 25 infants (36%) in the unreliable condition used the chimney, $\chi^2(1, 46)= 1.27$, p = .26, ϕ = .16. In contrast, on the second trial, 13 out of 21 infants (62%) in the reliable condition compared to 2 out of 20 infants (10%) in the unreliable condition used the chimney, $\chi^2(1, 39)= 11.90$, p = .001, ϕ = .54.

Instrumental Helping Task

All infants were found to be 100% attentive to the speaker's demonstration. Consequently, a score representing infants' total proportion of helping behaviors across the three

trials was computed. While there were some infants who chose not to help at all (5 infants in each condition), 72.0% and 66.7% in the unreliable and reliable condition, respectively, completed all three trials. The majority of infants chose to help as both infants in the reliable (M = 73.63, SD = 41.69) and unreliable condition (M = 76.00, SD = 41.42) displayed high proportions of helping across the three trials. In contrast to infants' learning behavior, an independent t-test failed to find differences in infants' proportion of helping, $t(47) = 0.20$, p = .84, Cohen's d = 0.05.

Discussion

Only recently have the effects of a model's epistemic reliability been examined as they impact infants' behavior. To date, no study has addressed whether infants modify their learning according to a speaker's verbal accuracy around the time of the "language explosion" or the scope of this effect on a range of infants' learning and prosocial behaviors. The present findings are therefore important because they provide three main contributions: 1) 18-month-olds' novel word mapping and familiar word comprehension are impacted when tested by an inaccurate speaker, the earliest age ever to report such an effect; 2) the effect of a speaker's accuracy extends beyond the domain of language, influencing infants' willingness to imitate the speaker's actions; and 3) infants' prosocial behaviors such as instrumental helping remain uninfluenced by a speaker's verbal accuracy.

Previous research with infants at 16 months of age has shown that they respond differently to an accurate versus an inaccurate speaker as well as to the object that receives a correct or incorrect label, based on their looking and pointing behavior (Koenig & Echols, 2003; Pea, 1982). The current study found that despite the experimenter's unexpected behavior when

mislabeling familiar objects, infants maintained their attention toward each speaker equally during the labeling phase and were as likely to engage with the toy afterward. While these findings appear to conflict with one another, there are methodological differences between the studies that make direct comparisons difficult. First, the set-up in Koenig and Echols' (2003) study allowed them to clearly assess differential looking time to the experimenter and the object being labeled, which was projected ahead of the experimenter on a screen. In the current study, the speaker was directly in line of (and behind) the toy being labeled and so infants' gaze and attention to the experimenter's labeling display could not be teased apart from their attention to the object being labeled. Thus, infants' interest in the toy being labeled by the experimenter may have masked their differential treatment of the experimenter. Furthermore, the current study reported looking times at the toy following the labeling phase, once infants had access to the toy. Since infants in Koenig and Echols' study never had access to the toy either during or following labeling, our reported looking times may reflect infants' desire to explore the toy, which may have overridden any preference they may have at this age for objects that are identified correctly. Nevertheless, it appears that infants were indeed able to detect the speaker's inaccuracy in light of their building receptive vocabulary as revealed by their differential treatment of the speaker in subsequent tasks.

Confirming our main hypothesis, infants performed more poorly on a word learning task when interacting with a speaker who demonstrated incompetence in object labeling. Specifically, 18-month-old infants performed less well during both novel and familiar word trials when tested by a speaker who previously incorrectly labeled familiar objects. Thus, it appears that not only was infants' ability to map a novel word to a novel object impaired but also their overall trust that the speaker was requesting the correct object during any aspect of the test phase. Infants

might have found it surprising that a speaker who had just shown a lack of knowledge about familiar object labels was later able to request a familiar object by its appropriate name (see Koenig & Woodward, 2010 for a similar interpretation). Nevertheless, chance analyses indicated that infants in both conditions performed at levels higher than would be expected by chance on familiar word comprehension trials and that only infants in the reliable condition showed a robust knowledge of the novel object labels. Taken together, it therefore appears that infants in the unreliable condition used their knowledge of the speaker's verbal inaccuracy to guide their behavior during all labeling contexts.

Research examining how word learning is tempered by the reliability of the source has largely been restricted to work with preschoolers (e.g., Jaswal & Neely, 2006; Koenig & Harris, 2005b; Pasquini, et al., 2007; Scofield & Behrend, 2008). In addition, previous research with 24-month-olds has been somewhat inconsistent, demonstrating that at times infants actually do learn novel words from sources that have previously been verbally inaccurate (Koenig & Woodward, 2010; Krogh-Jesperen & Echols, 2012). The current study used a procedure that required infants to disengage from their own toy in order to attend to the pragmatic cues of the speaker and correctly map a novel label to an object that was the focus of her attention. Although it was a challenging procedure, infants across both conditions displayed equally high levels of disengagement from their own toy in order to follow the speaker's gaze and map the referent of her novel label. Interestingly, infants in the unreliable condition spent significantly more time looking at the speaker than those in the reliable condition, suggesting that infants' differential word learning was not due to a lack of attention to the speaker's utterances.

In addition, and confirming our second hypothesis, epistemic reliability also extended its influence beyond the domain of language, reducing infants' willingness to attribute rational

intentions to the speaker. Thus similar to preschoolers (Koenig & Harris, 2005a; Rakoczy et al., 2009), infants in the current study made an assessment about the speaker's general level of competence, and used this information to infer whether the speaker was conventional enough to learn from in another epistemic context. As imitation is a cultural learning activity, there are times when it is important to perform exactly as the model does and other times when it is not (Schwier et al., 2006). Indeed, infants exposed to an inaccurate speaker erred on emulation rather than imitation, thus overriding infants' strong inclination to be "overimitators" and imitate an adult's actions regardless of the actions' efficiency (Kenward, 2012; Lyons, Young, & Keil, 2007; Nielsen & Tomasellli, 2010) or relevance (Gergely, Bekerring, & Király, 2002; Zmyj, Daum, & Ascherslebenb, 2009). Therefore, our results extend research demonstrating that a source's unreliable ostensive and communicative cues lead infants to infer that the source's acts are unlikely to be relevant (Poulin-Dubois et al., 2011; Zmyj et al., 2010), by suggesting that a source's verbal inaccuracy does as well.

Taken together, it appears that infants' differential response to verbally accurate versus inaccurate speakers indicates a robust understanding of the speaker's reliability and additionally, rationality. However, alternative explanations are possible and therefore need to be ruled out. One possibility is that infants may have found that the speaker was silly, in terms of lacking mentalistic ability or intent (e.g., Schwier et al., 2006). Specifically, they may have considered someone who inaccurately labeled familiar objects as not having firm understanding about object properties and relations, which would have marked her consequent demonstrations as lacking in intentional purpose. An avenue for future research would thus be to examine whether a person's ignorance of familiar object labels would yield similar results, as an ignorant person is not silly but rather unconventional and uninformed. Indeed, it has recently been found that both 18- and

24-month-olds prefer not to learn a novel word from an ignorant speaker (Chapter 3; Krogh-Jespersen & Echols, 2012), with the former study demonstrating that 18-month-olds also prefer not to imitate the speaker's irrational actions. Thus, infants' differential responses are probably not due to their attributions of the speaker as silly but rather as an inaccurate, unconventional speaker. It has been suggested that infants are more likely to imitate others who are conventional and culturally similar to them (Meltzoff, 2007; Schmidt & Sommerville, 2011; Tomasello, 1999), with preschoolers shown to prefer to learn new words and even endorse the use of a new tool from culturally similar as opposed to dissimilar sources (see Harris & Corriveau, 2011 for review).

A second possible explanation is that infants may have failed to form strong internal representations of the speaker's actions, making them harder to remember. Indeed, it has been suggested that infants might weakly encode an inaccurate speaker's semantic utterances (e.g., Koenig & Woodward, 2010; Sabbagh & Shafman, 2009). We assessed infants' attention during the speaker's demonstrations by: 1) recording the time infants spent looking at the speaker during her initial labeling demonstration, 2) examining and ensuring that infants displayed a similar ability to shift their attention toward the speaker and the object of her referent during the word learning task, 3) recording the time infants spent looking at the speaker during her novel labeling demonstration (also during the word learning task), and 4) proceeding with the rational imitation and instrumental helping tasks only if infants were attentive to the experimenter's actions. As indicated previously, both groups of infants spent equal amounts of time looking to the speaker's initial reliability manipulation whereas infants in the unreliable condition actually looked longer at the speaker during her labeling of the novel object during the word learning task. Therefore, it is unlikely that aversion of the unreliable speaker accounts for the current

findings. Nonetheless, these data do not inform about the quality or robustness of infants' processing; it is possible that infants were drawn to the unreliable speaker but shallowly encoded the information that she provided. It has been proposed that infants possess a negativity bias in that they display differential attention to others on account of their aversive traits or characteristics (e.g., Vaish, Grossman, & Woodward, 2008). Thus, a future direction for research would be to examine infants' visual processing of the experimenter in a non-learning task, potentially through the use of eye tracking technology, in order to assess whether infants do indeed spend greater amounts of time processing the face of the unreliable speaker or model. Certainly eye-gaze tracking can specify which part of a stimulus someone is thoroughly processing or focusing his or her attention on (Irwin, 2004), and has been used with infants in order examine how they focus on social events and attend to others' manual actions (Gredebäck, Johnson, & von Hofsten, 2010).

Finally, the current study also included a non-learning prosocial task, specifically an instrumental helping task, in order to tease apart whether speaker accuracy generates a strong "halo" effect. The present findings confirmed our hypothesis that infants' instrumental helping is not affected by the speaker's verbal accuracy. Instrumental helping has been described as an altruistically motivated, non-discriminatory behavior among young infants (Warneken & Tomasello, 2009) wherein the actions themselves are highly reinforcing and the relationship between actor and object is salient and easy to infer (i.e., trying to grasp an out-of-reach object, Brownell, Svetlova, & Nichols, 2009; Meltzoff, 2007; Svetlova, Nichols, Brownell, 2010). Perhaps slightly older infants would have been more likely to be affected by the reliability of the person with whom they interact (e.g., Dunfield & Kuhlmeier, 2010), and thus this issue remains an area for future research. Furthermore, as research has shown that a model who is more

familiar (Volland, Ulich, & Fischer, 2004), has negative intentions (Dunfield & Kuhlmeier, 2010), and lacks in reciprocation (Olson & Spelke, 2008) can influence older children's natural tendency to help, it is important to examine whether these aspects of a model's reliability would also be more influential on infants' helping.

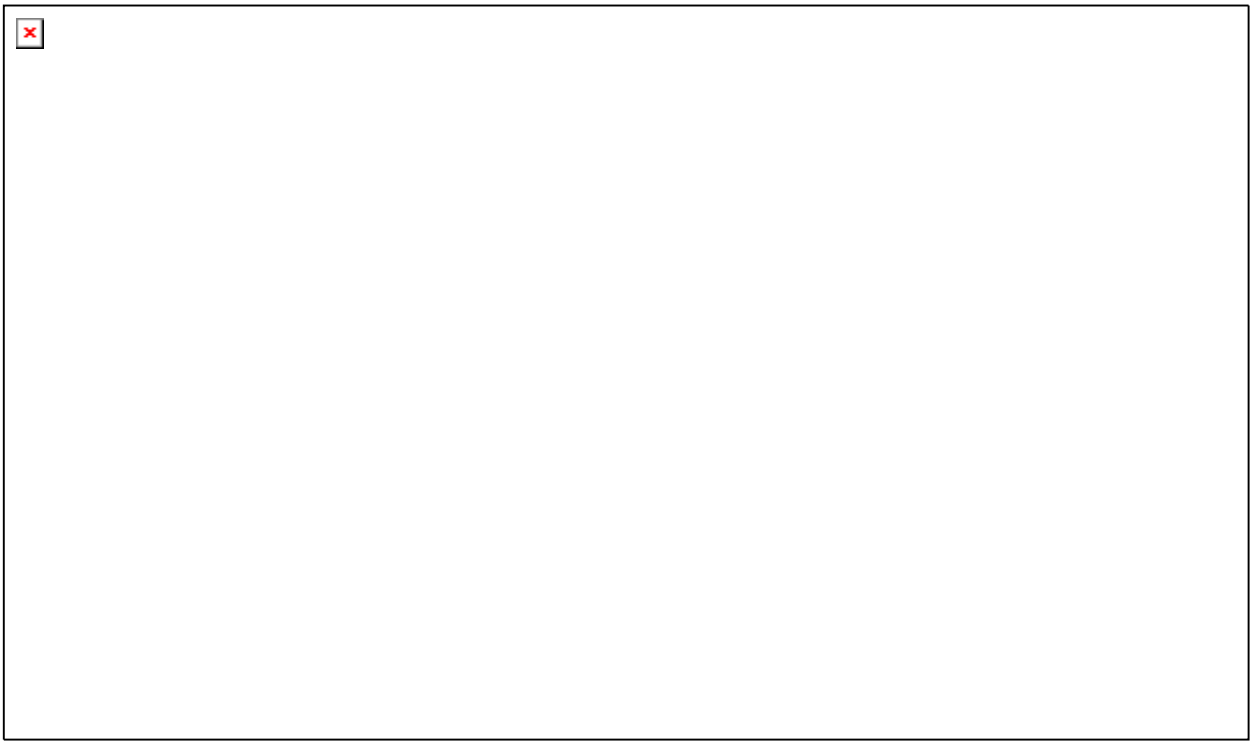
In sum, infants appear to be precocious selective learners who are able to use their recognition of a speaker's reliability after only four instances of labeling to guide their learning and behavior both in the domain of language and in the realm of cultural and imitative acts. This is a remarkable finding, given that attenuation of learning from a verbally inaccurate source in domains other than language has not been seen in children younger than 4 years of age (i.e., Fusaro et al., 2011; Rakoczy et al., 2009). Previous research has shown that infants are inclined to learn new words and imitate irrational actions in contexts that are driven by ostensive cues (Akhtar, Carpenter, & Tomasello, 1996; Baldwin & Moses, 1996; 2001; Brugger, Lariviere, Mumme, Bushnell, 2007; Csibra & Gergely, 2009; Király, Csibra, & Gergely, 2004; Király, 2009). The findings from the current study suggest that even a brief exposure to an inaccurate labeler is enough to override infants' default tendency to trust cues presented by others and learn from these displays. As infants are universal novices who must rely on others to make sense of the world around them, the ability to be selective when deciding whom to learn from is especially important during this critical developmental period.

Table 1

Mean scores on the word learning, rational imitation, and instrumental helping tasks, according to condition

Task	Variable	Mean (*SD*)	
		Reliable	Unreliable
Word Learning	Proportion of correct selections during novel trials	59.38% (23.09)	42.00% (31.22)
Rational Imitation	Proportion of trials infants imitated	54.35% (42.41)	28.00% (32.53)
Instrumental Helping	Proportion of total acts of helping	73.63% (41.69)	76.00% (41.42)

Figure 1. Infants' proportion of correct trials on the word learning task, for familiar and novel trials, according to condition. Error bars refer to the standard errors. a indicates values greater than chance ($p < .05$). b indicates significant condition difference ($p < .05$).



Modifications of Tasks between Chapters 2 and 3

Several changes were made regarding the tasks used between Chapters 2 and 3. With regard to word learning, we selected a new task in order to reduce task difficulty, as the infants in Chapter 2 did not perform above chance levels on novel word trials. Therefore, we chose a task that has been shown to be successful with a younger population (i.e., 13-month-olds; Woodward et al., 1994). In addition, a new rational imitation task was selected, as infants' rates of imitation in Chapter 2 were lower than that of 12-month-olds who were tested previously using the same task (specifically those in the "rational," door-open condition; Schwier et al., 2006). Since the study outlined in Chapter 3 incorporated and aimed to tease apart the effect of a model's communicative intent, a new task (Nielsen, 2006, Experiment 1) was selected on the basis that it has been used to test the effect of a similar construct (i.e., a model's sociability) on 18-month-olds' imitation. Finally, two new helping tasks were incorporated (selected and adapted from the same study; Warneken & Tomasello, 2006), in order to create a range of variation in scores, as all infants performed well on the Paperball task used in Chapter 2.

Chapter 3

"Competent but Malevolent" or "Ignorant but Benevolent": What Aspects of a Model's Behavior Influence Infants' Learning and Prosocial Behaviors?

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"Competent but Malevolent" or "Ignorant but Benevolent": What Aspects of a Model's Behavior Influence Infants' Learning and Prosocial Behaviors?

The ontogeny of young children's learning strategies has sparked great research interest recently, demonstrating that children are not the automatic and gullible learners they were once believed to be. Rather, after their second year of life and into preschool age, children have proven to be selective learners within of the domains of word learning (Einav & Robinson, 2011; Harris, 2007; Jaswal & Neely, 2006; Koenig, Clément, & Harris, 2004; Koenig & Harris, 2005a; Pasquini, Corriveau, Koenig, & Harris, 2007) and imitation (Poulin-Dubois, Brooker, & Polonia, 2011; Zmyj, Buttelmann, Carpenter, & Daum, 2010), as well as discerning helpers (Dunfield & Kuhlmeier, 2010). All of these domains require young children to use their developing understanding of social and referential cues in order to decipher a model's intent and verbal competence (Baldwin, 1993; Behne, Carpenter, Call, & Tomasello, 2005; Meltzoff, 1995; Warneken & Tomasello, 2006; Woodward, 1998). Indeed, in order to be selective within these domains, children need to be capable of discriminating between informants on the basis of their reliability, engaging in what is known as selective trust (e.g., Chapter 2; Scofield & Behrend, 2008; Sobel & Corriveau, 2010; Sperber et al., 2010). The current study sets out to examine the reasons for why children are selective, in the early stages of development.

A key strategy implemented by young children in selecting whom to trust and learn from is to monitor the model's verbal accuracy and knowledge, or in other words, his or her epistemic reliability (Harris & Corriveau, 2011; Mascaro & Sperber, 2009; Rendell et al., 2011; Sperber et al., 2010). This effect is most pronounced within the domain of language, with substantial research showing that by 3- to 4-years of age, children are more likely to learn novel words from those who label familiar objects correctly than those who label objects incorrectly (e.g., Birch,

Vauthier, & Bloom 2008; Jaswal & Neely, 2006). Preschoolers not only attend to a source's verbal accuracy but also to his or her verbal competence, preferring someone who is confident and certain about their knowledge as opposed to uncertain (e.g., Jaswal, 2004; Jaswal & Malone, 2007) as well as someone knowledgeable of familiar object labels as opposed to ignorant (Koenig & Harris, 2005a; Krogh-Jespersen & Echols, 2012; Sabbagh & Baldwin, 2001; Sabbagh, Wdowiack, & Ottaway, 2003). Examining the ontogeny of these behaviors, research has shown that infants are also sensitive to others' verbal inaccuracies, as demonstrated by their verbal and non-verbal disagreement (Koenig & Echols, 2003; Pea, 1982). In addition, 24-month-olds prefer not to learn novel labels from sources that are either verbally inaccurate (Koenig & Woodward, 2010) or ignorant (Krogh-Jespersen & Echols, 2012), with the most recent evidence of this effect found amongst infants at 18 months of age (Chapter 2). Taken together, empirical evidence demonstrates that preschoolers and infants trust and prefer knowledgeable, confident sources' testimony, particularly with regard to learning object names.

A model was recently proposed (see Szczésniak, Colaço, Rondón, 2012) explaining that young children's selective trust is not only comprised of an epistemic component, defined as expectancy or belief that another's word or action is reliable (Rotter, 1971), but also an emotional component, defined as trust in another because of felt concern and empathy as oppose to rationality or logic (Kuhlmann, 2008; Riegelsberger, Sasse, & McCarthy, 2007).). This extends research revealing that adult social cognition consists of two universal dimensions: warmth and competence (Fiske, Cuddy, and Glicke, 2006). Indeed, it is not always the case that children will have access to cues about an informant's epistemic knowledge or accuracy and thus it is important for them to be able to make decisions about who to trust based on other socio-emotional cues. In support of this line of thought, a probabilistic computational model has

suggested that preschoolers' selective trust, such as when learning about a novel object name, is equally dependent upon their inferences about a model's knowledge state as well as helpful (as opposed to deceptive) communicative intent (Shafto, Eaves, Navarro, & Perfors, 2012). This suggests that children deem a model's helpfulness and knowledge to be independent traits, and thus are likely to consider both factors when making a decision of whether to learn.

Research with preschoolers has demonstrated that their evaluation of others' intent contributes to whom they choose to learn from. For example, 5-year-olds, but not 3- or 4-year-olds, distinguish between "helpers," those who correctly inform others about where a sticker is located, and "trickers," those who incorrectly inform others, and use this knowledge that they have gained from observation to guide whose testimony to trust (Vanderbilt, Liu, & Heyman, 2011). Furthermore, when preschoolers are indirectly informed about an agent's intent by a third-party, 4-year-olds reject the testimony of a puppet that was previously described as "mean," and prefer instead the testimony of a puppet described as "nice" (Mascaro & Sperber, 2009). Infants as young as 7 months of age also prefer a geometric figure shown helping another figure (Hamlin, Wynn & Bloom, 2007; Hamlin & Wynn, 2011), while avoid a geometric figure who was shown to hinder another figure's goal (Hamlin, Wynn, & Bloom, 2010). Beginning at 9 months of age, infants can distinguish between those who have malevolent intentions (i.e., those who hold out a toy while looking at the infant and retract it in a teasing way when the infant tries to reach for it), and those who have benevolent intentions to give but are unable to enact them (i.e., such that they offer the toy but "accidentally" drop it), and become more impatient with the former (Behne et al., 2005).

In summary, while research has demonstrated that manipulating either a model's epistemic competence or communicative intent influences young children's selective behavioral

trust, such as their willingness to learn new words and endorse the testimony of others, more research is needed to clarify which aspect of a model's reliability matters most to children when they make their decision (see Reyes-Jaquez & Echols, 2013; Scofield, Gilpin, Pierucci, & Morgam, 2013 for examples of teasing apart the importance of different informant attributes). Specifically, no research exists that examines whether there may be instances in which a model's intentions (malevolence versus benevolence) or knowledge state carries more weight when both types of information are simultaneously available. This issue is of great theoretical importance as it sheds light on the underlying mechanism behind young children's selective trust, such as whether they operate from either emotional or epistemic motivations when deciding to learn. Thus the current study set out to examine whether a model's epistemic knowledge exerts a unique influence on children's selective trust in comparison to a model's helpfulness during the early stages of development, as well as the context for when such an influence is manifested.

There is another growing body of research demonstrating that children generalize a model's verbal competence and intent to impact their behavioral trust more globally, in domains beyond that of word learning and verbal testimony. Indeed, children's willingness to make more generalized assessments of a model's competence based on his or her past epistemic reliability is evidenced by preschooler's preference to imitate and learn new actions from a model that is accurate (Clément, Koenig, & Harris, 2004; Kim, Kalish, & Harris, 2012; Rakoczy, Warneken, & Tomasello, 2009), confident (Jaswal & Malone, 2007), and knowledgeable (Birch, Vauthier, & Bloom, 2008; Koenig & Harris, 2005a; Sobel & Corriveau, 2010). Eighteen-month-old infants also make generalized assessments of a model based on her verbal expertise to affect their imitation (Chapter 2), and at 14 months of age prefer to help someone who speaks the same native language (and thus who is likely to be perceived as verbally competent; Buttelman, Zmyj,

Daum, & Carpenter, 2012). There is also research suggesting that children make generalized attributions to a model based on his or her benevolent intent. For instance, 18-month-old infants are more likely to imitate a model that makes use of social cues and thus appears more friendly (Kiràly et al., 2004, Nielsen, 2006), and at 21 months, will prefer to help someone who has willingly intended to give them a toy, as opposed to someone who initially gave them a toy but subsequently grabbed it out of their reach (Dunfield & Kuhlmeier, 2010). Therefore, as imitation and helping are two behaviors influenced by a model's verbal competence and intent, a second objective of the present study was to examine which of the two characteristics of the model infants consider more when electing who to trust in these domains.

Finally, as an additional way to examine the data, a measure that uses eye-gaze tracking technology was included, as it is known for its direct, objective, and quantitative observation of gaze processing. By allowing the measurement of precise visual fixation patterns, eye-tracking can specify which part of a stimulus someone is focusing his or her attention on, with longer fixations indicating more thorough processing of those elements (Irwin, 2004). In fact, eye-tracking has been used in recent research with infants, in regards to how they focus on social events and others' manual actions (Gredebäck, Johnson, & von Hofsten, 2010) as well as how they scan faces that display different emotional expressions (De Wit, Falck-Ytter, & von Hofsten, 2008; Farroni, Menon, Rigato, & Johnson, 2007; Grossmann, 2010; Hunnius, de Wit, Vrins, & von Hofsten, 2011; Hunnius & Geuze, 2004; Peltola, Lappänen, Palokangas, & Hietanen, 2008; Schwarzer & Jovanovic, 2010). Furthermore, research with preschoolers has shown that their recognition memory for others' faces differs according to the type of moral behavior those people have reportedly engaged in (Kinzler & Shutts, 2008). Taken together, in the case that more overt differences would be hard to detect with our other behavioral markers, it

was expected that this measure's ability to capture subtle effects would help differentiate which aspect of a model infants were most attentive of.

In order to tease apart these effects, infants were presented with a model who was either: 1) verbally competent, as she was knowledgeable about familiar object labels, but malevolent such that she offered but then withheld a toy (Competent/Malevolent; CM) or 2) ignorant of familiar object labels but benevolent, such that she offered a toy and subsequently handed it over (Ignorant/Benevolent; IB). Infants were subsequently examined as to whether they would learn a novel word from the model, as well imitate, help, and scan her facial features. By comparing whether differences arose between conditions across broad markers of infants' behavioral trust, the current study aimed to clarify the conditions for when particular aspects of a model's reliability might matter most. For example, if infants were operating from emotional motivations to trust, one would predict that they would be better at discriminating the experimenter in the malevolent but competent condition and more likely to avoid trusting the malevolent experimenter for information generally and more globally. Conversely, if infants were operating from epistemic motivations to trust, one would predict that infants would be better at discriminating - but avoiding learning from and helping - the incompetent but benevolent experimenter. The current study examined 18-month-old infants, an age when rapid development in both vocabulary and communicative skill allows them to participate in joint triadic interactions such as linguistic communication and cooperative play, in order to observe the origins of these effects.

Method

Participants

Forty-nine 18-month-old infants (M = 18.02, SD = 0.69) were tested, ranging from 17.00 to 20.14 months. The participants' first language was either English (n = 30) or French (n = 19), languages in which infants at this age display a noun bias in their vocabulary. It was therefore possible to group them together as a homogenous sample for the purpose of this study, specifically for the word learning task where their ability to fast-map and understand nouns was tested, as neither group would be at a disadvantage (see Katerelos, Poulin-Dubois, & Oshima-Takane, 2011 for a similar procedure). All of the infants were tested in their mother tongue, by one of two experimenters who were fluent in the target language. Twelve additional infants were tested, but excluded due to fussiness (n = 11) and parental interference (n = 1). The final sample (23 females and 26 males) was randomly assigned to either the ignorant and benevolent (n = 25) or competent and malevolent (n = 24) condition.

Design and Procedure

Prior to starting the experiment, the experimenter met with infants and their parents in a reception room. While infants were familiarized to the testing environment, parents were asked to complete a questionnaire providing demographic information, a 20-word checklist indicating the words that their child understood, as well as the short-form version of the MacArthur-Bates Communicative Development Inventory – Level II (MCDI; Fenson et al., 2000). During testing, infants were seated in a highchair across from the experimenter or on their parent's lap if they were unwilling to sit in the highchair. Parents sat behind the infant, and were instructed to refrain from prompting their child in any way. All of the tasks were conducted in the same testing room, with the exception of the eye-tracking task, as the equipment was located in a separate room.

The reliability task was always completed first and was followed by the remaining tasks that, with the exception of the Cabinet task and the eye-tracking task, were counterbalanced. This was required because the cabinet was placed on the floor, not at the table, and so was easier to administer after all tasks had been completed. The eye-tracking task was always administered at the very end to avoid infants and their parents having to travel between rooms during the tasks, which would increase the risk of infants' fussiness. All tasks were attempted for each infant, however if they were appearing fussy, tasks subsequent to the reliability task were chosen in a randomized, counterbalanced fashion. In addition, those tasks that were required to be at the end of the session (i.e., the Cabinet and eye-tracking tasks) were simply not included. Therefore, sample sizes are reported separately for each task.

Reliability task. Infants were randomly divided into two conditions: 1) verbally competent and malevolent (CM) or 2) ignorant and benevolent (IB). The competence manipulation always occurred before the one manipulating communicative intent. This was conducted in a non-counterbalanced manner because the same experimenter was used for both manipulations and we wanted to maximize the possibility that infants would encode the speaker's knowledge or ignorance of familiar object labels. The experimenter labeled four familiar objects for each infant, ensuring that the target object labels were reported as familiar by his or her parent's endorsement of a word comprehension checklist. Thus infants in both conditions knew the labels for all four objects selected. The list of possible objects included: shoe, dog, sock, banana, apple, spoon, and book. During the first phase (Phase 1: Competence Manipulation), the experimenter either correctly labeled a familiar object (competent) or expressed ignorance of its name (ignorant). For example, in the CM condition the experimenter pointed to a toy and labeled it two times correctly with confidence (e.g., "I know the name of this! This is a banana. I know what

this is called! It's a banana!"). In the IB condition, the experimenter expressed ignorance of the name of the toy, rather than mislabeling it. Thus, the experimenter pointed to the toy (e.g., banana) and said with uncertainty (e.g., "What's the name of this? I don't know. I wonder what this is called. I don't know."). Following the labeling phase began the second phase (Phase 2: Intention Manipulation), where infants in both conditions were offered the toy, with the experimenter holding it in front of her and saying, "Do you want this? You can have it." In the CM condition, the experimenter subsequently (and without delay) placed the toy out of the infant's reach, ignoring his or her bids for it, whereas infants in the IB condition were simply given the toy after it was offered. When the experimenter placed the toy out-of-reach (by her side, counterbalanced across trials to reduce potential side-preference), she retained a neutral expression and maintained eye contact with the infant, for a period of approximately 20 s. After this delay, the child was given the toy by his or her parent (who was seated behind the infant) after receiving a signal from the experimenter to do so. Finally, in both conditions, once children were given the toy, they were given an opportunity to play with it for 30 s (Phase 3: Response Period). This cycle was repeated four times, with four familiar toys, for a total of four trials. A verbally competent experimenter was always malevolent (CM) whereas the verbally ignorant experimenter was always benevolent (IB).

Coding and reliability. The reliability task was coded for various behaviors during each of the three phases. In Phase 1, when the experimenter either expressed knowledge or ignorance of the object label, infants' total time spent looking at the experimenter (in s) was computed, which was then averaged across trials to create a proportion of total looking time. In addition, infants' reaching attempts and looking behavior were coded similarly to Behne and colleagues (2005), who also examined infants' response to a model whose intent had been manipulated. In Phase 2,

infants' attempt to obtain the toy when the experimenter extended her hand to offer it was coded. The current study implemented a categorical measure of attempts, as opposed to coding for frequency and duration of attempts, as the infants in Behne and colleagues' study never received the toy, whereas infants in the IB condition received the toy right away. An attempt (score of 1) was coded as any physical attempt to grab or reach for the toy (e.g., pointing or outstretched arms), whereas no attempt to obtain the toy was also coded (score of 0). During Phase 3 when the toy was placed in front of infants, the proportion of total looking time (averaged across trials) in which they spent looking away from the experimenter and/or the toy was coded, to either look down and away, or to turn to look at their parent (who was seated behind them). Each session was recorded and coded by the primary experimenter. An independent observer coded a random selection of 25% (n = 12) of the recorded sessions in order to assess inter-observer reliability in each condition. Using Pearson product-moment correlations, the mean inter-observer reliability for infants' looking times and attempts was r = .98 (range = .78 to 1.00).

Word learning task. This task was adapted from Woodward and colleagues (1994), and included a training phase and a test phase. The same primary experimenter carried out both phases.

Training phase. In the training phase, the experimenter introduced the child to a new pair of objects: a plastic ring and a plastic clip. The new label for the object was always either "Toma" for the English participants or "Muron" for the French participants. The object chosen as the target, as well as the object presented first, was always counterbalanced. The novel object was placed in front of the child, while the experimenter labeled it (i.e., "Look, it's a Toma. See, a Toma. Wow, it's a Toma"). This was interspersed with calling attention to the non-target item (i.e., "Ooo, look at that. See that? Wow, look at that"). This cycle was repeated three times, so

that infants heard nine repetitions of the novel label. While one object was commented on, the other was out of sight. In addition, the label was given only when the experimenter saw that the child was attentive to the object.

Testing phase. Immediately following the training phase, infants' word comprehension was tested for the new object-label. In addition, there was a preference control trial, measuring whether infants performed well as a result of their preference for one object, as well a familiar object comprehension trial, which measured whether 18-month-olds understood the demands of the task. Thus, there were three trial types, each presented three times for a total of nine trials. These trials were randomized per block, with one trial of each type per block (for a total of 3 blocks). The order of the blocks and the order that each trial type was presented within the blocks were counterbalanced.

During these trials, the experimenter brought out a red tray with the target and distracter objects placed along either side of an orange plastic bucket. For the familiar word trials, both a small, orange plastic bird and a small, brown plastic chair were used. For both novel and preference control trials, a small plastic pin and a small plastic ring were used. For novel trials only, the object that was presented first and the object that was given a label were counterbalanced. For all three trial types, the original pair as well as exemplar pairs was used, as we wanted to see whether infants would not only learn a novel label (or maintain their knowledge of the familiar label), but also generalize it to the same object or category, regardless of color. Therefore, for each trial type there were two generalization trials, which used different colored familiar objects (i.e., a brown bird and a white chair), as well as different colored rings (blue, green, and yellow) and pins (green, brown, and blue).

The experimenter then asked infants to put the target object in the bucket five times before the child was allowed to choose the object, beginning as the experimenter held the tray above the infant's head and continuing as she lowered the tray to the table. For novel trials, infants were asked to put either the "Toma" or the "Muron" in the bucket, dependent on their mother tongue. On the preference control trials, infants were simply asked to take one and complete the activity (i.e., "Can you put *one* in the bucket?"). On familiar trials, the target was chosen based on the object-label parents previously indicated as being familiar to their child (as indicated on the word comprehension checklist). Once infants chose an object, they were encouraged to complete the activity by putting it in the bucket. Infants were rewarded for their choice, regardless of whether it was correct or not. If the child did not respond or picked up both items at the same time, they were asked to complete the action later in the session.

Coding and reliability. Similar to Woodward and colleagues (1994), infants' choice of object was coded, such that they received a score of 1 if they touched the target toy first and a score of 0 if they touched the non-target toy first during any of the familiar, preference, and novel label trials. A score indicating infants' total proportion of success for each trial type was calculated by adding infants' total number of correct touches from each of the three blocks and dividing it by the total number of trials they completed, calculated separately for each trial type (thus a score out of a maximum of 3, for each trial type). For novel label trials only, a separate score indicating infants' proportion of success was computed for the training pair (out of 1), generalization pair (out of 2), and performance overall (out of 3). On the word learning task, there was excellent inter-rater reliability regarding infants' proportion of success scores, Kappa = 1.00 ($p < .001$).

Rational imitation task. In a modified version of Nielsen's (2006; Experiment 1) task, infants where shown how to use a tool to open three different drawers contained in a long box, each marked by a different toy handle (lion, giraffe, and bear) on the front (see Figure 1). When presented to infants, only one of these drawers was present to manipulate (the other drawers were out of sight). Each drawer had it's own accompanying set of tools. The lion had a purple ring, green poker, and small pan mirror. The giraffe had a small purple fork, a square pan mirror, and green stick. The bear had a purple ladle, a yellow poker, and a purple fan with a handle. All drawers, when presented to the infant, also contained a small toy inside (a fire truck, small cat, and airplane). In the training phase, the experimenter familiarized infants with opening the drawers using one of the tools from the set in order to retrieve a toy. The reason for having three objects to a set was to see how well infants would attend to the experimenter's demonstration and choose the exact means she did, either choosing to use any object or the specific object she used (alternatively, they could use no object). Which drawer was opened first, as well as the object chosen from the set to be the target tool to open the drawer, was counterbalanced.

Training and test phases. The experimenter first placed the box in front of the infant, placing the set of three objects to the side of the box. She then picked up the target object and demonstrated how it could be used to open the drawer and retrieve a toy. The experimenter then placed the box away from the infant's view in order to close the drawer. After a total of three demonstrations, the infant was presented simultaneously with the box, with the given drawer closed, as well as the accompanying object-set, including the target tool, and told, "Now it's your turn." The infant was given a response period, which terminated after he or she opened the drawer or after 60 s. This sequence was repeated two more times for the two remaining drawers.

Coding and reliability. Similar to Nielsen (2006), several behaviors were examined during the rational imitation task. During each trial, infants' success at opening the box was tabulated. In addition, we noted whether infants touched the box using an object, their hand, or the target object, regardless of whether they successfully opened the box (as it still represented attempted imitation). These categories (object, hand, and target object) were not mutually exclusive so infants could be scored as performing all of them. Use of an object was coded separately from use of the target object, as some infants used a different tool other than the one that the experimenter demonstrated the action with. All of these scores were tallied across all three trials to represent a total score for each category (maximum score of 3), which were then converted to proportion scores of total success. Inter-rater reliability regarding all of infants' imitation behaviors was in very close agreement, Kappa = .78 ($p < .001$).

Instrumental helping tasks. There were three helping tasks: the Cabinet, the Books, and the Paperball task, all of which were adapted from Warneken and Tomasello (2006). All helping tasks incorporated a 30 s response period, repeated over three trials. During the first 10 s, the experimenter looked toward the target of their end goal with a distressed facial expression, as demonstrated by pouting lips and a wrinkled, lowered brow. In the following 10 s, the experimenter alternated her gaze between the target and the infant. In the final 10 s, the experimenter verbally clarified the situation for the infant, saying either, "Oh no," "It won't open," or "I can't reach!" for the Books, Cabinet, and Paperball tasks, respectively.

Training and test phases. For the Books task, the infant observed as the experimenter repeatedly attempted and missed stacking a series of six blue plastic "books." For the Cabinet task, infants watched as the experimenter repeatedly approached a small, closed cabinet, measuring 60.2 cm x 33.9 cm x 60.9 cm., with the intention of placing books inside. However,

due to her hands being already full with several books, she bumped into the closed doors of the cabinet. For the Paperball task, the infant watched as the experimenter picked up all three colored blocks in front of her using a pair of child-safe tongs and placed them in a small yellow plastic bucket. Afterward, she tried unsuccessfully to reach for the three blocks on the infant's side of the table, reaching for each block systematically for a period of 30 s. All helping task trials ended once the infant helped the experimenter, or once the 30 s response period ended. Following receiving help from the infant, the experimenter continued immediately with the next trial. Infants were never reinforced for their behavior, in order to get a measure of their natural altruistic helping.

Coding and reliability. The helping task was coded so that within each task, for each trial, infants were given a score of pass or fail depending on whether they helped the experimenter or not. Specifically, infants were considered helpful if they put the dropped book on top of the pile, opened the cabinet door, and either moved the block closer to the experimenter or placed it in her tongs, for the Books, Cabinet, and Paperball tasks, respectively. For each task separately, infants' average success across all three trials was combined, in order to obtain a score representing infants' mean proportion of helping. Inter-rater reliability regarding infants' entire helping behaviors, Kappa = .98 ($p < .001$), was in very close agreement.

Eye-tracking task. During the eye-tracking task, infants sat in a highchair at a viewing distance of about 60 cm from the screen. Infants' gaze was recorded using an infrared corneal reflection eye-tracker (Tobii T60XL; Tobii Technology, Danderyd, Sweden). The Tobii T60XL is integrated in a 24" TFT flat-screen monitor where stimuli are shown. The device records gaze at 60 Hz with an average accuracy of 0.5˚ visual angle. The eye-tracking monitor, as well as the highchair the child was seated in, was adjustable so that the infant's face could be completely

parallel and in-line to the screen. One experimenter sat beside the infant, pressing a button to continue the trials, ensuring that the infant was paying attention. The parent stood behind, outside of the infant's view.

Calibration and test phase. Prior to testing, the gaze of each infant was calibrated using a 9-point infant calibration procedure, in which an expanding-contracting blue circle appeared, accompanied by a sound. The blue outlined circle appeared in every corner position, ending in the middle of the screen, which was white in background. Calibration was repeated if any of the nine points was missed. Once calibration was completed successfully, the experimental phase was started where 2 faces (a stranger's face and the experimenter's face) were shown for 10 s each, with an attention getter preceding each image. The order of the faces was counterbalanced. Infants were presented with two different female faces. One face was always that of the experimenter, and the other a European-American stranger, taken from the NimStim Face Set (Tottenham, Borsheid, Ellersten, Marcu, & Nelson, 2002; Tottenham et al., 2009). The colored digital images used displayed the neutral/calm facial expression. The picture of the experimenter matched the dimensions as the NimStim Face Set as closely as possible.

Coding and inclusion criteria. For the eye-tracking task, trials were included if infants' looking time at the stimulus display was a minimum of 500 ms. We defined a fixation as a series of data points within a 25-pixel radius (visual angle of about 1.5˚) for a minimum duration of 100 ms. A number of areas of interest were defined: the eyes, mouth, and inner facial features (the entire area of the face inside the hairline, including the eyes, and mouth**)**. These areas were chosen based on research that both adults and infants pay attention to these core features of facial expressions (Walker-Smith, Gale, & Findlay, 1977; Hunnius et al., 2011). The areas of interest were of equal size across model, within a 5% margin of difference. Within these areas of interest,

total fixation duration (in s) was calculated. We then converted this score to the proportion of time spent looking at each feature (eyes, mouth) out of the total time spent looking at the face. As the eye-tracking data was extracted automatically using the Tobii Fixation Filter, no inter-observer reliability was calculated.

Results

Preliminary Analyses

Initial analyses revealed that there was no effect of age, sex, trial order, experimenter, or language with regard to any of the outcomes of interest and therefore results were collapsed across these variables. Infants did not differ across condition in the number of spoken words in their vocabulary, as indicated by their MCDI score (IB: M = 16.12, SD = 13.39; CM: M = 12.29, SD = 6.49), $t(47) = 1.26$, $p = .21$, Cohen's d = - 0.25. Infants' MCDI score also did not correlate with their performance on any of the tasks, thus results were analyzed without controlling for their productive vocabulary. As some infants did not complete all of the tasks due to fussiness or fatigue, sample sizes are reported per task: Word learning: n = 48; Rational imitation: n = 44; Cabinet task: n = 39; Books task: n = 43; Paperball task: n = 44; Eye-tracking: n = 18. A summary of the main findings from the three main experimental tasks, according to condition, can be found in Table 1.

Reliability Task

Infants from both conditions were equally attentive to the experimenter when she was labeling the toy during Phase 1, as indicated by the high proportion of time infants spent looking at her across trials, (IB: M = 98.15%, SD = 37.74; CM: M = 98.24%, SD = 34.59), $t(47) = -0.09$, $p = .93$, Cohen's d = 0.15. During Phase 2, the average proportion of trials that infants made

attempts to reach the toy was significantly greater for infants in the IB (M = 67.00, SD = 38.00) than in the CM (M = 34.38, SD = 38.17) condition, $t(47) = 2.99$, p = .00, Cohen's d = 0.80. To examine infants' looking away behavior once infants had the toy in Phase 3, an independent t test was conducted. It was found that infants in the CM condition (M = 27.19, SD = 14.69) tended towards looking away from the experimenter and/or the toy significantly longer than infants in the IB condition (M = 19.68, SD = 12.60), $t(47) = -1.93$, p = .06, Cohen's d = 0.55.

Word Learning Task

Preliminary analyses. Infants' performance on the word learning task (n = 48) did not differ according to block, trial order, or which type of target was used (clip or ring), and so results were collapsed across these factors. In addition, infants' performance on the novel word trials for both the original training and generalization pairs did not differ both within and across conditions and so results are collapsed across these two factors.

Main analyses. To first assess infants' successful performance in terms of proportion of correct trials achieved, a 2 X 3 mixed factorial was run with condition (CM vs. IB) as a between-subjects factor and type of trial (familiar vs. preference vs. novel) as a within-subjects factor. There was a trend for a main effect of trial, $F(2, 92) = 2.79$, p = .067, η_p^2 = .06. Pairwise comparisons using Bonferroni adjustment revealed that this was due to infants' better performance on familiar (M = 64.65, SD = 29.59) than on novel (M = 51.73, SD = 33.66) trials, $F(2, 45) = 3.08$, p = .05, η_p^2 = .12. There was no main effect of condition, $F(1, 46) = 0.16$, p = .70, η_p^2 = .00, nor significant interaction, $F(2, 92) = 0.32$, p = .73, η_p^2 = .01. We then examined whether infants performed systematically on familiar, preference, and novel label trials, as a function of condition, in order evaluate whether they comprehended the task. Infants' proportion

of correct responses was significantly greater than chance (50%) on the familiar label trials for both the IB, (M = 64.08, SD = 33.29), $t(24) = 2.12$, $p < .05$ and CM condition, (M = 65.26, SD = 25.72), $t(22) = 2.85$, $p < .01$. In contrast, infants in both conditions performed at chance levels on preference, IB: (M = 58.68, SD = 36.44), CM: (M = 56.57, SD = 35.52) and novel label trials, IB: (M = 55.36, SD = 34.36), CM: (M = 47.78, SD = 33.18), ts < 1.19, ps > .25.

Rational Imitation Task

Preliminary analyses. Infants' overall performance on the rational imitation task (n = 44) did not differ according to which drawer or target object of the total set was used and so results were collapsed across these factors.

Main analyses. In order to examine infants' overall success with regards to the mean proportion of trials they opened drawers (out of 3), an independent t test revealed that infants in the IB condition (M = 74.60, SD = 33.17) opened fewer drawers on a greater proportion of trials than infants in the CM condition (M = 91.30, SD = 18.03), $t(42) = -2.10$, $p < .05$, Cohen's d = 0.63. This suggests that while most infants recognized the goal of the experimenter, those in the CM condition were more willing to replicate the experimenter's end goal. Infants did not differ according to condition in terms of their willingness to imitate the experimenter's exact means across all three trials or with respect to the second or third trial, ts < 0.85, ps > .16. The one exception was their performance on the first trial; the mean percentage of imitative acts wherein infants used the experimenter's target object to manipulate the drawer tended to be lower in the IB condition (9.52%) than those in the CM condition (30.43%), $t(42) = -1.74$, p = .09. Infants from both conditions quickly learned the most efficient method, as the proportion of trials that infants used the target object was fairly small (IB: M = 17.46, SD = 20.05; CM: M = 26.09, SD =

34.75), $t(42) = -1.00$, $p = .33$. The proportion of trials during which infants attempted to open a drawer with an object also did not differ between infants in the IB condition ($M = 34.92$, $SD = 30.69$) and those in the CM condition, ($M = 43.48$, $SD = 41.97$), $t(42) = -0.77$, $p = .45$, Cohen's $d = -0.24$. Rather, infants in both the IB condition, ($M = 80.95$, $SD = 29.00$) and the CM condition, ($M = 89.86$, $SD = 21.17$) spent the greatest proportion of trials trying to open the drawer using their hands, $t(42) = -1.17$,$p = .25$, Cohen's $d = -0.37$. Finally, while most infants from both conditions either imitated the experimenter's exact actions or emulated the experimenter's end goal across all three trials, there was a small percentage of infants that performed no action, in the IB (28.60 %) and CM (13.00%) condition. However, this difference did not differ between conditions, $\chi^2(1, n = 44)= 3.63$, $p = .16$.

Instrumental Helping Tasks

Preliminary analyses. Due to the fact that not all infants completed all helping tasks (Cabinet task: $n = 39$; Books task: $n = 43$; Paperball task: $n = 44$), separate analyses were computed for each task. There was no differences regarding infants' helping due to trial order on any of the tasks, and so results were collapsed across these factors.

Main analyses. Independent samples *t* tests were calculated to compare the mean proportion of times infants offered help across trials, according to condition. For the Cabinet task, infants' mean proportion of helping did not differ between the IB ($M = 50.89$, $SD = 44.99$) and the CM condition ($M = 51.65$, $SD = 39.77$), $t(37) = -0.06$, $p = .96$, Cohen's $d = 0.00$. For the Books task, infants also displayed similar rates of helping the experimenter in the IB condition ($M = 50.76$, $SD = 44.28$) and CM condition ($M = 54.55$, $SD = 41.89$), $t(41) = -0.29$, $p = .78$, Cohen's $d = -0.09$. Finally, during the Paperball task, infants in the IB condition did not differ in

their willingness to help (M = 52.43, SD = 45.45) compared to those in the CM condition (M = 55.09, SD = 47.80), $t(42) = -0.19$, $p = .85$, Cohen's $d = -0.06$.

Eye-Tracking Task

Preliminary analyses. A smaller subset of infants completed the eye-tracking task (n = 18) due to the fact that it was the final task and infants' compliance was reduced due to fatigue. In addition, there were strict inclusion criteria regarding type and duration of fixations (see Coding and inclusion criteria). Thus, infants from both the IB (n = 9) and the CM (n = 9) condition were compared on their total fixation durations spent on the pictures of neutral faces of both the experimenter and a neutral stranger, as well as the proportion of time they spent fixating on specific features.

Main analyses. To compare infants' total fixation duration, several 2 X 2 mixed factorial ANOVAs were calculated, with condition (IB vs. CM) as a between-subject variable and person (experimenter vs. stranger) as a within-subject variable. For total fixation duration on the inner features, there was a trend for a main effect of person, $F(1,16) = 3.29$, $p = .09$, $\eta_p^2 = .17$, resulting from infants looking longer at the experimenter (M = 3.91, SD = 2.14) than at the stranger (M = 2..78, SD = 1.96). There was no main effect of condition, $F(1,16) = 0.38$, $p = .55$, $\eta_p^2 = .02$, and no interaction between person and condition, $F(1,16) = 2.23$, $p = .16$, $\eta_p^2 = .12$. Regarding the proportion of time infants spent looking at the experimenter's eyes versus the stranger's, there was no main effect of person, $F(1,16) = 0.00$, $p = .99$, $\eta_p^2 = .00$, no significant interaction, $F(1,16) = 2.70$, $p = .12$, $\eta_p^2 = .14$., nor main effect of condition, $F(1,16) = 0.18$, $p = .90$, $\eta_p^2 = .001$. Finally, considering the proportion of time infants spent looking at the mouth, there was no

main effect of person, $F(1,16) = 0.52$, $p = .48$, $\eta_p^2 = .03$, no significant interaction, $F(1,16) = 2.21$, $p = .16$, $\eta_p^2 = .12$, nor a main effect of condition, $F(1,16) = 1.39$, $p = .26$, $\eta_p^2 = .08$.

Discussion

There are many reasons that are beginning to be explored for why young children engage in selective learning (Koenig & Sabbagh, 2013). One explanation is that children take into consideration the following characteristics of the model: 1) his or her epistemic reliability, such as knowledge versus ignorance, and 2) his or her moralistic intent, such as benevolence versus malevolence. Notably, no research has examined both factors in combination and observed whether children might place more weight on a model's malevolence or verbal incompetence, across a range of cognitive and affective domains. Secondly, it has yet to be examined whether a bias or motivation to pay attention to particular model attributes exists at an early age in development and if so, how it manifests. Thus the current study provides a timely and important contribution, as it examined both issues. Indeed, at just 18-months of age, infants in the current study differentially detected a model's communicative intent, as infants made fewer attempts to interact with her and tended to look away more often when she was malevolent then benevolent. Infants also, though more modestly, modified their selective learning; while they were less likely to learn a novel from both an ignorant and malevolent model, they were more likely to imitate a competent but malevolent model. Finally, all infants tended to look longer at the experimenter in comparison to a stranger and were still willing to help. We will now discuss in turn how infants' evaluations of the model on the two different dimensions differentially affected their selective trust, as well as what these findings imply about whether infants are operating from underlying epistemic or emotional motivations.

Initially all infants paid attention to the experimenter when she was demonstrating that she was either epistemically competent or ignorant. At first glance, these findings appear to conflict with research suggesting that infants are accustomed to adults being knowledgeable sources of information (e.g., Csibra & Gergely, 2009; Gergely & Csibra, 2005; Jaswal & Neely, 2006), such that they will look longer at speakers who mislabel familiar objects (Koenig & Echols, 2003). However, most recent findings with a similar methodological setup also found that 18-month-old infants look equally long at speakers when they label familiar objects correctly or incorrectly (see Chapter 2). It was not until after the experimenter revealed her "true colors" and demonstrated her malevolence that infants displayed differential attention to her, engaging with her less and looking away more often. In contrast to a similar study wherein infants were exposed to a malevolent experimenter who offered them a toy but never handed it over (Behne et al., 2005), infants in the current study received the toy in the end, regardless of their efforts; it is therefore quite reasonable that infants in the CM condition quickly became impatient and stopped trying to make requests from the experimenter, whereas infants in Behne and colleagues' study persisted. Once they had the toy, infants in the CM condition also looked away more often than those in the IB condition, suggesting that they grew impatient with the experimenter (see Behne et al., 2005, for a similar interpretation) or perhaps were engaging in social referencing with their parent to help make sense of the experimenter's previous uncooperative behavior. It remains possible that infants would have responded differently to the experimenter if the manipulation of competence was prior to the manipulation of intent, and thus remains an area for future research. A possible research design to explore this issue would be to have two test periods examining infants' behavioral trust, one before and one after the individual reliability manipulations (see Reyes-Jaquez & Echols, 2013); by comparing infants' pre- and

post- manipulation performance, the effect for whether intent affected infants' attention to verbal competence, or vice-versa, could be reached.

Upon examining infants' selective learning, the current study found that infants failed to learn a novel word from a model whose verbal competence or intent was alternately manipulated. Most recently, it has been found that 24-month-olds do modify their learning from inaccurate or ignorant speakers (Koenig & Woodward, 2010; Krogh-Jesperen & Echols, 2012), with the earliest age reported for the effect of speaker accuracy being found at 18 months (Chapter 2). Only one study to date has examined how a model's malevolent intent will deter 3- to 5-year-old children's willingness to learn novel words (Doebel & Koenig, 2013). These findings are therefore the first to indicate that a model's malevolence affects even young infants' word learning. Thus, even young infants are capable of extrapolating from a speaker's malevolent intentional cues as to whether or not that speaker is likely intending to provide truthful or deceitful information, an ability quite sophisticated for this age. Recent research has also tried to tease apart whether social or epistemic influences are more important to children's word learning. Certain developmental differences appear to exist, with younger children (3-year-olds, compared to 4- and 5-year-olds) favoring familiarity (e.g., their preschool teacher versus an unfamiliar teacher) over verbal accuracy (Corriveau & Harris, 2009), but verbal accuracy over similarity (e.g., a model with the same hair color and food preferences; Reyes-Jaquez & Echols, 2013). No research has examined whether children would prioritize different epistemic and socio-emotional markers, such as a model's intentional cues over his or her epistemic knowledge, at a much younger age in development. As cues about a model's accuracy or knowledge are not always available, it is quite adaptive for such young children to be able to use intentional cues to infer a model's trustworthiness. Taken together, it thus appears that both a

model's verbal knowledge and intent matter equally when infants decide whether or not to learn novel words.

No doubt, there are alternative interpretations for the finding that infants from both conditions did not learn the novel word. Task difficulty can be ruled out given that 13-month-olds have successfully learned novel words using this same task (Woodward et al., 1994) and that a plethora of studies exist that indicate that 18-month-old infants can learn novel words from others (Akhtar, 2005; Baldwin, 1993; Baldwin et al., 1996; Floor & Akhtar, 2006; Gampe, Liebal, & Tomasello, 2012; Gurteen, Horne, & Erjavec, 2011; O'Connell et al., 2009). Another alternative explanation that might explain the findings is the slight methodological differences between the current study's task and Woodward and colleagues (1994). For one, infants in Woodward and colleagues' study were not rewarded for their responses but rather were rewarded for completing filler activities in between trials, in order to motivate them to complete the task. Pilot work indicated that due to the number of tasks overall in the current study, the filler activities were making the task too long for infants. Thus, infants in the current study were rewarded for all responses made in order to motivate them. It is possible that infants were receiving mixed messages contingent upon their performance; specifically, infants may have understood that their selection of the wrong target was also correct, which may in turn have influenced their future selections of the target. However, as infants' selection of the correct familiar target was at above chance levels, it is unlikely that this aspect of the procedure was the sole reason for infants' performance on novel trials.

Additionally, infants in the current study were both taught and tested on the novel label by the same experimenter, whereas Woodward and colleagues (1994) used a different experimenter for test trials. It is possible that the cognitive load of both maintaining a memory

for the cognitive profile of the experimenter from the reliability training as well as paying attention to the object of her labeling may have been too high for infants at this age. Most recent research on infants' selective learning has stated that null findings, particularly in between-group designs, should not be interpreted as evidence of a child's insensitivity to a model's reliability, but rather may require new methods of looking at the question (Koenig & Sabbagh, 2013). Thus future research should examine infants' word learning further as affected by these two aspects of a model, taking into account these methodological considerations. Perhaps the best way to begin to tease apart the effects of each manipulation would be by splitting up the intentional and competence manipulation, as indicated above, while also including a neutral baseline condition. By including a baseline condition where the experimenter acted neutral, a conclusion could be made as to whether infants would have learned the novel word if the experimenter's reliability had not been manipulated.

When it comes to other cognitive tasks such as selective imitation, a model typically demonstrates culturally relevant actions about how an object works that are unlikely to change over time. Thus, children might be inclined to place more weight on how knowledgeable or successful a model appears before other characteristics, such as sociability and helpfulness, when making their decision of whom to learn from. Indeed the current study found that - though not reaching statistical significance - when the actions of the imitation task were unnecessary for goal completion, infants exposed to an ignorant but malevolent experimenter imitated less, using the exact target tool that the experimenter had used to open the drawer less often than those exposed to a competent but malevolent experimenter. This finding was found with regards to the first trial, which may be especially revealing as infants' first attempt or action could be considered the most conservative assessment of their imitative behavior. They also chose to

emulate the experimenter's end goal less, opening fewer drawers successfully. This extends recent research demonstrating that preschoolers are more likely to imitate someone who appears knowledgeable in interacting with novel objects, irrespective of whether these actions are embedded within a social or pedagogical context (Buchsbaum, Gopnik, Griffiths, & Shafto, 2011; Schmidt, Rakoczy, & Tomasello, 2011). Furthermore, when an action is demonstrated for children by a model that makes use of ostensive cues but appears naïve and unknowledgeable, preschoolers do not consider the demonstration to be pedagogical, and hence choose not to selectively imitate the model's actions (Bonawitz, Shafto, Gweon, Goodman, Spelke, & Schulz, 2011).

In support of this reasoning, a current theory that has been proposed to account for infants' motivation to learn from and imitate others is the culturally "normative" stance, which ascertains that children learn from others because they infer that their actions reflect the dominant, conventional acts of a particular culture (Casler & Kelemen, 2007; Casler, Terziyan, & Greene, 2009; Kenward, Karlssson, & Persson, 2011). It is likely that infants may have interpreted someone who knew the names of common objects as not only knowledgeable and successful, but also more conventional. As the competence manipulation occurred concurrently with the malevolence manipulation, it is difficult to determine whether malevolence had an effect. In addition, it is possible that fewer infants overall used the exact same tool as the experimenter when trying to open the drawers because they already had in their repertoire causal knowledge of how to successfully open drawers with their hands (Schulz, Hooppell, & Jenkins, 2008; Williamson, Meltzoff, & Markman, 2008). The task used in the current study was a modification of Nielsen's (2006) original task, which used a box with a special, hidden opening mechanism; it is thus possible that with a long box with drawers, infants in the current study

were reluctant to try out a less efficient means, such as using a tool (Nagell, Olguin, & Tomasello, 1993). In order to clarify both of these factors, future research should include a control condition (as indicated above) to observe how infants would have imitated differently had they been exposed to a neutral experimenter in a task identical to Nielsen's (2006); it is likely that infants would have reacted similarly to the 18-month-olds in that study who were exposed to a model who made use of "normal" ostensive cues. Specifically, infants in that condition imitated at rates higher than those who engaged with a model that made no use of ostensive cues (who was likely seen as unhelpful). Taken together, the current finding that infants in the verbally competent condition were more likely to imitate extends research with young children (Rakoczy, Warneken, & Tomasello, 2009) as well as with young infants (Chapter 2) that suggests that children appear to be influenced by a model's verbal competence and accurate cultural knowledge when engaging in selective imitation (e.g., Carptenter et al., 1998; Meltzoff, 1995).

It has been argued that young children may assume a default sense of emotional trust in others, such that they may become more influenced by others' warmth and good intent with age (e.g., Shafto et al, 2012). As 3- and 4-year-olds were demonstrated as trusting a model observed to intentionally deceive others, recent research has proposed that children might have such a strong expectation that others will be trustworthy and have prosocial intent that only overt cues might deter them in this reasoning (Vanderbilt et al., 2011). Indeed, as infants become more socially motivated to engage in tasks at around 18 months of age, such that they learn from and copy others in order to be "like" them (e.g., Meltzoff, 1997; Uzgiris, 1980), perhaps their emotional motivations to trust another do not develop until later. Thus a model's communicative intent might be more influential in explaining older children's selective behavior. In addition, as

children's ability to make trait-based inferences about a person as being "nice" or "mean" gets better with age (Lui,Vanderbilt, & Heyman, 2013), so too might their ability to distinguish others on their intent. Therefore, a direction for future research would be to examine for developmental differences by assessing whether older children would place more weight on a model's intent as opposed to his or her epistemic reliability.

Perhaps indicative that infants do assume that others possess good intent is the current study's finding that 18-month-olds have a strong propensity to help. Indeed, infants' likelihood of helping at this age is very robust and hard to deter (Hay, 2009; Hay et al., 1991; Warneken & Tomasello, 2009). Thus, the model's malevolent intent was not enough to deter 18-month-old infants' strong tendency to help others. This finding contrasts with previous research that reported that 21-month-olds will avoid helping others who were emotionally untrustworthy and previously unwilling to help them (Dunfield & Kuhlmeier, 2010), as well as with findings that infants appear to demonstrate a bias towards someone who is responsive and demonstrates benevolent intentions towards others (Hamlin et al., 2007; Hamlin & Wynn, 2011) while avoiding those who appear to have malevolent intentions (Hamlin et al., 2010). It is possible that the experimenter's malevolent intent in the current study was not "mean" or emotionally provoking enough to stop infants from helping. For example, Dunfield and Kuhlmeier's (2010) "unwilling" experimenter actually pulled a toy out of the infant's grasp and then smiled at this mischievous action. In contrast, the current study had the experimenter assume a still face and neutral manner that was generally unresponsive. Future studies should therefore examine whether 18-month-olds' willingness to help would be reduced by using a more explicit manipulation of a model's malevolence or by incorporating emotional helping tasks (see Svetlova, Nichols, & Brownell, 2010), where a level of inferring and trusting another's social

and referential cues is required. With respect to a model's level of competence influencing infants' decision, it may be that infants found the goal of the task easy to infer as well as highly reinforcing (Brownell, Svetlova, & Nichols, 2009; Meltzoff, 2007; Svetlova et al., 2010) and so did not find it necessary to help a model as a function of whether she was previously knowledgeable or ignorant.

Finally, among the innovative aspects of the present study was the inclusion of a visual processing measure that provided information about infants' orientation and attention to the model's face. This measure allowed for an in-depth examination of how a person's reliability impacted infants' interest in her face later on. Research in adult social cognition has shown that detection of trustworthiness based on exposure to an unfamiliar face occurs almost instantaneously (Willis & Todorov, 2006). Based on neuro-imaging research, it may be a spontaneous, automatic process (Winston, Strange, O'Doherty, & Dolan, 2002), potentially due to the implications and ramifications of trusting someone who has harmful intentions. The infants in the current study appeared to be highly attentive to the experimenter's face, as infants from both conditions tended to look longer at the experimenter's face overall in comparison to the stranger's. It was expected that infants would look longer at the "mean" malevolent model (Kinzler & Shutts, 2008) as there is accumulating evidence for a negativity bias in infancy, that is, that infants pay more attention to emotional expressions or behaviors that are different from those in which they have a history of being exposed to (e.g., Vaish et al., 2008). It is possible that the still, non-threatening, neutral image of the malevolent model was not enough to change infants' bias to visually process her image. However, as this portion of the study was exploratory and conducted with a very small sample size, future research should focus on examining whether

infants would be surprised by a model's lack of sociability and warmth in contrast to a model's verbal incompetence, two traits characteristic of those who they typically engage with.

In summary, infants by 18 months of age demonstrate the early precursors of social-cognitive understanding as they are able to attenuate their learning and associative behavior on account of how they encoded a model's socio-emotional and epistemic traits. As infants grow and encounter more novel situations, they are potentially exposed to harmful or threatening situations. They are also beginning to hear feedback from their parents, both positive and negative, that sends a message about these encounters. As infants have presumably been less exposed to these negative messages, they may come as more of a surprise. Indeed, the manner in which infants' process new pedagogical encounters with others has undoubtedly been impacted by their past experiences with their caregiver, and is an important area for future research. Furthermore, research should continue to examine how a model's communicative intent and verbal competence uniquely affect children's selective trust across development, taking into account the current study findings that suggest that these two model attributes are important contributors.

Table 2

Mean scores on the word learning, rational imitation, and instrumental helping tasks, according to condition

Task	Variable	Mean (*SD*)	
		Competent and Malevolent (CM)	Ignorant and Benevolent (IB)
Word Learning (*n* = 48)	Proportion of correct selections during novel trials	47.78% (33.18)	55.36% (34.36)
Rational Imitation (*n* = 44)	Proportion of trials infants engaged in exact imitation	26.09% (34.75)	17.46% (20.05)
Instrumental Helping	Proportion of helping across trials		
Cabinet task (*n* = 39):		51.65%(39.77)	50.89%(44.99)
Books task (*n* = 43):		54.55%(41.89)	50.76%(44.28)
Paperball task (*n* = 44):		55.09%(47.08)	52.43%(45.45)

Figure 1. Rational imitation task apparatus, displaying three-drawer box, with accompanying tool set.

Modifications between Chapters 3 and 4

In order to address the methodological challenges outlined in Chapter 3 regarding the word learning task, the same task was used (i.e., Woodward et al., 1994), with the following changes: 1) infants were no longer rewarded following their selection of a target, and 2) training and testing of the novel word were done by different people (by the primary caregiver and a naïve experimenter, respectively). The rational imitation task was replaced with the one used in Chapter 2, in order to rule out any bias or preference infants may have for tools at age 24-months (which may override their willingness to interact with the stimulus as a whole). Two of the three instrumental helping tasks were retained from Chapter 3, with the exception of the Cabinet Task, which was found to have lower rates of success.

Chapter 4

Is Parental Emotional Reliability Predictive of Toddlers' Learning and Helping?

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Is Parental Emotional Reliability Predictive of Toddlers' Learning and Helping?

The predominant view of developmental psychology asserts that young children take an active role in their learning process. Indeed, while children depend on learning new and culturally relevant information from observing or listening to others, particularly adults (Csibra & Gergely, 2009; Gergely & Csibra, 2005; 2006; Gergely, Egyed, & Király, 2007; Jaswal & Neely, 2006), they are also discriminate learners. Research has demonstrated that young children and even infants have been shown to judge informants according to how epistemically reliable they are, preferring an informant who demonstrates verbal expertise (Chapter 2; Corriveau & Harris, 2009; Koenig et al., 2004; Scofield & Behrend, 2008), confidence and knowledge (Sabbagh & Baldwin, 2001), conventionality (Diesendruck, Carmel, & Markson, 2010; Zmyj, Buttelmann, Carpenter, & Daum, 2010) and accurate communicative and affective cues (Chow, Poulin-Dubois, & Lewis, 2008; Poulin-Dubois, Brooker, & Polonia, 2011; Poulin-Dubois & Chow, 2009). Children are also sensitive to the nature of an informant's intentions, trusting a benevolent over a malevolent source (Mascaro & Sperber, 2009). This preference for someone who has displayed positive intentions has even been displayed in infants approaching the second year of life (Chapter 3; Dunfield & Kuhlmeier, 2010). What about young children's selection of informants based on their consistent responsiveness and emotional availability? Indeed, a claim has been made that a caregiver who possesses these attributes will be "regarded as trustworthy in the epistemic as well as the emotional domain" (Harris & Corriveau, 2011, p. 1181). The current study attempted to test this claim by examining how toddlers' acceptance of information presented by their primary caregiver might vary as a function of that parent's consistent behavior and consequent *emotional reliability*.

Children's selectivity of informants on the basis of their epistemic reliability, such as their competence, has been evidenced in learning contexts such as language and imitation. For example, it has been shown that by 3- to 4-years of age, children are aware of those who label familiar objects correctly versus incorrectly, and are more likely to learn novel words from (e.g., Birch, Vauthier, & Bloom 2008; Jaswal & Malone, 2007; Jaswal & Neely, 2006) as well as imitate (Rakoczy, Warneken, & Tomasello, 2009) the more accurate source. A preference for learning novel words from verbally accurate sources has also been seen among toddlers (Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2012) and even among infants, who additionally instill enough trust in the accurate speaker to also imitate the speaker's "irrational" actions (Chapter 2). Furthermore, infants also attribute rationality and consequently imitate someone who has displayed reliable affective and communicative cues (Poulin-Dubois et al., 2011) as well as conventional knowledge such as the proper means of interacting with familiar objects (Zmyj et al., 2010).

Less is known about how young children preferentially learn from someone who is emotionally trustworthy and reliable. Recent evidence suggests that young children are indeed influenced by the reliability and nature of a model's intentions. For example, preschoolers trust the testimony of a puppet described as "kind" over one described as "mean" (Mascaro & Sperber, 2009) and prefer not to learn a novel word from a model who has displayed malevolent intentions, such as destroying a friend's artwork (Doebel & Koenig, 2011). Similarly, Brooker and Poulin-Dubois (Chapter 3) found that infants do not learn new words from a model that intentionally offered but withheld a toy from them, even if that model demonstrated that she was competent and reliable in the verbal domain. Additionally, this study found that while infants showed a slightly better memory trace for that model's face compared to a stranger's, this short-

term interaction appeared insufficient to curtail their willingness to imitate the model's novel actions. Importantly, the children from these studies were either informed about the model's nature from a third-party or only exposed to the models during a brief interaction rather than a series of encounters; it is therefore possible that they were less able to form a robust impression of the model's consistent and reliable behavior. Perhaps children would be more influenced by a model's emotional availability and responsiveness when that person is someone for whom they have developed an attachment over time (e.g., Fonagy, Gergely, & Target, 2007), such as a primary caregiver.

According to attachment researchers, infants use their attachment figure as a secure base from which to explore (Ainsworth, 1963; Bowlby, 1969/1982; Cassidy, 1999). Infants' evaluation of their caregiver as available and responsive is therefore said to foster their desire to learn about their environment. Additionally, these evaluations are stable and cumulative, formed from infants' experience with their caregiver as being emotionally reliable and dependable (e.g., Xue, Moran, Pederson, & Bento, 2010). Only a few studies have attempted to measure young children's selective learning as influenced by their attachment or familiarity to a source. Corriveau and Harris (2009) first examined whether the familiarity of a preschool teacher would influence 3-, 4-, and 5-year-olds' preference in asking about both the label and use of novel objects. All children were found to prefer their own teacher to an unfamiliar teacher when inquiring about novel information, and 3-year-olds (but not 4-and 5-year olds) were unlikely to modify this preference despite seeing their familiar teacher previously label familiar objects incorrectly. It therefore appears that younger children have a strong tendency to favor familiarity over accuracy when deciding whom to learn novel information from (see also Harris & Corriveau, 2011). Although the authors proposed that the "emotional quality" of the repeated

interaction with the teacher was most likely the cause of children's initial preference, this hypothesis could not be supported because the level of closeness of the student-teacher relationship was found unrelated to children's preference ratings.

Corriveau and colleagues (2009) went on to examine whether a more conservative measure of familiarity, such as an attachment with a primary caregiver, influenced children's learning. Specifically, they examined whether 50- and 60-month-olds' preference for their mother or a stranger when endorsing the identity of a novel animal hybrid would be moderated by their attachment status. Children were first presented with hybrids that were made up of two animals, some of which were equally likely to have a given name (50/50 composition), whereas the other half was more representative of one animal (75/25 composition). In the 75/25 conditions, mothers were instructed to give the label that was least representative of the hybrid. Children demonstrated differential reliance on their mother according to their attachment status as assessed with the Strange Situation Procedure: avoidant children demonstrated the least reliance on their mother regardless of her accuracy, whereas securely attached children were flexible – accepting and preferring their mother's claims to that of the stranger but only when they were accurate. The authors suggested that perhaps the bidirectional quality of the signals sent between mothers and their children might explain this effect. Specifically, mothers of securely attached children may have instilled more reliance in their claims by virtue of how they have expressed them. On the other hand, as securely attached children are often classified as having more resilience and ego-strength (e.g., Sroufe, Egelnad, Carlson, & Collins, 2005), they may have been able to adopt a more flexible stance when relying on their mother's claims.

Taken together, these studies demonstrate that very young children are more likely to place epistemic trust in a familiar source and that the quality of the emotional relationship plays a

role as well. Perhaps a parent's level of emotional availability and history of sensitive responding, such as being aware of the child's signals, accurately interpreting them, and responding to them in a suitable and timely manner (e.g., De Wolff & van IJzendoorn, 1997; Sroufe, Edgeland, Carlson, & Collins, 2005), would have an influence on young children's selective learning behavior. Indeed, there exists an extensive literature on how children's cognitive and social-emotional development is influenced by the level of sensitivity of both mothers (Beckwith & Rodning, 1998; Field, Guy, & Umbel, 1985; Landry, Smith, & Swank, 2006; Landry, Swank, Assel, Smith, & Vellet, 2001; McElwain & Booth-LaForce, 2006) and fathers (Kelley, Smith, Green, Berndt, & Rogers, 1998; Shannon, Tamis-Lemonda, Cabrera, 2006; Shannon, Tamis-LeMonda, London, & Cabrera, 2002; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004), and that this effect is driven by similar behaviors implemented by both sexes, specifically by how responsive and contingent their behavior is (e.g., Davidov & Grusec, 2006; Page, Wilhelm, Gamble, & Card, 2010). Therefore, we used a measure of maternal sensitivity to assess individual primary caregiver's responsiveness and emotional availability, from which we inferred his or her level of emotional reliability. Indeed, one of the main objectives of the current study was to expand the literature on children's selective trust by investigating if 24-month-olds would learn from their primary caregiver differently as a function of his or her emotional reliability, on tasks measuring word learning and imitation.

If consistently sensitive and responsive parents are likely to be viewed by their children as trustworthy in the epistemic and emotional domains (e.g., Harris & Corriveau, 2011), it was hypothesized that children of more sensitive and responsive parents would be more likely to imitate them and learn from them. The current study was also expected to add to the existing research on young children's selective learning from an emotionally unreliable and unresponsive

source. Indeed, the only study to examine a similar topic with children younger than two years of age has manipulated both a model's benevolence and verbal competence simultaneously during a brief interaction (Chapter 3). Specifically, infants were exposed to a model that was either knowledgeable and malevolent *or* ignorant and benevolent, as demonstrated by the model's labeling behavior and willingness to provide infants with a toy, respectively. As the malevolent and unwilling (but knowledgeable) manipulation reduced infants' willingness to learn novel words from the model but did not dissuade them from imitating the model's actions, it is highly possible that a history of emotional reliability and sensitive responsiveness would have an even greater influence on young children's behavior. Indeed, research has shown that children whose parents are more consistent and reliable perform better on tasks measuring their capacity to learn, attend, and remember (see Beebe & Lachmann, 1994).

A final aim of the current study was to examine how children would generalize their caregiver's history of emotional reliability to non-learning contexts and thus modify their behavior, specifically during instrumental helping tasks. Helping tasks require children to be attentive to another's verbal and non-verbal cues, such as eye-gaze, tone of voice, and body language, in order to indicate whether that person is in need of assistance (Tomasello, Carpenter, Call, Behne, & Moll, 2005; Woodward, 2005). If that person was previously unreliable and lacked emotional availability, that is, had a history of demonstrating inconsistent, non-contingent verbal and non-verbal cues, it was expected that children would be less able to make appropriate responses when that person emitted cues that signaled that he or she required assistance and help (Grusec & Goodnow, 1994; Landry et al., 2001). In addition, if instrumental helping is measuring children's altruistic behavior in that children tend to help regardless of whether they are rewarded or reinforced (e.g., Warneken & Tomasello, 2009), children may be less inclined to

help a person who has been unavailable and unresponsive towards them and see it as a potentially costly act. Indeed, at 21-months, toddlers will selectively help those who have previously demonstrated positive intentions towards them, helping those who have provided them with a toy or tried to provide them with a toy but were unable to while choosing not to help those who have intentionally removed a toy from their grasp (Dunfield & Kuhlmeir, 2010). Thus by 24 months, it was considered likely that toddlers would differentially help their caregiver as a function of the caregiver's responsiveness and history of attending to their needs.

It is possible that responsive parents are better teachers, as research on parenting has often coupled together being responsive and being didactic (e.g., Kermani, 1995; Landry, Smith, & Swank, 2006; Shannon et al., 2002; Tamis-LeMonda et al., 2004). Indeed, mothers who have been found to be more sensitive when teaching their child a complicated task change or modify their instructions throughout the task according to how well the child is doing (Baker, Sonnenschein & Gilat, 1996; Meins, 1997). Therefore, it was important to account for the level or quality of the parent's instruction and thus provide parents with a standardized script to ensure that they were teaching their children in the same way. In addition, a measure of parental adherence to instructions was developed, so that if differences were found, they could be controlled for. We also examined for the potential influence of socioeconomic status, by including items that measured income and education in the demographic questionnaire. Finally, we controlled for and examined moderation by three child characteristics that have been shown to influence both parent behavior and child outcomes in related research: language ability (e.g., Corriveau et al., 2009; Jaswal, 2007; Koenig & Woodward, 2010), sex, and age (e.g., Eisenberg & Fabes, 1998; Davidov & Grusec, 2006).

Method

Participants

Forty-two primary caregivers and their 24-month-old infants were tested. The average age of toddlers was 24.31 months (*SD* = 0.61), ranging from 23.07 to 26.12 months. There were 23 male and 19 female toddlers, 18 were identified as French-speaking, 24 as English-speaking. Of the primary caregivers tested, 33 were mothers and eight were fathers. The primary caregivers' average age was 34.78 years (*SD* = 4.64). On average, they had a Bachelor's level of education (only two had received high-school education or less) and had an average income of $75,000- $100,000 (ranging from under $22,000 to over $150,000). All of the primary caregivers were either married or living with a partner at the time of data collection, with the exception of two who were single.

Participants were recruited from birth lists provided by a governmental health agency. There were several selection criteria, which consisted of: the toddler being born full term and having no signs of visual or auditory deficits, the accompanying parent needed to be the primary caregiver, and English or French had to be the primary language spoken in the home. Participants were compensated for their travel expenses and children received a toy and a certificate of merit for their participation. Three additional participants were tested but were excluded due to fussiness (*n* = 2) and parental interference (*n* = 1).

Measures and Experimental Tasks

Mini-Maternal Behaviour Q-Sort – V (MBQS). The Mini-MBQS-V is a 25-item sort that is an adaptation of the original Mini-MBQS (25-item), used specifically to provide a description of caregiver behavior and a measure of maternal sensitivity during limited videotaped interactions between mother and infant (Moran, 2009). Both versions were intended to be less

time-consuming than the original, full 90-item sort (Pederson & Moran, 1995). While the MBQS is useful for assessing maternal behavior, to date, no research has examined its use to assess paternal sensitivity. Items are sorted in five clusters, each containing five items. The five clusters range from 1 (*least descriptive*) to 5 (*most descriptive*), as they rate the quality of the mother's behaviors. The global sensitivity score is the correlation between the sorts of the observed mother (or father, in the present study's case) and the prototypically sensitive and responsive mother, provided by Moran (2009). The range of potential scores is from -1 (*least sensitive*) to 1 (*most sensitive*).

The MBQS is founded upon Ainsworth, Blehar, Waters, and Wall (1978) maternal sensitivity hypothesis, in that maternal sensitivity is the main contributor of a secure attachment between parent and infant. The short-form version of this scale has been found to be valid and reliable (Tarabulsy et al., 2009) as well as stable over time (Xue et al., 2010). Specifically, when used to assess maternal sensitivity during a 10-min free-play interaction, it was found to be significantly associated with both the full version of MBQS as well as with other measures of attachment behavior, such as the Attachment Q-Sort (Tarabulsy et al., 2009). In addition, sensitivity scores obtained from both forced and unforced q-sorts using the short form of the MBQS were found to be significantly and highly correlated with one another, suggesting that forced q-sorts with fewer than 30 items are still psychometrically sound and do not violate basic statistical assumptions (Bailey, Bisceglia, Roche, Jenkins, & Moran, 2009). The current study's trained primary coder independently coded the videotapes after the laboratory visit. A second trained coder coded 20% of the sample, wherein an intraclass correlation coefficient (ICC) revealed excellent inter-rater agreement, ICC = .91.

Parental compliance. A 34-item scale was created to measure the level of adherence of the parent to the verbal and non-verbal guidelines provided during the training phase (see Appendix). Each task thus contained a range of items on which parents were given a score of 1 or 0 indicating whether they complied or not, respectively. A total compliance score out of 34 was calculated and then converted to a total proportion score (out of 100%). A secondary trained coder independently coded this measure to avoid potential bias. The primary coder of the MBQS coded 20% of the sample to ensure that good inter-rater agreement was achieved, ICC = .87.

Productive language ability. All children were administered the MacArthur-Bates Communicative Development Inventory-short form Level II (MCDI; Fenson, Pethick, Renda, Cox, Dale, & Reznick, 2000), a 100-word checklist that provides a measure of the child's current expressive vocabulary (range of possible scores: 0 – 100). A French adaptation was administered in the case of French-speaking children (Trudeau, Frank, & Poulin-Dubois, 2009).

Interesting-but-scary paradigm (IbS). This measure was adapted from De Oliveira (2001) and was used as a context from which to code parental sensitivity and responsiveness, similar to Evans, Moran, Bento, and Pederson (2007). It was originally designed to assess mother-child interactions as well as activate attachment, exploratory, and fear/wariness behaviour within 24-month-olds. It has been proven as a valid instrument from which to code maternal sensitivity (Evans et al., 2007) as well as attachment behaviour (Forbes, Evans, Moran, & Pederson, 2007). Specifically, Evans and colleagues (2007) found that when maternal sensitivity was measured during the short laboratory interaction of the IbS, it was significantly correlated with assessments of sensitivity using the full version of the MBQS during a 2-hr home-visit as well as with assessments of security using the Attachment Q-Set. It is approximately 8 min long, consisting of a reunion between parent and child following a brief separation (of approximately 10 min), a 5

min interaction where parent and child are instructed to participate in free-play with toys provided (parents are instructed to play as they normally would), and then a 3 min period where a potentially fear-eliciting toy spider is introduced. The experimenter operated a small remote-controlled toy spider from an adjacent room.

Word learning. The word learning task was adapted from Woodward, Markman, and Fitzsimmons (1994). It contained two phases: a training phase and a test phase. The parent conducted the training phase. The experimenter then replaced the parent (who in turn sat behind the toddler) in order to conduct the test phase.

Training phase. The parent presented either a large plastic clip or a plastic hook to the child, and labelled it three times ("Toma" for English speakers, "Muron" for French speakers) e.g., "That's a Toma, see it's a Toma, look it's a Toma." Only three repetitions were used in order to make the task more age-appropriate, as pilot work suggested that all toddlers performed at ceiling when using the original procedure that consisted of nine repetitions. This was followed by a presentation of the distracter object, with the parent paying equal attention to it, saying, "Ooo look at that! Do you see that? Wow, look at that."

Test phase. Immediately following the training phase, the experimenter examined toddlers' word comprehension for the novel-object label. The experimenter began by placing two items on either side of a bucket on a tray. The tray was lowered in front of the child while the experimenter said: "Can you put the Toma in the bucket?" five times. The tray was then placed within the child's reach giving him/her the opportunity to choose an item and put it in the bucket. If children refused to select an item, they were asked to show it to their parent. Each item (both target and distracter) was presented in three different colors throughout the testing period as a

means of assessing word learning for the training pair (during one trial; same colors as in training), as well as on generalization pairs (during two trials; two different colors were presented than those during training). Thus there were three trials, with type, target item, color, and location on the tray, all counterbalanced.

Two types of control trials were also included in the procedure: three familiar item trials and three preference trials. Thus there were three blocks of trials, each block containing one type of each trial, for a total of nine test trials. The order of trials within each block was counterbalanced. To confirm the validity of the measure of comprehension, familiar word trials involved following the same procedure as the novel word trials, except that a toy bird and a toy chair were used as the target items (which involved using 1 target pair and 1 exemplar for the three trials). It was previously confirmed from the parent that the child understood both of these words. If the word learning test was indeed measuring word comprehension, it was expected that toddlers would perform above chance in their selection of the correct familiar item. There was also a preference trial to verify that toddlers' item selection was in response to the question asked and not simply due to a preference for the previously labelled item. These trials followed the same procedure as the novel word trials except that the toddler was asked to put *one* of the novel items in the bucket. In order to maintain the child's interest, there was a non-test activity between trials that involved putting an item in the bucket. These non-test activities were followed with cheers and applause.

Coding and reliability. Responses were coded similarly to Woodward and colleagues (1994), based on the first item the toddler selected. However, a few exceptions existed: 1) if both items were selected at the same time, the first item put in the bucket or shown to the parent who was sitting behind during test trials was considered the response, and/or 2) if children

clearly labelled the item verbally, it was coded as their final response, regardless of the item they elected to put in the bucket. Toddlers received a score of 1 if they chose the target toy and a score of 0 if they chose the non-target toy during any of the familiar, preference, and novel label trials. A total proportion score indicating successful selections for each trial type was calculated by adding toddlers' total score from each of the three blocks and dividing it by the total number of trials completed. Good inter-rater agreement was achieved concerning the coding of novel, r = .77, preference, r = .85, and familiar, r = .89 word trials.

Rational imitation. This task was adapted from Schwier, Van Maanen, Carpenter, and Tomasello (2006) task. It involved having the parent demonstrate a toy stuffed dog entering a small wooden house (measuring 37 cm x 25.5 cm x 22.5 cm) through the chimney rather than an open door, at the front of the house.

Demonstration and training phases. The parent modeled the event by first calling the child by name and only once the child was attending did he/she then make a sing-song voice while moving the toy dog along an imaginary path toward the house. The parent paused the dog's movement in front of the door, had it make two quick motions toward the door, and then lifted the dog up and exclaimed "Yippee" before dropping the dog through the chimney. Then the parent retrieved the dog from the back of the house via a hidden backdoor, placed the dog and house closer to the child, and stated "Now it's your turn." The child was then given a chance to put the dog inside the house. The procedure, including demonstration and response, was then repeated for the second trial.

Coding and reliability. We coded whether the child imitated by putting the dog in the chimney (score = 1) or emulated by putting the dog through the door (score = 0) during the two

trials. Toddlers therefore received a total score of imitation (max = 2), which was then converted into a total proportion score. Good interrater agreement was achieved regarding toddlers' imitation, $r = .91$.

Instrumental helping. Two helping tasks were adapted from Warneken and Tomasello (2006): the Wrong-result task (Books) and Out-of-reach (Paperball) task. The experimenter was always seated behind the child, facing the parent, to record the timings of the response period, as well as to signal to the parent when it was time to proceed to the next phase. Both tasks began with the parent gathering the child's attention by calling his or her name and only proceeded when attention was sufficiently garnered. In addition, parents were instructed to provide no feedback to their child for helping.

Demonstration and test phases. In the Books task, the parent first proceeded to stack three book-like objects (pieces of blue plywood, measuring 17.5 cm x 25 cm x 1 cm), and then slid them towards the child. The parent then attempted to stack a fourth book, but missed. The parent expressed his/her disappointment and alternated his/her gaze between the book and the child. After 20 seconds, he/she vocalized her disappointment by saying: "Oh, no!" Following another ten s, he/she proceeded with another failed attempt to stack another book. The process was repeated for a total of three trials. If at any point the child helped by attempting to stack the book, the parent moved on to the next trial immediately. The Paperball task followed the same basic procedure as the Books task. The parent also began by calling the child's name, and then began to pick up three different colored plastic blocks placed in front of him/her with a pair of plastic tongs in order to place them into a small plastic bucket. After he/she was done, the experimenter who was seated behind the child then placed a fourth block in front of the child,

wherein the parent reached for it, but failed. As in the Books task, he/she made his/her disappointment visible over the 30 s response period.

Coding and reliability. For the Books task, attempts to stack the book or place it closer to the pile were coded as helping (score of 1), while any failure to do so was also coded (score = 0). A total helping score (max = 3) was converted into a total proportion score. Good inter-rater agreement was achieved with regard to the total proportion of helping acts for this task, $r = .86$. For the Paperball task, attempts to hand the block to the parent or place it themselves into the bucket were coded as helping (score = 1), with failure to produce any action coded as well (score = 0). If at any point within this period the child attempted to help, the parent received the block neutrally, placing it in the bucket. Then the experimenter placed another block in front of the child for the next trial. The process was repeated for a total of 3 trials for a total score of helping (max = 3) which was converted into a total proportion score. Good inter-rater agreement was also achieved regarding the total proportion of helping acts for this task, $r = .95$.

Design and Procedure

Participants were greeted in a reception room where they read and completed the informed consent form that outlined the procedures of the study. This entailed the primary experimenter (E1) explaining to parents that we were interested in looking at parent-child interactions, how their child reacts to new environments and stimuli, and whether their child would help, imitate or learn a new word from them. Parents were instructed that they would be trained to administer four tasks that they would subsequently engage in with their child. We also mentioned that the experimental session would be recorded for the purposes of coding.

Participants were then lead into the testing room, where the primary caregiver and the child were left alone with age-appropriate toys for approximately 5 min. The parent was instructed to play with the child as he or she normally would (the first component of the Interesting-but-Scary paradigm (IbS), described in detail below). Following, both E1 and the secondary experimenter (E2) returned to the room so that the child could familiarize him/herself with E2 and the testing environment, while E1 explained the standard demographics questionnaire and the MCDI to the parent (who subsequently filled the forms out). Next, the child left the room with E2, while E1 trained the parent on each of the experimental tasks. The parent practiced with the experimenter until the parent performed the tasks properly and felt comfortable to proceed (approximately 10 to 15 min). Subsequently, parent and child were reunited (the second component of the IbS), wherein they were left alone to engage in another episode of free-play without toys for approximately 2 min. This additional free-play, which differed from Evans and colleagues (2007) who have coded maternal sensitivity solely from the IbS paradigm, was added in order to get a more robust and varied context of interaction between parent and child that allowed for sufficient coding of parental sensitivity using the mini-MBQS-V (e.g., for items such as parent engaging in social play with child). Again, parents were instructed to play with their child as they normally would. Finally, the spider was introduced, which moved around the parent-child dyad for approximately 3 min (the third component of the IbS). Parents were instructed beforehand to interact with their child as they normally would and therefore to intervene as they saw fit. If at any point the child appeared upset, the task was discontinued. Afterward, the parent administered the tasks in the child's mother tongue (either French or English). The order of the tasks was counterbalanced across participants. For the word learning, rational imitation, and instrumental helping tasks, the primary caregiver sat across from the child at a small table, where the child

was either seated in a high-chair or at a small chair. E1 sat behind the child to help guide and prompt the parent as needed, should the parent have forgotten a step in the task.

Results

Preliminary Analyses

Parental compliance scores ranged from .61 to 1.00 (M = .83, SD = .11). Parental sensitivity scores (MBQS) ranged from -.15 to .87 (M = .68, SD = .25). In addition, MCDI scores ranged from 2 to 100 (M = 46.92, SD = 25.76). Since there were too few fathers who participated in the study, there was not enough power to assess the effect of parents' sex[1]. There was also no effect of overall order of tasks on the child outcome measures. Therefore, results were collapsed across these variables.

To initially examine any potential influence of SES and parental compliance, bivariate correlations were conducted with the main variables of the study, including: the three central child outcomes (novel word learning, total proportion of rational imitation, and total proportion of instrumental helping on the two tasks combined), the parental MBQS score, as well as two of the control measures (MCDI score and age; see Table 1). As expected, MCDI was significantly related to parent's MBQS score. Interestingly, neither parental compliance nor any of the SES variables were related to any of the outcomes of interest. Therefore, they are not included as covariates.

A multivariate analysis of variance was also conducted in order to examine whether any of the three child outcome variables as well as the parenting variables (MBQS, parental

[1] All regressions were also run examining maternal data only. None of the overall models were significant, meaning that fathers' sensitivity contributed to, and was necessary, for the effects reported.

compliance) differed according to the sex of the child. No parenting variables differed according to child's sex, *p*s > .10. The only outcome variable where sex had an effect was on toddlers' total proportion of imitation, $F(1,39) = 7.46$, $p = .009$. The average proportion of imitation was higher for boys ($M = .71$, $SD = .08$) than for girls ($M = .40$, $SD = .08$). Therefore it was included as a control variable in analyses on toddlers' imitation.

Overview of Analyses

The main analyses are organized into three main sections, according to the main child learning outcomes: word learning, rational imitation, and instrumental helping. Within each section, we first present the main descriptive analyses, followed by the regression analyses. Table 2 includes the descriptive statistics for each task used for the subsequent regression analyses.

In order to provide a stringent test for the effect of parental responsiveness on children's learning outcomes we ran nine separate hierarchical regressions (three per outcome). In addition, to maximize power, regressions were run with four predictors at a time. Thus, the first step included two of the three control variables: age, sex (dummy coded), and MCDI. Due to evidence from the preliminary analyses as well as theoretical and research support (e.g., Corriveau et al., 2009; Davidov & Grusec, 2006), sex was always entered as the control for imitation and helping, while MCDI always served as the control for word learning. The other variable entered during this step was examined for main effects as it would be entered in the last step as an interaction term and examined for moderation (if the variable acting as a constant control was being examined for moderation, age was always used as the control). The second step included the parental responsiveness score (MBQS). Finally, the third step examined for

moderator effects and therefore included the interaction term of the moderator variable with MBQS (i.e., sex X MBQS, age X MBQS, or MCDI X MBQS). In order to further examine significant interactions, we followed up by examining the significance of their simple slopes. While the results from all regressions are reported, only the models accounting for the most variance are displayed in table format.

Word learning.

Descriptive analyses. There was no effect of order, block, or toy chosen as the target (clip or hook) on children's word learning performance and therefore results are collapsed across these factors. Confirming that toddlers understood the task, they selected the correct target 76.46% (*SD* = 31.87) of the time during familiar comprehension trials, a value greater than expected by chance (50%), $t(40) = 5.32$, $p = .00$. As expected, toddlers also displayed no preference, as they did not select the target systematically during preference trials 53.27% (*SD* = 32.43), $t(40) = 0.65$, *ns*. In addition, toddlers' successful selection of the target during test trials using the original pair (*M* = 53.66%, *SD* = 50.49) did not differ when compared to their selection using the generalization pairs (*M* = 51.22%, *SD* = 37.89), $t(40) = 0.24$, *ns*. Results showed that on average, children's proportion of correct selections on novel word trials was 53.29% (*SD* = 31.57), a value not greater than chance (50%), $t(40) = 0.67$, *ns*. One infant did not complete this specific task and so was not included in these analyses.

Regression analyses. The first regression was run to examine whether MCDI moderated the effect of parental responsiveness (MBQS). The overall model was at trend for significance, $F(4,40) = 2.46$, $p = .06$, accounting for 21% of the total variance in children's word learning. MBQS, entered in the second step, was the only significant predictor ($\beta = 0.42$, $p = .01$),

predicting 15% unique variance, after controlling for MCDI and age. The interaction was not significant (β = -.96*, ns*) indicating that children's word learning was not moderated by their productive vocabulary. The second regression was run examining for whether age moderated the relationship. The overall model was significant, $F(4,40) = 2.62$, $p = .05$, accounting for 23% of the total variance (see Table 3). Once again, MBQS was the only significant predictor (β = .42, $p = .01$), accounting for 15% unique variance. The interaction term indicated moderation by age was non-significant (β = -10.40, *ns*). Finally, the third regression tested for moderation by sex. The overall model was at trend for significance, $F(4,40) = 2.34$, $p = .07$, accounting for 21% of the total variance in children's word learning. The moderation by sex was found non-significant, (β = -0.43, *ns*). Consistent with previous regressions, MBQS was the only significant predictor of word learning, (β = 0.41, $p = .01$). Thus, consistent with our hypothesis, word learning was predicted by parental responsiveness.

Rational imitation.

Descriptive analyses. Since infants either emulated or imitated, infants' proportion of imitative responses was used, rather than the proportion of trials in which they imitated (as in Schwier et al., 2006, who had several non-responders on one of the two trials). Infants' proportion of imitative responses did not differ across the two trials as infants used the chimney 57.14% ($SD = 50.08$) of the time on trial 1 and 52.38% ($SD = 50.55$) on trial 2, $t(41) = 0.50$, *ns*. The remainder emulated the parent's goal and used the door to place the dog inside the house. Thus children's total proportion of imitation across the two trials (54.76%, $SD = 39.52$) was entered into a similar hierarchical regression.

Regression analyses. Children's imitation was first examined for moderation by MCDI. The overall model was at trend for significance, $F(4,41) = 2.47$, $p = .06$, accounting for 21% of the total variance in children's imitation. Toddlers' sex was the only significant predictor ($\beta = -0.35$, $p = .02$) that explained 15% unique variance, indicating that boys had higher rates of imitation. However, moderation was non-significant ($\beta = 0.68$, *ns*). A second regression was run, testing for moderation by age (see Table 4). The overall model was significant, $F(4,41) = 4.34$, $p = .006$, explaining 32% of the total variance. Sex was again a significant predictor, ($\beta = -0.35$, $p = .02$). Parental responsiveness was at trend for significance, ($\beta = 0.27$, $p = .08$), explaining 7% unique variance. This main effect of responsiveness was moderated by age, ($\beta = 17.36$, $p = .02$). The simple slope of this interaction was significant, $t(39) = -2.91$, $p = .006$ (see Figure 1). Thus parental responsiveness predicted higher rates of imitation only in older toddlers. Finally, a third regression was run testing for moderation by sex. The overall model was significant, $F(4,41) = 2.59$, $p = .05$, accounting for 22% of the total variance. Once again, sex was a significant predictor, ($\beta = -0.35$, $p = .02$), as was MBQS at trend for significance, ($\beta = 0.27$, $p = .08$). The main effect for parental responsiveness was not moderated by sex, ($\beta = 0.37$, *ns*). Overall, parental responsiveness did indeed predict higher imitation, but only in older toddlers.

Instrumental helping.

Descriptive analyses. Toddlers' mean percentage of trials during which they helped on the Books task ($M = 60.95\%$, $SD = 41.49$) did not differ from the mean percentage of trials that they helped on the Paperball task ($M = 70.67\%$, $SD = 39.80$), $t(40) = -1.03$, *ns*. While a small percentage of infants had difficulty on the individual helping tasks (approximately 21% during the Books task and 19% during the Paperball task performed no action, respectively) toddlers

appeared to help on the majority of trials, with only 5% not performing any helping acts on any of the six trials. Thus children's helping was converted into a total proportion score (M = 66.26%, SD = 29.12) for the main regression.

Regression analyses. The effect for moderation by MCDI was first examined revealing no significant main effects or interaction. The overall model was non-significant, $F(4,41) = 0.43$, *ns*, accounting for only 4% of the total variance. A second regression was run examining moderation for age. The overall model was also non-significant, $F(4,41) = 0.70$, *ns*, revealing no significant main effects or interaction and accounting for 7% of the total variance. Finally, the effect for moderation by sex was examined (see Table 5). The overall model was significant, $F(4,41) = 3.47$, $p = .02$, accounting for 27% of the total variance. Specifically, while no main effect for parental responsiveness arose, there was a significant interaction for sex moderating the relationship, ($\beta = 1.31$, $p = .001$). The simple slope of this interaction was significant, $t(39) = 3.69$, $p = .001$(see Figure 2). Thus parental responsiveness predicted higher helping rates in girls but not in boys.

Discussion

Children acquire many skills by observing and imitating the behaviors of those around them (Tomasello, Kruger, & Ratner, 1993). As early as infancy, they show selectivity in deciding whom they are willing to learn from (e.g., Chapter 2; Poulin-Dubois et al., 2011; Zmyj et al., 2009). More specifically, children's choice of an informant is influenced by factors such as expertise, familiarity, and even age (Corriveau & Harris, 2009; Harris & Corriveau, 2011; Jaswal & Neely, 2006; see also Rendell et al., 2011 for an overview of model-based characteristics influencing social learning across species). Because parents are children's principal informants,

it is critical to examine the impact of their reliability as models on children's learning. To our knowledge, only one study has investigated preschoolers' willingness to accept a parent's testimony as a function of the emotional relationship between parent and child, by examining the moderating role of preschoolers' attachment status (Corriveau et al., 2009). The current study therefore provides a timely contribution to the fields of selective learning and trust by being the first to report on toddlers' willingness to learn, help, and imitate as a function of the emotional reliability of the model – specifically the responsiveness and emotional availability of the primary caregiver.

Overall, the present pattern of findings is consistent with our initial predictions that a history of sensitive and responsive parenting behavior will instill a sense of epistemic trust in a child and impact their willingness to learn from, as well as help and imitate their parent. Despite their strong tendency to learn from adults, particularly within a pedagogical context, children were less likely to learn from a parent characterized as less sensitive and responsive within a laboratory setting. This effect was found with respect to children's word learning. Children's outcomes were not a result of variability in primary caregivers' teaching skills, as parents were given and adhered to a standardized script. Children also did not perform better as a function of their SES or productive vocabulary. Rather, it was age and sex that moderated outcomes in two situations, such that the responsiveness of a caregiver only impacted older children's imitation and girls' willingness to help.

Consistent with our hypothesis, children were not as willing to learn a novel word from a less responsive caregiver. When parent-child interaction is less optimal due to a parent's lack of responsiveness, there may be fewer verbal exchanges between the dyad including less labeling of objects in the child's environment that could ultimately result in a child's reduced ability to learn

new words and consequently, a smaller lexical repertoire (Chazan-Cohen et al., 2009; Tomasello & Farrar, 1986). Indeed, it was found that toddlers of more responsive and sensitive parents had a higher productive vocabulary. Nonetheless, parental responsiveness had an impact on children's learning above and beyond their vocabulary level. The current study thus extends findings demonstrating that by 24-months, children are sensitive to the reliability and previous verbal accuracy of a model who subsequently tries to teach them a novel object-word pairing (Chapter 2; Chapter 3; Krogh-Jespersen & Echols, 2012). One of the proposed reasons for children's less robust learning was that it was a result of poor semantic memory for the unreliable and inaccurate source (Chapter 2; Koenig & Woodward, 2010). It has been found that the more consistent and reliable a parent's behavior is, the more the child will be able to learn, attend, and remember (Beebe & Lachmann, 1994). In addition, children who have insecure attachments have demonstrated poorer memory of social information, after controlling for their cognitive functioning (Kirsh & Cassidy, 1997). It is therefore possible that children may also have poor memory for semantic information presented by a consistently less responsive caregiver.

Interestingly, parents' level of emotional reliability only influenced older children's likelihood of imitation. Perhaps young children need time and experience with their caregiver in order to reliably predict whether their caregiver will be responsive or not towards them; the older the child, the more they have learned whether or not they should trust their caregiver's intentions and learn from their behavior. As the age between the oldest and youngest participants only differed by 3 months, it is likely that the younger infants were on the verge of this transition. Certainly, a short interaction with an unwilling and unresponsive adult was not enough for 18-month-olds to modify their imitative behavior, as they were able to infer rationality to an adult's

intentions regardless of her previous intent towards them (Chapter 2). In their 24-months of experience in engaging with their primary caregiver, children arguably would have learned and developed expectations about their caregiver's reliable and dependable behavior. Thus, toddlers may have grown accustomed to the lack of expressive affect that parents low in sensitivity and responsiveness are likely to exhibit which could lead to a narrowed range of emotions that they experience and understand (Adams, 2006). This may have resulted in a weakening of the saliency of the parent's ostensive cues, making the exchange of information within a pedagogical context between the infant-parent dyad less effective and meaningful. Indeed, children are highly influenced by ostensive and communicative cues and are more inclined to imitate a source when these cues are present (Brugger, Lariviere, Mumme, & Bushnell, 2007; Király, Csibra, & Gergely, 2004; Sage & Baldwin, 2011; Southgate, Chevallier, & Csibra, 2009). However, as the presence – but not intensity – of the parent's ostensive cues was explicitly measured, this conclusion can only be made speculatively.

It may also be that a history of responsive caregiving has shaped how children view their parent as a rational, intentional agent. One of the characteristics of sensitive and responsive caregiving is in being able to view the child as an intentional being and reflect on the child's mental states (Fonagy, Steele, Steele, Moran, & Higgitt, 1991; Fonagy, 1998; Symons & Clark, 2000). In turn, this ability contributes to children's own capacity to learn from as well as understand others' intentions and behavior in a reflective capacity (e.g., Fonagy, Gergely, & Target, 2007; Guajardo, Snyder, & Petersen, 2009). This may be especially true in terms of children's understanding of their caregiver's mental state behavior. Indeed, Repacholi and Trapolini (2004) found that 4- and 5-year-old children who were classified with an avoidant attachment style were more likely to have difficulty attributing mental state knowledge to their

mother, but not to a stranger, on a false-belief task. However, since the current study did not employ a design that enabled children to choose between their parent and an unfamiliar source in deciding whom to learn from (as in Corriveau et al., 2009), no conclusions can be made about whether toddlers' would be more or less willing and able to selectively attribute rationale intentions to their parent in comparison to a neutral stranger. Rather, what can be concluded is that children are less willing and able to imitate and learn from their primary caregiver, as a function of his or her sensitivity and responsiveness.

Undoubtedly, a parent's responsiveness to a child's distress is how children learn whether to trust that their parent will make reasonable demands (e.g., Grusec, Goodnow, & Kuczynski, 2000). If parents are not sensitive in their interactions with their child, these demands may otherwise become overly intrusive and interfering, resulting in maladaptive behavior and learning outcomes (Guajardo et al., 2009). Indeed, less sensitive mothers were found to have more intrusive and less cooperative interaction styles with their daughters who in turn were noncompliant and demonstrated avoidant behavior towards them during a teaching task (Painta & Egeland, 1990). This supports another finding that emerged in the current study in that only girls with more responsive parents displayed more willingness to help. Research has shown that girls tend to display more acts of moral and empathic behavior than boys (Eisenberg & Lennon, 1983; Kochanska, 1997; Kochanska & Aksan, 1995; Silberman & Snarey, 1993) and tend to be more relationship oriented and therefore more prosocial (Maccoby, 1990). In addition, parenting style has been demonstrated to play a key factor in children's ability to internalize moral rules (Alessandri & Lewis, 1996; Hoffman, 1970), with more responsive parents impacting children's ability and willingness to be prosocial (Eisenberg & Fabes, 1998; Grusec & Goodnow, 1994; Trommsdorff, 1991; Zahn-Waxler, Radke-Yarrow, & King, 1979). Since girls tend to be more

inhibited and internalize moral messages differently (Kochanska, 1993; Kochanska, Murray, & Coy, 1997), they may be more sensitive to parents who promote this internalization. As an example, high maternal responsiveness to distress was predictive of early grade-school children's higher empathic and prosocial behavior, with more prosocial behavior seen in girls overall (Davidov & Grusec, 2006).

Since instrumental helping behavior is very robust among young children who appear to be motivated by inherent altruistic tendencies (Warneken & Tomasello, 2009; Hay, 2009), wherein 18-month-olds have been found to be able to interpret, understand and consequently help an unfamiliar adult's cues (Warneken & Tomasello, 2006), even irrespective of her previous malevolence or verbal accuracy (Chapters 2 and 3), it is perhaps not surprising that both girls and boys displayed high rates of helping overall. Certainly, there is a strong reinforcing nature to instrumental helping acts (Brownell, Svetlova, & Nichols, 2009; Meltzoff, 2007; Svetlova, Nichols, Brownell, 2010), which autonomous 24-month-olds may be highly motivated to take part in. In addition, a model's familiarity and kinship have been shown to increase older children's likelihood of helping (see Warneken & Tomasello, 2009 for review). Nevertheless, as children's performance on prosocial tasks becomes more sophisticated and robust in the third year of life (Brownell, Ramani, & Zerwas, 2006; Eckerman & Didow, 1996; Brownell & Carriger, 1990; Hunnius, Bekkering, & Cillessen, 2009), this might explain why a small percentage of children were unable to understand and hence perform during each individual helping task.

In contrast was toddlers' overall low performance on the learning tasks. With regard to the word learning task, though it has been used to demonstrate that 18-month-olds can learn a novel word (e.g., Woodward et al., 1994), toddlers failed to do so. It is possible that the task was

too easy for 24-month-olds who thus grew bored of the task. Indeed, pilot work revealed that toddlers performed at ceiling levels when parents presented the original nine repetitions of the novel object label. Certainly their low performance was not due to a lack of understanding of the task demands, as they performed above chance on familiar object trials. Similarly, toddlers' average level of rational imitation was lower in comparison to that of 12-month-old infants' using the same task (Schwier et al., 2006), suggesting that toddlers were not as motivated to replicate their caregiver's actions. Though future studies should examine whether tasks specifically designed with 24-month-olds would increase children's general performance on the learning tasks, it is possible that our results reflect a trend in children's growing developmental abilities. Indeed, young children's motivation to engage in tasks has been noted to switch from that of more cognitive to social reasoning at around 18-months of age (Uzgiris, 1981; Nielsen, 2006). Thus perhaps children's greater overall performance on the instrumental helping tasks may have simply been due to a developmental change in their motivation and desire to practice this new and budding skill.

In sum, the current study has generated many interesting findings and lays important groundwork for future research. A strength of the current study was the further validation of observational and psychometrically sound measures, such as the mini-MBQS-V and IbS. However, these measures have been used explicitly to measure maternal sensitivity, only for the first time being used to obtain a more global measure of parental responsiveness and emotional availability. Thus caution should be made in interpreting these results. Indeed, future research should examine whether the same associations would be found using different measures of parental responsiveness, using a forced-choice design, or when conducted in a more naturalistic setting over a longer period of time. Though outside the scope of this paper, future research

should also examine what other factors might influence the relationship between parent's responsiveness and children's willingness to respond and learn, as the statistical analyses employed by the current study still cannot prove causation. For example, it is likely that children's characteristics play an important role in their social cognitive development, such as their externalizing behaviour (e.g., Guajardo et al., 2009), and temperament (Eisenberg & Fabes, 1998). In addition, as the dyads were recruited from an affluent, non-clinical population, there may have been less variation or range in the key measures than expected. Therefore generalizability of these findings to a more diverse population is unknown. Indeed, scores of parental compliance, parental sensitivity and responsiveness, and SES were all high. Furthermore, parents were prompted during their instruction on the tasks in order to ensure that tasks were standardized and delivered according to a baseline level. It is therefore unclear whether this created a ceiling effect for parental compliance or whether real differences would be found in teaching ability according to parental level of sensitivity if parents were not given a script from which to follow. Thus future research should be conducted with a clinical or larger sample more representative of the community, perhaps allowing for teaching variance. It is likely that such a study would yield even stronger findings, given that the current study found an effect for parental responsiveness despite the limited range of scores on this measure.

The present findings fill an important gap in the literature on young children's epistemic trust and sensitivity to reliability, as they are the first to demonstrate that children's learning is influenced by the responsiveness and emotional availability of a model with whom they have established an extended history of trust: their primary caregiver. It is possible that the level of trust children feel with their primary caregiver extends to how they trust and interact with others as well, therefore impacting their global learning and behavior (e.g., Harris, 2007). The current

study therefore raises certain clinical implications that highlight the important role parental sensitivity and responsiveness play in a young child's early social cognitive development. As such, early parent-child interventions should educate parents about how their interaction style can influence their child's development, thus enhancing and promoting both early and late child outcomes.

Table 3

Intercorrelations among demographic variables, productive language, parental responsiveness (MBQS), parental compliance, toddlers' outcomes and age

Variable	1	2	3	4	5	6	7	8	9
1. Income	-	.32	-.16	.24	.22	.05	.13	.07	.06
2. Education		-	.22	.25	.10	.06	-.07	.06	-.04
3. Compliance			-	-.18	-.10	-.03	-.15	-.20	.11
4. MBQS				-	.41**	.39*	.10	.39**	.06
5. WL					-	.12	.03	.16	-.07
6. Rational Imitation						-	.002	.24	-.03
7. Instrumental Helping							-	.12	-.02
8. MCDI								-	.09
9. Age									-

*$p < .05$. ** $p < .01$

Table 4

Mean scores (and standard deviations) on the word learning, rational imitation, and instrumental helping tasks

Task	Variable	Mean (*SD*)
Word Learning	Proportion of correct selections during novel trials	53.29% (31.57)
Rational Imitation	Proportion of imitative acts	54.76% (39.52)
Instrumental Helping	Proportion of total helping behaviors	66.26% (29.12)

Table 5

Regression analysis predicting toddlers' novel word learning, examining for moderation by age

Step	Variable	R^2 (block)	R^2 Change (block)	F Change (block)	β
1: Covariates	MCDI				0.16
	Age	.03		0.63	-0.09
2: Predictors	MBQS	.18†	.15	6.77*	0.42*
3: Interactions	Age X MBQS	.23*	.04	2.05	-10.40

*$p < .05$. †$p = .057$

Table 6

Regression analysis predicting toddlers' rational imitation, examining moderation by age

Step	Variable	R^2 (block)	R^2 Change (block)	F Change (block)	β
1: Covariates	Age				-0.07
	Sex	.13†		2.97†	-0.35*
2: Predictors	MBQS	.20*	.07	3.25†	0.27†
3: Interactions	Age X MBQS	.32**	.12	6.46*	0.02**

** $p < .01$. * $p < .05$. $^{\dagger}p < .10$

Table 7

Regression analysis predicting toddlers' total proportion of instrumental helping, examining for moderation by sex

Step	Variable	R^2 (block)	R^2 Change (block)	F Change (block)	β
1: Covariates	Age				-0.03
	Sex	.02		0.48	0.15
2: Predictors	MBQS	.04	.016	0.63	0.13
3: Interactions	Sex X MBQS	.27*	.23	11.85***	1.31***

***$p < .001$. *$p < .05$

Figure 3. Toddlers' age moderating the association between imitation and parental responsiveness (MBQS).

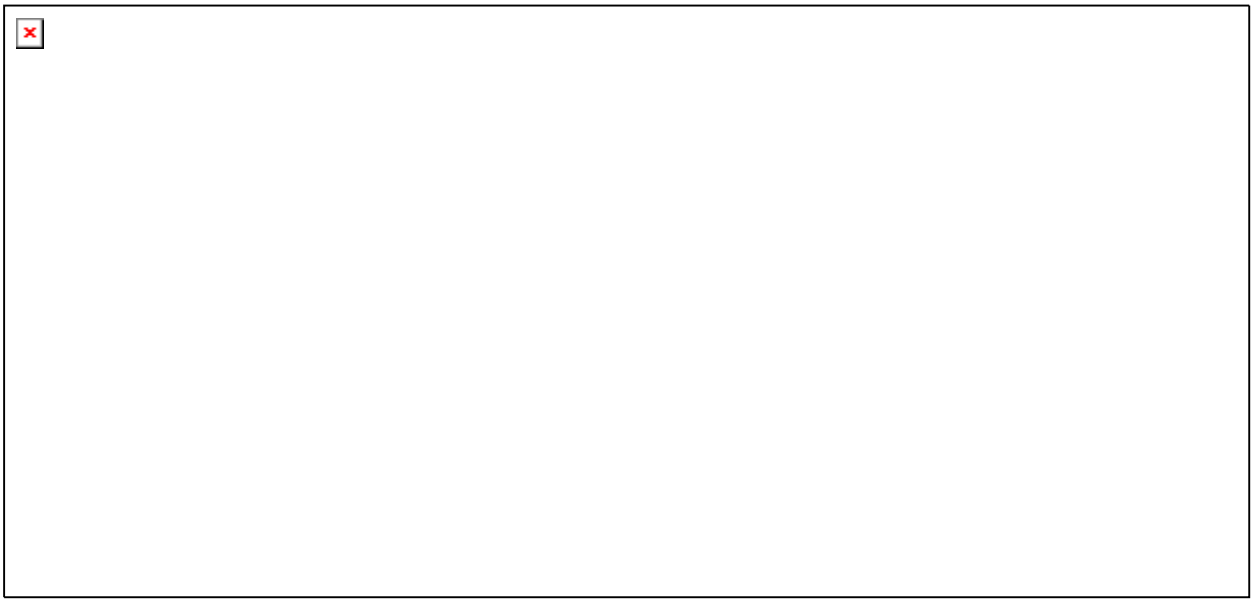
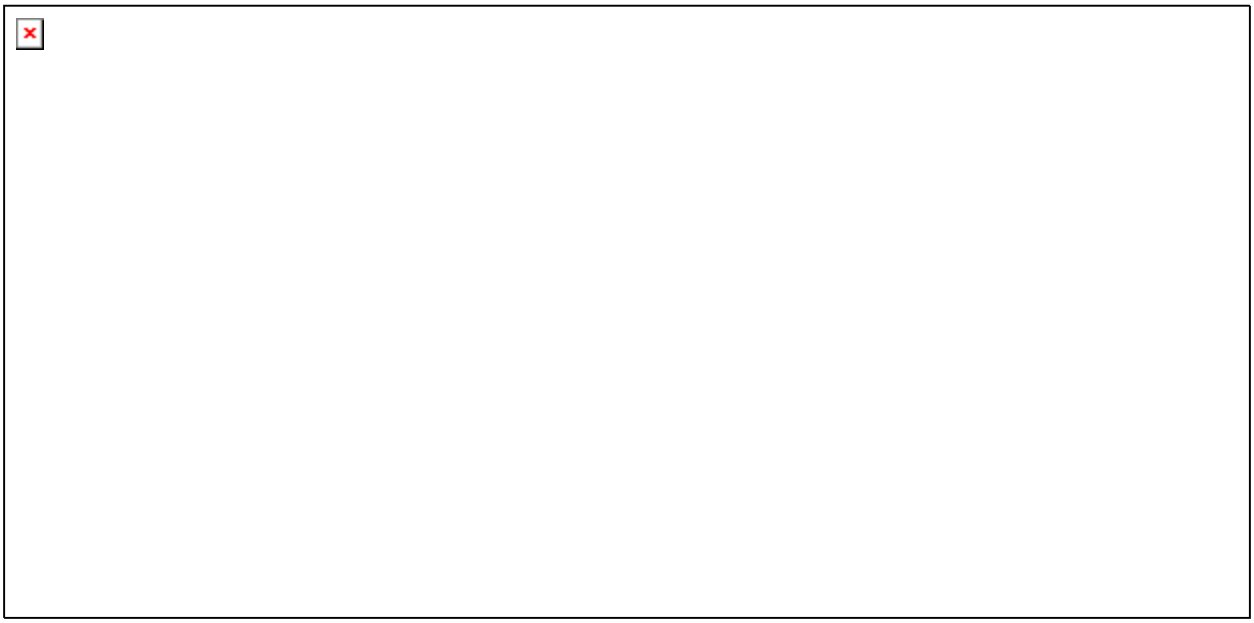


*Figure 4***.** Toddlers' sex moderating the association between helping and parental responsiveness (MBQS).



Addendum

No further stylistic modifications can be made to Chapters 2 and 4 as both were accepted for publication and are currently in press. However, at the request of the committee members, clarification is made here regarding some of the content of Chapter 4. To begin, clarification is made regarding the construct of the parental sensitivity score, as well as potential differences between mothers and fathers (further addressing the footnote that appears on page 102). More rationale is provided regarding the hierarchical linear regressions as well as more detailed tables (modifications of Tables 5-7). Finally, further rationale for the parental compliance task, as well as additional analyses and interpretation concerning the instrumental helping task, are included.

Parental Sensitivity Score

We used a measure of maternal sensitivity to assess primary caregivers' responsiveness and emotional availability, which we used to operationally define caregivers' level of emotional reliability. Maternal sensitivity coded from a short interaction of the IbS has been found to be significantly correlated with assessment from the full 2-hr MBQS ($r = .45$, $p < .01$) and AQS ($r = .47$, $p < .01$). Paternal sensitivity scores did not differ from maternal sensitivity scores, nor were there differences between mothers and fathers in terms of their compliance scores. The inclusion of fathers in our sample invariably allowed a sample size that enabled greater power for our statistical analyses. Since there were too few fathers included to make a valid test for possible differences, there may be real discrepancies that exist between the sexes on measures of sensitivity and compliance that cannot be accounted for in the current study. Therefore, future research should include equal numbers of mothers and fathers to explore this possibility, given that this was not the current study's main point of interest. Furthermore, as this was not a high-

risk sample and the range and variability of scores was limited, the generalizability of these findings is unknown and therefore results should be interpreted with caution.

Rationale for Hierarchical Linear Regressions

In order to provide a stringent test for the effect of parental responsiveness on children's learning outcomes we ran nine separate hierarchical linear regressions (three per outcome). In addition, to maximize power, the ratio of cases to independent variables was 10:1. Our primary goal was to examine whether parental sensitivity predicted the three child outcomes (word learning, rational imitation, and instrumental helping) above and beyond that predicted by sex, age, and MCDI. A secondary goal was to examine whether this effect was moderated by these same three variables. Therefore, we interpreted our main (conditional) effects before the interaction term was entered, as the primary theoretical interest was to examine the variance accounted for by the predictor, once the other independent variables were accounted for (Cohen, Cohen, West, & Aiken, 2003; Frazier, Tix, & Barron, 2004). The independent variables other than our main predictor were chosen in order to be consistent with the literature in this area; receptive language and gender have been examined for their contributing role in the relationship between maternal sensitivity and the outcomes of word learning and helping, respectively (Corriveau et al., 2009; Davidov & Grusec, 2006), whereas age has been a contributing factor to the relationship between a model's accuracy and children's willingness to learn novel words (e.g., Koenig & Woodward, 2005a).

Sex (dummy coded), age, and MCDI were specifically examined both as covariates and moderators and thus appeared in the first block. Due to evidence from the preliminary analyses as well as theoretical and research support, sex was always entered as the control for imitation

and helping, while MCDI always served as the control for word learning. Thus, the first block included two variables: one control variable and one moderator variable. If the variable acting as a constant control was being examined for moderation, age was always used as the control. For example, if MCDI was examined for moderation in the regression for word learning, age acted as the control, and MCDI and age both appeared in the first step. The second block included the main predictor: the parental responsiveness score (MBQS). Finally, the third block examined for moderator effects and therefore included the interaction term of the moderator variable with MBQS (i.e., sex X MBQS, age X MBQS, *or* MCDI X MBQS; see Davidov & Grusec, 2006 for similar procedure). Therefore, three separate regressions were run examining for moderation by each of the control variables, for each of the three outcomes, for a total of nine regressions.

In order to further examine significant interactions, we followed up by examining the significance of their simple slopes and plotted the relations between the predictor and the outcome, at different levels of the moderator. In the case of examining moderation by the categorical variable of sex, the entire model (including main effects and interaction) was run twice, alternating between whether girls or boys were designated as the comparison group (dummy coded; see Baron & Kenny, 1986 for rationale; Davidov & Grusec, 2006 for similar procedure). For the interaction between gender and helping, the interaction was found non-significant for boys, ($\beta = -0.34$, *ns*), but significant for girls ($\beta = 0.65$, $p = .004$), as indicated by the regression weights of our predictor (i.e., MBQS) in the final model.

Mediation was not examined for several reasons (see Baron & Kenny, 1986). Specifically, as there is no research to suggest that parental sensitivity precedes the relationship between any of the potential mediator variables (age, sex, and MCDI) and the three different child outcomes (word learning, imitation, helping), it is difficult to argue and therefore examine

for a mediating relationship. In addition, as indicated in the preliminary analyses, there were non-significant bivariate correlations between all three of the variable types, thus ruling out the possibility of a mediation effect. Finally, as the sample size was small and in the absence of strong and consistent correlations between our predictor and the different outcome variables, mediation was not considered.

Rationale for Parental Compliance Measure

Parental teaching ability was not of main theoretical interest, in comparison to that of parental sensitivity. Indeed, we aimed to control for it by standardizing the instructions given to parents. The parental compliance measure was nevertheless incorporated in order to account for the possibility that parents varied in the adherence to the instructions. As the preliminary analyses indicated no correlation with any of our measures, it was not added to our statistical model. With respect to its internal reliability, each component was significantly correlated with the overall score: word learning compliance, (r = .40, p = .01); rational imitation compliance, (r = .72, p = .00); and instrumental helping compliance, (r = .80, p = .00). As it is the first time it is ever being used, more research is needed to understand its validity.

There are likely other components of parental sensitivity that this protocol did not capture; sensitivity that is measured during a brief, one time assessment in a laboratory setting is only a crude indicator of sensitivity when measured in naturalistic contexts. Though outside the scope of the paper, the possibilities that sensitive parents are better teachers, that their children are better learners, or that their children are more willing to learn from their teaching, are important to consider and worthy of examination in future research.

Instrumental Helping

Toddlers' total proportion of instrumental helping behaviors ranged from 0 to 100%. The percentage of infants who helped on one to six trials is as follows: one trial (2.4%), two trials (7.1%), three trials (23.8%), four trials (19.0%), five trials (11.9%), and six trials (28.6%). It is possible that not all toddlers helped for reasons other than not understanding. An alternative explanation might be because parent's behavior during the tasks violated their expectation for their behavior; certainly, toddlers are accustomed to their parents explicitly asking for help as well as praising them afterward. Anecdotally, several parents mentioned that they were surprised that their child did not help more and expected that the lack of praise may have been the reason.

Table 5

Regression analysis for parental sensitivity (MBQS) predicting toddlers' novel word learning, examining for moderation by age

Step	R	F	R^2 (block)	R^2 Change (block)	F Change (block)	β
1: Covariate and Moderator	.18	0.63	.03		0.63	
MCDI						0.16
Age						- 0.09
2: Predictors	.43	2.74†	.18†	.15	6.77*	
MCDI						- 0.10
Age						- 0.01
MBQS						0.42*
3: Age Interaction	.48	2.62*	.23*	.04	2.05	
MCDI						0.53
Age						- 0.01
MBQS						10.76
Age X MBQS						-10.40

*$p < .05$. †$p = .057$

Table 6

Regression analysis for parental sensitivity (MBQS) predicting toddlers' rational imitation, examining moderation by age

Step	R	F	R^2 (block)	R^2 Change (block)	F Change (block)	β
1: Covariate and Moderator	.36	2.97†	.13†		2.97†	
Age						- 0.07
Sex[a]						- 0.35*
2: Predictors	.45	3.18*	.20*	.07	3.25†	
Age						- 0.64
Sex[a]						- 2.14*
MBQS						0.27†
3: Age Interactions	.57	4.34**	.32**	.12	6.46*	
Age						- 1.16*
Sex[a]						- 0.25†
MBQS						-16.98*
Age X MBQS						0.02**

Note. [a]Dummy coded (boys = 0, girls = 1)

** $p < .01$. * $p < .05$. † $p < .10$

Table 7

Regression analysis for parental sensitivity (MBQS) predicting toddlers' total proportion of instrumental helping, examining for moderation by sex

Step	R	F	R^2 (block)	R^2 Change (block)	F Change (block)	β
1: Covariate and Moderator	.15	0.48	.02		0.48	
Age						- 0.03
Sex[a]						0.15
2: Predictors	.20	0.52	.04	.016	0.63	
Age						- 0.04
Sex						0.17
MBQS						0.13
3: Interactions	.52	3.47*	.27*	.23	11.85***	
Age						0.00
Sex						- 1.02
MBQS						- 0.34†
Sex X MBQS						1.31***

Note. [a]Dummy coded (boys = 0, girls = 1)

***$p < .001$. *$p < .05$. †$p < .10$

Chapter 5

General Discussion

Over the past decade, numerous studies have examined young children's selective trust by observing how children decide who is trustworthy enough to learn from or engage with (e.g., Clément, Koenig, & Harris, 2004; DiYanni, Nini, Rheel, & Livelli, 2012; Harris & Corriveau, 2011; Koenig, Clément, & Harris, 2004; Pasquini, Corriveau, Koenig, & Harris, 2007; Shafto, Eaves, Navarro, & Perfors, 2012; Sperber et al., 2010). These studies reveal that children pay attention to the model's profile and characteristics; children will track the reliability of the model, such as his or her use of verbal accuracy and intent, as well as observe for other traits, such as accent and expertise. Recently this area of research has expanded to also examine how widely children will generalize a model's reliability, such as whether they deem a model that has demonstrated expertise in one area will also be an expert in another (Fusaro, Corriveau, & Harris, 2011; Kim, Kalish, & Harris, 2012; Rakoczy, Warneken, & Tomasello, 2009). While preliminary research has begun to examine the developmental origins of selective trust during the second year of life (e.g., infants' sensitivity to a model's reliable looking behavior; Chow, Poulin-Dubois & Lewis, 2008; Poulin-Dubois, Brooker, & Polonia 2011), more research is needed to determine how infants understand that a model is reliable or not, including when they decide to modify their behavior.

Therefore the current dissertation consisted of three studies that were conducted with several goals in mind. The first goal was to examine the ontological origins of selective trust by examining how previously unexplored epistemic and emotional factors of a model, such as his or her status of verbal accuracy, verbal competence, communicative intent, and emotional

availability, would impact infants' behavior. Specifically, infants were exposed to a model who varied on these indices and were subsequently observed as to whether they attenuated their learning or behavior in domains for which they have previously demonstrated some expertise (i.e., word learning, imitation, and instrumental helping). The second goal was to examine how broadly infants would attribute expertise or competence to a model based on his or her record of reliability. This was to determine whether infants expect a reliable model to also possess other positive traits, or in other words, whether a model's reliability is subject to produce halo effects.

Chapter 2 (Brooker & Poulin-Dubois, 2013) examined whether 18-month-old infants can detect the verbal accuracy of a model and use this information to decide whether to attenuate their learning within the domain of language as well as within other domains. By doing so, we intended to extend the current literature that has demonstrated that children as young as 24-months avoid learning words from a verbally inaccurate source (Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2003). Furthermore, we wished to replicate research demonstrating that preschoolers will make generalized attributions of expertise to a model based on her previous verbal accuracy that carry over to the context of imitation (Rakoczy et al., 2009) and the attribution of traits (i.e., believing that a verbally accurate source would be more likely to be prosocial toward others; Brosseau-Liard & Birch, 2010). In this study, infants were first exposed to a person who either labeled familiar objects correctly or incorrectly and then were observed as to whether they would choose to learn a novel word from her as well as imitate and help. As expected, infants chose not to learn novel words from or imitate the inaccurate model. In contrast, a model's previous verbal accuracy did not influence infants' willingness to help. Taken together, these findings suggest that not only do infants keep track of a person's reliability

in the domain in which it is manipulated, but also extend a person's record of reliability to another similar domain wherein learning of cultural knowledge occurs.

The second study (Brooker & Poulin-Dubois, under review) aimed to distinguish and disentangle whether infants are sensitive to and influenced by a model's verbal credibility and malevolent behavior. We thus examined whether 18-month-olds' word learning, imitation, and helping behaviors would be attenuated when presented with evidence of both a model's knowledge and communicative intent, which were alternately manipulated. Additionally, we incorporated a measure that captured infants' eye-gaze as they looked at images of the model and a neutral stranger, in order examine infants' visual processing of the model (and her features) across conditions. Our goal in doing so was to detect if subtle effects would be found after exposing infants to a model who may have violated infants' expectations of normal behavior. It was found that both conditions attenuated their word learning by avoiding learning a novel word from the experimenter. In addition, infants exposed to an ignorant but benevolent model imitated slightly less than those exposed to a competent but malevolent model. Finally, infants from both conditions tended to look longer at the experimenter while none of the infants avoided helping.

The third and last study (Brooker & Poulin-Dubois, 2013) examined older infants, at 24-months of age, in their interactions with their primary caregiver who was assessed for his or her level of emotional reliability, such as consistent availability and responsiveness. It was expected that infants' selective helping and learning would be more influenced if they were to be tested by someone whose profile of reliability they have already been able to internalize. It was found that on similar tasks to those used above, infants were more likely to learn novel words from their primary caregivers as a function of the caregiver's assessed emotional availability and consistency. Interestingly, parental sensitivity was moderated by a third variable, in that age and

gender enhanced the effect it had on imitation and helping, respectively. A comparison will now be made across the three studies in order to assess what can be learned about the motivation behind infants' selective trust, highlighting the significant contributions this research has made.

Overall, the findings from the three studies contribute to an emerging topic in developmental psychology regarding the ontological origins of selective trust in infancy, by providing the earliest evidence of selectivity in word learning ever reported. Specifically, one of the main significant contributions of this dissertation is demonstrating that infants by 18-months of age are capable of attenuating their word learning according to the reliability of a model as inferred across several indices, such as accuracy, ignorance, and malevolence. Furthermore, our findings demonstrate that even young infants are capable of extrapolating from a speaker's malevolent intentional cues to infer whether or not that speaker is likely intending to provide truthful or deceitful information, an ability quite sophisticated for this age. As cues about a model's accuracy or knowledge are not always available, it is quite adaptive for infants who are just starting to develop their productive and receptive vocabulary to be able to use intentional cues to infer a model's trustworthiness. Indeed, word learning is one of the first tools of a culture that young children must grasp, and as linguistic or communication errors are perhaps not uncommon, it is quite reasonable for infants in the early stages of lexical development to have established mechanisms to block or detect all types of deceptive communication from others in order to protect their own knowledge base (Perner, 1991; Sperber, 2001). Indeed, it has been proposed that children engage in less robust learning as a result of poor semantic memory for an unreliable and inaccurate source (Sabbagh & Baldwin, 2001; Koenig & Woodward, 2010).

The findings from Chapter 4 indicated that infants also failed to learn a novel word from their primary caregiver as a function of his or her level of sensitivity, above the effects of

vocabulary level. One possible reason is that 24-month-old infants may have also had poor memory for the semantic information their parents provided. Indeed, the more consistent and reliable a parent's behavior is, the more the child will be able to learn, attend, and remember from others (Beebe & Lachmann, 1994). In addition, children who have insecure attachments have demonstrated poorer memory of social information, after controlling for their cognitive functioning (Kirsh & Cassidy, 1997). Thus the final study included in this dissertation extends findings demonstrating that not only do children attenuate their word learning according to a model's social factors, such as his or her familiarity and similarity (Reyes-Jaquez & Echols, 2013) as well as moralistic intent (Doebel & Koenig, 2013), but also according to a familiar caregiver's level of sensitivity and responsiveness. All things considered, infants' willingness to trust others to learn novel words from others appears to be motivated by epistemic and emotional factors, such as their expectancy or belief that another is knowledgeable (Rotter, 1971), as well as their empathy and felt concern (Kuhlmann, 2008; Riegelsberger, Sasse, & McCarthy, 2007).

In contrast, infants' rational imitation appears more influenced by their epistemic motivations to trust another, as demonstrated by the findings in Chapters 2 and 3. In these studies, infants were able to make a generalized assessment of a model's competence based on her verbal accuracy and knowledge, and were more likely to imitate the knowledgeable and accurate model. These findings extend research showing that 14-month-old infants are more likely to attribute rational intentions to and imitate a communicatively and affectively reliable and conventional source (e.g., Poulin-Dubois et al., 2011; Zmyj et al., 2010). The reason for why a model's epistemic reliability is more influential may be due to the nature of the task. Specifically, during acts of imitation, a model typically demonstrates culturally relevant actions about how an object works that are unlikely to change over time. Thus, children may place more

weight on how knowledgeable or successful a model appears before other characteristics, such as sociability and helpfulness, when making their decision of whom to learn from. Furthermore, when it comes to a model's demonstrated knowledge, one's *cultural competence* is likely most relevant. Indeed, the strongest evidence found in the present set of studies for the effect of reliability on infants' imitation was in Chapter 2, wherein the experimenter's mislabeling of familiar object labels may have been interpreted by infants as highly unconventional and in violation of cultural norms and expectations. This certainly supports findings from Buttelmann and colleagues (2013) who also found that 14-month-olds were sensitive to cultural norms in that they were more likely to imitate members of their in-group, specifically those who spoke the same language.

A well-documented theory to account for why infants' imitate others is the culturally "normative" stance, which asserts that children learn from others because they infer that their actions reflect the dominant, conventional acts of a particular culture (Casler & Kelemen, 2007; Casler, Terziyan, & Greene, 2009; Kenward, Karlssson, & Persson, 2011). Indeed, the implicit "normative language" used by the model when introducing these types of pedagogical tasks to children (Schmidt, Rakoczy, & Tomasello, 2011) is more likely to be prime them to engage in epistemic motivations to trust. Specifically, the verbal information provided by the experimenter subsequent to producing a novel action to be modeled in an imitation task (e.g., "Now, it's your turn") suggests to infants that these novel objects are to be used in a specific conventional way. The term "natural pedagogy" has been coined to explain how infants' processing and acquiring of relevant cultural knowledge from others is aided by their possession of domain-specific cognitive machinery that is triggered by the model's use of ostensive cues (Csibra & Gergely, 2006, 2009). However, recent research has suggested that the mere presence of ostensive cues is

not sufficient. Specifically, recent research regarding preschoolers' selective imitation has demonstrated that preschoolers are more affected by the model's attitude and air of conventionality, and will selectively imitate a model who appears confident in her approach toward objects, irrespective of whether her actions are embedded within a social or pedagogical context (Bonawitz, Shafto, Gweon, Goodman, Spelke, & Schulz, 2011; Buchsbaum, Gopnik, Griffiths, & Shafto, 2011). Thus, if infants have a domain-specific way of processing cognitive information that is most influenced by the language and confident, conventional means by which a teacher or model acts, then it is perhaps unsurprising that the model's verbal accuracy and competence were more influential than a model's malevolent intent with respect to infants' imitation.

A different pattern of findings emerged regarding older infants' selective imitation. Specifically, *older* infants (those closer to 26-months of age) were more likely to imitate as a function of the warmth and socio-emotional reliability of their parent, as demonstrated in Chapter 4. Perhaps these results can be best understood when examining an alternative explanation for children's motivation for learning during a pedagogical demonstration. Specifically, in contrast to a culturally normative account for children's learning, a social account suggests that children will perform a task in order to be "like" or affiliated with a model (Meltzoff, 1997; Nielsen, 2006; Want & Harris, 2002). This type of motivation appears to be triggered by the model's use of social and ostensive cues, such as eye contact and name-calling, that are both warm and in contingence or consistent with the model's subsequent behavior and actions (Hobson, 2002; Gergely, 2001; Stern, 1985). As infants' motivation for engaging in tasks has been argued to switch at 18-months of age from that of being cognitively based, such as learning about a task, to that of being socially based, such as to be similar to another (Kuhl,

2007; Uzgiris, 1981), it is likely that infants' sensitivity to markers eliciting this type of emotional, social trust becomes even more pronounced with age (DiYanni et al., 2012; Shafto et el., 2012). Furthermore, according to attachment theorists (e.g., Ainsworth, 1967; Bowlby, 1969/1982), infants' ability to construct cognitive representations of others as intentional agents likely results from infants' interactions with consistent and contingent caregivers who have treated them as an intentional agent (Fabes et al., 1991; Gergely et al., 2007; Kaye, 1982; Lagutta & Wellman, 2001). Thus, as infants mature past their second year of life and are able to build cognitive representations of their caregiver and others, the more likely they are to be influenced by emotional markers of trust such as the emotional availability and reliability of a model's communicative cues, and consequently modify their behavior.

It is also likely that with infants' growing ability to internalize others' behavior, as well as grasp the concepts of reciprocity and fairness, the more they might learn that it is costly to trust certain individuals with their acts of helping. Before that, infants have demonstrated a very strong inclination to help irrespective of reward or cost to themselves (Warneken & Tomasello, 2006, 2007, 2009), wherein only overt measures of a person's malevolence or cruelty will deter them (Dunfield & Kuhlmeier, 2010). In addition, helping is likely a task that children receive a lot of attention and reinforcement for, and that (with respect to the tasks used in the current study) is also highly reinforcing. Indeed, the only evidence for infants' attenuated helping in the current set of studies was in Chapter 4, wherein *only* 24-month-old girls were more likely to help their parent as a function of his or her emotional availability and responsiveness. Previous research has found that a model's kinship, familiarity, and reciprocity influence children's selective prosocial behavior (see Warneken & Tomsasello, 2009 for review). In addition, parenting style plays a key role in helping children internalize moral rules (Alessandri & Lewis,

1996; Hoffman, 1970), with more responsive parents impacting children's ability and willingness to be prosocial (Eisenberg & Fabes, 1998; Grusec & Goodnow, 1994; Trommsdorff, 1991; Zahn-Waxler, Radke-Yarrow, & King, 1979). This is especially the case for girls, who compared to boys, internalize moral messages differently (Kochanska, 1993; Kochanska, Murray, & Coy, 1997) and tend to exhibit more prosocial behavior as a function of their mother's responsiveness (Davidov & Grusec, 2006). Thus the findings of the current dissertation extend this literature by suggesting that for girls even at 24-months-of-age, felt emotional trust, particularly the responsiveness of a primary caregiver, contributes to their willingness to help.

The possibility exists that the pattern of findings found in the current dissertation are partly due to a "negativity bias" that begins at around 7-months of age, when infants begin to pay more attention to negative facial expressions and emotions (e.g., Vaish et al., 2008). It has been proposed that certain information - particularly that of negative valence - may carry more cognitive and informational weight, and so require more attention and processing (Peeters & Czapinski, 1990). Indeed, preschoolers' selective trust is said to be exhibitive of a "pitchfork" as opposed to a "halo" effect, with negative information about a model being more salient and the cause of learning attenuation (Koenig & Jaswal, 2011). The current study found that in Chapter 2, infants in the unreliable condition were more likely to attend to the experimenter's novel learning display despite being less likely to learn a novel word from her, whereas all infants displayed a slight bias to attend to the experimenter's face over a stranger's in Chapter 3. It is therefore possible that during the word learning task, infants were attending to the model's affective cues rather than attending to the link between the novel word she gave and the object. In other words, perhaps part of infants' decreased performance on some of the tasks can be

explained by their lack of trust in the model, and thus a desire to read the model's cues and process her social and affective message closely as oppose to learn from her.

The mechanism behind infants' bias toward negative information may have something to do with the unexpectedness of the reaction; certainly young infants are used to receiving positive messages and signals from their caregivers and thus may be less accustomed to negative behavior. However, the emotional availability and responsiveness of the caregiver, and consequently the attachment style of the infant, may moderate this finding. Indeed, according to attachment theory, insecure-resistant infants typically rely on the signals emitted by their caregiver and are unlikely to explore their environment and new stimuli without approval (e.g., Green, Stanley, Smith, & Goldwyn, 2000), whereas securely attached infants typically feel free to explore the environment knowing that their caregiver is a secure base (e.g., Ainsworth et al., 1978). Therefore, though not directly tested, it is possible that infants' learning ability and willingness to learn differs as a function of how emotionally available and responsive their primary caregivers are, which in turn influences how they interpret the behavior and learn from others as well.

Finally, it is also possible that the present pattern of findings speaks to the debate regarding the "rich" versus "lean" interpretation of infants' social cognitive understanding (see Poulin-Dubois & Chow, 2009 for a discussion of how this debate has implications for infants' trust of others' beliefs). Specifically, the "rich" interpretation would argue that infants tested in the current dissertation understood the model's mental state and were aware that the model was intentionally trying to deceive them and was therefore unreliable. In contrast, proponents of the "lean" interpretation would argue that infants processed the negative cues that the model displayed and so learned to be cautious of her actions and therefore avoided learning from her.

Research examining selective trust at preschool age has measured or inferred children's capacity to trust a model based on the child's verbalizations; whether a child is able to answer a prompt correctly as to which model said right or wrong information, whether a child would prefer to ask a certain model for new information, or whether a child would prefer to endorse the new information a model has stated are all ways selective trust is typically assessed (see Koenig & Sabbagh, 2013 for review). In order to tease apart whether a "rich" or "lean" interpretation is more descriptive of infants' selective behavior, future research would need to empirically validate that infants' selective behavioral trust, and thus performance on the non-verbal tasks used in the current dissertation (i.e., the word learning, rational imitation, and instrumental helping tasks), would correlate with their performance when tested on these same tasks using verbal measures later on in development. Certainly, similar non-verbal tasks such as those used in the current study have been used to measure selective trust in children younger than preschool age (e.g., Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2012). Whether or not young children's non-verbal selective learning and behavior, such as their decision to select the object an experimenter previously labeled when she later requests for it, is indicative of their capability to trust and understand a model's mental state (and consequently, her intent and reliability) is an interesting and challenging question that further adds to the extant debate about the robustness of infants' early social-cognitive understanding. While the current findings might not be able to fully answer this question, they do reveal that by 18 months, infants do modify their learning and behavior according to the epistemic and emotional reliability of a model.

Limitations and Future Directions

The findings across the three studies comprising the present dissertation show that a differential pattern of infants' word learning, rational imitation, and instrumental helping was

observed as a function of the model's previous record of reliability. However, it could be argued that infants did not have the ability to make an informed decision or selectively choose one model over another on account of his or her reliability, as the dissertation utilized either a between-subjects or correlational research design. This represents a limitation of the current dissertation and makes it difficult to compare to other studies in the field of selective trust that have examined preschoolers, as they have typically used a forced-choice, within-subject design. However, a criticism of a forced-choice design is that it is too demanding for young children to keep track of who is reliable and who is not, and thus too taxing for their limited executive functioning skills, such as working memory (Pasquini, Harris, Tivnan, & Koenig, 2006). Indeed, Koenig and Woodward (2010) used a single source to assess 24-month-olds' word learning, as they argued that it is especially difficult to keep track of two experimenter's differing reliability profiles at this age.

In terms of examining whether infants interpret reliability as a person-specific trait, there is a methodological design - known as a switch-actor design - that has been used in previous research to examine for this possibility. In using this method, Chow and colleagues (2008) found that 14-month-old infants were unlikely to generalize their selective gaze following from an unreliable looker to a naïve looker, but rather treated the latter as trustworthy; the authors were therefore able to suggest that infants' treatment of a naïve looker as reliable indicates that infants have a spontaneous default to trust others. Therefore, future research should extend the work of the current dissertation by including a switch-actor design in order to clarify that infants' decision to engage in selective learning was the result of the reliability manipulation, and that infants would not treat a naïve experimenter similarly. Nevertheless, in the absence of doing so, the current pattern of findings has revealed that infants did not make their decision of whether or

not to selectively learn, help, or imitate the experimenter or their caregiver as a result of inattentiveness or avoidance. Indeed, all infants were attentive to the displays given by the model during each of the three studies, and as indicated above, were sometimes especially attentive to the model when she was unreliable.

Another limitation of the current dissertation is that there was no baseline or control condition included, wherein a model's reliability was not manipulated. Thus, it is difficult to ascertain whether infants were more impacted by the model's unreliable or reliable behavior when making the decision of whom to learn from or associate with. By including a baseline condition where the experimenter acted neutral, a conclusion could be made as to whether infants would selectively choose a neutral model over an unreliable model when electing whom to learn from (evidence of a "pitchfork" effect) or whether they would selectively choose a reliable model over a neutral model (evidence of a "halo" effect). With regard to Chapter 3, perhaps the best way to tease apart the effects of each manipulation would be by splitting up the intent and competence manipulation while also including a neutral baseline condition. For example, a possible research design would be to have two test periods examining infants' behavioral trust, one before and one after the individual reliability manipulations, and then to compare infants' pre- and post- manipulation performance (e.g., Reyes-Jaquez & Echols, 2013). Though a major strength of the current dissertation is the number of ways in which we examined a model's reliability, the inclusion of control or baseline conditions would certainly be a promising avenue for future research on infants' selective trust, in terms of highlighting what qualities of a model matter most to infants when making their decision of whom to learn from and help.

Finally, another potential limitation of the present dissertation (particularly with respect to Chapter 2) is the potential confound that some infants might have been exposed to two languages both inside and outside the home. Indeed, all infants were recruited from a multicultural bilingual city where exposure to both English and French (or even other languages) is very likely. However, there are reasons to believe that this factor would not have unduly influenced our results. Firstly, all infants were assessed for their mother-tongue and subsequently tested in that language for all the tasks. If infants spoke two languages, the language that was most dominant, or that infants had most exposure to (as indicated by the parent), was the language infants were tested in. In addition, there is evidence that by 2-years-of-age, both monolinguals and bilinguals are able to recognize and understand that object labels are conventional shared knowledge between them and adult speakers within their linguistic community (Chen, Byers-Heinlein, & Xu, 2009). Thus, it is unlikely that infants from bilingual backgrounds differed in terms of how they perceived the speaker's conventionality or lack thereof. However, 18-month-old bilinguals (in comparison to monolinguals) do not appear to operate from the principles of disambiguation and mutual exclusivity, which specify that infants will assume that a novel label is the name for a novel object and not the name for an object that already has a known label existing in their repertoire (Halberda, 2003; Houston-Price, Caloghiris, & Raviglione, 2010; Werker & Byers-Heinlein, 2009). Bilingual infants may perform best when within-language disambiguation is possible such that both the familiar and novel label presented are belonging to their native-language (Werker &Byers-Heinlein, 2009). As the word learning task implemented in Chapter 2 did present labels for both familiar (e.g., "bird") and novel objects (e.g., "Dax") that followed or were consistent with the linguistic principles of either the English or French language, we believe that this decreased the possibility that infants'

performance on the word learning task would have differed according to infants' linguistic background. However, it is still a limitation of the study that future research needs to address.

In terms of future research, another potential avenue would be to directly measure the link between parental emotional availability and responsiveness and children's willingness to trust others, in order to tease apart whether a causal relationship exists. Indeed, a previous study found that 3- to 4-year-olds willingness to trust the verbal testimony of their mother over a stranger was moderated as a function of their level of attachment; the more securely attached children were flexible in that they trusted their mother's testimony over a stranger's only if she was accurate whereas those insecurely attached trusted and preferred their mother regardless of her accuracy (Corriveau et al., 2009). Furthermore, it would be interesting to examine whether children's willingness to trust others would be associated with their later social and cognitive functioning. A longitudinal study could explore these issues. Specifically, such a study could first examine a caregiver's emotional reliability and sensitivity and then assess how children of preschool age would selectively choose to learn from or help either their caregiver or a stranger on a variety of tasks, utilizing a forced-choice design. Subsequently, these same children could be examined in later childhood on tasks measuring more robust indices of theory of mind and cognitive skills. This line of research would clarify the link between children's early and late social cognition, as well as establish the precursors for children's development of trust in others. Furthermore, it would contribute to existing research that has examined, longitudinally, the implications of parenting behaviors on children's emotional competence and present and distal measures of social and cognitive functioning (Stack, Serbin, Enns, Ruttle, & Barrieau, 2010; Stack et al., 2012), by examining more covert measures of children's earlier emotion

understanding, such as how children recognize and understand the behavior and motives of others.

As a last suggestion for future research, a better understanding of the scope of infants' selective learning could be obtained by examining different tasks than the ones implemented in the current dissertation. Indeed, as mentioned throughout the dissertation, infants appeared to have seemingly truncated performance on some of these measures. It remains a challenge to assess infants' true knowledge and behavior, as individual variation certainly exists in their already limited repertoire of behaviors (e.g., Chow et al., 2008). For example, infants' ability to learn and produce novel words varies between the ages of 18 to 24 months, as demonstrated by infants' range of scores on the measure of productive vocabulary (MCDI) utilized in the present studies. Furthermore, it is also possible that infants would have had more successful performance if there were fewer tasks conducted, as evidenced by the attrition rate in Chapter 3. Perhaps one potential solution would be to examine infants' performance on a task that was comprised of both social and cognitive elements, thus reducing task demands. For example, it would be interesting to examine whether infants would be inclined to help an inaccurate or incompetent speaker map the correct label to a familiar object if she was uncertain or requesting help in doing so. Furthermore, it would be of interest to examine the extent to which infants would generalize a person's reliability to even other domains. Possible research avenues could be to investigate whether infants believe a reliable model would also possess positive personality traits or be a more deserving recipient of their prosocial behaviors such as comforting or sharing. By further examining this area, research in the field of selective trust could obtain a greater understanding for the scope of infants' understanding of others' reliability and whether they perceive it as a person-dependent trait (e.g., Chow et al., 2008; Koenig & Harris, 2005b).

Conclusions

In summary, the current set of studies pave the way for research concerning the developmental origins of selective trust by providing the first line of evidence that infants as young as 18 months of age are capable of attenuating their learning on account of a model's reliability. Indeed, not only do infants in the second year of life register a model's verbal accuracy, verbal competence, communicative intent and emotional reliability, but they also demonstrate the ability to make broad attributions to that model based on his or her reliability. Specifically, 18-month-olds believed that a verbally accurate model was a good source to learn novel words and culturally relevant actions from, whereas they believed a verbally incompetent and malevolent source was not. Later, at 24 months of age, infants preferred to learn novel words as a function of a model's reliable and responsive emotional cues, but only older infants and girls modified their willingness to imitate and help. These findings provide important contributions to the fields of selective trust and learning as they shed light on the factors that infants find most important in a model or are most sensitive to. By understanding these factors, we can obtain valuable insight as to what contributes to infants' budding social-cognitive development, which in turn shapes the individual they become later in life.

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Appendix A

Sample Recruitment Letter

(Chapter 2)

Dear Parents,

The Cognitive and Language Development Laboratory, part of the Center for Research and Human Development at Concordia University, is presently involved in a study examining how infants' understanding of trust and how this affects their learning and prosocial behaviours. Our research has been funded by federal and provincial agencies for the past twenty-five years and our team is internationally recognized for its excellent work on early child development. Our articles are frequently published in prestigious journals, such as "Infancy" and "Developmental Science". You also might have heard about our studies on national radio or on the Discovery Channel.

The Commission d'Accès à l'Information du Québec has kindly given us permission to consult birthlists provided by the Régie Régionale de la Santé et des Services Sociaux de la Région de Montréal-Centre. Your name appears on the birthlist of June 2010, which indicates that you have a child of an age appropriate for our study. We therefore invite you to participate in one of our new studies and have the unique experience of learning more about your child and child development, as well as contributing to research in this field!

The present investigation involves a few short games. The first task involves observing the experimenter as she labels a series of familiar objects correctly or incorrectly. The second task is a word learning task, where the experimenter will first label and then request objects from your child. In the final task, your child will observe the experimenter demonstrate a series of actions, and he or she will then have an opportunity to imitate her actions. During all tasks, your child will either be sitting in a child seat and you will be seated directly behind, or he/she will be standing and/or assisting the experimenter by engaging with certain props (e.g., a small cabinet). We will videotape your child's responses and all tapes will be treated in the strictest of confidentiality.

Overall, your participation will involve approximately one 45-minute visit to our laboratory at the Loyola Campus of Concordia University, located at 7141 Sherbrooke Street West, in Notre-Dame-de-Grace. Appointments can be scheduled at a time which is convenient for you and your child, including weekends. Free parking is available on the campus and we offer babysitting for siblings who come to the appointment. Upon completion of the study, a Certificate of Merit for Contribution to Science will be given to your child, and you will be offered a financial compensation of 30$ for participating. A summary of the results of our study and a photograph taken in our lab of you and your child will be mailed to you once it is completed.

For the purposes of this study, we are looking for infants who are 18 months of age, who have English or French as a 1st language, and who do not have any visual or hearing difficulties. All our studies are independent, so you may choose to participate once, or several times. If you are interested in having your child participate in this study, or would like any further information, please contact Katherine Gittins at (514) 848-2424 ext. 2279, or Dr. Diane Poulin-Dubois at (514) 848-2424 ext. 2219. If you would like more information about our studies, you can also visit our new website at http://crdh.concordia.ca/dpdlab. As we are very interested in having you participate, we will try to contact you by telephone within a few days of receiving this letter.
We are looking forward to speaking with you in the near future.

Diane Poulin-Dubois, Ph.D.	Katherine Gittins, B.Sc.	Ivy Brooker, M.A.
Professor	Research Assistant	Ph.D candidate
Department of Psychology	Department of Psychology	Department of Psychology

Appendix B

Sample Consent Form

(Chapter 2)

Parental Consent Form

This is to state that I understand that I have allowed my child to participate in a research project being conducted by Dr. Diane Poulin-Dubois, in collaboration with Ivy Brooker of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to examine infants' early development of trust, and how this influences their willingness to learn, help and imitate another person.

B. PROCEDURES

The present investigation involves a few short games. In the first game, your child will observe a female experimenter label either correctly or incorrectly familiar objects. Next, your child will have the opportunity to learn new words from this person. Of interest is whether his/her prior learning experience with the experimenter will influence his/her ability to learn from the experimenter. In the third game, the same experimenter will demonstrate a novel action, after which your child will have the opportunity to imitate her gestures. In the fourth game, your child will do a helping task during which he/she will be given the opportunity to help the experimenter complete an action. During all tasks, your child will be sitting in a child seat and you will be seated directly behind, while he/she participates in the tasks with the experimenter.

We will videotape your child's responses and all tapes will be treated in the strictest of confidentiality. That means that the researcher will not reveal your child's identity in any written or oral reports about this study. Your child will be assigned a coded number, and that number will be used on all materials collected in this study.

As well, because we are only interested in comparing children's understanding as a function of age, no individual scores will be provided following participation. The entire session is expected to last approximately 40-minutes.

C. RISKS AND BENEFITS

Your child will be given a certificate of merit at the end of the session as a thank-you for his/her participation. Also, you will be offered 30$ for your participation.

There is one condition that may result in the researchers being required to break the confidentiality of your child's participation. There are no procedures in this investigation that inquire about child maltreatment directly. However, by the laws of Québec and Canada, if the researchers discover information that indicates the possibility of child maltreatment, or that your child is at risk for imminent harm, they are required to disclose this information to the appropriate agencies. If this concern emerges, the lead researcher, Dr. Diane Poulin-Dubois, will discuss the reasons for this concern with you and will advise you of what steps will have to be taken.

D. CONDITIONS OF PARTICIPATION

I understand that I am free to withdraw my consent and discontinue my participation at any time without negative consequences, and that the experimenter will gladly answer any questions that might arise during the course of the research.

I understand that my participation in this study is confidential (i.e. the researchers will know, but will not disclose my identity).

I understand that the data from this study may be published, though no individual scores will be reported.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOUNTARILY AGREE TO HAVE MY CHILD PARTICIPATE IN THIS STUDY.

MY CHILD'S NAME (please print) _____

MY NAME (please print) _____

SIGNATURE _____ DATE _____

WITNESSED BY _____ DATE _____

I would be interested in participating in other studies with my child in the future (yes/ no): _____

If at any time you have questions about your rights as a research participant, you are free to contact the Research Ethics and Compliance Officer of Concordia University, at (514) 848-2424 ext 7481 or by email at ethics@alcor.concordia.ca

Diane Poulin-Dubois, Ph.D.	Ivy Brooker, M.A.
Professor	Ph.D. Candidate
Department of Psychology	Department of Psychology
848-2424 ext. 2219	848-2424 ext. 2279
diane.poulindubois@concordia.ca	ivybrooker@gmail.com

Participant # _____ Researcher: _____

Appendix C

Sample Demographic Questionnaire

(Chapters 2 and 3)

Participant Information

Child's first name: _____ Date of birth: _____

Child's last name: _____ Gender: _____

Language(s) spoken at home:_____

Country of birth: _____

If not born in Canada, when did your child come to Canada (MM/YY): _____ /_____

Mother's first name: _____ Father's first name:_____

Mother's maiden name: _____ Father's last name: _____

Country of birth of the MOTHER: _____

If not born in Canada, when did the mother come to Canada (MM/YY): _____ /_____

Country of birth of the FATHER:_____

If not born in Canada, when did the father come to Canada? (MM/YY) _____ /_____

Address: _____ Telephone #:_____home

City: _____ _____work mom

Postal Code:_____ _____work dad

E-mail address: _____

Mother's occupation:_____ Father's occupation:_____

Mother's education (highest level attained):_____

Father's education (highest level attained):_____

Other children in your family:

Name: _____Date of birth: _____

Name: _____Date of birth: _____

Name: _____Date of birth: _____

Name: _____Date of birth: _____

Participant # :_____ Researcher:_____

Appendix D

Coding Form for Word Learning Task

(Chapter 2)

Word Learning Coding

Subject Number		**Date Coded**	
Order		**Coded by**	

Trial		**Response**	**Correct (Y or N)**	**Trial Type**
1	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
2	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
3	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
4	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
5	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
6	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
7	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**
8	1st Toy Touched Toy Shown to Parent/Experimenter (if both toys touched simultaneously)	_____	_____	**F N**

*F denotes familiar object trial
N denotes novel object trial

Condition	**Correct Object**
Novel	
Familiar	

Totals	**Correct**	**Incorrect**	**Score**
Novel			
Familiar			

Did the child disengage from their toy and look at the object being labeled?

Labeling Object	**Yes**	**No**
1st time		
2nd time		
3rd time		
4th time		

Appendix E

Coding Form for the Rational Imitation Task

(Chapters 2 and 4)

Rational Imitation: Coding

Subject Number		**Date Coded**	
Order		**Coded by**	

First Demonstration

Method of Entry	First Action	Second Action	Infant Attentiveness[2]
Chimney[1]			
Door			

No Action: _____

Second Demonstration

Method of Entry	First Action	Second Action	Infant Attentiveness[2]
Chimney[1]			
Door			

No Action: _____

[1]**Chimney:** Did infant place dog in the doghouse via chimney, or clearly attempt to (see Schwier, 2006). If infant has difficulties putting dog though chimney and experimenter helps them, this is still coded as an attempt.

[2]**Infant Attentiveness**: The proportion of time the infant was attentive to the experimenter's display.

Appendix F

Coding Form for the Instrumental Helping Tasks

(Chapters 2, 3, and 4)

Instrumental Helping: Coding

Subject Number		**Date Coded**	
Order		**Coded by**	

1. Attempts to help E (perform the target behavior):

Scenario	Trial 1	Trial 2	Trial 3	Infant Attentiveness[1]
Paperball				
Books[2]				
Cabinet[3]				

[1]**Infant Attentiveness**: The proportion of time the infant was attentive to the experimenter's display.

[2]**For Chapter 3 and 4 only.**

[3]**For Chapter 3 only.**

Appendix G

Coding Form for the Word Learning Task

(Chapters 3 and 4)

Word Learning: Coding

Subject Number		**Date Coded**	
Order		**Coded by**	

Trial	Target Response (1=target; 0=not target)	Training vs Generalization Pair (1=training 0=generalization)	Trial Type
1			**F N P**
2			**F N P**
3			**F N P**
4			**F N P**
5			**F N P**
6			**F N P**
7			**F N P**
8			**F N P**
9			**F N P**

Enter in amount of Total **Choices** that fit under appropriate column:

Trial type	**Correct**	**Training**	**Generalization**	**Block 1**	**Block 2**	**Block 3**	**Score (out of 3)**
Novel							
Familiar							
Preference							
Total (out of 9)				-	-	-	-

Appendix H

Sample Recruitment Letter

(Chapter 3)

Dear Parents,

The Child Development Laboratory at Concordia University is presently involved in a study examining infants' early understanding of trust and other people's mental states. This research is funded by the Social Sciences and Humanities Research Council of Canada. The Commission d'Accès à l'Information du Québec has kindly given us permission to consult birthlists provided by the Régie Régionale de la Santé et des Services Sociaux de la Région de Montréal-Centre. Your name appears on the birthlist of October 2008, which indicates that you have a child of an age appropriate for our study.

The present investigation involves a few short games. In a succession of games, your child will observe a female experimenter produce a series of demonstrations, wherein he or she will get a chance to be involved. These tasks will vary, depending on the experiment, but may entail: observing the experimenter as she labels familiar objects either correctly or incorrectly, as well as appear helpful or unhelpful; word learning; imitating a series of novel actions; helping the experimenter to complete an action; observing the experimenter interact with a toy inside a puppet-theater; and learning to perform an action in order to retrieve a toy from inside a box.

During all tasks, your child will either be sitting in a child seat and you will be seated directly behind, or he/she will be required to be standing and/or assisting the experimenter by engaging with certain props (e.g., a small cabinet). The whole session should last approximately 45 minutes. We will videotape your child's responses and all tapes will be treated in the strictest of confidentiality.

Overall, your participation will involve approximately one 45-minute visit to our laboratory at the Loyola Campus of Concordia University, located at 7141 Sherbrooke Street West, in Notre-Dame-de-Grace. Appointments can be scheduled at a time which is convenient for you and your child, including weekends. Free parking is available on the campus. Upon completion of the study, a Certificate of Merit for Contribution to Science will be given to your child, and you will be offered a financial compensation of 20$ for participating. A summary of the results of our study will be mailed to you once it is completed.

For the purposes of this study, we are looking for infants who are 16-20 months of age, who hear English or French spoken in the home, and who do not have any visual or hearing difficulties. If you are interested in having your child participate in this study, or would like any further information, please contact Alexandra Polonia at (514) 848-2424 ext. 2279, or Dr. Diane Poulin-Dubois at (514) 848-2424 ext. 2219. We will try to contact you by telephone within a few days of receiving this letter.

_____	_____	_____
Diane Poulin-Dubois, Ph.D.	Alexandra Polonia, B.A.	Ivy Brooker, M.A.
Professor	Research Assistant	Ph.D candidate
Department of Psychology	Department of Psychology	Department of Psychology

Appendix I

Sample Consent Form

(Chapter 3)

Parental Consent Form

This is to state that I agree to allow my child to participate in a research project being conducted by Dr. Diane Poulin-Dubois, in collaboration with Ivy Brooker of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to examine infants' early development of trust, and how this influences their willingness to learn, help and cooperate with another person.

B. PROCEDURES

The present investigation involves 4 short games. In the first game, your child will observe a female experimenter label either correctly or incorrectly familiar objects. The experimenter will also appear helpful or unhelpful to your child, as demonstrated by her willingness to give him/her a toy. In the instance that the experimenter is unhelpful, we will be requiring your assistance to provide your child with the toy. Next, your child will have the opportunity to learn new words from this person. Of interest is whether his/her prior learning experience with the experimenter will influence his/her ability to learn from the experimenter. In the third game, the same experimenter will demonstrate a novel action, after which your child will have the opportunity to imitate her gestures. In the fourth game, your child will do a helping task during which he/she will be given the opportunity to help the experimenter complete an action. During all tasks, your child will either be sitting in a child seat and you will be seated directly behind, or he/she will be required to be standing and/or assisting the experimenter by engaging with certain props (e.g., a small cabinet). We will videotape your child's responses and all tapes will be treated in the strictest of confidentiality. That means that the researcher will not reveal your child's identity in any written or oral reports about this study. Your child will be assigned a coded number, and that number will be used on all materials collected in this study. As well, because we are only interested in comparing children's understanding as a function of age, no individual scores will be provided following participation. The entire session is expected to last approximately 45-minutes. If at any time during the testing session your child feels upset, we will discontinue the testing.

C. RISKS AND BENEFITS

Your child will be given a certificate of merit at the end of the session as a thank-you for his/her participation. Also, you will be offered 20$ for your participation.

There is one condition that may result in the researchers being required to break the confidentiality of your child's participation. There are no procedures in this investigation that inquire about child maltreatment directly. However, by the laws of Québec and Canada, if the researchers discover information that indicates the possibility of child maltreatment, or that your child is at risk for imminent harm, they are required to disclose this information to the appropriate agencies. If this concern emerges, the lead researcher, Dr. Diane Poulin-Dubois, will discuss the reasons for this concern with you and will advise you of what steps will have to be taken.

D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at any time without negative consequences, and that the experimenter will gladly answer any questions that might arise during the course of the research.

- I understand that my participation in this study is confidential (i.e. the researchers will know, but will not disclose my identity).
- I understand that the data from this study may be published, though no individual scores will be reported.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOUNTARILY AGREE TO HAVE MY CHILD PARTICIPATE IN THIS STUDY.

MY CHILD'S NAME (please print) _____

MY NAME (please print) _____

SIGNATURE _____ DATE _____

WITNESSED BY _____ DATE _____

I would be interested in participating in other studies with my child in the future (yes/ no): _____

If at any time you have questions about your rights as a research participant, you are free to contact Adela Reid, Research Ethics and Compliance Officer, Concordia University, at (514) 848-2424 ext 7481 or by email at areid@alcor.concordia.ca

Diane Poulin-Dubois, Ph.D.	Ivy Brooker
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Participant # _____ Researcher: _____

Appendix J

Coding Form for Rational Imitation Task

(Chapter 3)

Rational Imitation: Coding

Subject Number	
Order	

Date Coded	
Coded by	

Trial 1:

1. Child's success at opening the drawer: Y / N
2. What does child use to open the drawer?
    a. Hands : Y / N
    b. Object : Y / N
    c. Target Object: Y / N

Trial 2:

1. Child's success at opening the drawer: Y / N
2. What does child use to open the drawer?
    d. Hands : Y / N
    e. Object : Y / N
    f. Target Object: Y / N

Trial 3:

1. Child's success at opening the drawer: Y / N
2. What does child use to open the drawer?
    g. Hands : Y / N
    h. Object : Y / N
    i. Target Object: Y / N

Appendix K

Sample Recruitment Letter

(Chapter 4)

Dear Parents,

We would like to take this opportunity to thank you for your recent participation in studies conducted by our Cognitive and Language Development Laboratory. We are truly grateful for your enthusiasm and commitment to research and hope that you found the findings that we sent to you informative. You may recall expressing interest in our future studies. We would like to invite you to take part in a new and exciting study examining how infants respond to novel situations, as well as learn and imitate the behaviours of their mother. This research is funded by the Social Sciences and Humanities Research Council of Canada.

The present investigation involves a few short games that entail your cooperation. The first game involves you and your infant engaging in free play with toys. Afterward, your child will leave the room to go play with a female experimenter so that you can be instructed how to teach your child a series of games, involving imitation, word learning, and helping. Subsequently, you and your child will be reunited and you will engage in more free play. With both of you present, we will then show your child a novel object, a moving plastic toy spider, in order to examine your child's response to an unusual object. Finally, you will engage in the tasks with your child, with the experimenter present. We will videotape the entire session and all tapes will be treated in the strictest of confidentiality.

Overall, your participation will involve approximately one 60-minute visit to our laboratory at the Loyola Campus of Concordia University, located at 7141 Sherbrooke Street West, in Notre-Dame-de-Grace. Appointments can be scheduled at a time which is convenient for you and your child, including weekends. Free parking is available on the campus. Upon completion of the study, a Certificate of Merit for Contribution to Science will be given to your child, and you will be offered a financial compensation of 20$ for participating. A summary of the results of our study will be mailed to you once it is completed.

For the purposes of this study, we are looking for infants who are approximately 24 months of age, who have English or French as a 1st language, and who do not have any visual or hearing difficulties. If you are interested in having your child participate in this study, or would like any further information, please contact Katherine Gittins at (514) 848-2424 ext. 2279, or Dr. Diane Poulin-Dubois at (514) 848-2424 ext. 2219. For more information on our studies, please visit our website at http://crdh.concordia.ca/dpdlab/. We will try to contact you by telephone within a few days of receiving this letter.

We are looking forward to speaking with you in the near future.
Sincerely yours,

Diane Poulin-Dubois, Ph.D.	Katherine Gittins, B.Sc.	Ivy Brooker, M.A.
Professor	Research Assistant	Ph.D candidate
Department of Psychology	Department of Psychology	Department of Psychology

Appendix L

Sample Consent Form

(Chapter 4)

Parental Consent Form

This is to state that I understand that I have been asked if my child and I can participate in a research project being conducted by Dr. Diane Poulin-Dubois, in collaboration with graduate student Ivy Brooker of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to examine interactions between parents and their child including infants' reactions to novel situations, their willingness to learn from, observe, as well as imitate and help their primary caregiver, and how this may be influenced by parental behaviors and attitudes.

B. PROCEDURES

You will first be invited to complete short questionnaires about your child's vocabulary, your attitude toward parenting and about characteristics of your family (education, siblings, etc). The present investigation involves also a few short games that you will play with your child. The first game involves you and your infant engaging in free play with toys. Afterward, your child will leave the room to go play with a female experimenter so that you can have your photograph taken while posing in negative (e,g. fear) and positive (e.g. joy) facial expressions. You will be provided with models of each facial expression. Subsequently, you and your child will be reunited and you will engage in more free play. With both of you present, we will then show your child a novel object, a moving plastic toy spider, in order to examine your child's response to an unusual object. Finally, you will be instructed how to teach your child a series of games, involving imitation, word learning, and helping. In the final task, your child will be looking at a computer screen where your pictures will be presented. If for any reason your child becomes upset during any of the tasks, testing will be discontinued immediately. We are interested in parent-child interactions, and how these may be influenced by your attitudes toward your parenting role.

We will videotape you and your child and all tapes will be treated in the strictest of confidentiality. That means that the researcher will not reveal your child's identity in any written or oral reports about this study. You and your child will be assigned a coded number, and that code will be used on all materials collected in this study. All materials and data will be stored in secure facilities in the Department of Psychology at Concordia University. Only members of the research team will have access to these facilities. Questionnaires and electronic datafiles will be identified by coded identfication numbers, unique to each family. Information collected on paper (questionnaires) or videotape (observed behavior) will be entered into computer databases. Raw data will be kept for a minimum of 5 years. When it is time for disposal, papers will be shredded, hard-drives will be purged, and and videotapes and computer disks will be magnetically erased.

As well, because we are only interested in comparing children's understanding as a function of age, no individual scores will be provided following participation. The entire session is expected to last approximately 60-minutes.

C. RISKS AND BENEFITS

Your child will be given a certificate of merit at the end of the session as a thank-you for his/her participation. Also, you will be offered 30$ for your participation.

There is one condition that may result in the researchers being required to break the confidentiality of your child's participation. There are no procedures in this investigation that inquire about child maltreatment directly. However, by the laws of Québec and Canada, if the researchers discover information that indicates the possibility of child maltreatment, or that your child is at risk for imminent harm, they are required to disclose this information to the appropriate agencies. If this concern emerges, the lead researcher, Dr. Diane Poulin-Dubois, will discuss the reasons for this concern with you and will advise you of what steps will have to be taken.

D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at any time without negative consequences, and that the experimenter will gladly answer any questions that might arise during the course of the research. I am entitled to keep the total amount of $30 if I choose to withdraw my participation in the study.
- I understand that my participation in this study is confidential (i.e. the researchers will know, but will not disclose my identity).
- I understand that the data from this study may be published, though no individual scores will be reported.

I would be interested in participating in other studies conducted through the Centre for Research in Human Development with my child in the future (yes/ no): _____

I am willing to have my photos taken (yes/no):____

I am willing to have my photos rated by a person blind to the purpose of this study (yes/no): _____

I am willing to have my participation in this study videotaped, for coding purposes (yes/no):_____

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOUNTARILY AGREE TO HAVE BOTH MY CHILD AND I PARTICIPATE IN THIS STUDY.

MY CHILD'S NAME (please print) _____

MY NAME (please print) _____

SIGNATURE _____ DATE _____

WITNESSED BY _____ DATE _____

If at any time you have questions about your rights as a research participant, you are free to contact the Research Ethics and Compliance Officer of Concordia University, at (514) 848-2424 ext 7481 or by email at ethics@alcor.concordia.ca

Diane Poulin-Dubois, Ph.D.	Ivy Brooker
Professor	Graduate student
Department of Psychology	Department of Psychology
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diane.poulindubois@concordia.ca	i_br@live.concordia.ca

Participant # _____ Researcher: _____

Appendix M

Sample Demographic Questionnaire

(Chapter 4)

Cognitive and Language Development Laboratory Participant Information

Child's Name: _____

First Last

Child's Date of Birth: _____ **Child's Gender: ☐M ☐F**

MM / DD / YY

Basic Family Information

Parent A's Full Name: _____ **☐M ☐F**

First Last

Parent B's Full Name: _____ **☐M ☐F**

First Last

Address (including **postal code**):

_____

_____

Phone numbers	**Where?** (e.g. home, Mom work, Dad cell)
1.	
2.	
3.	
4.	
5.	

E-mail: _____

Does your child have any siblings?

Name of Sibling	Date of Birth	Gender	Can we contact you for future studies for this child?
		M F	**☐Yes ☐No**
		M F	**☐Yes ☐No**
		M F	**☐Yes ☐No**

Languages Spoken in the Home and at Childcare

What percent of the time does your baby hear **English**? **_____ %**

What percent of the time does your baby hear **French? _____ %**

What percent of the time does your baby hear **another language**? **_____ %**

Please specify this language**:_____**

Has the child lived/vacationed in any country **where s/he would hear a language other than English or French**?

☐Yes ☐ No

If yes, please detail (when, where, and for how long?) _____

Health History

Parent A age: **_____** Parent B age: **_____**

What was your child's birth weight? **__ __ lbs __ __ oz** OR **__ __ __ __ grams**

How many weeks was your pregnancy? **_____weeks**

Were there any **complications** during the pregnancy? **☐Yes ☐ No**

If yes please detail _____

Has your child had any major **medical problems**?

If yes please detail_____

Does your child have any **hearing or vision problems**?

If yes please detail_____

Does your child **currently** have an ear infection? ☐**Yes** ☐**No**

Has your child had any ear infections **in the past**? ☐**Yes** ☐**No**

If yes at which ages_____

Does your child have a **cold** today? ☐**Yes** ☐**No**

If yes, does he/she have pressure/pain in ears (if known)? ☐**Yes** ☐**No**

Is there any other relevant information we should know (health or language-related)?

Has another university contacted you to participate in one of their studies? ☐**Yes** ☐**No**

If yes, which university? _____

Family and Child Background Information (optional)

Parent A marital status:_____Parent B marital status:_____

Parent A's Current Level of Education

Check any/all that apply:

- ☐ Primary School
- ☐ Some High School
- ☐ High School
- ☐ Some College/University
- ☐ College Certificate/Diploma
- ☐ Trade School Diploma
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctoral Degree
- ☐ Professional Degree
- ☐ Not Applicable/Unknown
- ☐ Other (please specify):

_____

Parent B's Current Level of Education

Check any/all that apply:

- ☐ Primary School
- ☐ Some High School
- ☐ High School
- ☐ Some College/University
- ☐ College Certificate/Diploma
- ☐ Trade School Diploma
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctoral Degree
- ☐ Professional Degree
- ☐ Not Applicable/Unknown
- ☐ Other (please specify):

_____

Parent A's Occupational Status (optional)

Check any/all that apply:

- ☐ Employed Full-Time
- ☐ Employed Part-Time
- ☐ Stay-at-Home-Parent
- ☐ Student
- ☐ Unemployed
- ☐ Not Applicable/Unknown
- ☐ On Temporary Leave (e.g., maternity, paternity, sick, etc.; **please also check status when *not* on leave**)
- ☐ Other (please specify):

_____

- ☐ Occupation

_____

Parent B's Occupational Status (optional)

Check any/all that apply:

- ☐ Employed Full-Time
- ☐ Employed Part-Time
- ☐ Stay-at-Home-Parent
- ☐ Student
- ☐ Unemployed
- ☐ Not Applicable/Unknown
- ☐ On Temporary Leave (e.g., maternity, paternity, sick, etc.; **please also check status when *not* on leave**)
- ☐ Other (please specify):

_____

- ☐ Occupation

_____

Income bracket for the entire household (per year/before tax):

- ☐ < $22 000
- ☐ Between $22 000 and $35 000
- ☐ Between $35 000 and $50 000
- ☐ Between $50 000 and $75 000
- ☐ Between $75 000 and $100 000
- ☐ Between $100 000 and $150 000
- ☐ > $150 000

What language community do you (and your partner) identify with? Check any/all that apply:

- ☐ Anglophone
- ☐ Francophone
- ☐ Allophone
- ☐ Other (please specify): _____

What are your child's ethnic origins?

Check any/all that apply:

- ☐ Aboriginal
- ☐ African
- ☐ Arab
- ☐ West Asian
- ☐ South Asian
- ☐ East and Southeast Asian
- ☐ Caribbean
- ☐ European
- ☐ Latin/Central/South American
- ☐ Pacific Islands
- ☐ Not Applicable/Unknown
- ☐ Other (please specify):

  _____

What culture do you (and your partner) identify with?

Check any/all that apply:

- ☐ Aboriginal
- ☐ African
- ☐ Arab
- ☐ West Asian
- ☐ South Asian
- ☐ East and Southeast Asian
- ☐ Caribbean
- ☐ European
- ☐ Latin/Central/South American
- ☐ Pacific Islands
- ☐ Canadian/American
- ☐ Not Applicable/Unknown
- ☐ Other (please specify):

  _____

Appendix N

Coding Form for Parental Compliance

(Chapter 4)

Coding Scheme for Compliance for Parental Behaviors

Word Learning

1. Repeats "*Toma/Muron*" **only 3 times** Y/N

2. Calls attention to other object **only 3 times** Y/N

3. Does not give child access to toy when labeling Y/N

4. Only labels when child is attending Y/N

Total score out of 4 (Y = 1; N = 0): _____

Rational Imitation

Trial 1:

1. Begins demonstration when child attending Y/N

2. Begins trial by saying, "*the door is open*" Y/N

3. **Does not** have the dog 'bump' its head on door/frame

(including sound effects, e.g. "*oops*") Y/N

4. Gives the child easy access to the house by pushing it in front

of him/her Y/N

5. Reminds child of task by saying, "*now it's your turn*" Y/N

Total score out of 5 (Y = 1; N = 0): _____

Trial 2:

1. Begins demonstration when child attending Y/N

2. Begins trial by saying, "*the door is open*" Y/N

3. **Does not** have the dog 'bump' its head on door/frame

(including sound effects, e.g. "*oops*") Y/N

4. Gives the child easy access to the house by pushing it in front

of him/her Y/N

5. Reminds child of task by saying, "*now it's your turn*" Y/N

Total score out of 5(Y = 1; N = 0): _____

Instrumental Helping - Books

Trial 1

1. Begins demonstration when child attending Y/N

2. Stacks book one at a time, in front of him/her before pushing

pile in front of child for easy access Y/N

3. Looks back and forth at child, while emoting (sad/frustrated) Y/N

4. **Does not** say thank you or reinforces child after helping

(including smile, nods) Y/N

Total score out of 4 (Y = 1; N = 0): _____

Trial 2

1. Begins demonstration when child attending Y/N

2. Looks back and forth at child, while emoting (sad/frustrated) Y/N

3. **Does not** say thank you or reinforces child after helping

(including smile, nods) Y/N

Total score out of 3 (Y = 1; N = 0): _____

Trial 3

1. Begins demonstration when child attending Y/N

2. Looks back and forth at child, while emoting (sad/frustrated) Y/N

3. **Does not** say thank you or reinforces child after helping

(including smile, nods) Y/N

Total score out of 3 (Y = 1; N = 0): _____

<u>Instrumental Helping – Paperball</u>

Trial 1

1. Begins demonstration when child attending Y/N

2. Holds onto tongs, without giving child access Y/N

3. Looks back and forth at child, while emoting (sad/frustrated) Y/N

4. **Does not** say thank you or reinforces child after helping

(including smile, nods) Y/N

Total score out of 4(Y = 1; N = 0): _____

Trial 2

1. Holds onto tongs, without giving child access Y/N

2. Looks back and forth at child, while emoting (sad/frustrated) Y/N

3. **Does not** say thank you or reinforces child after helping

(including smile, nods) Y/N

Total score out of 3(Y = 1; N = 0): _____

Trial 3

1. Holds onto tongs, without giving child access Y/N

2. Looks back and forth at child, while emoting (sad/frustrated) Y/N

3. **Does not** say thank you or reinforces child after helping

(including smile, nods) Y/N

Total score out of 3(Y = 1; N = 0): _____

Total Score of Compliance (/34): _____

Proportion (out of 1):_____