Infants' reactions to the unjustified emotions of a model

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Infants' reactions to the unjustified emotions of a model

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The object of the present dissertation was to examine infants' abilities to detect unjustified emotions and how this detection influences their selective trust towards unreliable individuals. The focus of the first study was to investigate whether 15- and 18-month-olds react the same way to unjustified (i.e., distress following a positive experience or happiness following a negative experience) and justified (i.e., distress following a negative experience or happiness following a positive experience) emotional reactions. Only 18-month-olds detected the mismatching facial expressions: the unjustified group showed more hypothesis testing across events than the justified group. Older infants in the justified group also showed more concerned reactions to negative expressions than those in the unjustified group.

The second study examined whether 18-month-olds' helping behaviors, emotional referencing and imitation are influenced by the reliability of an emoter. Infants exposed to an unjustified emoter did more hypothesis testing and showed less concern towards the actor than those exposed to a justified emoter. During the emotional referencing task, the justified group first opened a container towards which the actor expressed "happiness" rather than "disgust", while the reverse was true for the unjustified group. As expected, no differences were found between the groups on the instrumental helping and imitation tasks, but the justified group needed fewer prompts to help the actor than the unjustified group when emotional help was requested.

The third study examined how 18-month-olds react to someone who displays a neutral facial expression following negative experiences. In one condition, infants saw the actor display

sadness, while she remained neutral in the other condition. Then, infants interacted with the actor in emotional referencing, instrumental helping, empathic helping, and imitation tasks. Infants in both groups engaged in similar levels of hypothesis testing. However, infants in the sad group expressed more concerned facial expressions towards the actor than those in the neutral group. No differences were found between the two groups on the interactive tasks.

Taken together, the results from these studies show that 18-month-olds are sensitive to emotions following emotional experiences and that a person's emotional accuracy modifies infants' subsequent behaviors towards that person, specifically in the emotional domain.

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This Ph.D. thesis consists of three manuscripts.

Study 1 (see Chapter 2)

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Study 2 (see Chapter 3)

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Study 3 (see Chapter 4)

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Relative Contributions

The overall topic and the focus of each of the three studies were developed in collaboration with my thesis supervisor, Dr. Diane Poulin-Dubois. This entailed: conceptualizing the design of the studies, the methods, and selecting the experimental stimuli. Prior to testing, the recruitment letters were prepared with the assistance of research assistants (Katherine Gittins for Study 1 and Monyka Rodrigues for Studies 2 and 3). I placed all of the recruitment calls for all three of the studies and I followed up with participants, as needed. Before beginning testing, I created all of the protocols and the scripts for all of the tasks and trained the secondary experimenters. With respect to data collection, I was the primary experimenter for all three studies. For Study 1, Ali Butler, Lana Karbachian, Melissa Dimitriadis, and Katherine Gittins helped with data collection

as secondary experimenters. For Study 2, Amanda Santache, an Honours Psychology Student, helped in data collection as part of her Honours' thesis project. For Study 3, Amanda Santache, Olivia Kuzyk, and Josée-Anne Bécotte helped in data collection as secondary experimenters. Once all of the data was collected, I coded 100% of the infants' responses in all three studies. I was responsible for all of the data entry, statistical analyses, interpretation of the data, and preparation of the manuscripts. Ali Butler and Lana Karbachian (Study 1), Katherine Gittins and Amanda Santache (Study 2) and Amanda Santache and Josée-Anne Bécotte (Study 3) helped in the various stages of reliability. For each of the three manuscripts, I wrote the first draft while Dr. Poulin-Dubois provided feedback. A few months after the completion of each study, a summary of the study and its findings were mailed via a laboratory newsletter to all of the research participants to update families on the findings and to thank them for their contribution.

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Chapter 1

Introduction

Individuals gain knowledge about the world through their experiences with the world around them. These experiences can be direct (e.g., trial and error) or indirect (e.g., observational learning). Most of what humans learn about the world is not acquired through direct experiences but rather from interactions with social partners through observation. In this way, humans learn how to act appropriately and efficiently in the social world and also gain an understanding about the complexities of the world around them (e.g., Harris & Koenig, 2006). This strategy involving model-based learning is, of course, not unique to humans but found in a range of species (Rendell et al., 2011) suggesting an evolutionary benefit. However, since not all models have accurate or relevant knowledge about a given topic, individuals must be selective in whom they choose to learn from (Harris, 2007). This selectivity is critically important for children, as children must learn to function competently in social contexts. Given that children and infants must rely heavily on others for knowledge, the question is whether young children and infants render adult information as constantly reliable, or whether they have already developed strategies to assess whether to believe information from some adults and not others (Harris, 2007). Interestingly, most of the literature on selective behavior or trust has focused on preschoolers and mainly on how their evaluations of others' epistemic or non-emotional cues, such as word labeling or object use, impacts their behavior towards them. However, little is known about how young infants evaluate emotional cues from an emoter (i.e., an individual who displays emotional expressions) during familiar emotional events, and how those cues subsequently influence infants' selective behaviors towards that emoter.

Selective Trust

Trust during the early childhood and infancy period can be defined as the extent to which an individual can be considered "reliable" in different contexts (Corriveau & Harris, 2009; Harris, 2007). The ability to detect consistency in individuals across contexts has been shown to develop along with children's cognitive abilities and conceptual understanding, and becomes more defined as children's social understanding becomes more sophisticated (Doebel & Koenig, 2013; Koenig & Sabbagh, 2013; Mills, 2013). In fact, children interact differently with others depending on overt characteristics of partners such as sex (e.g., Taylor, 2013), age (adults over children; Jaswal & Neely, 2006; Kuhlmann, 2008; Riegelsberger, Sasse, & McCarthy, 2007), within-group status (e.g., MacDonald, Schug, Chase, & Barth, 2013), native vs. non-native speakers of their language (e.g., Corriveau, Kim, Song, & Harris, 2013; Kinzler, Corriveau, & Harris, 2011), and the social relationship they hold with their partner, such as caregivers vs. strangers (Corriveau et al., 2009) and a familiar vs. an unfamiliar adult (Corriveau & Harris, 2009; Reyes-Jacquez & Echols, 2013).

Children's attribution of "trust" towards another can vary depending on these aforementioned characteristics. Furthermore, within dyads, partners must certainly display more subtle or internal social cues to children in order to allow them to attribute "trust" or to provide children with a reliable source of model-based learning. For example, individuals often display epistemic cues, relaying to others that their actions and/or words are based on knowledge such as correctly labeling objects or actions (see Harris, 2007; Mills, 2013 for a review). Another type of common cue, often labeled as communicative intent, relies on an individual's behavioral intent towards an object or person, such as wanting to help another, or wanting to reach a specific goal. A third, and one less researched, is that of emotional cues, or communicating through the use of emotions. Together, these three types of cues provided by social partners influence children's

behavioral trust; that is, their ability to infer reliability and attribute trustworthiness to others and to modify their behavior towards them based on their partner's attributions and beliefs (Szczesniak, Colaco, & Rondon, 2012).

The current dissertation will first begin with a review of the selective trust literature on how both preschoolers and infants detect epistemic cues and communicative intent from others, and how those cues modify children's behavioral trust, that is, their selective behaviors towards others. Following this review, the focus will be placed on the paucity of studies regarding the detection of emotional cues by preschoolers and infants, by considering how emotional information may influence children's selective behaviors. Finally, the main goals of the dissertation will be outlined, while highlighting how each of the three manuscripts attempted to address these goals.

Epistemic Accuracy

The bulk of the literature on selective trust has focused on the development of trust during the preschool period. One key strategy implemented by young children in selecting whom to trust and learn from is to consider a model's epistemic reliability, particularly whether someone's words or actions are found to be accurate (Harris & Corriveau, 2011; Mascaro & Sperber, 2009; Mills, 2013; Rendell et al., 2011; Sperber et al., 2010). In one of the first studies to use this paradigm (Koenig, Clément, & Harris, 2004), children watched as a person labeled a familiar object (such as a ball) either accurately (*"That's a ball!"*) or inaccurately (*"That's a shoe!"*). Children were then taught new words from either the accurate or inaccurate labeler, and were found to be more likely to learn a new word for a novel object from the accurate versus the inaccurate labeler. The findings from this study suggested that children are sensitive to certain cues from adults and are able to track their accuracy to a later event. Other studies have also

consistently found that children are quite sensitive to verbal inaccuracy. Four-year-old children prefer to learn new words from someone who has shown knowledge about the name of a familiar object ("I know this is a shoe!") rather than ignorance ("I don't know what this is called") (Koenig & Harris, 2005). Similarly, 3- and 4-year-old children prefer to learn new words from a confident speaker ("I *know* this is a ball!") rather than from a non-confident speaker ("I *think* this is a ball") (Jaswal & Malone, 2007; Moore, Bryant & Furrow, 1989). In addition, by 5 years of age, children will track a speaker's verbal accuracy when that speaker is teaching new words; that is, children are more likely to predict an accurate speaker's knowledge of words and will be more likely to accept information from this person over those speakers whom had previously been inaccurate (Brosseau-Liard & Birch, 2010). Thus, beginning at age 3, children prefer to learn from adults who show knowledge of, or display certainty or expertise about object labels (Birch, Vauthier, & Bloom, 2008; Harris, 2007; Koenig & Harris, 2005; Landrum, Mills, & Johnston, 2013; Rakoczy, Warneken, & Tomasello, 2009; Sabbagh & Baldwin, 2001; Scofield & Behrend, 2008). By 4 years of age, children also prefer speakers who are accurate 75% of the time (Pasquini, Corriveau, Koenig & Harris, 2007).

More recent results from research also suggest that even infants also detect epistemic cues. Sixteen-month-olds have been found to look longer at a person who mislabeled objects (Koenig & Echols, 2003), while 18- and 24-month-olds are more likely to learn new words from accurate than inaccurate labelers (Brooker & Poulin-Dubois, 2013; Koenig & Woodward, 2010). Similarly, 24-month-olds avoid learning a new label for a familiar object from a labeler who proved to be ignorant (e.g., "*I don't know what that is*") (Krogh-Jespersen & Echols, 2012). Together, these results suggest that infants, like preschoolers, prefer to learn new verbal information from those who have a track record of being verbally accurate.

The scope of tracking a speaker's accuracy has been shown to extend beyond the domain of word learning. For example, 3- and 4-year-old children prefer to learn the function of a new object from a speaker who had been previously accurate (Koenig & Harris, 2005), and believe an accurate labeler to be "nicer", "smarter", "stronger" and "better" in domains outside of naming novel objects (Brosseau-Liard & Birch, 2010; Fusaro, Corriveau, & Harris, 2011). Three-year-olds will also prefer to imitate the actions of a verbally accurate source within the context of a rule-governed game (Rakoczy et al., 2009). In a recent study (Brooker & Poulin-Dubois, 2013), 18-month-olds were shown a set of familiar objects (e.g., a banana) and an adult either labeled each object accurately ("it's a banana!") or inaccurately ("it's a shoe!"). Infants then watched as the adult had a toy animal enter a home through the chimney rather than an accessible door, and infants were asked to imitate this "irrational" action. Infants were more likely to imitate the accurate versus the inaccurate object labeler (Brooker & Poulin-Dubois, 2013). Another recent study (Brosseau-Liard & Poulin-Dubois, 2014) had 18- and 24-month-olds watch an experimenter as she expressed either confidence or uncertainty as she demonstrated the function of familiar and unfamiliar objects. Infants were then asked to imitate the action and learn new words from the examiner. Twenty-four-month-olds, but not 18-month-olds, were more likely to imitate the confident model over the uncertain model, but neither age group showed a preference in the word learning task, which may suggest a developmental progression in the emergence of this skill. Eighteen-month-olds have also been shown to be more likely to help an individual who spoke the infants' native tongue (Buttelmann, Zmyj, Daum, & Carpenter, 2013), while 14-month-olds prefer to imitate a model who properly used a familiar object (Zmyj, Buttelmann, Carpenter, & Daum, 2010). Together, these findings suggest that as infants track the reliability of an individual in one area, they may then extend their selective behaviors towards that person in a

separate and unrelated domain. In addition, the findings suggest that subtle emotional cues such as certainty may impact selectivity in imitation by the end of the second year.

Benevolence

While children's use of epistemic cues have received the most attention in the selective trust literature, communicative intent involving indications of injustice, unhelpfulness, unresponsiveness or antisocial behavior, has also begun to be investigated. In a study with preschoolers, Mascaro and Sperber (2009) presented 3-year-olds with a puppet they described as "mean" (the puppet hit the experimenter as the experimenter described the puppet as mean), and a puppet they described as "nice" (the puppet stroked the experimenter gently). Then, children were asked to trust the testimony of either the "mean" or the "nice" puppet, and to choose to receive a present from one of the two puppets. Children were more likely to do both from the nice puppet compared to the mean puppet, suggesting that they detected when a puppet was acting unpleasantly. Preschoolers, aged 3 to 5 years, are also more likely to trust a new label from a "neutral" (played with her own toy) individual rather than a "mean" (ripping a friend's artwork) person (Doebel & Koenig, 2013). Moreover, 3-year-old children have been found to prefer to help a helpful person rather than a person who intends to harm another (Vaish, Carpenter, & Tomasello, 2010), and will act in a more prosocial manner towards a puppet who was harmed by another than when no harm was done to the same puppet (Vaish, Missana, & Tomasello, 2011). When pitting expertise and "niceness" against one another, 3- and 5-year-olds preferred "nice" individuals who were non-experts to individuals who were "mean" but could nonetheless provide expert and relevant information (Landrum et al., 2013).

More recent findings have found that infants also appear to prefer benevolence; as early as 3 months of age, infants avoid geometric figures that previously hindered another up a cliff,

and 6-month-olds prefer to play with geometric figures that helped another (Hamlin, Wynn, & Bloom, 2007; 2010). In addition, by 8 months of age, infants prefer puppets whose previous actions had been prosocial, even when those actions were unsuccessful but the puppet's behavioral intent was clearly prosocial (Hamlin, 2013). Older infants also appear to engage in more prosocial behavior towards "nice" individuals: 21-month-olds have been found to prefer to instrumentally help an adult who had previously been "unable" to give the infants a toy (i.e., the object constantly fell out of the adult's hand) than to help an adult who was "unwilling" to give the toy (i.e., the adult reached out to give the infant the toy then constantly revoked her hand when the infant reached for it) (Dunfield & Kulhmeier, 2010). However, others have found that at 30 months of age, when asked to fairly distribute stickers, children appear to cooperate and are willing to share their stickers even with adults who had previously been selfish, that is, did not share their stickers fairly (Sebastian-Enesco, Hernandez-Lloreda, & Colmenares, 2013). Together, these findings strongly suggest that preschoolers, as well as infants, appear to attribute positive and negative intentions to another's actions, and that spontaneous cooperative and sharing behaviours may be too robust for children to overcome early in development.

Emotional Cues

The ability for infants to detect actions as positive, negative, or even uncertain, suggests that they may be also able to detect emotional "accuracy". While there has been a focus on epistemic cues and communicative intent in the literature on selective trust, a limited area of research has been the investigation of emotional cues. Emotional cues help children and infants rely on others' emotional signals to guide their behaviors in ambiguous contexts. Others' behaviors are often predicted and/or explained through their emotional expressions. In fact, by 12 months of age, infants are able to categorize and discriminate different types of emotions,

such as sadness, happiness and fear (see Quinn et al., 2011; Nelson, 1987). For example, infants are less likely to approach a novel object if parents or a peer expressed fear towards it rather than happiness (Hornik, Risenhoover & Gunnar, 1987; Mumme, Fernald, & Herrera, 1996; Nichols, Svetlova, & Brownell, 2010), and are less likely to cross a "visual cliff" if a parent expresses fear or anger towards the infant (Sorce, Emde, Campos, & Kinnert, 1985; Striano, Vaish, & Benigno, 2006). Similarly, infants as young as 7 months use another's facial expression to guide their own behavior not only for information about ambiguous objects, but also to determine their intentions during ambiguous situations (Striano & Vaish, 2006). However, infants do not use others' emotions simply to guide their behavior, but also use these emotions to infer others' preferences for objects around them. For example, when 12- and 14-month-olds watch an actor constantly express a positive facial expression towards a particular object, infants can detect (i.e., will look longer) at that same actor when her positive facial expression is now paired with and geared towards a novel object rather than a previously "liked" object (Phillips, Wellman, & Spelke, 2002). Extending these findings to 9-month-olds, Barna and Legerstree (2005) had infants watch as an actor expressed both positive and negative emotional expressions towards objects. Infants looked longer when the same actor later reached for the object towards which she had previously expressed a negative emotional expression. In addition, infants looked longer when the actor reached towards a novel object rather than an object towards which she had previously expressed a positive emotional reaction. Thus, 9-month-olds appear to be able to process emotional expressions and may use them to make predictions about others' future actions. Similarly, 15-month-olds are able to detect when positive emotional vocal cues are inconsistent with the preceding action; that is, infants look longer when an actor expresses a "humorous" voice (raised pitch and volume) while performing a "sweet" action (in this case, placing a toy cat into its bed)

rather than performing a humorous action (i.e., placing a cat on the actor's head) (Hoicka & Wang, 2011). Together, this set of findings suggests that by 9 months, infants use gaze and positive emotional expressions to predict others' actions. Nonetheless, some researchers have suggested that emotional cues do not allow infants to predict behavior, but rather that infants simply use attentional cues to form predictions; that is, where an individual's *attention and gaze* is directed is more important than the emotion the actor expresses towards an object. To investigate this question, Vaish and Woodward (2010) had an actor express a negative emotion while looking into only one of two cups. Their findings revealed that at 14 months, infants simply looked longer at the actor when she reached into an unattended cup, regardless of the emotion she had previously expressed toward the other cup. These findings suggest that infants' predictions about someone's object preference are based on attentional cues alone at the age of 14 months, rather than on emotions.

Notably, the focus of these latter studies has been to investigate infants' emotion understanding by using infants' abilities to rely on people's emotional expressions as cues to their subsequent behaviors. However, infants do not experience the world in a vacuum where they continually come across ambiguous situations and depend on others' emotional expressions to guide them. Indeed, infants constantly encounter emotionally salient events, either by experiencing them on their own or by watching others experience them. Thus, infants are very much attuned to emotionally salient events, reacting most prominently when they are exposed to distressing contexts (e.g., Vaish, Grossman, & Woodward, 2008), such as seeing a person in pain after hurting herself (e.g., Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). During these instances, 8- to 12-month olds will show observable non-verbal empathic responses, such as concern, hypothesis testing (i.e., checking behaviours associated with deciphering what

occurred to the actor), and social referencing (e.g., Roth-Hanania, Davidov, & Zahn-Waxler, 2011; Zahn-Waxler et al., 1992). By 14 months of age, infants engage in prosocial behaviors, such as helping and comforting, towards the distressed individual (e.g., Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Svetlova, Nichols, & Brownell, 2010; Warneken & Tomasello, 2007). In addition, results from one study demonstrated that 18-month-olds are also more likely to show concerned looks and more prosocial behaviors towards a victim who has lost an object in the absence of any emotionally distressing cues by that victim (Vaish, Carpenter, & Tomasello, 2009*).* These latter results suggest that infants may be more responsive to the valence of events than to the valence of emotional expressions.

While the aforementioned findings provide evidence regarding children and infants' detection of emotional expressions and experiences, less is known about children's ability to detect inconsistencies between a person's emotional expressions and the valence of *emotional* events, as most studies often incorporate an ambiguous and neutral event. In one of the first studies to address this issue with preschoolers, three-year-olds were exposed to an adult who tried to retrieve toys from a box (Hepach, Vaish, & Tomasello, 2012). Children then either saw the lid of a box fall shut on the adult's arm (the justified response condition), or the box simply closed and the adult was not harmed (the unjustified condition). After each condition, the adult expressed sadness. The researchers found that children showed more concern and less "checking" behaviors when the negative emotions matched the context. Interestingly, recent research has suggested that 14-month-olds engage in some lower level processing of sympathetic arousal by showing an increase in pupil dilation when the infants witnessed an incongruence between the actor's actions and his emotional expressions (e.g., softly patting a toy tiger with an angry expression) (Hepach & Westermann, 2013). Similarly, 10-month-olds have been shown to

be sensitive to a cartoon's incongruent facial reactions after either successfully or unsuccessfully arriving at a desired goal (e.g., sadness after successfully jumping over a barrier; Skerry & Spelke, 2014). These findings suggest that preschoolers, as well as infants, appear to show sensitivity to the suitability of a negative, distressed emotion with its appropriate context.

While preschoolers appear to be able to detect the appropriateness of an emotion given its emotional context, it remains unknown in the literature if *infants* can detect whether a person's positive and negative emotions are justified given a particular emotional context. Therefore, the first goal of the current dissertation was to determine whether infants would be able to detect when a person's emotional expressions do not match the emotions that are expected to follow a person's experience. Examining infants' responses to the inconsistencies between an actor's positive or negative emotions and an emotional event would allow for a better understanding of infants' abilities to detect the meaning of others' emotions in context; that is, whether infants' reactions are being driven by the context of that emotion, or simply reacting to emotional expressions, without placing them in context.

Selective trust based on emotional reliability

There has been some research manipulating the reliability of an actor's emotional cues in order to examine infants' sensitivity to "accuracy" in the emotional domain. In a series of studies, Poulin-Dubois and her colleagues had infants watch as an experimenter gazed into a box while she expressed positive affect and exclaimed "Wow!". In the reliable condition, the box contained a toy; in the unreliable condition, the box was empty. The researchers found that 14-month-old infants were more likely to subsequently follow the gaze of the reliable person behind a barrier (Chow, Poulin-Dubois & Lewis, 2008). In addition, 14-month-olds were also more likely to imitate an irrational action (turning on a push-on light in an unconventional manner,

using her forehead to illuminate the light) from a previously reliable looker (Poulin-Dubois, Brooker, & Polonia, 2011). By 16 months of age, infants were shown to be more likely to attribute beliefs to a previously emotionally reliable individual (Poulin-Dubois & Chow, 2009).

Together, the series of studies from Poulin-Dubois and her colleagues suggest that by 16 months, infants engage in selective rational imitation, attribution of beliefs, and gaze following when exposed to someone as a function of the accuracy of emotional expressions. Despite these findings however, less is known about how selective infants' responses are towards a person who expressed unjustified emotions in other domains, such as prosocial helping. Infants as young as 14 months demonstrate instrumental, goal-oriented action based helping behaviors (Warneken & Tomasello, 2007) and by 18 months, they add empathic, emotional helping to their prosocial repertoire (Svetlova et al., 2010). Nonetheless, whether infants show selectivity in their helping behaviors after experiencing an actor whose emotions are constantly unjustified after an emotional context is unknown. Therefore, we pose the following question: As is the case for preschoolers, would a display of inappropriate emotional expressions influence infants' willingness to help? Furthermore, we ask: Would their selective helping behaviors extend to different types of helping contexts, including goal-oriented, action-based instrumental helping (Warneken & Tomasello, 2007) and emotional, empathic helping (Svetlova et al., 2010), or, would they be *specific* to a context during which requests for help are expressed mainly through emotional expressions of distress? Given the robustness of helping behaviors early in the second year, the second goal of the present dissertation was to examine whether infants would show changes in their willingness to both instrumentally and empathically help an actor after witnessing her express negative emotions that are repeatedly unjustified.

In view of the first and second goals of this dissertation, if infants are indeed able to

detect emotional mismatches and then subsequently use these to influence their helping behaviors, it remains in question whether infants will also then subsequently use the emotions they witness from a previously emotionally unreliable adult as a source referent, or whether they will disregard them as a trustworthy referent. Infants use others' emotions to guide their behavior as early as 12 months of age **(**Hornik et al., 1987) and this ability aids them in learning about their environment (Vandivier & Hertenstein, 2013). In an emotional referencing paradigm, Repacholi (1998) showed that when presented with two containers, 14- and 18-month-olds were more likely to initially search into the container previously associated with a "happy" expression by an actor, than into the container associated with a "disgust" emotional expression. This suggests that infants as young as 14 months are able to use both the experimenter's attentional cues and emotional expressions to predict the nature of the referent that is the focus of her attention. Interestingly, 16-month-old infants prefer to try a previously "liked" food item from a prosocial puppet over the "disliked" food item, while they do not show a preference for the "liked" or "disliked" food item from a previous anti-social puppet (Hamlin & Wynn, 2012). However, it remains unknown whether infants' experience with an emotionally unjustified individual would impact their robust tendency to use them as a referent, and consequently be inclined to first look inside a box associated with positive emotions. Thus, a third goal of the present dissertation was to examine whether infants' reactions would be selective in their behaviors outside of helping and extend to other contexts, such as emotional referencing. Taken together, a number of goals in the present dissertation were designed to examine infants' ability to detect unjustified negative and positive emotional reactions, and how this "unreliability" may later impact infants' selective behaviors towards that individual. However, not all individuals are as equally expressive, and less is known about how infants interpret and

react to individuals who show no emotional expression after a seemingly emotional negative experience. Newborns appear to differentiate positive from fearful facial expressions, but not fearful from neutral expressions (Farroni, Menon, Rigato, & Johnson, 2007), while 4- and 6-month olds can differentiate between happy and angry, as well as happy from neutral facial expressions, but they do not distinguish angry from neutral (LaBarbera, Izard, Vietze, & Parisi, 1976). Importantly, however, is that differentiating between emotional expressions and placing them in context can provide very different set of the understanding of the utility of emotional expressions with young infants. In the ground breaking social referencing studies with 12-month-olds (Hornik et al., 1987; Mumme et al., 1996), researchers had parents express a number of emotions towards ambiguous objects, and then observed how infants reacted towards those objects. The results revealed that the infants were equally likely to approach an ambiguous object when the parent had expressed either happiness or no emotion at all towards it, but avoided objects towards which the parent expressed a negative (i.e., fear, sadness) emotion.

Some interpretations as to why this latter effect occurs in infants have been proposed by Vaish and her colleagues, suggesting that when witnessing a caregiver convey a neutral expression towards a non-emotional object or context, infants attribute a positive stance to the neutral emotion, exhibiting a "positivity offset" (Vaish et al., 2008). Indeed, evidence for the "positivity offset" interpretation has been supported by other studies as well (Cacioppo & Berntson, 1999; Cacioppo, Gardner, & Bernston, 1997; 1999; Repacholi, 2009). For example, 18-month-olds are more likely to imitate an action from a model when she expressed a neutral or positive emotion towards the neutral object than when she expressed negative emotion (i.e., anger) towards it (Repacholi, 2009).

It is important to note that the bulk of the research examining infants' reactions to neutral

facial expression has often used ambiguous objects or contexts in their studies. Yet, infants encounter non-ambiguous, emotional contexts on a daily basis, which may influence their interpretations of the neutral facial expressions. In order to examine this effect, Vaish, Carpenter and Tomasello (2009) had infants watch as an actor constantly remained neutral during either a neutral context (two individual interactions in which no harm was done to either individual) or a distressing situation (where one individual's possessions were destroyed by the other). The findings showed that infants as young as 18 months were more likely to show empathic responses towards the neutral individual in the harm condition than in the neutral condition, and were also more likely to later help the individual in the harm context. Thus, the researchers concluded that in the absence of any overt emotionally distressing cues, infants will consider the context above all and will show empathy and prosocial behaviors towards neutral individuals in distressing situations. However, an important limitation to the design by Vaish and colleagues (2009) was that they did not include a manipulation of the facial expression with respect to a negative situation. Therefore, it remains unknown whether infants would respond similarly towards an individual's justified negative reaction during a negative experience (e.g., sadness) than towards an individual who remained neutral during the same negative experience. In a recent study, researchers found that when manipulating emotional facial expressions (neutral vs. sad) during an instrumental helping task, 19-month-olds were equally likely to help the experimenter fulfill a goal, regardless of the emotion expressed (Newton, Goodman, & Thompson, 2014). These findings suggest that during goal-oriented helping tasks, infants may treat neutral expressions similar to negative expressions as they are aiding the individual to complete a desired goal. However, a limitation of the study by Newton and her colleagues is that the infants had no prior experience with the neutral or sad experimenter, and thus no history of

whether the person was consistently neutral during a number of emotional events was available for examination. With this in mind, a fourth goal of the dissertation was to examine whether infants would display different empathic responses towards a consistently neutral versus a consistently sad individual during distressing situations. In addition, given the limited literature on infants' selective behaviors towards stoic individuals, a fifth goal was to examine whether infants would show a difference in their willingness to instrumentally help, empathically help, and emotionally reference an individual who constantly conveys either an appropriate sad reaction or a neutral emotional expression after a negative experience.

Taken together, the three studies that make up the current dissertation had several objectives that were designed to examine whether infants would detect an emotionally unjustified individual, as well how emotionally unjustified individuals would influence infants' subsequent willingness to emotionally reference and help them. Specifically, Study 1 (Chiarella & Poulin-Dubois, 2013) set out to examine the developmental progress of infants' reactions towards emotionally unjustified individuals, in the context of empathic responses. Thus, 15- and 18-month-olds were exposed to an actor experiencing negative and positive events, with one group exposed to an actor whose emotional reactions were consistently unjustified (i.e., did not match the event), while the other saw an actor whose emotional reactions were justified (i.e., always matched the event). Study 2 (Chiarella & Poulin-Dubois, 2014) examined 18-month-olds' reactions to unjustified (i.e., distress after receiving a desired object) or justified (distress after receiving an undesired object) sadness. Then, infants' subsequent interactions with the emoter were examined, including infants' willingness to emotionally reference, help, or imitate her. Finally, Study 3 (Chiarella & Poulin-Dubois, 2015) examined 18-month-olds infants' reactions towards a "stoic" individual; that is, an individual who remained neutral following a

negative experience. Then, infants interacted with the emoter during the same tasks as in Study 2. If infants made a context-emotion association based on their previous experiences with the contexts, then having an unexpected emotion follow a familiar emotional event would violate infants' beliefs. Consequently, if an emoter's facial expression constantly violates infants' prior emotional experience with that context, then infants may choose not to trust that individual during subsequent tasks. However, infants may not rely on others' facial expressions if they have familiarity with the emotional context, and thus, they would not display any discrepancies in their responses towards the emoter between the justified and unjustified emotional conditions.

Chapter 2

Crybabies and pollyannas: Infants can detect unjustified emotional reactions

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Cry babies and pollyannas: Infants can detect unjustified emotional reactions

In order to function effectively in the social world, children must develop the ability to understand others' behaviours through the attribution of internal states, such as beliefs, intentions, and emotions. The detection and understanding of emotions is particularly important to infants, as others' behaviours can often be predicted and explained through their emotional expressions. By 12 months, infants are able to both categorize and discriminate a variety of emotional expressions (see Quinn et al., 2011; Nelson, 1987). With this newly acquired knowledge, infants also begin to use emotional information from others to modify their own behaviours. For example, in the standard social referencing paradigms, 12-month-olds have consistently been shown to approach a novel object when a person displays a positive expression towards the object, and avoid it when a negative expression is posed (e.g., Hornik, Risenhoover & Gunnar, 1987; Mumme, Fernald, & Herrera, 1996). Central to the current paper, however, is whether infants can use the emotions expressed by others to infer their future actions and make predictions about how emoters will react to a given situation.

In one of the first studies examining such abilities, Repacholi and Gopnik (1997) presented 14- and 18-month-olds with two food items and assessed which item each infant preferred. Then, the experimenter tasted each food, expressing facial and vocal disgust toward the food item the infant had previously preferred, and happiness toward the item that the infant had previously disliked. The experimenter then asked the infants to give her one of the food items. Only 18-month-olds gave the experimenter what she herself had preferred. Thus, by 18 months of age, infants appear to be able to infer desires from facial and vocal expressions. In a similar study which did not require infants to inhibit their own desires, Repacholi (1998) presented 14- and 18-month-olds with two containers, the contents of which were unknown to

the infants. The experimenter opened the lids, looked inside the boxes and expressed happiness towards one and disgust towards the other. When offered the two boxes, both 14- and 18-month-olds were more likely to initially search into the "happy" box, indicating that when they do not have to inhibit their own desires, infants as young as 14 months are able to use both the experimenter's attentional cues and emotional expressions to predict the nature of the referent that is the focus of her attention.

Other studies have considered whether someone's emotional expressions toward objects is interpreted by infants as a cue about that person's object preference. Using a violation of expectation paradigm, Phillips and colleagues (2002) habituated 12- and 14-months-olds to an actor attending to and expressing positive affect towards an object. On the test trials, the actor either held a novel object (inconsistent event), or the previously "liked" object (consistent event). By 14 months, infants looked longer at the inconsistent event, suggesting that they use gaze and positive emotional expression to predict others' actions. Barna and Legerstree (2005) extended these findings by including both positive and negative emotions in the paradigm and by testing younger infants. Their findings revealed that 9-month-olds are able to use emotions to make predictions about others' subsequent actions on objects. Finally, Hoicka and Wang (2011) recently showed that by 15 months of age, infants can detect a violation when an actor performs an action on an object that does not match her preceding vocal cue.

Challenging the aforementioned findings, Vaish and Woodward (2010) recently attempted to tease apart whether infants were responding to attentional or emotional cues. Adapting Phillips et al.'s (2002) procedure, they included a negative emotion condition, in which the actor expressed disgust or happiness while looking into only one of two cups. They hypothesized that on test trials, infants should look longer when the actress acted in a manner

inconsistent with her emotional displays (i.e., look in Cup B when she was previously happy with Cup A, and look in Cup A when she was previously disgusted with Cup A). Their findings revealed that 14-month-olds looked longer when the actress reached into the unattended cup, regardless of the emotion she had previously expressed toward the other cup. They concluded that infants' predictions about someone's object preference are based on attentional cues alone at the age of 14 months.

The two previously mentioned studies investigated infants' emotional understanding by assessing if they understand that people's emotional expressions are reliable cues of their subsequent goal-directed behaviours. However, another important way in which to examine whether infants can understand emotional expressions is by examining whether they can predict the appropriate emotional reactions *after* witnessing someone who experiences positive or negative events. An extensive literature has shown that infants are very much attuned to emotionally salient events, reacting most prominently when they are exposed to distressing contexts (e.g., Vaish, Grossman, & Woodward, 2008), such as seeing a person in pain after hurting herself (e.g., Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). During these events, infants as young as 8 months will show increasingly observable non-verbal empathic responses, such as concern, hypothesis testing (i.e., deciphering what occurred to the actor), and social referencing (e.g., Roth-Hanania, Davidov, & Zahn-Waxler, 2011; Zahn-Waxler et al., 1992) and later engage in more prosocial behaviors, such as helping and comforting the distressed individual, as early as 14 months of age (e.g., Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Svetlova, Nichols, & Brownell, 2010; Warneken & Tomasello, 2007). Interestingly, one study has demonstrated that 18-month-olds are also more likely to show concerned looks and more prosocial behaviours towards a victim who has lost an object in the

absence of any emotionally distressing cues by that victim (Vaish, Carpenter, & Tomasello, 2009). These last results suggest that infants are more responsive to the valence of events than to the valence of emotional expressions.

While infants react to distressing events with or without emotional cues, it remains unknown if infants can detect whether a person's emotions are justifiable given a particular context. That is, can infants detect when a person's emotional expressions do not match the emotions that are expected following a person's experience? Examining infants' responses to a mismatch between an actor's display of emotion and the valence of the event would allow for a new way to examine whether infants detect the meaning of others' emotions in context; that is, whether infants' reactions are being driven by the context of that emotion, or simply reacting solely to emotional expressions, without placing them in context. To date, only one study has addressed this question. Hepach and colleagues (2012) examined whether 3-year-olds would show concern towards an actor displaying distress after one of three conditions: after the actor received substantial-harm (e.g., catching his finger in the lid of a box), minor-harm (e.g., catching his sleeve in the lid), or no-visible-harm (showing distress "out of the blue"). Children in the substantial-harm condition showed more concern than those in the no-visible-harm condition, but not in the minor-harm condition (Hepach, Vaish, & Tomasello, 2012). Similarly, the researchers examined children's checking behaviours (i.e., looking to see what happened to the actor, assessment of the situation) in all three conditions, and found that children engaged in more checking behaviours in the no-visible-harm than in the substantial-harm condition. Thus, these findings showed that preschoolers are sensitive to the appropriateness of the distress given the context.

While the study by Hepach and colleagues show that preschoolers can detect whether

distress is unjustified in a given context through their empathic responses, it remains unknown whether infants will detect when emotional distress is unjustified versus when it is justified. Furthermore, no research has examined if infants (or older children) react differently when happiness is justified or unjustified. Thus, the main objective of the current paper was to examine whether *infants* would display an experience-emotion causal understanding, through their looking time and empathic behavioural responses. That is, will infants respond the same way to "crybabies" and "pollyannas" (i.e., a person whose emotional expression is unjustified) as to a person whose emotional reaction is justified? Furthermore, will infants' empathic responses demonstrate that they can detect the incongruity of someone's negative emotional reaction following a positive experience? Negative and positive experiences that infants would be familiar with were selected, such as having an object stolen and hurting one's finger. Infants as young as 5 months consider that stealing an object is a negative behavior (Hamlin, Wynn, Bloom & Mahajan, 2011) and by 8 months, infants show empathy to someone who is hurt (Roth-Hanania et al., 2011). In order to provide more extended findings, a positive event condition in which the infant saw a person obtaining a desired object, was also included. Two groups of infants were shown an actor experiencing distressing and positive events, with one group exposed to an actor whose emotional reaction was consistently unjustified (i.e., did not match the event), while the other group saw an actor whose emotional reactions were justified (i.e., always matched the event). It was hypothesized that if infants understand which emotional expressions are associated with each type of event, then 1) the unjustified group would engage in more hypothesis testing than the justified group across all events; 2) the justified group would display more concern for the actor during the negative events (as her emotional reactions were appropriate) than the unjustified group; and 3) both groups of infants would show equal levels of

concern during the positive events. The second objective was to examine the age at which infants develop the ability to detect mismatching experience-emotion associations. Given that past research on the understanding of emotions in infants has shown a developmental change during the second year, the design included both 15-month-olds and 18-month-olds.

Method

Participants

Forty-five 15-month-olds (M = 15.31, SD = 0.65, range = 14.27 – 16.90) and fifty-three 18-month-olds (M = 18.45, SD = 0.25, range = 18.07 – 18.96) participated in this study (39 females, 53 males). Of the 15-month-olds, one child was excluded due to experimental error, leaving a final sample of 44 infants (Unjustified = 21, Justified = 23). Of the 18-month-olds, five were excluded due to experimental error, leaving a final sample of 48 infants (Unjustified = 24, Justified = 24).

Materials

An apparatus resembling a puppet theatre was used to display the experimenter (E1) acting out four events (Spoon, Pegs, Cup, and Ball) live in front of the infants. Infants observed E1 from a child seat placed 90 cm from the display. The events included the following materials: a plastic orange food bowl and a plastic purple spoon, a yellow and orange plastic drum with a yellow drum stick, a colorful wooden peg and hammer set, and a colorful ball. Above E1's head was a camcorder (Panasonic HDC-TM900) focused on the infants' face to record their looking times and behaviours.

Stimuli and Procedure

Parents initially signed consent forms and were then invited with their infants into the

testing room. Infants were seated in a child's seat attached to a table and parents were asked to sit behind and to the left of the infant. They were instructed to remain neutral and keep their eyes on E1 so as to maintain the infants' attention on the display. Between trials, a screen (controlled by E2) was lowered, a small bell was rung to attract the infants' attention toward the stage, and then E2 raised the screen to begin the next trial.

During each trial, infants saw E1 on the left side of the stage. Each trial lasted 20 s and included two phases: a familiarization phase during which the infant saw E1 interacting with the toys, with E1 positioned slightly angled towards the toys (5 s) followed by a positive or negative event experienced by E1 (5 s), and E1 expressing the target emotion (happiness, sadness, or pain, based on Ekman and colleagues' guidelines, 1972) while looking downwards (10 s) without any vocalizations or movements. E1 looked downwards so as to not attract the infants' attention to her face and eyes, as well as to reduce distress for the infants during the negative facial expressions. Each infant saw all four events, which included two positive events (E1 received objects) and two negative events (an object was taken away from E1 or E1 pretending to hurt herself). Positive and negative events alternated across the four trials, and the order of the trials was counterbalanced across participants.

The two positive events included Play-Drum and Play-Ball. During the Play-Drum trial, the infant watched as E1 pretended to beat a toy drum with an invisible drumstick. Her face was neutral and gazed at the drum set. Then E2's gloved hand entered from the right side of the stage and handed E1 the drumstick. E1 then exclaimed "Ah!" while remaining neutral, froze with her hand above the drum set, turned her head towards the infant (gazing downwards), and showed either a happy (justified) or sad (unjustified) facial expression without vocalizations (see Figure 1). During the Play-Ball trial, infants watched as E1 moved her empty cupped left hand up and

down while expressing no emotion. E2's gloved hand then emerged and handed E1 a ball, at which point E1 exclaimed "Ah!" while remaining neutral, froze her hand holding the ball, turned her head towards the infant (gazing downwards) and froze with an expression of happiness (justified) or pain (unjustified) without vocalizations.

The two negative events included Object-Loss (Spoon) and Hurt-Finger (Pegs). During the Object-Loss trial, E1 dunked her spoon into a food bowl and brought the spoon to her mouth twice. During the third dunk, E2's gloved hand entered and took away E1's spoon. While remaining neutral and freezing her hand above the bowl, E1 exclaimed "Oh!", turned her head towards the infant (gazing downwards), and expressed either sadness (justified) or happiness (unjustified) without vocalizations. Finally, during the Hurt-Finger trial, E1 pretended to hammer a peg while holding the hammer in her right hand and a peg in her left hand. E1 then pretended to hit her left thumb, exclaimed "Ouch!" while remaining neutral, held her left thumb, turned her head towards the infant (gazing downwards), and expressed either pain (justified) or happiness (unjustified) without vocalizations.

Coding and Reliability

Infants' empathic behaviours were coded based on the coding scheme developed by Zahn-Waxler and colleagues (1992) with adaptations to account for the context and age of the infants. Two codes for the infants' empathic-related responses were used for the purposes of the current study: Concern for victim and Hypothesis Testing. Concern for victim was coded on a 3-point scale (0 = none; 1 = facial concern only (e.g., furrowed or raised eyebrows in concern, open mouth, widened eyes); 2 = facial concern with vocalizations (e.g., same as 1, but with vocalizations such as "Oh!" or calling to the parent in the room with concern or pointing to the actor). Hypothesis Testing was coded on a 4-point scale: 0 = none; 1 = looks back and forth

between face and object or hands at least twice, in an attempt to decipher the distress; 2 = looks back and forth between face and object or hands more than twice in a more sophisticated attempt to decipher the distress than 1; 3 = looks back and forth between face and object at least twice, with a back and forth look towards the parent on the room OR looks back and forth between parent and the actor at least twice, in a sophisticated attempt to decipher the distress. Looking behaviours, which have consistently been considered a primary variable for hypothesis testing as a sign of very young children's attempts to attribute cause (e.g., see Zahn-Waxler et al., 1992, Knafo et al., 2008; Hepach et al., 2012) were extended as a primary code for hypothesis testing due to infants' limited verbal abilities. Infants' total looking times at the stage, which included the actor's face and hand, during the familiarization phase (i.e., when the event occurred) and the test trials (i.e., when the actor was expressing the target emotion) were also coded for each trial. Infants' looking times were coded using INTERACT 8.0.

Each participant's responses were coded by the primary investigator. In order to keep the investigator blind to the hypotheses, all looking times for the entire sample were coded first, which allowed each event to be divided into the familiarization and test trials. Then, the investigator coded the 10 s test trial which did not include the "Oh!" or the "Ah!" vocalization of the familiarization phase (and thus the scene and condition remained blind to the coder). To establish inter-rater reliability, 35% of the sample (n = 33) was coded by a second independent observer who was blind to the hypotheses and the condition. The kappas for the concern variable were $\kappa = 1.00$ for the negative events and $\kappa = .90$ for the positive events, while the hypothesis testing variable kappas were $\kappa = 1.00$ for the negative events and $\kappa = .98$ for the positive events. Pearson correlations were calculated to determine the inter-rater agreement for the looking times measures. The inter-rater agreement for looking times at the face was $r = .97$ during the negative

events and $r = .96$ during the positive events. The two coders also showed high agreement for looking times at object-hand, with $r = .92$ for the negative events and $r = .95$ for the positive events, all highly significant ($ps < .001$).

Results

Infants' scores on the Play-Drum and Play-Ball trials (positive events) were correlated for both concern ($r = .48$, $p < .01$) and hypothesis testing ($r = .28$, $p < .01$), and thus averaged to create two separate variables: *Concern during positive events*; and *Hypothesis Testing during positive events*. Similar variables were created for the negative events, as the Object-Loss and Hurt-Finger trials were correlated for concern ($r = .50$, $p < .001$) and hypothesis testing ($r = .47$, $p < .001$). Preliminary analyses revealed that the concern variable for the positive and negative events was positively skewed. Therefore, an additive (+1) transformation was conducted on the two concern variables (*Concern during positive events* and *Concern during negative events*) (added 1 to every data point) and was used for the remaining analyses. Independent-Samples *T*-tests revealed that gender was unrelated to all of the outcome measures (range $t = -.854 – 1.53$, $p = .13 – .82$); as a result gender was not considered in the analyses.

To examine whether infants were attending to the scene during the familiarization phase, infants' total looking time at the scene (i.e., looking at the face, objects and hands) was calculated in an Age (15 and 18 months) X Condition (Justified/Unjustified) ANOVA. No significant differences emerged, in that infants in both conditions and across both age groups, looked at the scene during the familiarization trials the same high amount of time out of 10 s ($M = 9.45$ s, $SD = .50$ s and $M = 9.43$ s, $SD = .80$ s, *ns.*, for justified and unjustified conditions, respectively). During the test trials, infants' looking times at the scene were divided into their looking times at the actor's Face and at Objects-Hand, and were analyzed using an Age x

Condition (Justified/Unjustified) x Area (Face/Object-Hand) mixed ANOVA. A significant main effect of area emerged (F (1, 88) = 48.48, $p < .001$, $\eta^2 = .36$). Overall, infants looked at the actor's face more than at the objects-hand (Face: M = 5.10 s, SD = 1.33 s, Object-Hand: M = 3.43 s, SD = 1.23 s, $p < .001$). Results also revealed a trend for a three-way interaction, F (1, 88) = 3.58, $p = .06$, $\eta^2 = .04$). Older infants in the unjustified condition looked at the objects-hand more than those in the justified condition (Unjustified: M = 3.86 s, SD = 1.35 s, Justified: M = 3.16 s, SD = 1.43 s, $p = .05$), but no difference emerged in looking times at the face (Unjustified: M = 4.88 s, SD = 1.5 s, Justified: M = 5.51 s, SD = 1.40 s, *ns.*). No such differences were observed in the younger group.

Given the non-parametric nature of the hypothesis testing and concern variables, Mann-Whitey U tests were used to analyze the effects of Condition for the positive and negative events for both age groups separately**.** For the 15-month-olds, infants in the justified and unjustified conditions showed similar levels of hypothesis testing during the negative events (U = 227.5, *ns.*). Similarly, no significant differences were found between the justified and unjustified groups' levels of hypothesis testing during positive events (U = 227.5, *ns.*). In contrast, at 18 months, the findings revealed that the unjustified group showed more hypothesis testing during the negative events (U = 105 $p < .001$) than the justified group. Likewise, the unjustified group showed more hypothesis testing during the positive events (U = 139, $p = .002$) than the justified group (see Figure 2).

With regards to the concern variables, results revealed that 15-month-old infants in the justified condition showed more concern during the negative events than those in the unjustified condition (U = 152.5, $p = .025$), while the unjustified group showed more concern during the positive events than the justified group (U = 157.5, $p = .033$). For the 18-month-olds, results

showed that the justified group showed more concern during the negative events than those in the unjustified condition ($U = 175.5$, $p = .013$). However, the reverse was not true: infants in the unjustified group did not show more concern during the positive events than the justified group ($U = 241.5$, *ns.*) (see Figure 3).

Discussion

The present study examined infants' emotion understanding by investigating whether they recognize inconsistencies between emotional displays and the valence of events in which a person has been involved, providing two important contributions to the literature. First, our findings provide new insight on the development of theory of mind during the infancy period (Poulin-Dubois, Brooker, & Chow, 2009; Sodian, 2010). More specifically, a developmental progression was observed in infants' abilities to link emotional expressions typically associated with emotion-inducing events. While 15-month-old infants did not engage in more hypothesis testing when the emotion did not match the context, older infants in the unjustified group displayed more hypothesis testing than those in the justified group, regardless of whether the event was positive or negative, supporting our first hypothesis only for the older infants. These findings were also confirmed through the analyses of looking times. Younger infants in both conditions did not differ at what aspects of the scene they were looking at during the test trials. However, although 18-month-olds in both conditions looked at the face a similar amount of time, it was only those in the unjustified condition who looked more often at the source of the emotional display (i.e., object and the actor's hand).

Notably, in order to detect inconsistencies between facial expressions and experiences, infants must have some implicit understanding of the underlying emotional states that are associated with experiences such as losing or receiving an object. While infants change their

behavioral responses when someone shows signs of pain (Hamlin et al., 2011; Roth-Hanania et al., 2011) or modify their behavior following someone's facial expression (Hornik et al., 1997; Mumme et al., 1996), the understanding of the link between a facial expression *following* an emotional experience, that is understanding the appropriateness of that emotion, is an ability that has yet to develop at 15 months. The developmental pattern observed in the current study is in accord with previous (limited) research that has shown developmental changes in infants' processing of emotional expressions with regard to an occurring event around the middle of the second year (e.g., Repacholi & Gopnick, 1997; Repacholi, 1998; Vaish & Woodward, 2010). The current findings are also consistent with those of Hepach and colleagues (2012) with preschoolers, showing that when individuals' emotional reactions are inconsistent with the context, *18-month-old infants* will also check back and forth between the actor and the source of distress in what seems to be an attempt to try to "figure out" what happened. Our study provides the first evidence that as early as 18 months infants respond differently to others' emotional reactions depending on the credibility of that distress with respect to the context.

Our findings diverge with those from Philips and colleagues (2002) and Barna and Legerstee (2005), who showed that 9- to 14-month-old infants can encode an emoter's desires towards an object and predict if they will further act on that object. However, an important methodological discrepancy must be noted between the current study and the two aforementioned ones: the fact that infants never observed the actor directly act on the object in both Philips and colleagues' (2002) and Barna and Legerstee's (2005) studies and yet looked longer when the emotion-action sequence was inconsistent renders the interpretations as only indirect evidence for infants' emotion understanding. In fact, another way the results could be explained in both studies is by the type of associative learning mechanisms suggested by several

researchers (e.g. Csibra, 2003; Perner & Ruffman, 2005; see Paulus, 2011, for a discussion). Indeed, Vaish and Woodward (2010) provided evidence that it is attentional cues and not emotional cues that drive 14-month-old infants' reactions to an actor's unexpected object choice. The current study provides more substantial direct evidence as the infants watched a live presentation of an actor undergoing an emotional experience followed by an emotional expression, rendering the findings more generalizable to everyday experiences.

The second contribution of the current paper concerns the development of empathy during the second year of life. Our findings demonstrate that as early as 15 months, infants react with more concern when an actor displays pain or sadness rather than happiness after being hurt or having an object taken away. However, when the same negative facial expressions followed positive events (unjustified condition), infants of that age continued to react with concern to the negative face and ignored the mismatch between the event experienced by the emoter and her emotional expression. Thus, regardless of condition and event, younger infants showed more concern in the presence of the actor's negative expression even when triggered by a positive experience. In addition to supporting the past literature on the negativity bias in young children (see Vaish et al., 2008 for a review), these findings are also consistent with the literature on empathy development in infancy, demonstrating that young infants will react with concern when watching someone in pain (e.g., Roth-Hanania et al., 2010; Zahn-Waxler et al., 1992). More importantly, however, the current findings suggest that 15-month-olds' responses to negative emotional expressions are driven by bottom-up processes, as they focus on the emoter's face rather than on the emotional valence of the event at this age. In contrast, 18-month-old infants' behaviors are also guided by a top-down strategy with respect to their responses of concern, as they take into account the appropriateness of the emoter's expressive response given the valence

of her recent experience. While infants in the justified condition showed more concern during the negative events than those in unjustified group, they did *not* show more concern during the positive events, supporting our second and third hypotheses. These findings are in line with those from Hepach and colleagues (2012) with preschoolers, proposing that similar to 3-year-olds, 18-month-olds can also take into consideration the event that generated the emotional display, rather than simply react to the actor's face.

In sum, our study is the first to examine *infants'* reactions to a mismatch between the positive and negative valence of people's experiences and their subsequent emotional reactions to these experiences. The present design is a new way to investigate infants' complex understanding of how emotional valence of events is associated with subsequent behaviours. Future studies should extrapolate from these findings and examine whether infants who are exposed to unreliable individuals in the emotional domain will be affected in their willingness to help or learn from that individual. Recent research has shown that the reliability of an actor's emotional referencing affects infants' gaze following, imitation, and attribution of beliefs to that actor as early as 14 months of age (Poulin-Dubois, Brooker, & Polonia, 2011; Chow, Poulin-Dubois & Lewis, 2008; Poulin-Dubois & Chow, 2009). However, in these emotional referencing situations infants only needed to react to a violation of their expectations (finding a toy) but did not need to assess the congruence between the valence of the person's experiences and the valence of that same person's emotional reactions. While it has been shown that preschoolers are more likely to act prosocially toward reliable individuals (Hepach et al., 2012), the impact of an emoter's reliability on young infants' later willingness to help that emoter remains unknown. Thus, future studies can use the present paradigm to examine how infants' experience with reliable or unreliable individuals in the emotional domain impacts their subsequent prosocial

behaviours, as well as their attribution of intentions, desires, and beliefs.

Figure 1. Events shown during the Play-Drum trial. During the familiarization phase, (a) the actor pretended to hit the drum with a drumstick then (b) E2 hands the actor the drumstick and the actor expressed "Ah!" before taking the drumstick. During the test phase, the unjustified group saw the actor express sadness for 10 s (c) while the justified group saw the actor express happiness for 10 s (d).

FAMILARIZATION

(a) **(b)**

TEST

(c) **(d)**

Figure 2. Mean Hypothesis Testing scores for the Justified and Unjustified groups as a function of type of event for each age group.

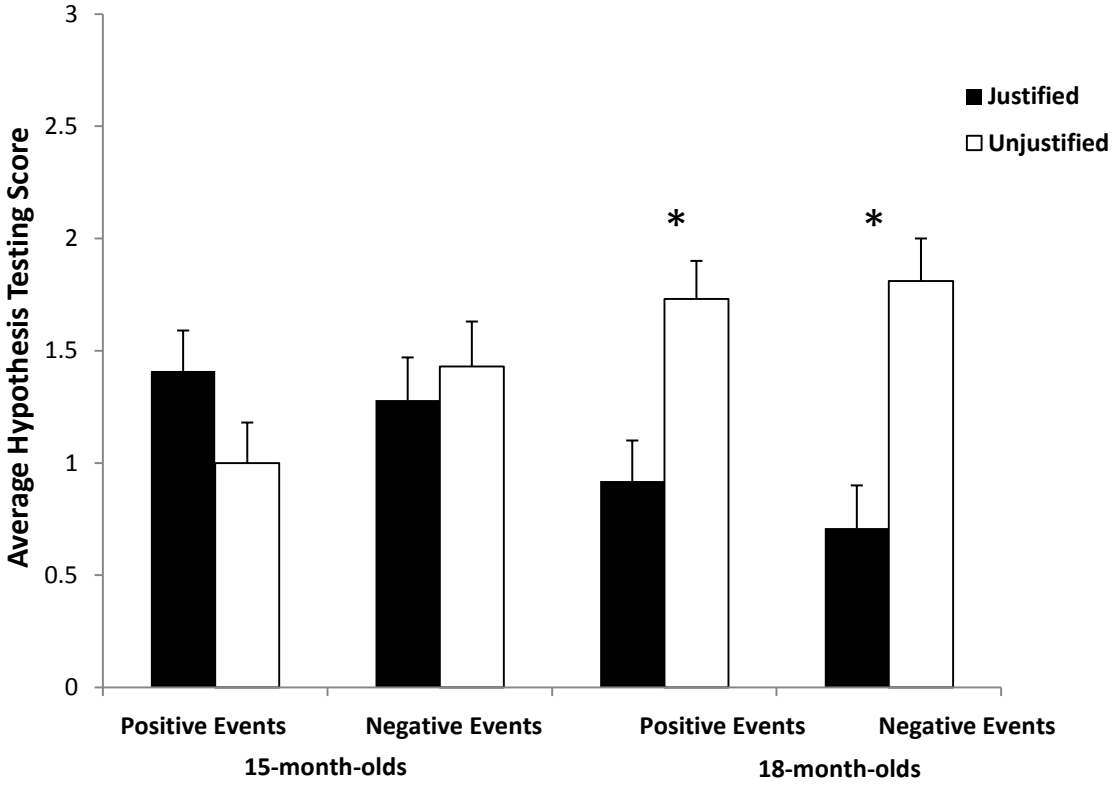
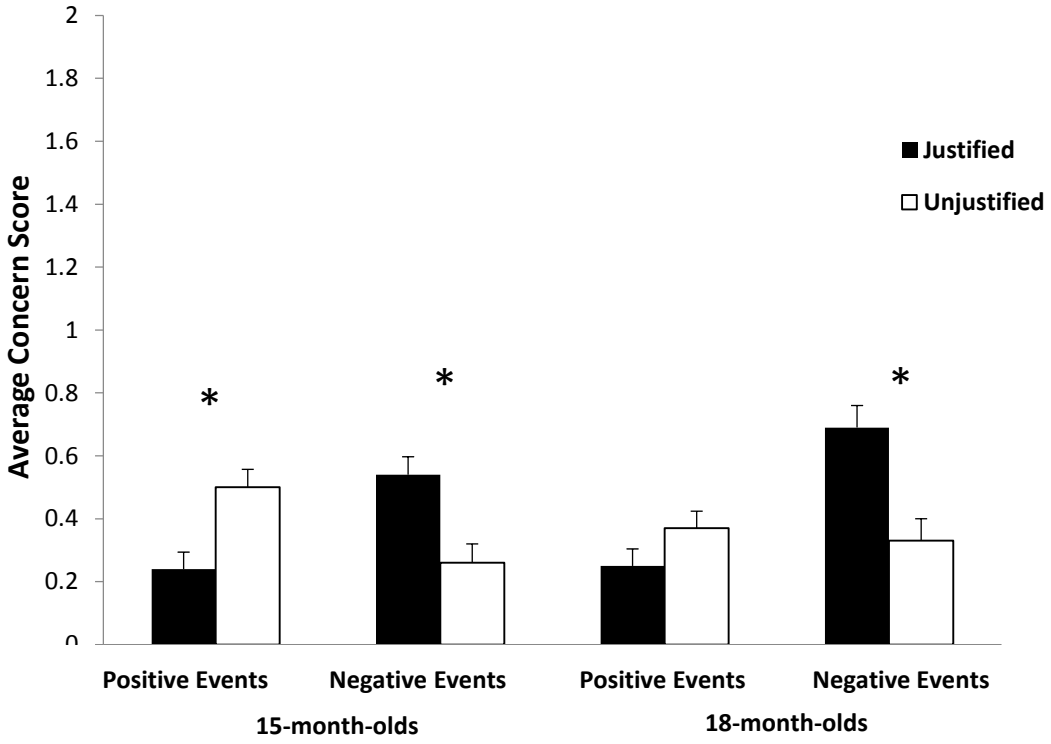


Figure 3. Mean Concern scores for Justified and Unjustified groups as a function of type of event for each age group.



Modifications between Studies 1 and 2

Given the findings from Study 1, only 18-month-old infants were tested in Study 2 as no significant findings emerged with the 15-month-olds in Study 1. In addition, during the exposure phase, the presentation of the stimuli was slightly modified in order to rule out any novelty effects which may occur due to the introduction of novel stimuli. Therefore, during each of the 4 test trials of the exposure phase, all of the relevant stimuli to that particular trial were present at all times on the stage in the infant's line of sight, during both the familiarization and test periods of the trial.

Chapter 3

"Are you *really* sad?" Infants show selectivity in their behaviors towards an unjustified emoter

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"Are you *really* sad?" Infants show selectivity in their behaviors towards an unjustified emoter

Children constantly observe and interact with others in order to gain knowledge about the world (e.g., Csibra & Gergely, 2009; Harris & Koenig, 2006). Since not all individuals have accurate or relevant knowledge about a given topic, children must be selective in whom they choose to learn from (Harris, 2007). Thus, understanding the factors that may contribute to the development of the ability to selectively choose whom to learn from becomes critical in understanding the underlying factors in children's learning skills. Evidence for selective trust has begun to be documented during the infancy period. For example, 14-month-olds prefer to imitate an irrational action from a model who properly uses a familiar object (Zmyj, Buttelmann, Carpenter, & Daum, 2010), 16-month-olds look longer at a person who mislabels objects (Koenig & Echols, 2003), and by 18 months, infants are more likely to imitate an irrational action and learn new words from an accurate rather than an inaccurate speaker (Brooker & Poulin-Dubois, 2013).

While these studies used object labeling and object use as a source of accuracy, previous work shows that it is also possible to examine children's sensitivity to "accuracy" in the emotional domain, by manipulating an actor's emotional cues. For example, Hepach, Vaish, and Tomasello (2012) had 3-year-olds watch an adult consistently express sadness in either an appropriate (harm), a neutral (no visible harm), or an inappropriate (minor harm) context. Although the original goal of their study was to document the conditions required for children to exhibit empathic responses, they also found that children were more likely to show checking behavior (i.e., to decipher what occurred) when the sad reaction mismatched the context (minor harm) or when the children were unaware of what had occurred (no-visible harm), compared to when they saw appropriate distress following harm (harm condition). They were also faster to

help the justified emoter than the unjustified emoter in a subsequent prosocial task. In a more recent study, 18-month-old infants, but not 15-month-old infants, showed more checking behaviors when they observed an actor exhibiting an incongruent emotional reaction (happiness or sadness) after being exposed to an emotional event (Chiarella & Poulin-Dubois, 2013). More specifically, infants observed an individual displaying pollyanna-type behaviors (i.e. responding positively to having an object taken away), and crybaby-type behaviors (responding negatively to having an object given to them), and were able to detect the emotional incongruence of these responses. Interestingly, another recent study reported that infants as young as 14 months show increased pupil dilation when they witness an actor express emotions that are incongruent with the valence of their ongoing actions (e.g., patting a toy tiger with an angry expression), suggesting some lower level processing of sympathetic arousal (Hepach & Westermann, 2013). Similarly, 10-month-olds have been shown to be sensitive to a cartoon's incongruent facial reactions after either successfully or unsuccessfully achieving a desired goal (e.g., sadness after successfully jumping over a barrier) (Skerry & Spelke, 2014). These studies together show a developmental progression in the ability to detect goal-emotion mismatches as well as desire-emotion mismatches.

Infants' selective behaviors toward individuals who demonstrate justified or unjustified emotional responses have just started to be examined in the context of the selective trust literature. In the first investigation on infants' behavior as a function of emotional accuracy, Chow, Poulin-Dubois and Lewis (2008) exposed 14-month-olds to either an accurate emoter, who expressed positive affect while looking inside a box that held a toy, or an inaccurate emoter, who expressed positive affect while looking inside an empty box. Then, infants watched the same adult gaze behind a barrier. Infants were more likely to follow the gaze of the accurate

adult looker behind the barrier (Chow et al., 2008). In a task using similar accurate and inaccurate conditions, infants watched the same adult turn on a push-on light in an unconventional manner, using her forehead to illuminate the light (Poulin-Dubois, Brooker, & Polonia, 2011). In this case, infants were more likely to imitate the unconventional action if the adult had previously exhibited appropriate emotional behavior while looking inside the container. These findings suggest that by 14 months, infants are selective in whom they chose to imitate and whose gaze they choose to follow. Taken together, the selective trust literature during the infancy period suggests that the ability to select certain individuals over others is present earlier than what was once thought. This in turn has implications for our understanding of how infants learn, trust, and how they are guided by others. Although these studies have provided a starting point for this area of research, there is still much to be learned concerning the effect of a model's accuracy or reliability on infants' prosocial behaviors.

An important and well-established finding in the literature is that infants begin to engage in prosocial behaviors during the second year of life (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Warneken & Tomasello, 2007). For example, infants as young as 14 months demonstrate instrumental prosocial behaviors (Warneken & Tomasello, 2007), and by 18 months they add empathic helping to their prosocial repertoire (Svetlova, Nichols & Brownell, 2010). As mentioned before, 3-year-old children are more likely to act pro-socially towards an adult whose emotional response was previously justified with regards to context (Hepach et al., 2012). However, it remains unknown whether displaying an inappropriate emotional reaction will decrease *infants'* spontaneous willingness to help. Importantly, one of the aims of the current study was to examine infants' selective helping behaviors towards emotionally unjustified individuals across a wide range of helping contexts, including both non-emotional, goal-oriented,

instrumental helping (Warneken & Tomasello, 2007) *and* emotional, empathic helping (Svetlova et al., 2010). We set out to answer whether infants' willingness to help an emotionally unjustified individual is *specific* to a context where requests for help are expressed through emotional expressions of distress, or whether unreliability can affect instrumental helping, an action known to be indiscriminate in very young children.

Another major focus of the current study was to examine *the extent to which* infants' responses are selective towards an individual who has previously expressed sadness during an inappropriate context. To do so, we examined whether infants' exposure to an emotionally unjustified individual impacts their responses towards her (i.e. emotional referencing) during other tasks. Infants have been shown to use other's emotions to guide their behavior in ambiguous situations as early as 12 months of age **(**Hornik, Risenhoover, & Gunnar, 1987). Moreover, in an emotional referencing paradigm, Repacholi (1998) showed that when presented with two containers, 14- and 18-month-olds are more likely to initially search the container previously associated with a "happy" expression, compared to the container associated with a "disgust" emotional expression. This suggests that infants as young as 14 months are able to use both the experimenter's attentional cues and emotional expressions in order to predict the nature of the referent that is the focus of her attention. However, it remains unknown whether infants' experience with an emotionally unjustified individual would impact their powerful tendency to first look inside the box associated with positive emotions.

As a major objective of the present study was to examine the extent of 18-month-olds' selective trust, infants' willingness to engage in learning from the emoter was investigated using a classic deferred imitation task for assessing episodic memory in infants (Bauer & Mandler, 1989). Examining deferred imitation was deemed important in order to rule out a simple "halo"

effect, that is, a negative bias toward the unjustified model or a positive bias toward the justified model (who always received the non-target object in the reliability exposure phase). In contrast to the rational imitation task used in previous research on selective trust (Poulin-Dubois et al., 2011; Zmij et al., 2010), the deferred imitation task does not require infants to choose between the models' novel action and a conventional action. Rather, the Bauer and Mandler (1989) task simply requires the infant to replicate a 3-step action produced by the actor. The inclusion of this task (as well as the instrumental helping task) allowed for an investigation of whether emotional unreliability might influence infants' selective behavior in non-emotional contexts.

In sum, there were three main objectives to the current study. The first objective was to determine whether an adult's unjustified, negative emotional responses would impact 18-month-old infants' prosocial behaviors toward her in the absence (instrumental helping) *and presence* (empathic helping) of signs of emotional distress. The second objective was to examine the extent of the effect of unjustified emotional behavior on infants by testing its impact on infants' selective behaviors beyond the emotional domain (i.e., on instrumental helping and deferred imitation). Finally, we attempted to replicate recent findings showing that infants can identify an emotionally inaccurate person. This was previously shown through increased looking times, increased hypothesis testing (i.e., checking behaviors), and decreased empathic concern towards someone expressing negative emotions following a positive experience (Chiarella & Poulin-Dubois, 2013). As the detection of unjustified, positive emotional expressions had already been shown in infants of this age (Chiarella & Poulin-Dubois, 2013), this condition was not included because a critical follow-up task (empathic helping) measured infants' responses to expressions of sadness, and therefore the manipulation of "accuracy" in expressing sadness was an essential component of the design.

Thus, it was hypothesized that infants would not consider an unjustified individual's emotional expressions as reliably reflecting his or her needs, and that infants would exhibit reduced helping behaviors towards that person when helping was requested with emotional signals of distress. In addition, it was hypothesized that when exposed to someone expressing happiness and disgust towards two containers, infants in the justified group would be more likely to first look into the "happy" container. In contrast, because infants in the unjustified group watched the actor express a negative emotion following a positive experience, it was hypothesized that they would be more likely to first look into the "disgust" container, as they would expect the actor's negative expressions to follow a positive experience. Finally no differences were expected between the justified and unjustified groups on the instrumental helping and deferred imitation tasks.

Method

Participants

Eighty-six 18-month-old infants (M = 18.2 months, SD = .68, range = 17.1-19.6 months) participated in the current study. In order to be included in the final sample, infants were required to watch 3 out of the 4 reliability exposure trials. Thirteen infants did not meet the inclusion criterion due to fussiness (0/4 trials n = 2, 1/4 n = 3, 2/4 n = 8; Justified: n = 7, Unjustified: n = 6), leaving a final sample of 73 infants (Justified = 37, Unjustified = 36; 46 males, 27 females).

Materials

During the reliability exposure phase, an apparatus resembling a puppet theater was used to display the experimenter (E1) acting out four live events. Infants observed E1 from a child seat placed 90 cm from the display. A video camera was placed underneath E1 that focused on infants' faces to record looking times and behaviors. During the interactive tasks, the infants sat

in a highchair at a table directly across from E1. A split-screen camera angle focused on the infant's face, while a second camera recorded the whole scene. The emotional referencing task included two colored boxes with lids, a plastic cockroach, and a toy figurine. The *Book Stacking* (instrumental helping) task was administered using three thin sheets of wood painted blue to resemble books. These wooden "books" were exact replicas of those used in Warneken and Tomasello's study (2007). The *Blocks* (instrumental helping) task consisted of 6 differently colored plastic shapes, a red container, and a pair of plastic tongs. For the empathic helping tasks, a pair of red, cotton gloves and a brown teddy bear were used. The *Rattle* trial of the imitation task included two plastic blue containers (which fit into one another) and a small rubber ball. The *Teddy-to-Bed* trial consisted of a purple teddy bear, a pink, toy crib, a small, felt pillow, and a cover.

Design

Each infant was randomly assigned to either the justified or unjustified condition. All infants saw four different trials of goal-directed behavior for which E1 needed a tool: Play-Drums, Play-Pegs, Eat-Spoon and Play-Ball (all trials were counterbalanced across participants). Each trial lasted 20 s and included two phases, a familiarization (10 s) and a test phase (10 s). During the familiarization phase, infants watched as E1 received an appropriate (if they were in the unjustified condition) or inappropriate tool (if they were in the justified condition), and during the test phase, E1 always expressed sadness (based on Ekman, Friesen, & Ellsworth, 1972) once she received her tool. Following the reliability exposure phase, infants in both groups engaged in the same 4 interactive tasks with E1. They remained seated in a high chair that was placed in front of a table across from E1. There were four counterbalanced orders for the interactive tasks.

Procedure

Infants and their parents first spent a brief period of time in a waiting room in order to familiarize themselves with the two experimenters. Parents were asked to sign a consent form and complete a short demographic questionnaire. Infants' expressive vocabulary was measured using the Level II short form of the MCDI: Words and Sentences, a parent report checklist of language comprehension and production developed by Fenson et al. (2000). They were then invited into the testing room. Infants were seated in a high chair and parents were asked to sit behind and to the left of the infants. They were instructed to remain neutral and keep their eyes on the stage so as to maintain the infants' attention on the events. Between trials, a screen (controlled by E2) was lowered and a small bell was rung to attract the infants' attention toward the stage at the onset of each trial.

Reliability exposure. On each trial, E1 was positioned to the left side of a "puppet theater" stage. She had one object located in front of her, and two objects located on the right hand side of the stage, blocked from her view by a small barrier located in the center of the stage. In the Play-Drum familiarization phase, E1 mimicked beating a toy drum with an invisible drumstick, and then sighed audibly in frustration before peering over the barrier at the two objects on the right hand side of the stage. These objects consisted of a drumstick (appropriate object) and a brush (inappropriate object). E1 repeated this sequence of actions twice. E2's gloved hand then entered the scene through the right hand side of the stage, and handed E1 either the drumstick (unjustified condition) or the brush (justified condition). While her facial expression remained neutral, E1 then exclaimed "Ah" (unjustified condition), with a higher pitch to mimic a pleasant tone, or "Oh" (justified condition) with a lower pitch to mimic disappointment, before taking the object from E2. Vocalizations were included during the exposure phase in order to increase the

realistic nature of the scene, as infants often hear people vocalize as they express emotions after a positive or negative event. In the Play-Pegs familiarization phase, E1 mimicked hammering a set of pegs twice, sighed, and then peered over the barrier at the two objects, which included a hammer (appropriate) and a cup (inappropriate). Then, E2 handed E1 either the hammer or the cup, again followed by E1 exclaiming either "Ah" or "Oh" before taking the object. In the Eat-Spoon familiarization phase, E1 twice mimicked eating from a bowl of rice, again sighing and looking over at the objects available, including a spoon (appropriate) and a wooden block (inappropriate). E2's gloved hand then handed E1 either the spoon or the block, with E1 exclaiming either "Ah" or "Oh". In the Play-Ball familiarization phase, E1 twice mimicked bouncing a ball up and down, sighed, and then peered over the barrier at the two objects which included a ball (appropriate) and a plastic bowl (inappropriate). E2's gloved hand then handed E1 either the ball or the bowl, followed by E1 exclaiming "Ah" or "Oh".

During all test phases, E1 expressed sadness as she held the object received from E2 in her left hand, which was extended towards the right side of the stage. E1 looked downwards without any vocalizations or movements (10 s) in order to avoid attracting the infant's attention to her face and eyes, as well as to reduce infants' arousal during the negative facial expressions. Familiar scenarios were specifically chosen to reflect events that infants would have had prior experience with, so that it would be easy for them to identify which object from the pair would be the "conventional" choice.

Coding of the reliability exposure. The percentage of looking times at the stage (which included the actor's face and hand) during the familiarization phase (i.e., when the event occurred) and the test phase (i.e., when the actor was expressing the target emotion) were coded for each trial using INTERACT 8.0 (Mangold, 2010). Two other variables, hypothesis testing

and concern, were coded based on adaptations of the coding scheme developed by Zahn-Waxler and colleagues (1992). Hypothesis testing was assessed through infants' level of checking responses to the event. Looking behaviors are considered a primary variable for hypothesis testing as they appear to be a sign of very young children attempting to attribute a cause to a particular event (e.g., see Zahn-Waxler et al., 1992, Knafo et al., 2008; Hepach et al., 2012). Hypothesis testing was coded on a 4-point scale: 0 = none; 1 = looks back and forth between face and object or hands at least twice, in an attempt to decipher the distress; 2 = looks back and forth between face and object or hands more than twice in a more frequent attempt to decipher the distress than 1; 3 = looks back and forth between face and object at least twice, with a back and forth look towards the parent in the room OR looks back and forth between parent and the actor at least twice, in a more frequent attempt to decipher the distress than 1 or 2. Concern included infants' observable preoccupied responses. Given the nature of the exposure phase (the sadness expression was only 10 s in length) and that infants were seated in a high chair rather than standing, the concern variable coding was reduced from the original 5-point scale (which included different intensities and lengths, in seconds, of concern; Zahn-Waxler et al., 1992) to a 3-point scale: 0 = none; 1 = facial concern only (e.g., furrowed or raised eyebrows in concern, open mouth, widened eyes); 2 = facial concern with vocalizations (e.g., same as 1, but with vocalizations such as "Oh!" or calling to the parent in the room with concern or pointing to the actor). Hypothesis testing and concern were not mutually exclusive categories, and thus children could engage in both behaviors simultaneously.

Interactive tasks.

Instrumental helping tasks. Two instrumental helping tasks adapted from Warneken and Tomasello (2007) were administered. In the *Book Stacking* task, E1 demonstrated the stacking of

three blue, wooden "books" on top of one another. During the test phase, E1 pretended to drop the fourth book next to the pile while exclaiming "Oh", and remained neutral for 30 s through a series of prompts (looking at the book, gazing back and forth from the infant to the book, and ending with, "Oh no! It fell!"). This was repeated for 2 more test trials. In the *Blocks* task, E2 quietly entered the room and sat behind the infant. E1 then demonstrated placing three blocks into a bucket using plastic tongs. After E1's demonstration, E2 placed one block in front of the infant. While remaining neutral E1 engaged in a series of prompts to encourage the infant to hand her the block (reaching towards the block using the tongs, gazing back and forth from the block to the infant, and ending with, "Oh no! I can't reach it!"). The *Blocks* task included 3 test trials.

Coding of the Instrumental Helping Tasks. During the *Books Stacking* task, infants were given a score of 1 if they helped at any point during the 30 s trial, either by placing the book on the stack or by handing the fallen book to E1 (total score of 3). During the *Blocks* task, infants were given a score of 1 if they handed or pushed the block towards E1 at any point during the 30 s trial (total score of 3). The *Book Stacking* and *Blocks* tasks were counterbalanced across participants.

Empathic helping tasks. Two empathic helping tasks were adapted from Svetlova et al. (2010). For the *Glove* task, E1 showed the infant a pair of red gloves and displayed positive affect by saying, "Look! These are my favorite gloves! They keep me warm!" E1 then rubbed her hands together while saying "Brrrr!" before putting on the gloves. E1 then handed the infant one of her gloves and said, "Here, this one's yours!" E2 then entered the room, put on E1's remaining glove, rubbed her hands together and walked out of the room. In the *Bear* task, E1 showed the infant a teddy bear while displaying facial and vocal expressions of happiness by

saying, “Look! This is my favorite bear!” while hugging the bear. She then handed the bear to the infant and said, “Here you can play with it!” E2 then entered the room and pretended to whisper something sad to E1, by cupping E1’s ear in her hand and hissing in different tones for 3-5 seconds. She then left the room. For both tasks, E1 gasped loudly as E2 vacated the room, and went through a series of 5 s prompts to encourage the child to help her (see Table 1). The *Glove* and *Bear* tasks were counterbalanced across participants.

Coding of the Empathic Helping Tasks. Infants were given a score from 0 (no help) to 8 (gave the bear/glove during E1’s first prompt), with higher scores indicating that infants needed less overt, verbal requests for the bear/glove from E1 (i.e., needing only the emotional cues) before handing the bear/glove to E1 (see Table 1).

Emotional referencing. The emotional referencing task was modeled after Repacholi (1998). After a brief warm-up trial, E1 placed two round opaque containers with lids on the table, out of the infant’s reach. E1 shook the containers to indicate that they were full, and placed one container to her left and one to her right. E1 always began by turning to the container on her left. During the “happy” container trial, E1 opened the lid, tilted the container towards her and exclaimed, “Wow! I found something! Wow I can see it! Wow!” (10 s), accompanied by happy vocalizations and facial expressions, and then replaced the lid. E1 then turned to her right, opened the lid and said, “Ew! I found something… Ew! I can see it... Ew!” (10 s), to the “disgust” container, while displaying vocal and facial expressions of disgust. She then replaced the lid and adopted a neutral facial expression, gazed at a marker on the table located in front of the infant, and slid the two containers simultaneously towards the infant, at an equal distance from the marked area on the table. E1 continued to look at this marked area until the trial ended (30 s). The order of presentation of the “happy” and “disgust” containers was counterbalanced.

Infants were given 30 s to open one of the two boxes. The *first* container that infants attempted to open (by touching the lip) was coded.

Imitation task. All infants engaged in two deferred imitation tasks adapted from Bauer and Mandler (1989). In the *Rattle* task, infants were shown two plastic containers (which fit into one another) and a small rubber ball that could fit inside the containers, aligned on a tray. After a brief warm-up period, E1 said, "Watch me!" before taking the ball and putting it in the largest container. She then picked up the small container, inverted it, and placed it on top of the large container (containing the ball), and then shook the items together to make a rattle while remaining neutral. This demonstration was repeated twice. During the test trial, E1 lined the items up on the tray while saying "Can you make the ball move, just like I did?" while sliding the tray towards the infant. E1 gazed at a marker on the table located in front of the infant while remaining neutral until the trial was over (60 s). In the *Teddy-to-Bed* task, infants were shown a teddy bear, a toy crib, a small felt pillow and a cover. After a brief warm-up period, E1 took the items back, said "Watch me!" and placed the pillow, teddy, and cover in the crib, respectively. This demonstration was repeated twice. Then E1 replaced all of the items on the tray and said "Can you make the teddy go night-night, just like I did?"

Coding of the Imitation Tasks. During the *Rattle* Task, infants were given a score of 1 for each step they completed in the correct order (1 = ball into large container, 2 = small container inverted over large container, 3 = shaking the containers) for a maximum score of 3. During the *Teddy-to-Bed* Task, Infants were given a score of 1 for each step they completed in order (1 = pillow into the crib, 2 = teddy on pillow, 3 = cover on teddy) for a maximum score of 3.

Inter-coder reliability. In order to keep the coder blind to the hypotheses during the reliability exposure phase, all looking times for the entire sample were coded first, which

allowed each event to be divided into the familiarization and test trials. The behavioral variables were then coded (concern and hypothesis testing) during the 10 s test trial which did not include the vocalization in the familiarization phase (and thus the scene and condition remained blind to the coder). To establish inter-coder reliability, 40% of the sample (n = 30) was coded by a second, independent observer, who was blind to the hypotheses and the condition. The kappa for the concern variable was $\kappa = .89$, while the hypothesis testing variable yielded $\kappa = .94$. Pearson correlations were calculated to determine the inter-rater agreement for the looking time measures. The inter-rater agreement for looking time at the stage was $r = .98$, $p = .001$. The four kappas for the interactive tasks ranged from $\kappa = .95 – 1.00$.

Results

There were a total of 4 task orders. To control for multiple testing, a Gender x Condition x Task Order MANOVA (Tabaknick & Fidell, 2013) on all of the 7 trials (i.e., instrumental helping (2), empathic helping (2), imitation (2), and emotional referencing (1)) was computed, with trials as the within-subject factor. Given that a slightly different number of infants completed each task, analyses were run only with the subsample of children who completed all seven trials (n = 60). Regarding the between-subject factors, no significant main effect of Condition (F (1, 44) = .31, p = .091, η^2 = .07), Task Order (F (3, 44) = .340, p = .796, η^2 = .02) or Gender (F (1, 44) = 2.76, p = .104, η^2 = .06) emerged. In addition, no Condition x Task Order (F (3, 44) = 1.28, p = .292, η^2 = .08), Condition x Gender (F (1, 44) = 1.62, p = .210, η^2 = .04), Task Order x Gender (F (3, 44) = 1.75, p = .170, η^2 = .11), or Condition x Task Order x Gender (F (3, 44) = 1.75, p = .170, η^2 = .11) interactions emerged.

Regarding the effects of the between subject factors on the within-subject individual task trials, a significant overall Condition x Trial interaction emerged, F (2.83, 124.58) = 4.40, p =

.010, $\eta^2 = .10$), indicating a significant effect of condition in at least one dependent variable. Post-hoc analyses from the mixed MANOVA revealed a condition effect for the two empathic helping trials as well as for the emotional referencing trial. However, given that not all children completed all of 7 task trials, repeated measures multivariate ANOVAs were conducted separately in order to increase the number of children per task and, in turn, increase statistical power. No other interaction effects emerged between trials and any another of the between subject factors (Task Order, Gender). As task order effects were not observed, this variable was removed from the remaining analyses to preserve the integrity of the data. Finally, although participants were randomly assigned to each condition, infants' vocabulary scores on the Level II short form of the MCDI: Words and Sentences (Fenson et al., 2000) were compared across groups and correlated with the scores on each interactive task. Results revealed no difference in the verbal abilities between the infants in the justified ($M = 14.67$, $SD = 12.74$) and unjustified ($M = 12.88$, $SD = 12.14$) groups, t (68)= .594, $p = .554$. In addition, infants' verbal skills were unrelated to any of the scores of the interactive tasks (imitation: $r = .082$, $p = .534$; instrumental helping: $r = .020$, $p = .871$; empathic helping: $r = -.042$, $p = .739$; emotional referencing $t(50) = -.231$ $p = .818$).

Reliability Exposure

Infants' looking times at the scene during the familiarization and test trials were analyzed with two Condition (Justified/Unjustified) x Gender repeated measures ANOVAs on the 4 exposure trials (Pegs/Drums/Spoon/Ball). During the familiarization phase, no significant between-subjects main effects of Condition (F (1, 68) = .346, $p = .559$, $\eta^2 = .01$), Gender (F (1, 68) = .669, $p = .416$, $\eta^2 = .01$), within-subjects main effects of trial (F (3, 68) = 1.66, $p = .178$, $\eta^2 = .02$), or interactions (F (3, 204) = .741, $p = .529$, $\eta^2 = .01$) emerged. During the test exposure

phase, no significant between-subjects main effects of Condition (F (1, 64) = 2.66, p = .108, η^2 = .04), Gender (F (1, 64) = .312, p = .579, η^2 = .01), within-subjects main effects of trial (F (3, 64) = .411, p = .745, η^2 = .01), or interactions (F (3, 192) = .718, p = .531, η^2 = .01) were revealed. In addition, infants' looking times at the scene on the four trials were correlated both during the familiarization phase (r = .18 - .56, p = .050) and during the test phase (r = .31 - .52, p = .010). Thus, infants in both conditions looked at the stage an equally high amount of time during the familiarization phase (Unjustified: M = 95.87%, SD = 4.31%; Justified: M = 94.37%, SD = 6.91%) and during the test phase (Unjustified: M = 76.31%, SD = 11.94%; Justified: M = 80.41%, SD = 9.06%).

In order to analyze the effects of Condition on the hypothesis testing and concern variables during the test exposure phase, a Gender x Condition MANOVA on these two dependent variables was run. There was a main effect of gender, in that boys showed more concern (M = .58, SD = .48) overall than girls (M = .36, SD = .36), F (2, 68) = 4.73, p = .012, η^2 = .12, Wilks' λ = .878. A main effect of Condition also emerged, F (2,68) = 4.73, p = .001, η^2 = .19, Wilks' λ = .806. Infants in the unjustified group showed more hypothesis testing than the justified group, F (1, 69) = 5.07, p = .030, η^2 = .07. In contrast, the justified group showed more concern than the unjustified group, F (1, 69) = 7.68, p = .011, η^2 = .10 (see Figure 4). No Gender x Condition interaction emerged, F (1, 68) = 1.24, p = .295, η^2 = .12, Wilks' λ = .806).

Interactive Tasks

Instrumental helping. Of the 73 infants, 4 were excluded due to fussiness (Justified: n = 3, Unjustified: n = 1), leaving a final sample of 69. The *Book Stacking* and *Blocks* tasks were significantly correlated (r = .22, p = .035) and were thus averaged into a single score out of 3. A Gender x Condition univariate ANOVA revealed no main effects of Condition (F (1, 65) = 1.43,

$p = .236$, $\eta^2 = .02$) or Gender (F (1, 65) = 1.91, $p = .172$, $\eta^2 = .03$) and no interactions emerged (F (1, 65) = 1.00, $p = .320$, $\eta^2 = .02$). Infants in the justified and unjustified conditions were equally likely to engage in instrumental helping (Justified: $M = 2.13$, $SD = .86$, Unjustified: $M = 2.41$, $SD = .74$; see Figure 5).

Empathic helping. Of the 73 infants, 5 infants were excluded due to fussiness (Justified: $n = 3$, Unjustified: $n = 2$) and 1 infant was excluded due to parental interference (Unjustified: $n = 1$) leaving a final sample of 67. The scores on the *Bear* and *Glove* tasks were significantly correlated ($r = .61$, $p = .001$) and were thus averaged into a single score on 8. A Condition x Gender univariate ANOVA revealed no main effects of Gender (F (1, 63) = 2.04, $p = .158$, $\eta^2 = .03$), or interaction (F (1, 63) = .020, $p = .887$, $\eta^2 = .00$). However, a main effect of Condition emerged (F (1, 63) = 5.61, $p = .021$, $\eta^2 = .08$); infants in the justified condition helped more quickly (i.e., at earlier prompts) than those in the unjustified condition (Justified: $M = 5.27$, $SD = 2.50$, Unjustified: $M = 3.84$, $SD = 2.20$; see Figure 5). Infants' scores were further examined by dividing each infant's score into covert prompts (scores 4-8) in which E1 did not directly ask for help, and overt prompts (scores 0-3) in which E1 directly asked infants for help through gestures or vocalizations. Infants in the justified group were more likely to give E1 the object based on covert ($n = 25$) rather than overt cues ($n = 8$), while infants in the unjustified group were equally likely to give after covert ($n = 16$) and overt cues ($n = 18$) ($\chi^2 = 5.81$, $p = .050$, $\varphi = .30$).

Emotional referencing. Out of the 73 infants, 20 were excluded from the emotional referencing tasks because they did not try to open the containers (Justified: $n = 2$, Unjustified: $n = 2$), opened both containers simultaneously (Justified: $n = 3$, Unjustified: $n = 6$), or fussiness (Justified: $n = 4$, Unjustified: $n = 3$), leaving a total of 53 infants (Justified: $n = 27$, Unjustified: $n = 26$). A Pearson Chi-Square revealed that infants in the justified condition were more likely to

choose the "happy" container (n = 17) than the "disgust" container (n = 10), whereas the infants in the unjustified group tended to choose the "disgust" container (n = 17) more than the "happy" container (n = 9; χ^2 = 4.30, p = .050 φ = .28). In addition, a Fisher's Exact Test revealed no difference between conditions for excluded infants.

Imitation. Of the 73 infants, 9 infants were excluded due to fussiness (Justified: n = 5, Unjustified: n = 4) and 2 infants were excluded due to parental interference, leaving a total sample of 62. The *Rattle* and *Teddy-to-Bed* tasks were correlated (r = .39, p = .001) and were thus averaged into a score on 3. A Gender x Condition univariate ANOVA revealed no main effects of Condition (F (1, 58) = .654, p = .422, η^2 = .01) or Gender (F (1, 58) = .977, p = .327, η^2 = .02), and no interactions emerged (F (1, 58) = .591, p = .746, η^2 = .01). Infants in both conditions recalled an equal amount of steps in order (Justified: M = 1.14, SD = .94, Unjustified: M = .89, SD = .84). Exploratory analyses also revealed that infants in both conditions were equally likely to imitate the steps in any order (Justified: M = 1.79, SD = .97, Unjustified: M = 1.86, SD = .87, F (1, 58) = .056, p = .814, η^2 = .00).

Discussion

The current findings provide two main contributions. The first is within the area of selective trust, and provides evidence that in accord with our hypotheses, infants showed selective behaviors towards a "normal" vs. a "crybaby" actor during tasks at which infants of this age are quite competent. Infants in the unjustified group showed fewer helping behaviors on the basis of emotional cues than those in the justified group. More specifically, infants required more overt, verbal prompts and explicit reaching gestures from the emotionally unjustified adult before offering to help than the infants who were exposed to the emotionally justified individual. In fact, the empathic helping score of the infants in the justified condition is almost identical to

the score reported in the default condition of the original study reporting this task (Svetlova et al, 2010). More importantly, the score in the unjustified condition is lower than this baseline. Thus, in the case of empathic helping, infants responded differently to requests for help in the justified vs. unjustified condition. These findings demonstrate that while infants are willing to help an actor in emotional distress (Svetlova et al., 2010), the development of this prosocial ability is emerging along with infants' capacity to monitor the past reliability of a person's emotional reactions. Importantly, they appear to be relying on both emotional and non-emotional cues in order to determine whether or not they should offer help to an "inaccurate" emoter. These findings also expand upon past research showing that preschoolers are hesitant to help adults who have displayed unjustified distress (Hepach et al., 2012). We extend this literature in an important way by showing that infants detect unjustified emoters (more hypothesis testing and less concern) and that they are subsequently less likely to be guided by an unjustified emoter in situations where she displays emotion. Importantly, no differences were found in infants' willingness to help an emotionally unjustified or justified actor when instrumental, goal-directed behavioral cues were used as requests for help, suggesting that the selective helping that was observed is specific to situations involving a need for emotional help. Importantly, this study provides the first evidence of the development of these specific helping preferences at such a young age. It is known that instrumental helping related to simple, shared, goal-oriented tasks emerge around 14 months of age, earlier than emotional or empathic helping (Svetlova et al., 2010; Warneken & Tomasello, 2007). Thus, it confirms that at that age, instrumental helping may be a more reflexive or automatic form of prosocial behavior, which is less rooted in context, as evidenced in a similar study which also found no differences in 18-month-old infants' instrumental helping behaviors towards accurate and inaccurate speakers (Brooker & Poulin-

Dubois, 2013). Past research has mapped helping behaviors into categories of instrumental, empathic, and altruistic helping, all of which are said to develop sequentially in order of their complexity and breadth of understanding required (Svetlova et al., 2010). Thus, the absence of effect with regard to unjustified emotional responses on instrumental helping reinforces past findings that empathic and instrumental helping are qualitatively different behaviors at this point in development.

Remarkably, the present study showed that infants' selective behavior towards an emotionally unjustified individual extend beyond helping behaviors and also impact other infants' behaviors such as emotional referencing. First, the present findings replicate and extend those of Repacholi (1998) who reported that, by default, infants are influenced by the valence of an adult's emotional expressions when choosing between two containers. As expected, this was replicated as 18-month-olds in the justified group first looked into the "happy" container. However, infants in the unjustified group were more likely to first choose the "disgust" container. Thus, when the actor's previous show of distress followed a positive experience, 18-month-olds were guided by her *negative* emotional cues in deciding which container was associated with a positive experience, overriding their robust tendency to first touch the "happy" container (Repacholi, 1998). These are striking findings, as they suggest that infants extrapolated an actor's past emotional unreliability to a different context (akin to social referencing) and generalize the unreliability of the actor to another emotional reaction, that is, from sadness to disgust. These findings suggest some form of "emotional monitoring" that may be occurring at this young age. Finally, the lack of significant differences between the two conditions in the deferred imitation task, which included no explicit emotional cues from the models, also corroborates our hypothesis that infants' selective behaviors would show uniquely in the

emotional domain.

The second important contribution of the current paper is within the empathy literature, as the results indicated that infants exposed to an adult expressing sadness instead of happiness following a positive experience (unjustified condition) showed increased hypothesis testing and reduced concern while watching the crybaby. These behaviors toward a "crybaby" individual (unjustified, unjustified distress) are consistent with what has been demonstrated in 3-year-old children (Hepach et al., 2012) and, more recently, in 18-month-olds (Chiarella & Poulin-Dubois, 2013). These findings suggest that children *and* infants show selectivity in determining whether a person's distress is warranted. While it has been reported that 14- and 15-month-old infants do not appear to consider the experience of the emoter, and that they react solely to emotional expressions on the basis of facial or attentional cues (Chiarella & Poulin-Dubois, 2013; Vaish & Woodward, 2010), recent evidence suggests that even younger infants may be sensitive to incongruent emotional reactions when pupil dilation is the measure of infants' reactions, or when they must monitor simple goal attainment (Hepach & Westermann, 2013; Skerry & Spelke, 2014). Taken together, these findings suggest that infants' ability to detect incongruent emotional responses shows a developmental progression. First, infants appear to be able to identify and appropriately match emotional reactions that are directly related to the achievement or non-achievement of simple goals, as shown in their looking behaviors (Skerry & Spelke, 2014). Then, they appear to detect the emotional expressions that should accompany simple actions (Hepach & Westermann, 2013), followed by the ability to engage in observable empathic and looking responses, in scenarios in which emotional reactions match, or do not match, with the fulfillment of object requests, as show in the current study as well as others (Chiarella & Poulin-Dubois, 2013). Thus, as children gain more knowledge about the social world, their detection of

"appropriate emotions" becomes more sophisticated.

No doubt, there are other possible interpretations to account for the differences between the justified and unjustified groups during the interactive tasks. First, it is possible that infants reacted simply to the familiarity of the behaviors displayed by the justified emoter. By definition, in order to be tested on the selective trust paradigm, infants must be familiar with the behaviors expected in a given context (e.g., a speaker's accuracy cannot be detected until a child knows the correct words). Thus, an unjustified model (e.g., speaker, object user, emoter) typically displays an unfamiliar behavior and a justified model displays a familiar behavior. However, if infants simply reacted to familiarity and preferred the individual most similar to them, then such a bias should have been observed in all of the interactive tasks. However, this is not what was observed; infants displayed *specific* preferences for the justified individual, that is, *only* when she displayed emotional expressions.

A second possible interpretation for infants' selective behavior towards the two persons is that they were confused by the unjustified model's unexpected emotional expressions. If so, infants would have been expected to either act randomly toward that individual, or refuse to respond on all of the following interactive tasks. This is not what was observed. Importantly, evidence challenging this interpretation comes from the results of the emotional referencing task. During that task, infants were guided by the model's emotions in their decision of which container to open. A striking reverse effect was observed with infants in the unjustified condition choosing the box associated with a disgust expression, and infants in the justified condition choosing the positive box. Had infants been confused in the presence of the unjustified emoter, then there would be no reason for them to choose the "disgust" container over the "happy" container, as the emotional expression would have appeared ambiguous to them. The fact that

they *did* show a preference for the disgust container suggests that infants in the unjustified group were guided by their knowledge that this individual's negative emotions were misleading. Taken together, while it is well known that the depth of infants' understanding of the model is difficult to assess, we believe that the current pattern of findings provides evidence that infants recognize the "accuracy" of an individual's emotional reactions, and that they take this information into account when subsequently interacting with that individual.

While the current study has many strengths, one limitation is that only negative emotional expressions were examined. In order to replicate and extend previous research, examining empathic responses to unjustified and justified expressions of sadness was critical during the exposure phase. Although the detection of a mismatch between happy emotional expressions and negative experiences has recently been documented in infants of this age (see Chiarella & Poulin-Dubois, 2013), an important line of future research will be to investigate if it will have a similar impact on subsequent prosocial behaviors. Similarly, as recent research shows that 8-month-old infants are sensitive to inappropriately sad reactions in response to goal achievement (see Skerry & Spelke, 2014), it would be intriguing to investigate whether they also display selective behaviors toward such unjustified emoters. Furthermore, it would be interesting to determine if infants are sensitive to more subtle forms of context-emotion mismatch, such as a neutral facial expression in response to a positive or negative emotional experience, and if so, whether their behaviors would be different towards such a "stoic" person.

Taken together, the current findings suggest that by 18 months of age, infants have begun to develop some ability to distinguish between justified and unjustified sad expressions – and that this distinction impacts infants' subsequent emotional referencing and empathic helping behaviors. This is in line with recent accounts of a precocious form of cognitive empathy

(attempts to explore and comprehend the others' distress) during the second year of life (Davidov, Zahn-Waxler, Roth-Hanania, & Knafo, 2013; Hoffman, 2000). More importantly, the present findings make an important contribution to the growing research on the early development of selective trust in infancy by showing that infants' expertise in the emotional domain prepares them to detect the best informants as well as the needs of their social partners.

Table 1

Communicative Cues and Helping Score

Order of Presentation	Description	Helping Scores
1	Facial/Vocal Cues of Sadness	8
2	"I'm Sad"	7
3	"I need something to make me happy/warm"	6
4	"A teddy bear/Glove!"	5
5	Alternating gaze from child to bear/glove	4
6	Reaching toward the bear/glove	3
7	"Can you help me?"	2
8	"Can you give me my bear/glove please?"	1
9	No Response	0

Note. Adapted from *"*Toddlers' prosocial behaviours: From instrumental to empathic to altruistic helping" by M. Svetlova, S. R. Nichols, & C.A. Brownell, 2010, *Child Development, 81*, 1814-1827.

Figure 4. Concern and hypothesis testing scores for the justified and unjustified groups.

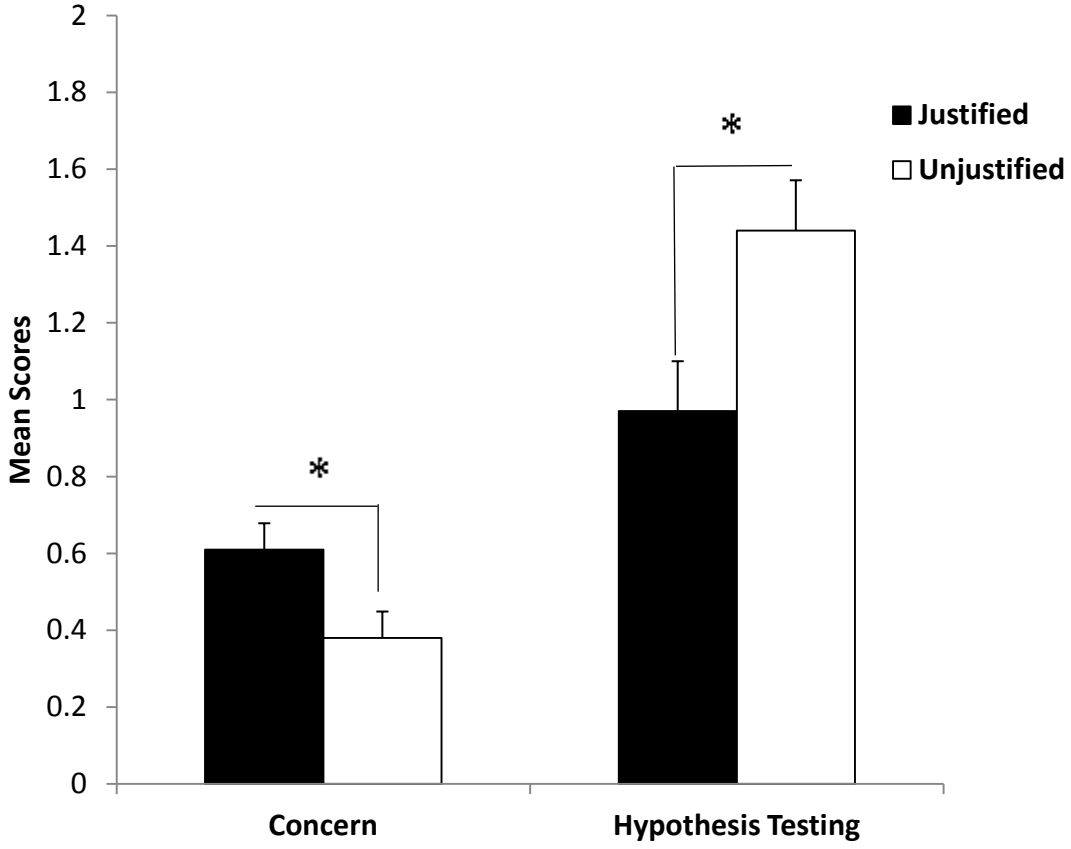
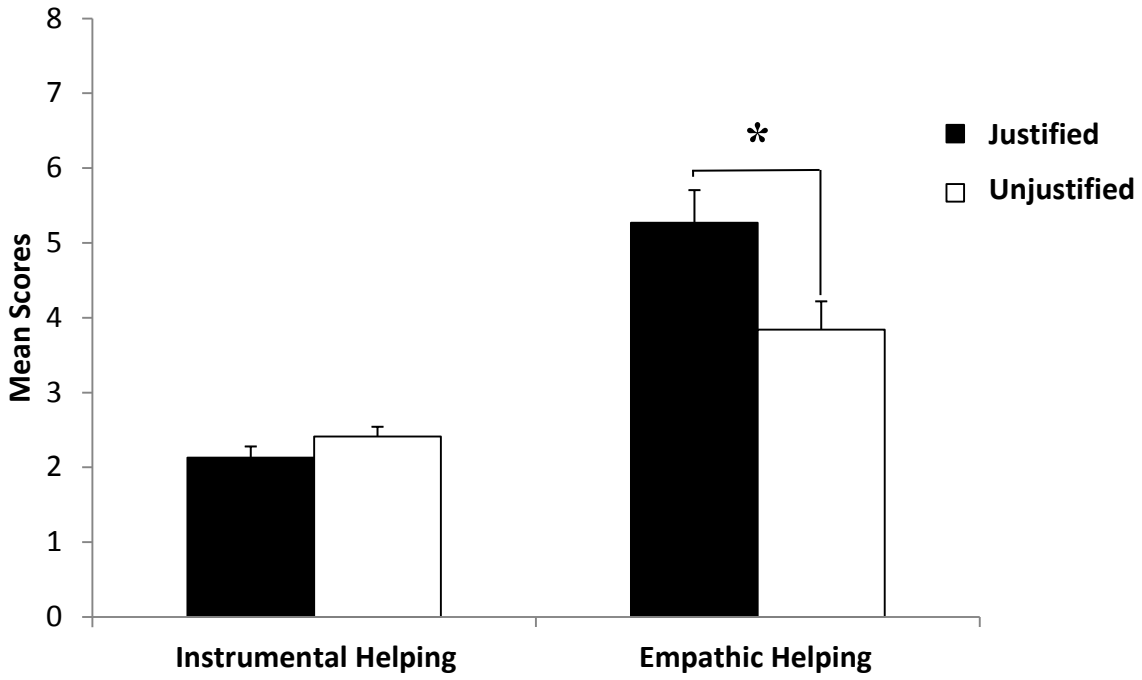


Figure 5. Instrumental and empathic helping scores for the justified and unjustified groups. The maximum score on the instrumental helping tasks was 3, while the maximum score on the empathic helping task was 8.



Modifications between Studies 2 and 3

As the focus of Study 3 was to examine infants' responses towards neutral and sad individuals following negative events, the exposure phase therefore included scenes that would be most salient to infants, that is, losing a toy. All of the interactive tasks from Study 2 were retained in Study 3.

Chapter 4

"Aren't you *supposed* to be sad?" Infants do not treat a stoic person as an unreliable emoter

Chiarella, S. S., & Poulin-Dubois, D. (2015). *Infant Behaviour and Development, 38,* 57-66. doi: 10.1016/j.infbeh.2014.12.007

"Aren't you *supposed* to be sad?" Infants do not treat a stoic person as an unreliable emoter

As not all individuals have accurate or relevant knowledge about a given topic, children must be selective in whom they choose to learn from (Harris, 2007). There is ample evidence showing that toddlers and preschoolers are not gullible and show selectivity in learning (Harris & Corriveau, 2011; Mascaro & Sperber, 2009; Mills, 2013; Rendell et al., 2011; Sperber et al., 2010). Recently, selective trust has also begun to be documented during the infancy period, although the bulk of this research has focused on infants' detection of verbal communication or functional cues, such as mislabelling or misusing a familiar object (Brooker & Poulin-Dubois, 2013; Koenig & Echols, 2003; Koenig & Woodward, 2010; Zmyj, Buttelmann, Carpenter, & Daum, 2010).

Interestingly, the appropriateness of an actor's emotional expressions has also been manipulated in order to examine infants' sensitivity to "accuracy" in the emotional domain. As others' behaviors can often be predicted and explained through their emotional expressions, the detection and understanding of emotional expressions is critical in early socio-cognitive development. Infants are able to both categorize and discriminate a variety of emotional expressions early in development and begin to use emotional information from others to regulate their own behaviors. For example, infants are more likely to approach a novel object when a person displays a positive expression toward it, and avoid it when a negative expression is posed (Hornik, Risenhoover, & Gunnar, 1987; Mumme, Fernald, & Herrera, 1996; Quinn et al., 2011). In fact, such social referencing is observed even when the referent is out of sight, as 14- and 18-month-olds are more likely to initially search into a container previously associated with a "happy" expression by an actor, than into a container associated with a "disgust" emotional

expression (Repacholi, 1998). This suggests that infants as young as 14 months are able to use both the experimenter's attentional cues and emotional expressions to predict the nature of the referent that is the focus of her attention.

Importantly, as others' emotional expressions may not always be accurate, children also begin to modify their behaviors based on the accuracy of the emoter. In a study with preschoolers, Hepach, Vaish, and Tomasello (2012) had 3-year-olds watch an adult constantly express sadness in either an appropriate or inappropriate context (being harmed or not), and found that children were more likely to show concern, less "checking" behaviors, and more prosocial behavior when the negative emotions matched the context. In an investigation of infants' exposure to emotional accuracy and how this affects their behaviors, infants as young as 14 months have been shown to be less likely to imitate or follow the gaze of an actor who had previously displayed inaccurate affect while looking into a container (e.g., positive affect while looking into an empty container) (Chow, Poulin-Dubois, & Lewis, 2008; Poulin-Dubois, Brooker, & Polonia, 2011). More recently, Chiarella and Poulin-Dubois (2013) reported that 18-month-olds, but not 15-month-olds, showed more concern when exposed to justified sadness and more checking behaviors when they saw actors express an unjustified emotion (happiness or sadness)after experiencing an emotional event. That is, infants were able to detect both positive (polyannas) and negative (crybabies) emotion-context mismatches. In a follow-up study, they had infants watch as an actor always expresses sadness after consistently receiving a desired object ("crybaby", unjustified group) or after receiving an undesired object (justified group) (Chiarella & Poulin-Dubois, 2014). Results showed that infants not only detected the actor's unjustified negative emotions, but also reacted differently to the actor during subsequent tasks measuring emotional referencing and prosocial behaviors. More specifically, infants in the

justified group were more likely to be guided by her positive emotions when deciding which of two containers to look into first, and were quicker to help her when she needed emotional, but not instrumental, help. These findings show that infants as young as 18 months show selective behaviors toward emotionally unjustified individuals. Interestingly, it was recently reported that infants as young as 14 months show increased pupil dilation when they witness an actor express emotions incongruent with her actions (e.g., patting a toy tiger with an angry expression), suggesting some lower level processing of sympathetic arousal (Hepach & Westermann, 2013). Similarly, 10-month-olds have been shown to be sensitive to a cartoon's incongruent facial reactions after either successfully or unsuccessfully arriving at a desired goal (e.g., sadness after successfully jumping over a barrier; Skerry & Spelke, 2014).

In summary, there is evidence that infants are able to detect inappropriate emotional reactions (Chiarella & Poulin-Dubois,2013; Hepach & Westermann, 2013; Skerry & Spelke, 2014) and also exhibit selective behaviors in emotional referencing and empathic helping tasks when interacting with someone who previously showed misleading negative expressions (Chiarella & Poulin-Dubois, 2014). However, it remains unknown if infants will be willing to help and whether they will follow someone's emotional cues after witnessing a "stoic" actor, that is, someone expressing no emotions after a negative experience.

The literature on infants' reactions to neutral facial expressions has typically used it as a control measure for the effects of other emotions, such as happiness, sadness, anger, and fear. For example, research on social referencing has shown that12-month-olds are equally likely to approach a toy toward which a model expressed a happy or neutral facial expression, but not if the expression was negative (Hornik et al., 1987; Mumme et al., 1996). Similarly, Repacholi (2009) showed that18-month-olds were equally likely to imitate an action by a model who

showed a neutral or positive facial expression but less so if she showed a negative expression toward an ambiguous object. These findings, as well as others (Cacioppo & Berntson, 1999; Cacioppo, Gardner, & Berntson, 1997, 1999), suggest that in the absence of any emotional cues or information about an ambiguous novel object or stimulus, infants express a "positivity offset" (Vaish, Grossmann, & Woodward, 2008); that is, they evaluate these objects and stimuli as if they had experienced a positive reaction. However, many of these studies examined infants' willingness to approach or interact with an object which had been previously ambiguous. In an investigation of infants' reactions to a non-ambiguous context using neutral facial expression, Vaish, Carpenter, and Tomasello (2009) had 18-and 25-month-olds watch an actor experiencing a harmful situation (where her possessions were taken away or destroyed) and a neutral situation (where there was no harm done to the victim's possessions). After each event, the victim remained neutral. Both 18- and 25-month-olds were more likely to show concern and checking behaviors in the "harm" condition than in the "neutral" condition, despite the actor's neutral facial expression in both cases. Children in both age groups were also more likely to help the victim who had experienced the "harm" condition than the "neutral" condition. These findings suggest that infants as young as 18 months will show empathy and prosocial behaviors toward an individual experiencing a negative event even in the absence of overt negative cues. Although the study by Vaish et al. (2009) revealed that infants showed empathic reactions and helped an individual in the absence of overt emotional cues, the design had two important limitations. First, the authors did not include a manipulation of the *facial* expression with respect to a negative situation. Thus, it remains unknown whether infants would respond similarly to a "victim" expressing a justified reaction to a negative situation (e.g., sadness) and to a victim who remained neutral. In addition, only prosocial sharing and instrumental helping were manipulated

in the study, so generalization of emotional "inaccuracy" to other tasks is unknown. In a recent study manipulating sad and neutral expressions during instrumental helping tasks, Newton, Goodman, and Thompson (2014) reported that 19-month-olds were equally willing to instrumentally help (i.e., fulfill a goal) individuals who displayed sad or neutral facial expressions. These findings suggest that during an instrumental prosocial act, neutral facial expressions alone are not sufficient for 19-month-olds to be selective in their willingness to engage in goal-oriented prosocial actions. An important limitation to this study was that the authors manipulated the neutral and sad facial expressions *during* the instrumental helping tasks, and found that infants were equally willing to aid the experimenter in a goal-oriented helping act in either condition. However, the infants had no prior experience with the experimenter, raising the question as to whether infants are equally willing to help, emotionally reference, and imitate an individual who is either consistently neutral or sad following negative situations (i.e., having objects stolen).

Taken together, it remains unknown whether infants will (1) display different empathic responses toward a neutral versus a sad individual and (2) show selectivity in both their instrumental and empathic helping behavior, imitation, and emotional referencing toward an individual who either constantly expresses the appropriate sad reaction after a negative event or a neutral emotional expression. There were two main objectives to the current study. First, we wanted to examine whether infants would show increased looking times, increased hypothesis testing (i.e., checking behaviors), and decreased empathic concern toward an emotionally neutral, "stoic" person, and thus whether infants consider neutral expressions as unjustified after a negative experience, as they do for positive expressions (Chiarella & Poulin-Dubois, 2013). The second objective was to determine whether an adult's constant "unjustified" neutral

emotional responses would impact infants' subsequent emotional referencing and prosocial empathic helping behavior, as they do for unjustified negative expressions (Chiarella & Poulin-Dubois, 2014). Given that the only study to date to have examined empathic responses toward neutral facial expressions reported that infants consider the context when presented with neutral expressions and only used instrumental helping tasks (Vaish et al., 2009), it was unknown whether infants' selective responses toward an actor would differ across neutral or negative facial expressions or would be mainly guided by the negative emotional experiences of the protagonist, and whether these would impact a wide range of infants' behaviors toward the actor, in both emotional and non-emotional contexts. It was hypothesized that if infants judge the neutral facial expression as "unjustified", they would show more hypothesis testing (i.e., checking) behaviors than if the actor expressed sadness after a negative event. In addition, if infants are sensitive to the valence of emotional expressions, it was hypothesized that they would show less concerned reactions toward a neutral individual following a negative event than toward a sad individual. In line with previous findings (Chiarella & Poulin-Dubois, 2014; Newton et al., 2014), no differences were expected between the sad and neutral group on the imitation task or in the instrumental helping task. However, if infants detected the neutral individual as "unreliable", then infants in the neutral groups would likely show less empathic helping and emotional referencing than those in the sad group.

Method

Participants

75 18-month-old infants (M = 18.35 months, SD = .41, range = 17.63–19.67 months) participated in this study. In order to be included in the final sample, infants were required to watch 3 out of the 4 exposure trials (preliminary analyses revealed no differences on any of the

tasks between infants who watched all 4 trials (n = 62) and those who watched a minimum of 3 trials). Three infants did not meet the inclusion criteria due to fussiness (0/4 trials n = 1, 2/4 n = 2) and one infant was excluded due to parental interference, leaving a final sample of 71 infants (Sad = 34; Neutral = 37, 36 males, 35 females).

Materials

During the reliability exposure phase, an apparatus resembling a puppet theater was used to display the experimenter (E1) acting out four live events (Spoon, Pegs, Drum, and Ball). Infants observed E1 from a child seat placed 90 cm from the display. A video camera placed underneath E1 focused on the infants' faces in order to record looking times and behaviors. During the interactive tasks, the infants sat in a high chair at a table directly across from E1. A split-screen camera angle focused on the infant's face, while a second camera recorded the whole scene. The emotional referencing task consisted of two colored boxes with lids, a plastic cockroach and a toy figurine. The *Book Stacking* (instrumental helping) task consisted of three thin sheets of wood all painted blue to resemble books (but that did not open as to not provide a source of distraction to the infants). These wooden "books" were exact replicas as those used in Warneken and Tomasello's (2007) study. The *Blocks* (instrumental helping) task consisted of six differently colored plastic shapes, with a red container and a pair of plastic tongs. For the empathic helping tasks, a pair of red cotton gloves and one brown teddy bear were used. The *Rattle* task (imitation) consisted of two plastic blue containers (which fit into one another) and a small rubber ball that could fit inside the containers. During the *Teddy-to-Bed* task (imitation), a purple teddy bear, a pink toy crib, a small felt pillow and cover were used.

Design

Infants were randomly assigned to one of two exposure conditions which included a

between-subjects factor: A sad and neutral group. Infants in both groups saw four different trials of goal-directed behavior during which the experimenter (E1) played with a toy: Play-Drums, Play-Pegs, Eat-Spoon and Play-Ball. Each trial lasted 20 s and included two phases, a familiarization (10 s) and a test phase (10 s). All infants saw E1 have her toy taken away from her during the familiarization phase. During the test trials, depending on which condition the infant was in, E1 then always expressed sadness or she always remained neutral (both emotional expressions were based on Ekman, Friesen, and Ellsworth, 1972). Following the exposure phase, infants in both groups engaged in the same four interactive tasks with E1. They remained seated in the high chair that was placed in front of a table across from E1.

Procedure

Infants and their parents first spent a brief period of time in a reception room in order for infants to familiarize themselves with the two experimenters. They were then invited into the testing room. Infants were seated in a high chair and parents were asked to sit behind and to the left of the infants. They were instructed to remain neutral and keep their eyes on the stage so as to maintain the infants' attention on the events. Between trials, a screen (controlled by E2) was lowered and a small bell was rung to attract the infants' attention toward the stage at the onset of each trial.

Reliability exposure. On each trial, E1 was positioned on the left side of a stage with one object on the right hand side of the stage, and withE1 holding another object in her left hand. Each trial lasted 20 s and included two phases. First, in the familiarization phase, E1 played with the object in her hand (5 s) then experienced a negative event, wherein the object was taken by E2's white, gloved hand (5 s). Second, during the test phase, E1 displayed either a sad or a neutral facial expression (depending on the condition), while looking downwards without any

vocalizations or movements (10 s) and holding her left, empty hand in the air over the object on the left. E1 looked downwards as to not attract the infants' attention to her face and eyes, as well as to reduce infants' arousal during the negative facial expressions. Each infant saw four negative events. All events were counterbalanced across participants. The four events included Play-Drums, Play-Pegs, Eat-Spoon and Play-Ball. In the Play-Drum familiarization phase, E1 beat a toy drum with a drumstick, repeating this sequence of actions three times. E2's gloved hand then entered the scene through the right hand side of the stage and took E1's drumstick. E1 then exclaimed "Oh". In the Play-Pegs familiarization phase, E1 hammered a set of pegs three times. Then, E2's gloved hand entered the scene and took E1's hammer, after which E1 exclaimed "Oh". In the Eat-Spoon familiarization phase, E1 mimicked eating from a bowl of rice. E2's gloved hand reached in and took E1's spoon, after which E1 then exclaimed "Oh". In the Play-Ball familiarization phase, E1 bounced a ball up and down in her hand. E2's gloved hand then took the ball from E1, followed by E1 exclaiming "Oh". The vocalizations were included in the familiarization so as to mark the transition to the test phase. The vocalizations were also added in order to increase the realistic nature of the scene, as infants themselves would often produce a vocalization after an emotional experience. During the test phase of all trials, E1 remained immobile while holding her left hand in the air, her head facing the infant (while gazing downwards) with a neutral or sad expression.

Coding of the exposure phase. The percentage of looking times at the stage, which included the actor's face and hand, during the familiarization phase (i.e., when the event occurred) and the test phase trials (i.e., when the actor was expressing the target emotion) was coded for each trial using INTERACT 8.0 (Mangold, 2010). Two other variables, hypothesis testing and concern, were coded based on an adaptation of the coding scheme developed by

Zahn-Waxler, Radke-Yarrow, Wagner, and Chapman (1992) with modifications to account for the context and age of the infants. Concern, which included infants' observable preoccupied responses, was coded on a 3-point scale: 0 = none; 1 = facial concern only (e.g., furrowed or raised eyebrows in concern, open mouth, widened eyes); 2 = facial concern with vocalizations (e.g., same as 1, but with vocalizations such as "Oh!" or calling to the parent in the room with concern or pointing to the actor). Hypothesis testing, which included infants' level of checking responses to the event, was coded on a 4-point scale: 0 = none; 1 = looks back and forth between face and object or hands at least twice, in an attempt to decipher the distress; 2 = looks back and forth between face and object or hands more than twice in a more sophisticated attempt to decipher the distress than 1; 3 = looks back and forth between face and object at least twice, with a back and forth look toward the parent in the room OR looks back and forth between parent and the actor at least twice, in a more frequent attempt to decipher the distress than 1 or 2. Given that looking behaviors have consistently been considered a primary variable for hypothesis testing as a sign of very young children's attempts to attribute cause (e.g., see Hepach et al., 2012; Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008; Zahn-Waxler et al., 1992), this variable was extended as a primary code for hypothesis testing due to infants' limited verbal abilities. Hypothesis testing and concern were not mutually exclusive categories, and thus children could engage in both behaviors simultaneously.

Interactive tasks.

Emotional referencing. The emotional referencing task was modeled after Repacholi (1998). After a brief warm-up trial, E1 placed two round opaque containers covered with lids on the table, out of the infant's reach. E1 shook the containers as to indicate that they were full, and placed one container to her left and one to her right. E1 always began by turning to the container

on her left. During the "Happy" container trial, E1 opened the lid, tilted the container toward her and exclaimed "Wow! I found something! Wow I can see it! Wow!" accompanied by happy and excited vocalizations and facial expressions and then replaced the lid. E1 then turned to the right container, opened the lid, and said "Ew! I found something. . . Ew! I can see it. . . Ew!" to the "Disgust" container while displaying vocal and facial expressions of disgust and then replaced the lid. E1 then adopted a neutral facial expression, gazed at a marked area on the table located in front of the child, and slid the containers in synchrony toward the infant, at an equal distance from the marked area on the table. E1 continued to look at this marked area until the trial ended. The order of presentation of the Happy and Disgust container was counterbalanced across participants. Infants were given 30 s to open one of the two boxes. The *first* container that infants attempted to open (by touching the lid) was coded.

Instrumental helping. Two instrumental helping tasks adapted from Warneken and Tomasello (2007) were administered. In the *Book Stacking* task, E1 demonstrated the stacking of three blue, wooden "books" on top of one another. During the test phase, E1 pretended to drop the fourth book next to the pile while exclaiming "Oh" and remained neutral for 30 s through a series of prompts (looking at the book, gazing back and forth between the infant and the book and ending with "Oh no! It fell!"). This was repeated for two more books trials. In the *Blocks* task, E2 quietly entered the room and sat behind the infant. E1 then demonstrated placing three blocks into a bucket using plastic tongs. After E1's demonstration, E2 placed one block in front of the infant. While remaining neutral, E1 engaged in a series of prompts to enable the infant to hand her the block (reaching toward the block using the tongs, gazing back and forth from the block to the child and ending with "Oh no! I can't reach it!"). The *Blocks* task included three trials.

Coding of the Instrumental Helping Tasks. During the *Book Stacking* task, infants were given a score of 1 if they helped at any point during the 30 s trial, for a total score of 3, either by placing the book on the stack or by handing the fallen book to E1. During the *Blocks* task, infants were given a score of 1 if they handed or pushed the block toward E1 at any point during the 30 s trial, for a total score of 3. The *Blocks* and *Book Stacking* tasks were counterbalanced across participants.

Empathic helping. Two empathic helping tasks were adapted from Svetlova, Nichols, and Brownell (2010). For the *Glove* task, E1 showed the infant a pair of red gloves and displayed positive affect by saying "Look! These are my favorite gloves! They keep me warm!". E1 then rubbed her hands together while saying "Brrrr!" before putting on the gloves. E1 then handed the infant one of her gloves and kept the second glove on the table in front of her. E2 then entered the room, put on E1's glove, rubbed her hands together and walked out the room. In the *Bear* task, E1 showed the infant a teddy bear while displaying affective and vocal expressions of happiness by saying "Look! This is my favorite bear!" while hugging the bear, then handed the bear to the infant. E2 then entered the room and pretended to whisper something sad to E1 by cupping E1's ear in her hand and hissing in different tones for 3–5 s, and then left the room. As E2 left the room for both tasks, E1 gasped loudly and went through a series of 5 s prompts (see Table 2).

Coding of the Empathic Helping Tasks. Infants were given a score from 0 (no help) to 8 (gave the bear/glove during E1's first prompt), with higher scores indicating that infants needed less overt and verbal requests from E1 (i.e., needing only the emotional cues) before handing the bear/glove to E1 (see Table 2).

Imitation task. All infants engaged in two deferred imitation tasks adapted from Bauer and

Mandler (1989). In the *Rattle* task, infants were shown two plastic containers (which fit into one another) and a small rubber ball that could fit inside the containers, aligned on a tray. After a brief warm-up period, E1 said "Watch me!", while taking the ball and putting it in the largest container, then picked up the small container, inverted it then placed it on top of the large container (as to contain the ball), and then shook the items together to make a rattle while remaining neutral. This demonstration was repeated twice. During the test trial, E1 lined the items up on the tray while saying "Can you make the ball move, just like I did?" while sliding the tray toward the infants, as she gazed at a marker on the table located in front of the child while remaining neutral until the trial was over (60 s). In the *Teddy-to-Bed* task, infants were shown a teddy bear, a toy crib, a small felt pillow and cover. After a brief warm-up period, E1 took the items back, said "Watch me!" and placed the pillow, teddy, and cover in the crib, respectively. This demonstration was repeated twice. Then E1 replaced all of the items on the tray and said "Can you make the teddy go 'night-night', just like I did?". Both tasks were counterbalanced across participants.

Coding of the Imitation Tasks. During the *Rattle* Task, infants were given a score of 1 for each step they completed in the correct order (1 = ball into large container, 2 = small container inverted over large container, 3 = shaking the containers) for a maximum score of 3. During the *Teddy-to-Bed* Task, infants were given a score of 1 for each step they completed in order (1 = pillow into the crib, 2 = teddy on pillow, 3 = cover on teddy) for a maximum score of 3.

Intercoder Reliability. In order to keep the coder blind to the hypotheses during the reliability exposure phase, all looking times for the entire sample were coded first, which allowed each event to be divided into the familiarization and test trials. The behavioral variables were then coded (concern and hypothesis testing) during the 10 s test trial which did not include

the vocalization in the familiarization phase (and thus the scene and condition remained blind to the coder). To establish inter-coder justifiability, 35% of the sample (n = 27) was coded by a second independent observer who was blind to the hypotheses and the condition. The kappa for the concern variable was $\kappa = .91$, while the hypothesis testing variable yielded $\kappa = .87$. Intra-class correlations (ICC, McGraw & Wong, 1996) were calculated to determine the inter-coder agreement for the looking times measures. The ICC for the looking times at the scene was .936, $p < .001$. The ICCs for the interactive tasks with continuous variables were as follows: instrumental helping = .994 $p < .001$, empathic helping = .949 $p < .001$, imitation = .969 $p < .001$, while the kappa coefficient for the emotional referencing task was $\kappa = .90$.

Emotion Ratings. As a validity check of the reliability of the actor's facial emotional expression during the live events, as well as during the interactive tasks, adult participants (N = 31) were shown still pictures of E1 displaying the same emotional expressions that she displayed during the test trials and the interactive tasks as well as distractors (Anger, Disgust, Happiness, Neutral, Fear, Pain, Sadness, Scared; based on Ekman, Hager, and Friesen (1972) and asked to identify each from a choice of seven emotions and to rate its intensity on a 5-point Likert-scale (with 1 *very low* and 5 *very high*). All 31 students rated the sad actor as expressing sadness (mean intensity = 3.71, *SD* = 1.01, range = 2 – 5), and as neutral when the neutral expression was displayed(mean intensity = 3.21, *SD* = 1.04, range = 1 – 5) during the live exposure events; while disgust (mean intensity = 4.00, *SD* = 1.10,range = 1–5) and happiness (mean intensity = 2.87, *SD* = .56, range = 2 – 4) were rated as the primary emotions manipulated during the interactive tasks.

Results

A Gender x Condition x Task Order repeated measures MANOVA was used to control for

multiple testing on the interactive variables (i.e., instrumental helping, empathic helping, imitation, emotional referencing). The analyses were run only on the subsample of infants who completed *all* tasks (n = 50). No significant effect of Condition (F (1, 49) = .374, p = .825, η^2 = .046, λ = .954), Gender (F (1, 49) = .399, p = .808, η^2 = .049, λ = .951), Task Order (F (3, 49) = .841, p = .609, η^2 = .097, λ = .736) emerged. Similarly, no Condition x Task Order (F (3, 49) = .330, p = .982, η^2 = .041, λ = .883), Condition x Gender (F (1, 49) = 1.16, p = .349, η^2 = .130, λ = .870), Gender x Task Order (F (3, 49) = .1.17, p = .321, η^2 = .129, λ = .660), nor Condition x Gender x Task Order interactions (F (3, 49) = .734, p = .715, η^2 = .086, λ=.764) emerged on any of the dependent variables. Given that not all of the 71 infants completed all of the tasks, repeated measures multivariate ANOVAs were conducted separately to increase the sample size and statistical power per task. In addition, as task order effects were not observed, it was therefore removed from the remaining analyses to preserve the integrity of the data.

Exposure phase

Preliminary analyses examining infants' looking times at the scene during the familiarization phases using a Condition (Sad/Neutral) x Gender mixed repeated measures MANOVA on the trials (Pegs/Drums/Spoon/Ball) revealed a significant main effect of trial, F (3, 56) = 5.32, p = .003, η^2 = .22, Wilks' λ = .778). All infants looked longer at the Spoon trial than at any other trial (Spoon: M = 98.40, SD = 4.67; Pegs: M = 92.58, SD = 14.32; Drums M = 94.68, SD = 8.68; Ball: M = 92.66, SD = 11.13). However, no main effect of Condition (F (1, 58) = 2.95, p = .09, η^2 = .05), Gender (F (1, 58) = 1.72, p = .19, η^2 = .03), nor Condition x Gender emerged (F (1, 58) = .659, p = .220,η^2 = .03), suggesting that infants in both conditions looked at the scenes the same high percentage of time during the familiarization phase (Sad: M = 96.17, SD = 4.10, Neutral: M = 93.19, SD = 7.83).

Infants' looking times at the scene during the test phase using a Condition (Sad/Neutral) x Gender mixed repeated measures MANOVA on the trials (Pegs/Drums/Spoon/Ball) revealed a significant main effect of trial, F (3, 58) = 5.60, p = .002, η^2 = .23, Wilks' λ = .775). Infants overall looked less at the scene during the Ball trial (M = 71.29%, SD = 16.33%) than any other trial (Pegs: M = 80.57%, SD = 14.70%; Drums: M = 80.00%, SD = 17.50%; Spoon: M = 79.34%, SD = 21.35%). However, no main effect of Condition (F (1, 60) = .565, p = .445, η^2 = .01), Gender (F (1, 60)= 3.15, p = .08, η^2 = .05 Wilks' λ = .778), nor Condition x Gender (F (1, 60) = 1.13, p = .959,η^2 = .00) interaction emerged. Thus, across conditions, infants in both conditions looked at the actor an equally high amount of time during each of four test trials. Analyses were run for looking times including and excluding the Ball trial. However, no differences were noted in the results for either the looking times or the concern and hypothesis testing variables.

Preliminary analyses revealed that the concern variable was positively skewed. Therefore, a log10 transformation was conducted on the concern variable for the analyses. A Condition x Gender MANOVA was used to analyze the effects of the empathy variables during the test phase. Results revealed that the sad group (M = .51, SD = .37) showed more concern than the neutral group (M = .33, SD = .38; F (1, 70) = 4.03, p = .04, η^2 = .06). However, no differences emerged between both groups on hypothesis testing (Sad: M = 1.33, SD = .74; Neutral: M = 1.45, SD = .49; F (1, 60) = 1.13, p = .959, η^2 = .00) (see Figure 6). No Gender (F (2, 66) = 1.54, p = .86, η^2 = .01, Wilks' λ = .996) nor Condition x Gender interaction effects emerged (F (2, 66) = .781, p = .46, η^2 = .02, Wilks' λ = .977).

Interactive Tasks

Emotional referencing. Out of the 71 infants, 11 were excluded from the emotional referencing tasks (did not try to open the containers n = 6, opened both containers

simultaneously $n = 3$, fussiness $n = 2$), leaving a total of 60 infants (Sad: $n = 31$; Neutral: $n = 29$). A Pearson Chi-Square revealed that infants in both conditions were equally likely to choose the "happy" (Sad: $n = 15$; Neutral: $n = 16$) and the "disgust" container (Sad: $n = 12$; Neutral: $n = 17$) ($\chi^2 = .30$, $p = .614$, $\varphi = .07$). In addition, a Fisher's Exact Test revealed no differences between the two groups for the infants who did not open the containers (Sad: $n = 4$; Neutral: $n = 2$) nor for the infants who opened both containers (Sad: $n = 2$; Neutral: $n = 1$) ($p = .541$, $\varphi = .00$).

Instrumental helping. The scores on the *Blocks* and *Book Stacking* tasks were averaged into a score on 3. Of the 71 infants, 3 infants were excluded due to fussiness (Sad: $n = 0$; Neutral: $n = 3$), leaving a final sample of 68. A Gender x Condition univariate ANOVA revealed no main effect of Condition (F (1, 68) = 2.45, $p = .12$, $\eta^2 = .04$) nor Gender (F (1, 68) = .402, $p = .528$, $\eta^2 = .01$) and no interaction effects (F (1, 68) = 1.55, $p = .217$, $\eta^2 = .02$). Therefore, infants in the sad and neutral conditions were equally likely to engage in instrumental helping (Sad: $M = 2.31$, $SD = .88$, Neutral: $M = 1.98$, $SD = .90$).

Empathic helping. The scores on the *Bear* and *Glove* tasks were averaged into a score on 8. Of the 71 infants, 7 infants were excluded due to fussiness (Sad: $n = 3$; Neutral: $n = 4$), leaving a final sample of 64. A Gender x Condition univariate ANOVA revealed no main effect of Condition (F (1, 64) = .339, $p = .56$, $\eta^2 = .01$) nor Gender (F (1, 64) = .776, $p = .382$, $\eta^2 = .01$) and no interaction (F (1, 64) = .005, $p = .943$, $\eta^2 = .00$). Therefore, infants in the sad and neutral conditions were equally likely to empathically help (Sad: $M = 4.77$, $SD = 2.19$, Neutral: $M = 4.43$, $SD = 2.36$).

Imitation. The *Rattle* and *Teddy-to-Bed* tasks were averaged into a score on 3. Of the 71 infants, 7 infants were excluded due to fussiness (Sad: $n = 5$; Neutral: $n = 2$), 3 for not touching the toy (Sad: $n = 1$; Neutral: $n = 2$) and 1 for parental interference (Sad: $n = 1$), leaving a total

sample of 59 (Sad: $n = 28$; Neutral: $n = 31$). A Gender x Condition univariate ANOVA revealed no main effects of Condition (F (1, 59) = .663, p = .42, η^2 = .01) nor Gender (F (1, 59) = .088, p = .768, η^2 = .01) and no interaction (F (1, 59) = .068, p = .795, η^2 = .00). Thus, infants in the sad and neutral conditions were equally likely to recall an equal number of steps in order (Sad: M = 1.30, SD = .95, Neutral: M = 1.12, SD = .68). A second univariate ANOVA revealed that infants in both groups were also equally likely to recall the steps in any order (Sad: M = 2.03, SD = .93, Neutral: M = 1.97, SD = .71, F (1, 59) = .851, p = .360, η^2 = .02).

Discussion

The current study examined whether infants would show selectivity in their behaviors toward individuals who showed neutral or sad facial expressions after a series of negative experiences (having objects taken away from them). As expected, infants who saw the actor express sadness after experiencing a sad event showed more concern toward her than those who witnessed the actor express no emotion, while no differences in hypothesis testing were found between the two groups. These findings make two important contributions. The first contribution concerns the emergence of selective trust in infancy. As demonstrated in previous studies (Chiarella & Poulin-Dubois, 2013, 2014; Skerry & Spelke, 2014), infants' engagement in hypothesis testing or checking behavior is indicative that they have noticed an inconsistency between someone's experience and the emotional reactions that follow. Infants in the current study showed similar levels of hypothesis testing in the sad and neutral condition. These null results suggest that infants did not consider the actor's neutral facial expression as an inappropriate reaction to an unpleasant experience. This was shown by the absence of differences between the neutral and the negative expression groups for both hypothesis testing and total looking times. Therefore, infants do not consider this lack of emotional reaction as "unjustified"

as they do when an actor expresses a positive emotion after a negative experience (Chiarella & Poulin-Dubois, 2013). Given that neutral facial expressions provided no information about the emotion of the person, and that the stimuli in the current study (and those from Vaish et al., 2009) included an emotionally loaded negative event that infants of that age have most likely experienced (e.g., having objects taken away from them), infants appear to be able to consider both their prior experiences with the negative event and the reaction of the emoter. Thus, while infants can detect when the emotions following familiar emotional events are unjustified (Chiarella & Poulin-Dubois, 2013, 2014), they do not appear to consider the absence of overt emotional cues as incongruent with a negative experience, just as they assume a "positivity attribution" to ambiguous objects (Cacioppo & Berntson, 1999; Cacioppo et al., 1997, 1999; Hornik et al., 1987; Mumme et al., 1996; Newton et al., 2014).

The findings also revealed that infants did not behave differently toward the "sad" versus "neutral" actor on subsequent interactive tasks. As infants did not seem to judge the neutral expression as inconsistent with the negative event, their apparent interpretation of the neutral facial reaction as a "justified" reaction rather than "unjustified" renders this lack of findings predictable since they did not have any reason to assume that the neutral actor is "untrustworthy". Previous studies on selective trust have revealed that infants are less likely to follow the gaze of a person whose emotional expressions are misleading (excitement about an empty container: Chow et al., 2008) and that they are less likely to learn from an inaccurate labeler (Brooker & Poulin-Dubois, 2013). In the current study, we extend this research by showing that 18-month-olds consider a neutral expression as "accurate" as a sad response to a negative event. Confirming their reactions to the display of emotions, their behaviors toward the "neutral" person were identical to those toward the "sad" person. This is an important finding in

that it shows that infants of that age require a strong violation of their expectations about emotional reactions to events.

The current findings are in line with those from Vaish et al. (2009) and Newton et al. (2014), who demonstrated that infants are willing to subsequently help individuals who displayed neutral facial expressions following a negative scene. Interestingly, our study extends these findings by showing that infants display less concern for "neutral" than sad individuals after a negative event, but are equally willing to help and imitate them and be guided by their emotional expressions, perhaps giving them "the benefit of the doubt". This contrasts with previous research revealing that when shown unjustified emotional reactions (happiness) following a negative event, infants are less likely to trust the person's emotional expressions in other contexts (Chiarella & Poulin-Dubois, 2014). We believe that the null results that are part of the current findings, as well as others (Brooker & Poulin-Dubois, 2013; Chiarella & Poulin-Dubois, 2013; Newton et al., 2014; Walle & Campos, 2014), provide important contributions to the selective trust literature during the infancy period. As infants' understanding of others' emotions develop with age, it is possible that neutral expressions are considered inaccurate at later ages and the development of this ability should be examined in future studies. Until then, the current findings provide important insights on the development of these selective abilities within the second year of life.

The second contribution of these findings is to the literature on empathy development in infancy, replicating previous observations that young infants will react with concern when watching someone express a negative emotion (Roth-Hanania, Davidov, & Zahn-Waxler, 2011; Zahn-Waxler et al., 1992). However, the current findings also show that while infants react appropriately to a sad facial expression following a negative event (i.e., displaying concern), a

neutral facial expression following the same negative event does not appear to justify concern for the emoter. These findings also extend this literature by showing that, contrary to the suggestions made by Vaish et al. (2009), context alone does not trigger empathic responses. In their study, infants watched as an actor experienced either a negative (e.g., an actor breaking, tearing, or taking another actor's possessions) or neutral (e.g., an actor breaking, tearing, or taking another object that did not belong to the second actor) event, while the actor always remained "stoic", with a neutral facial expression. Their results revealed that infants showed more concern toward a "stoic" actor experiencing a negative event than a neutral event, concluding that in the absence of emotions, infants rely on context to guide their empathic responses toward individuals. However, without a negative facial expression condition, it remained unknown whether infants would show empathic responses with the same intensity toward expressive and non-expressive individuals experiencing the same negative event. The current study shows that infants do show concern toward individuals who express no emotion following a negative event, however, they do so less than toward an actor who displays a negative facial expression following the same event. These findings provide a more conservative test of infants' processing of neutral expressions and suggest that while infants do consider context in the absence of emotional facial expressions (as suggested by Vaish et al., 2009), they are also sensitive to the salience of the appropriate facial expressions. These findings are in line with the literature that highlights the importance of emotional salience in infancy (Beebe & Lachmann, 1994; Brown, Robinson, Herbert, & Pascalis, 2006; Gross, Hayne, Herbert, & Sowerby, 2002; Messinger, Mattson, Mahoor, & Cohn, 2012; Montague & Walker-Andrews, 2001).

Taken together, the current findings show that infants aged 18 months appear sensitive to subtle forms of emotional valence in response to negative emotional experiences. Given their

increased concerned responses toward a sad versus a neutral individual, this conservative test of selective trust suggests that 18-month-olds do not solely rely on the context when processing others' emotional reactions but also take into account the valence of their emotions. However, the lack of difference in hypothesis testing behaviors suggests that infants treat negative and neutral emotions as equally appropriate reactions after a negative experience. Consequently, this lack of detection of "accuracy" induces similar subsequent selective behaviors.

No doubt, there are other interpretations to the current pattern of results. First, it is possible that infants in both conditions did not perceive the protagonist as having a negative experience at all. However, we believe that this interpretation can be ruled out. Importantly, the main dependent variable during the exposure phase is hypothesis testing, as analyzed through looking time at the face and object during the test phase. Given that infants of the same age showed more hypothesis testing behaviors when exposed to a happy person than a sad person in exactly the same context (Chiarella & Poulin-Dubois, 2013), it is clear that infants perceived the event as negative. Second, one could argue that it is possible that the adult's vocal expression in both conditions (Oh!) was interpreted by infants as a negative reaction, accounting for the lack of differences between the sad and neutral conditions. Again, the fact that infants perceived the protagonist as inaccurate if she responded to the same event (including the vocal expression) with a happy face also rules out this interpretation (Chiarella & Poulin-Dubois, 2013).

While the current study has many strengths, one limitation is that only negative emotional expressions were contrasted with neutral expressions. A previous study by Chiarella and Poulin-Dubois (2013) demonstrated that infants are sensitive to the mismatch between positive emotions and negative events. Given that one of the goals of this study was to replicate and extend previous research on empathic responses, expressions of sadness were essential during the

exposure test phase and thus a positive condition was not included in the current study. Furthermore, a future line of research may investigate whether older infants or toddlers would identify a neutral facial expression as an "unjustified" reaction to a negative experience. Until then, the present study presents the first test of infants' sensitivity to subtle forms of emotional inaccuracy and its impact on prosocial and emotional referencing behaviors. These findings provide an important contribution to the emergence of selective learning and prosocial behaviors during the infancy period.

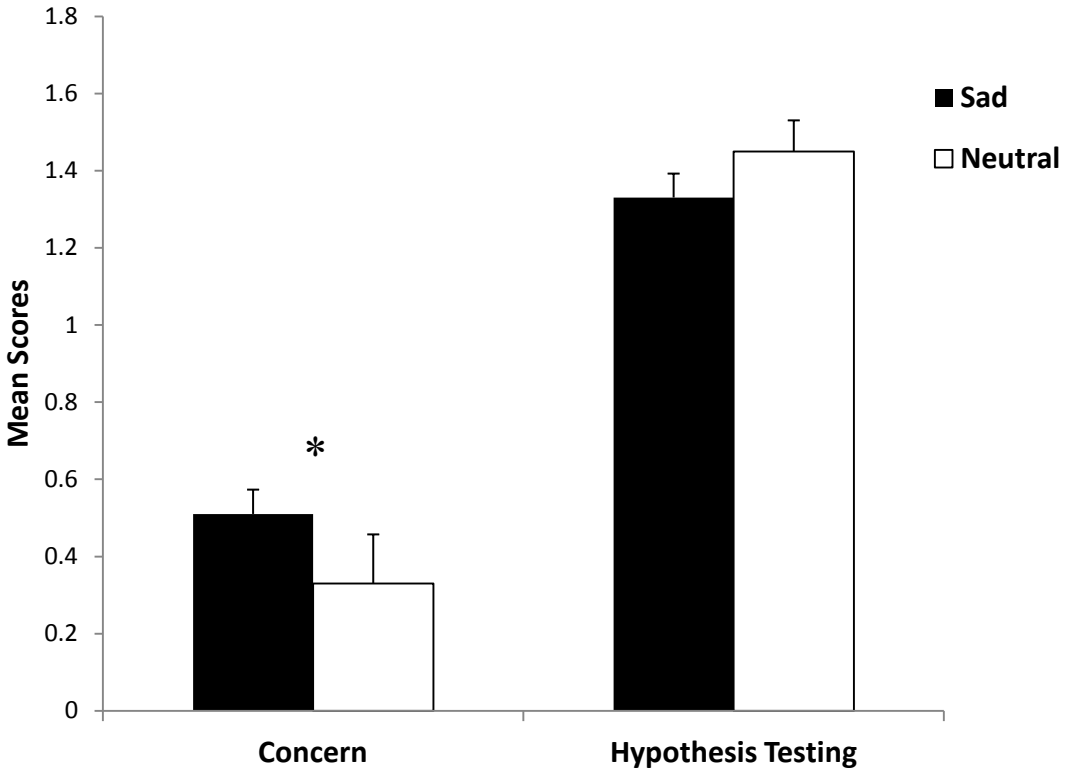
Table 2

Communicative Cues and Helping Score

Order of Presentation	Description	Helping Scores
1	Facial/Vocal Cues of Sadness	8
2	"I'm Sad"	7
3	"I need something to make me happy/warm"	6
4	"A teddy bear/Glove!"	5
5	Alternating gaze from child to bear/glove	4
6	Reaching toward the bear/glove	3
7	"Can you help me?"	2
8	"Can you give me my bear/glove please?"	1
9	No Response	0

Note. Adapted from *"*Toddlers' prosocial behaviours: From instrumental to empathic to altruistic helping" by M. Svetlova, S. R. Nichols, & C.A. Brownell, 2010, *Child Development, 81*, 1814-1827.

Figure 6. Concern and hypothesis testing scores for the Sad and Neutral groups.



Chapter 5

General Discussion

Investigating the ways in which children respond to individuals who prove to be less trustworthy in a number of domains provides direct evidence of the importance of selective trust during childhood (Clément et al., 2004; Harris & Koenig, 2006; Harris, 2007; Kuhlmann, 2008; Riegelsberger et al., 2007; Pasquini et al., 2007; Szczesniak et al., 2012). There has been an abundance of research on the effects of a model's verbal accuracy and helpfulness, particularly during the preschooler period. These studies have shown that children are sensitive to whether an actor is displaying trustworthy behavior; that is, they will monitor whether a person has been exhibiting reliable verbal information or actions, or positive social cues, such as helpful behavior towards another. This "detection" of reliability, in turn, later influences children's selective behavior towards that individual in other contexts. More recent research has extended the selective trust literature into infancy in order to document the developmental origins of selective trust. This research has shown that within the second year of life, infants are sensitive to a model's reliability and selectively modify their behavior towards a verbally inaccurate individual (Brooker & Poulin-Dubois, 2013; Koenig & Echols, 2003; Koenig & Woodward, 2010; Krogh-Jespersen & Echols, 2012; Poulin-Dubois et al., 2011), towards an unhelpful person (Doebel & Koenig, 2013; Dunfield & Kulhmeier, 2010; Hamlin et al., 2007; 2010; Hamlin, 2013), and towards an unreliable emoter (Chow et al., 2008; Poulin-Dubois & Chow, 2009; Poulin-Dubois et al., 2011). However, to date, little is known about infants' behaviors towards individuals who react inappropriately, not solely during situations with no pre-existing familiar emotional experiences attached to them (such as those examined in studies by Poulin-Dubois and her colleagues, 2008; 2009; 2011), but rather, during events involving familiar emotional

experiences, such as watching someone gaining (happiness) or losing (sadness) attractive objects. In addition, there is little research examining the ways in which infants use unjustified emotional cues to inform their view about the reliability of the individual (i.e., whether to trust the individual) and how to act toward that that individual.

Goals and Overview of Studies

There were several goals to the current dissertation which we attempted to address through a series of three separate studies. The first goal was to determine when infants begin to understand the emotions of others by examining if they can detect when a person's emotional expressions are inconsistent with their emotional experiences. Study 1 (Chiarella & Poulin-Dubois, 2013) explored the age differences in infants' abilities to detect the justifiability of positive and negative emotional expressions given an emotional context. In this way, we wished to broaden the existing research literature on 3-year-olds' abilities to detect negative emotional mismatches (Hepach et al., 2012) to younger infants, in order to determine when infants begin to detect this mismatch. Furthermore, we wished to extend the emotional repertoire to include the mismatch of positive emotions. Both 15- and 18-month-old infants watched as an experimenter experienced both positive (e.g., receiving a desired object) and negative (e.g., having an object stolen) events that would be familiar to infants. One group was exposed to an actor whose emotional reactions were consistently unjustified (i.e., did not match the event: displayed positive affect after a negative experience), while the other saw an actor whose emotional reactions were constantly justified (i.e., always matched the event: showed a negative emotion after a negative experience). Consistent with our hypothesis, 18-month-olds showed more hypothesis testing (i.e., checking) behaviors towards a person who was continuously displaying unjustified emotions given the context. Similarly, 18-month-old infants showed less concerned

reactions towards the emotionally unjustified individual. These results did not hold for the 15-month-olds. In fact, the 15-month-old infants only displayed more concern when they witnessed a negative facial reaction, regardless of the valence of the emotional event that had just been experienced by the actor. In addition, the younger infants did not display more hypothesis testing when the emotional reaction from the actor did not match her emotional experience. Interestingly, recent research has replicated our findings from Study 1 with parents as the emoters, rather than a stranger, showing a similar developmental pattern: 19-month-olds, but not 16-month-olds, were more likely to show concern when their parents showed pain after hurting themselves, rather than when they showed happiness (Walle & Campos, 2014). These findings, together with those from Study 1, demonstrate that as early as 18 months, infants respond differently to others' emotional reactions depending on the credibility of that distress with respect to the context.

The second and third goals of the current dissertation were to examine whether infants would show disparity in their willingness to help and to emotionally reference those individuals whose emotions had previously been "unjustified" and thus, emotionally unreliable individuals. Study 2 (Chiarella & Poulin-Dubois, 2014) investigated whether 18-month-olds understand how the emotional valence of people's experiences predicts their subsequent emotional reactions, as well as how infants' helping behaviors and emotional referencing are influenced by the "justifiability" of the emoter. Infants were exposed to a sad actor who always received either a desired object (unjustified condition) or an undesired object (justified condition). Infants then interacted with the actor in the context of instrumental helping, emotional helping, emotional referencing, and deferred imitation tasks. Replicating the findings from Study 1, but using only negative emotions, infants detected the "crybaby" individual, that is, the individual who was

constantly expressing sadness after a positive experience. This was demonstrated by the fact that infants showed less concern and more hypothesis testing behaviors towards unjustified individuals. More importantly, infants who had experienced an unjustified emoter took more time to emotionally help her and were reticent in trusting her emotions to guide themselves in a subsequent search task. In contrast, no differences were found between the groups on the instrumental helping and deferred imitation tasks, corroborating our hypothesis that infants' selective behaviors would show uniquely in the *emotional* domain.

The fourth and fifth goals of the dissertation were to examine, more conservatively, whether infants would show selectivity in their responses and behaviors towards a neutral, "stoic" individual following emotional experiences. Given the limited literature on infants' selective behaviors towards stoic individuals, Study 3 (Chiarella & Poulin-Dubois, 2015) involved a more conservative test of emotion understanding and selective trust by examining how 18-month-olds reacted to an emotionally neutral, "stoic" individual as she experienced constant negative events (i.e., having objects stolen from her), after which they interacted with the individual during the same tasks as in Study 2. Infants who witnessed the individual act appropriately after a distressing event (i.e., with sadness) engaged in similar levels of hypothesis testing as those infants who witnessed an inappropriate adult (i.e., neutral emotion after a distressing event). However, infants in the appropriate condition expressed more concern towards the individual than those in the inappropriate condition. The findings showed that by 18 months, infants are sensitive to the valence of emotional expressions following negative events, as they showed more concern when the expression observed following the emotional experience is appropriate. However, these young infants appear to consider an actor's neutral expression as equally appropriate as a sad expression following a negative experience, as their subsequent

prosocial behaviors and learning is equivalent when interacting with these individuals.

Main findings

Taken together, the findings from the three studies contribute to two main areas in the field of infancy. The first is within the field of emotional understanding and empathy. Through the examination of infants' empathic responses, the findings from Studies 1 and 2 in particular, show that by 18 months, infants are able to detect the appropriateness of positive and negative emotional expressions *following* emotional experiences. However, as demonstrated in Study 1, this ability has not yet developed by 15 months of age. Importantly, 18-month-olds do not express empathic concern in their responses to just anyone displaying any type of emotional reactions, as the 15-month-olds were found to do in Study 1. Rather, despite the fact that actors were all showing negative affect in Study 1 (which has been shown to be quite salient for very young infants in their first year; Roth-Hanania et al., 2011), 18-month-olds were found to assess and take into account the emotional events that preceded an emotional reaction before expressing concern for the actor.

According to Hoffman's theory of empathic development (1979, 2000), developmental changes in empathy are based on the psychological foundation of social perspective-taking of others' mental states. That is, with an increased understanding that others' experiences may differ from their own, children are hypothesized to be more capable of correctly identifying and sympathizing with others' emotional states in a variety of social contexts. The importance of internal state understanding in moral development has been outlined throughout the developmental literature (Batson, 1991; Decety, 2005; Hoffman, 2000) and children's ability to take on others' perspectives is considered to be critical to feeling empathy and engaging in empathic responses (Decety, 2005; Eisenberg, Fabes, & Spinrad, 2006; Eisenberg & Fabes,

1998; Hoffman, 2000; Roberts & Strayer, 1996). Thus, it appears that as infants get older, their experiences with the world allow them to have a better understanding of the appropriateness of emotions in different contexts. This ability indeed has an adaptive element, in that infants appear to be able to draw on their own experiences in order to assess the quality of that emotional expression. This enables infants to learn from others in determining what "appropriate" and "inappropriate" reactions entail, and their interpretations are, in turn, displayed through their affective empathic responses.

Interestingly, recent findings similar to those of Study 2, showed that 10-month-olds are sensitive (i.e., look longer) to a cartoon's incongruent facial reactions after either successfully or unsuccessfully arriving at a desired goal (e.g., sadness after successfully jumping over a barrier) (Skerry & Spelke, 2014). Another recent study on conventional actions rather than goal achievement reported that 14-month-olds, but not 10-month-olds, showed an increase in pupil dilation when watching the incongruence between both negative and positive emotional expressions and actions, such as showing an angry expression while nicely patting a toy tiger (Hepach & Westermann, 2013). This increase in pupil dilation is suggestive of some lower level processing of sympathetic arousal with respect to viewing incongruent emotions and contexts early in the second year. Taken together, these findings suggest that infants' ability to detect incongruent emotional contexts shows a developmental progression. First, infants appear to be able to perceive appropriate emotions related to simple goals through their looking behaviors. Then, they appear to detect emotional appropriateness in emotional contexts through a form of lower level sympathetic arousal, followed by their ability to engage in observable empathic concerned responses in scenarios in which emotions are paired with emotional familiar events, as evidenced through the current study as well as others (Walle & Campos, 2014). Thus, as children

gain more knowledge about the social world, their detection of "appropriate emotions" become more sophisticated.

While results from Studies 1 and 2 showed that infants are sensitive to the incongruence between emotional expressions and their contexts, results from Study 3 demonstrated that infants are sensitive to the *valence* of emotional expressions when they precede an emotional event, as demonstrated through their lack of concern responses to neutral emotional expressions. This is an important contribution, as some researchers (Vaish et al., 2009) have suggested that in the absence of any emotional information from an actor after an emotional experience, infants consider the context during an emotional event and are more likely to show concern towards this individual than if the actor had no prior emotional experience. The lack of comparison between an actor's negative expression and an actor's neutral expression after negative events is noteworthy in the previous study (Vaish et al., 2009). Given the importance of the saliency of emotional expressions during infancy (Beebe & Lachmann, 1994; Brown et al., 2006; Gross, et al., 2002; Messinger et al., 2012; Montague & Walker-Andrews. 2001), the absence of a negative facial expression condition questions whether infants would express empathic responses *to the same extent* as they would towards an individual with no facial emotional expression. Indeed, this conservative test of emotion understanding shows that while 18-month-olds in the current dissertation were found to consider the context in the absence of emotional expressions, they expressed more intensity in their concern expressions when the context followed an appropriate "sad" emotion, as opposed to a "neutral" emotional expression. These findings suggest that the emotional context as well as the emotional facial reaction is more salient to them than an emotional context alone. However, the similar responses in hypothesis testing behaviors in both the sad and neutral groups suggest that, while infants are sensitive to the salience of emotions,

they do not consider the neutral facial expression following a negative event as "odd". This is in line with studies that suggest that infants at this age engage in some form of affective perspective-taking (i.e., infants project their own emotional experience to the one being experienced by the individual, and infer the appropriate emotion) when no emotional expression is available (Vaish et al., 2009). To our knowledge, this is the first study that directly compares infants' reactions towards sad and neutral individuals following emotional events.

The second important contribution of this dissertation concerns the emergence of selective trust in infancy. The combined findings from Studies 1 and 2 show that not only are 18-month-olds able to detect when someone is reacting with inappropriate positive and negative emotions following an emotional experience, but also that infants of that age consider this individual "untrustworthy". As demonstrated in a previous study (Hepach et al., 2012), children's engagement in hypothesis testing behavior is indicative of an inconsistency between someone's experience and the emotional reactions that follow. In Studies 1 and 2, this ability was reflected in the 18-month-olds' increase in cognitive empathic reactions as measured through hypothesis testing (Zahn-Waxler et al., 1992); that is, when the emotion seems inappropriate to the context, infants engaged in more frequent "checking" behaviors, that can be described as infants' more sophisticated attempt at trying to decipher what just occurred (Hepach et al., 2012; Zahn-Waxler et al., 1992), and also show changes in pupil dilation in the first year of life (Hepach & Westermann, 2013). In addition, the findings from Study 2 show that by 18 months, infants appear to display some selective behavior towards these individuals who react inappropriately after an emotional experience. Specifically, infants were more likely to emotionally reference and emotionally help individuals who had previously been emotionally justified. These results are noteworthy because with the manipulation of emotional cues, infants'

knowledge of this individual renders their behaviors towards them not only more selective, but *specific*; their willingness to help and reference appears to be limited within the emotional domain, as they were equally willing to instrumentally help and imitate emotionally justified and unjustified individuals.

Regarding infants' helping behaviors, the findings are consistent with data from preschoolers demonstrating the willingness of 3-year-olds to prefer helping adults who have displayed justified distress (Hepach et al., 2012). Yet, results from Study 2 add a level of complexity by including instrumental helping tasks as a manipulation to assess the full impact of emotional reliability. It is hypothesized that because instrumental helping is a robust behavior at this age based on goal-oriented behavior (Warneken & Tomasello, 2007) and develops before empathic helping (Svetlova et al., 2010), the behavior may be less rooted in context and is therefore not affected by emotional reliability at this age. In fact, instrumental, goal-directed behavior is often praised and reinforced and begins early in life, thus children have extended experience with this type of prosocial behavior (Dunfield et al., 2010; Warneken & Tomasello, 2007). In addition, as evidenced by recent findings, instrumental helping is so robust that it remains unaffected by the actor's affect at this age (Newton et al., 2014). Empathic helping, in contrast, is a cognitively more complex form of helping, with which children may have had less experience and thus may require them to depend more heavily on others' emotions for cues to guide them. Our findings are consistent with others that have found that 18-month-olds' instrumental helping behavior is similarly unaffected by neither verbal accuracy (Brooker & Poulin-Dubois, 2013) nor affect (Newton et al., 2014). Similarly, our findings are in line with other research on prosocial behaviours showing that behaviours that are often goal-oriented, such as cooperation and sharing, have also been found to be unaffected by a partner's actions in the

second and third year of life (Sebastian-Enesco et al., 2013). Therefore, this particular finding suggests that empathic and instrumental helping may be qualitatively different at this age.

Importantly, the results of Study 2 show that infants' behaviors were not solely selective in the helping domain, but also during the emotional referencing task. As infants typically aim to explore the "happy" container rather than a "disgust" container (Repacholi, 1998), the emotional reliability of the individual was robust enough so that infants not only ignored the happy container, but rather aimed for the disgust one *more so* than the happy container. As infants use others' emotional referencing cues from a very early age, and do so quite intently (Hornik et al., 1987; Mumme et al., 1996; Nichols et al., 2010; Sorce et al., 1985; Striano et al., 2006), it is a compelling finding that infants extrapolated an individual's unjustified emotions of sadness to another negative emotional reaction, that of disgust.

In addition to the findings from the helping tasks as well as the emotional referencing task, infants in both groups performed similarly on the imitation task. This is in contrast to studies examining verbal accuracy, in which infants as young as 18 months have been found to be more willing to imitate actions and learn new words from an individual who reliably labeled familiar objects (Brooker & Poulin-Dubois, 2013; Poulin-Dubois et al., 2011) as well as a recent study showing less imitation of a non-confident model (Brosseau-Liard & Poulin-Dubois, 2014). However, one significant difference between the design of our imitation task and that of others (Brooker & Poulin-Dubois; 2013; Poulin-Dubois et al., 2011), is that we administered an immediate imitation task (i.e., simple step-by-step rational actions that the infant is required to immediately imitate), while others (Brooker & Poulin-Dubois; 2013; Gergely, Bekkering, & Király, 2002; Meltzoff, 1995; Poulin-Dubois et al., 2011; Schwier, van Maanen, Carpenter, & Tomasello, 2006; Zmyj, Daum, & Aschersleben, 2009) have used rational imitation tasks, during

which the infant is required to choose between imitating rational or non-rational actions from the model, such as having a dog enter a house through a chimney (when the door to the house is clearly opened) or imitating the examiner turning on a light with her head (rather than using her hands). Thus, the difference between the current findings and those of others (Poulin-Dubois et al., 2011; Zmyj et al., 2010) likely lies in the discrepant nature of the imitation tasks. Infants' ability to imitate simple rational, step-by-step actions, such as those used in the current set of studies, is a robust skill at this age (Barnat, Klein, & Meltzoff, 1996; Barr, Dowden, & Hayne, 1996; Bauer & Mandler, 1989; Hanna & Meltzoff, 1993; Hayne, Boniface, & Barr, 2000; Herbert & Hayne, 2000; Teiser et al., 2014), while imitating irrational actions (such as turning on a light with one's forehead; Gergely et al., 2002; Meltzoff, 1995) is one that is quite dependent on the context: infants will imitate an action (e.g., the forehead motion) but only if they infer that the experimenter is doing so for some reason (Gergely et al., 2002; Schwier, et al., 2006; Zmyj et al., 2009), and not because of her limited means to attain her goals (e.g., her hands are restrained and therefore cannot use her hands to turn on the light; Gergely et al., 2002). Therefore, it is perhaps not surprising that no differences were found in the imitation task when selective trust was manipulated. In addition, these findings suggest that verbal accuracy and other social cues, such as confidence, can extend an individual's trustworthiness into different domains. In contrast, the manipulation of emotional reliability may show a domain-specificity that differs from accuracy knowledge in other domains, such as immediate imitation, towards unjustified individuals.

The findings from Study 3 extend those from Study 2, by examining infants' reactions towards neutral individuals. Extensive research using the Still-Face Paradigm, in which mothers adopt a "still-face" (i.e., neutral facial expression, no vocalizations and no tactile stimulation

towards their infant) after a positive bi-directional interaction with their infant, has shown that young infants are negatively affected by their mother's emotionally unavailable stance (e.g., Field, 1984; Tronick, Als, Adamson, Wise, & Brazelton, 1978). Yet, this negative influence on infants' behaviors during the "still-face" procedure appears to be less robust when the interactions are with strangers rather than with their mothers (Kisilevsky et al., 2003; Lamb, Morrison, & Malkin, 1987; Legerstee, Pomerleau, Malcuit, & Fieder, 1987), suggesting perhaps that neutral facial expressions may be less salient for young infants when interacting with strangers. However, an important distinction between the Still-Face Paradigm studies and the present design is that in the Still-Face procedure, the adult's reaction is somewhat out of context, sudden and unexpected, rather than a reaction towards either an object or a situation. Importantly, the findings from Study 3 showed that infants are sensitive to the valence of individuals' emotions, and when faced with an individual expressing sadness after a negative event rather than a neutral expression, they react more prominently with concern. Nevertheless, it is striking that infants do not consider a "stoic" individual as being "inconsistent" or "unreliable" after negative emotional events. This was evidenced by the fact that no differences were found between the two groups of infants on the hypothesis testing empathy variable, measuring a detection of "oddity", nor on any of the subsequent interactive tasks with the emoter. These findings suggest that at this early age, infants may give neutral individuals the "benefit of the doubt" when it follows a negative event, and that a neutral facial expression may not be as pertinent as a positive face for infants to consider it "odd" and consequently consider that person "untrustworthy" or "unreliable". These results are consistent with those from Vaish and her colleagues (2009), demonstrating that 18-month-olds will react with concern and will be willing to help individuals who were neutral after a negative experience. It is important to note here that

to our knowledge, our study, and that of Vaish and colleagues (2009) are the only published studies to date that have examined neutral facial expressions following emotionally salient events. Most other studies (Barna & Legerstee, 2005; Hornik et al., 1987; Mumme et al., 1996; Nichols et al., 2010; Phillips et al., 2002; Sorce et al., 1985; Striano et al., 2006) have typically examined infants' reactions to ambiguous objects or situations, and thus provide little information on how infants use their affective perspective taking skills in order to disambiguate another's emotional experience. Thus, Study 3 adds an important contribution in examining how infants interpret how people experience an emotionally salient event when no information is provided by the emoter.

The findings from Study 3 may give rise to inquiries regarding situations in which infants are exposed to stoic individuals on a more consistent basis. For instance, depressed mothers are more expressively neutral and more emotionally unresponsive towards their infant than non-depressed mothers (Field, 1984; Field, Hernandez-Reif, Diego, Feijo, Vera, Gil & Sanders, 2007). In fact, during the "still-face" procedure, infants of depressed mothers are less distressed than those of non-depressed mothers, showing less gaze aversion, crying, and less motor activity, suggesting some habitation to more non-responsive and stoic faces (Field, 1984; Fogel, Diamond, Langhorst & Demos, 1982). Additionally, infants of depressed mother will show this style of interaction not only with their depressed mothers, but also with non-depressed female strangers (Field et al., 1988). Maternal depression was not accounted for in Study 3 as it was not an element of the primary research question. However, it would be expected that infants of depressed mothers may react with less levels of concern when witnessing a sad facial expression, as they may be exposed more regularly to this negative emotion and thus may be more familiar with it. It would be interesting to see whether infants of depressed mothers would detect the

"happy" facial expression after a negative event as "odd", as their own mother's reactions would be more subdued. This is certainly a question for future research.

Taken together, the findings from the present series of three studies confirm infants' abilities to "trust" someone at this early age. However, do infants have the capacity to "trust" in the second year, or are their observable selective behaviors prerequisites to a full concept of trust? Do infants have the capacity to fully understand another's experiences and therefore possess the ability to consider this person "untrustworthy"? The findings from this dissertation bring to light the relations between infants' social understanding of others' mental states, often referred to as a Theory of Mind. If infants have an understanding of others' mental states and thus attribute "epistemic trust", this "rich" ability would support the interpretation that infants not only consider the adult model as attempting to deceive, but also understand what they should feel in this situation, and then label that person as "unreliable", thus selectively choosing a "reliable" individual over an "unreliable" one. This understanding of the "division of cognitive labour" (Danovitch & Keil, 2004), or the understanding that individual knowledge can vary depending on one's intentions, experiences and abilities, marks a divergence from a "halo effect" of trust, that is, the concrete assessment that one may be globally untrustworthy in all domains if they fail in one specific domain of knowledge (Lucas & Lewis, 2010). This latter, "leaner" interpretation, would propose that infants have experience with appropriate and inappropriate cues, thus having learned to be cautious of those who do not act according to social norms, and therefore are leery of this person in the future after identifying them as "globally untrustworthy" (Lucas & Lewis, 2010).

While the research on selective trust in infancy is increasing at a rapid rate, it has focused mainly on establishing that infants are able to selectively modify their behavior in a specific

domain towards an individual who was previously reliable or unreliable in the same domain (Brooker & Poulin-Dubois, 2013; Dunfield &Kulhmeier, 2010; Hamlin et al., 2007; 2010; 2013; Koenig & Woodward, 2010; Koenig & Echols, 2003; Krogh-Jespersen & Echols, 2012). Others, in contrast, have shown that an individual's unreliability in one domain impacts infants' behaviors towards them in a separate domain all together (see Hamlin & Wynn, 2012; Poulin-Dubois et al., 2009; 2011; Zmyj et al., 2010 for examples), establishing evidence for a "global" assessment of trustworthiness in infancy and supporting the "leaner" interpretation. However, despite a few exceptions (see Brooker & Poulin-Dubois, 2013; Brosseau-Liard & Poulin-Dubois, 2014; Chow et al., 2008) there is limited research examining a possible "richer" interpretation, that is, directly comparing whether infants' attribution of certain knowledge or character traits to specific individuals in a specific domain, is more likely to impact their behaviors towards that individual more globally (i.e., in all domains) or whether a domain-specificity of selective trust is more prominent within the first two years of life.

Interestingly, the findings from the current dissertation (specifically in Study 2), provide some evidence for the rich interpretation using emotional cues, as infants selectively modified their behavior towards an unjustified individual but exclusively in the emotional domain, suggesting a disambiguation from the "halo" effect of trust. Nevertheless, the studies from the current dissertation did not attempt to disentangle and directly examine the relations between infants' understanding of other's mental states (i.e., theory of mind) and selective trust. Evidence with younger and older preschoolers has suggested that increased theory of mind abilities may contribute to evaluating others based on trust (Danovitch, 2013; DiYanni, Nini, Rhee, & Livelli, 2012; DiYanni & Kelemen, 2008; Fusaro & Harris, 2008; Koenig & Harris, 2005; Mills & Elashi, 2014; Lucas, Lewis, Pala, Wong & Berridge, 2013). However, these results are mixed,

with some researchers finding that mental state understanding is not necessary for selective learning and predicting accuracy from others (Lucas & Lewis, 2010; Nurmsoo & Robinson, 2009; Pasquini et al., 2007), especially in younger children (Fitneva, Lam & Dunfield, 2013; O'Neill & Chong, 2001; Robinson, Butterfill & Nurmsoo, 2011). Consequently, future studies may wish to examine these selective behaviors and compare them to infants' abilities to attribute mental states to others, such as using false beliefs tasks (Onishi & Baillargeon, 2005) or tasks that require infants to understand different visual perspectives (Flavell, Everett, Croft, & Flavell, 1981), and adapting tasks for infants in order to assess their understanding of others' emotional experiences (e.g., Wellman & Wooley, 1990). Nonetheless, the current dissertation has taken the first steps in showing that these selective behaviors towards an "unreliable" person appear to be "domain-specific", suggesting a cognitive maturity that seems to be developing during the first two years of life.

Limitations and Future Directions

The present dissertation includes three studies which show that infants are able to detect when an emotional expression is inconsistent with the context, and that they show selective patterns of responses in their empathic helping and emotional referencing towards individuals who are emotionally unjustified. As the findings revealed that infants show selectivity in their behaviors in the emotional domain, one limitation of the current study is that there were only a selected number of outcome tasks. In order to fully comprehend the extent of infants' selective behaviors towards emotionally unjustified individuals, we must understand how infants would respond to them during other emotional tasks, for instance, tasks that would require infants to share or cooperate with that individual. Similarly, while this focus on this dissertation was not on the long term influence of emotional reliability, the current findings that have emerged with

limited exposure to strangers allows us to conclude that long-term exposure to emotionally inconsistent individuals would likely have long-term effects on infants' selective trust, as has been shown in preschoolers (Corriveau et al., 2009). Nonetheless, this will be an important question to be addressed in future studies. In addition, the studies in the current dissertation focused on a limited range of negative emotions, which included sadness, pain, and disgust. As we attempted to establish a baseline, it was decided to use emotions that have been used in the past, such as sadness and disgust, in order to make a comparison to previous studies. However, whether infants' selective behaviors towards an individual would be similar with other negative emotions, such as anger and fear, remains to be answered.

Another limitation is the lack of a pollyanna condition on selective trust. Study 1 incorporated both pollyannas (i.e., individuals who are always happy after sad events) and crybabies (i.e., individuals who are always sad after positive experiences) which aimed to produce fairly conservative justified and unjustified conditions, as infants in each condition saw a mix of happy and sad emotions. In contrast, Studies 2 and 3 did not examine the pollyanna effect on selective trust. Given that the current study was designed to examine and extend research from Hepach and colleagues (2012), and to consequently examine the impact of "crybabies" (i.e., unjustified negative emotions) on infants' subsequent behaviors towards them, infants' selective helping, emotional referencing and imitative behaviors towards pollyannas was not examined in order to facilitate the comparison to the original study with preschoolers. However, the pollyanna condition would be an interesting condition that further research may want to explore, as it would directly complement and extend the research from the current dissertation by examining the extent of unjustified positive emotions on infants' subsequent selective behaviors.

Another potential limitation is the presence of vocal cues during the exposure phase to signal disappointment or happiness. In all three studies, the actor's vocalization after receiving an appropriate object or having her object taken away were always appropriate (i.e., "Ah!" or "Oh!", respectively), while her emotional expression was manipulated. The vocal cues after the events in the three studies were inserted in order to increase the ecological validity of the exposure phase. Thus, it is possible that infants were simply reacting to the inconsistency between the vocal cues and the emotional expressions, rather than between the events and the emotions. While this explanation cannot be ruled out, we believe that it is unlikely. In the only study to date that has examined infants' detection of a mismatch between actions and vocal cues (in positive emotions), even 15-month-olds were able to detect action-vocal cues inconsistencies (Hoicka & Wang, 2011). The fact that infants of that age failed to detect the unjustified emotion in the first study of the present dissertation indicates that this is unlikely the mismatch between vocal and emotional facial cues that account for the effect observed at 18 months. Furthermore, the results from Study 2's emotional referencing task, where infants watched an actor display appropriate vocal and facial cues simultaneously, showed that infants considered an actor's previous emotional justifiability to guide their behaviour; that is, infants were less likely to be guided by an emotionally unjustified actor's happy face and vocalizations, and more likely to expect an attractive object when paired with a negative emotion, suggesting that infants had made an emotion-event association. Similarly, during the empathic helping task, infants were required to make a decision based on the actor's emotions and the events rather than solely her vocal cues. These two findings suggest that infants appeared to have considered the event-emotion mistmatch during the exposure, rather than simply the vocal cue-emotion mistmatch. Nonetheless, it remains to be seen if removal of the vocal cues during the exposure phase would

yield similar findings.

Another possible limitation may be that infants were required to interact with the same experimenter who was deemed emotively "appropriate" or "inappropriate", as that individual was the only experimenter in the room. While unlikely (given the results of the three studies), this may have prompted infants to respond differently than if there were two experimenters present, and the infants were given a choice on whom to help, imitate, or emotionally reference, and thus examining the infants' *preference*. These forced-choice paradigms have been used with preschoolers (Birch et al., 2008; Corriveau & Harris, 2008; Koenig & Harris, 2005) but are scarce and more difficult to implement with infants; 14-month-olds do not generalize their selective looking behaviors from an unjustified to a new and naïve looker behind a barrier (Chow et al., 2008), and within the first year, infants are more likely to choose puppets that had been previously helpful than unhelpful when given a choice (Hamlin et al., 2007; 2010; Hamlin, 2013). However, such a "switch-actor" or "forced-choice" paradigm has not been used with infants in cases where the infants themselves were required to choose whether to help or to reference a previously emotionally justified individual, or one who was previously displaying inappropriate emotions. While using such a methodology may be too demanding for young infants, as keeping track of who is reliable may be limited due to high executive functioning and working memory demands (Carlson, Mandell, & Williams, 2004; Carlson, Moses, & Claxton, 2004; Koenig & Woodward, 2010; Pasquini et al., 2007), it would provide a better understanding as to whether infants would develop a "halo" effect of selective behaviors towards all of the individuals in the laboratory context, or whether the selective behavior would be specific to one individual.

Related to the abovementioned possibilities for future studies would be an examination as

to whether infants would attribute trust to certain individuals versus others, depending on various social and characteristic traits. Studies with preschoolers have shown that they prefer to attribute trust to adults rather than to children their own age; however, they will choose a peer if he or she proves to be more accurate than the adult (Jaswal & Neely, 2006). Preschoolers are also more likely to "know" that an unfamiliar adult knows the meaning of a complex word more so than an unfamiliar child (Taylor, Cartwright, & Bowden, 1991), and are more likely to repeat misleading information if it was given by an adult rather than by another child (Ceci, Ross, & Toglia, 1987; Lampinen & Smith, 1995). In addition, preschoolers are more likely to attribute trust towards a caregiver rather than towards a stranger (Corriveau et al., 2009). However, many of these studies have examined the accuracy of verbal information, while very little is known about whether children and infants will take age, or the social relationship they hold with an individual into account when having to assess emotionally accurate information. Given how strongly infants detect emotional signals from both caregivers and strangers (e.g., Hornik et al., 1987; Mumme et al., 1996; Nichols et al., 2010), it could be hypothesized that emotional reliability would be strongly salient during infancy with respect to the attribution of trust towards others. Thus, future research may want to examine this question to better understand the ongoing impact of age and social relationships on infants' and preschoolers' knowledge and assessment of emotionally relevant information. In addition, it would provide some insight on the development of infants' social preferences during a period of significant developments in social learning.

A final suggestion for future research would be to examine infants' gaze patterns during tasks involving the assessment of emotional reliability by using eye-tracking methods to examine precisely where the child is looking on the emoter's face during mismatching emotions, as well as whether any changes in pupil dilation occur during the interactive tasks. Recent evidence has

shown that 10-month-olds look longer at incongruent facial reactions after the actor either missed or attained a goal (Skerry & Spelke, 2014). However, using pupil dilation measures provide more sensitive information regarding infants' arousal states than simple looking time measures (Jackson & Sirois, 2009; Laeng, Sirois, & Gredebäck, 2012). Previous studies have found that infants will show an increase in pupil dilation when they are exposed to unexpected physical, social, and emotional events (Gredebäck & Melinder, 2010; Hepach & Westermann, 2013; Jackson & Sirois, 2009). More recently, Hepach and Westermann (2013) showed that by 14 months, infants display increased pupil dilation and gazing patterns when exposed to incongruent emotions to emotional events, providing a measure of lower level physiological processing of emotional scenes. However, it remains unknown whether the changes in pupil dilation (as well as gaze patterns) remain consistent towards an unjustified emoter over the long term, or during interactive tasks in which infants are *interacting* with the emoter.

Conclusion

In conclusion, the current set of studies examined the impact of emotional reliability on selective learning and prosocial behaviour within the second year of life. Infants as young as 18 months are able to detect crybabies and pollyannas, and in turn, become selective in their behaviors towards an individual who was previously emotionally unjustified, specifically in the emotional helping and referencing domains. Infants are also sensitive to the valence of emotions, although they may not be salient enough to detect "neutral" individuals as "inappropriate" during emotionally significant events. These findings provide an important contribution to the field of emotional understanding, empathy development, and selective trust, allowing for a more comprehensive understanding of which factors may be important for infants in attributing trust. These factors allow for a richer understanding of infants' social-cognitive development during the first years of life.

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Appendix A

Sample Recruitment Letter

(Study 1)

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 the understanding of other's emotions and empathy. 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 might also 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!

For the present study, your child will have the opportunity to participate in a few short games. The first task involves examining how your child reacts to an actor who will express positive and negative emotions following certain events. For example, these events will involve the actor pretending to hurt her finger with a toy hammer, or pretending to find a toy. Following, your child will observe a scene in which the actor will look into two different containers, and express different emotions towards each of them. Then, the experimenter will play several games with your child and he/she will have the opportunity to imitate and help the actor. In the final task, your child will be looking at a computer screen where pictures of the experimenter displaying different emotions will be presented. During all tasks, your child will be sitting in a child seat and you will be seated directly behind. We will videotape the entire session and all tapes will be treated in the strictest of confidentiality.

Overall, your participation will involve one approximately 45-minute-long 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 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 14-20 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.	Sabrina Chiarella, M.A.
Professor	Laboratory Coordinator	Ph.D. Clinical Psychology Student
Department of Psychology	Department of Psychology	Department of Psychology

Appendix B

Sample Consent Form

(Study 1)

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 graduate student Sabrina Chiarella of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to examine children's understanding of emotions and their willingness to imitate and help others.

B. PROCEDURES

For the present study, you will be invited to complete a short questionnaire about your child's vocabulary. Then, your child will participate in a series of short games with a female researcher. In the first game, your child will watch her engaging in four activities which will make her pretend happiness, sadness or pain, including playing with a drum set, eating with a spoon, playing with a toy hammer and pegs, and playing with a ball. In the second game, your child will watch her look into two different containers while expressing different emotions, after which your child will have the chance to search in the containers. The third game will involve your child imitating a series of actions from the same person or helping her to complete simple actions. In the final task, your child will be looking up at a computer screen where pictures of the experimenter displaying different emotions will be presented.

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 the 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 identification numbers, unique to each family. Information collected on paper (questionnaires) or videotapes (observed behaviours) 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, heard-drives will be purged, 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 whole session should last approximately 60 minutes. During all tasks, your child will be sitting in a child seat and you will be seated directly behind.

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

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 _____

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.

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Appendix C

Sample Demographic Questionnaire

(Studies 1-3)

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 D

Coding Form for Empathic Responses

(Studies 1-3)

Sabrina Ph.D.

MALTS-FETZER
EMPATHY CODING FOR CHILDREN
(Zahn-Waxler et al., 1992)
(adapted by Sabrina Chiarella, Marie-Pier Gosselin, & Amanda Aldercotte)

Participant #: _____ Coded by: _____
Date coded: _____

1. CONCERN FOR VICTIM (facial, vocal, and or gestural/postural expressions; sadness, not pain)

1. Absent
2. Concerned facial expression present in face.(e.g., furrowed brow, raised eye brows)
3. Concerned facial expression present in face and vocalizations. (e.g, furrowed brow, raised eye brows WITH an "oh!" or "bobobo!")

2. HYPOTHESIS TESTING (attempt to cognitively understand/ interpret the distress circumstances)

1. None
2. Looks back and forth between face and object **AT LEAST 2 times**
3. Looks back and forth between face and object **3 or more times**
4. Looks back and forth between face and object **at least 2 times**, with a **look towards parents in the room** (sophisticated attempts to understand distress) OR **looks back and forth at parent in the room at least 2 times**

Appendix E

Coding Form for Emotional Referencing

(Studies 2 and 3)

Sabrina Ph.D.

Emotional Referencing Task

Participant #: _____ Coded by: _____
Date coded: _____

Warm Up

	Opened Lid? (Y/N)	**Removed Object? (Y/N)**
Trial 1		
Trial 2		

Test Trials

	1st Box Tries to Open	**1st Box Opening It (hand or looking inside)**	**Does not show a preference**
Happy-Disgust	Happy _____ Disgust _____	Happy _____ Disgust _____	

Order (Circle)

E1: Happy-Disgust
E2: Disgust-Happy

Appendix F

Coding Form for Helping Tasks

(Studies 2 and 3)

Sabrina Ph.D.
Helping: Coding

Participant # _____ **Coded by:_____**

1. **Instrumental Helping**

Attempts to help E (perform the target behaviour):

	Trial 1	Trial 2	Trial 3	TOTAL SCORE
Paperball				
Books				
TOTAL INSTRUMENTAL SCORE (OUT OF 6)				
AVERAGE SCORE				

2. **Emotional Helping**

Cues to help E (perform the target behaviour):

TOY BEAR	**Score**
1) Facial/vocal cues of sadness	8
2) "I am sad"	7
3) "I need something to make me happy"	6
4) "A teddy bear!"	5
5) Alternate gaze	4
6) Reaches toward the teddy bear	3
7) "Can you help me?"	2
8) "Can you give me my teddy bear?"	1
9) NO RESPONSE	0

GLOVE	**Score**
1) Facial/vocal cues of sadness	8
2) "I am sad"	7
3) "I need something to make me warm"	6
4) "A glove!"	5
5) Alternate gaze	4
6) Reaches toward the warm	3
7) "Can you help me?"	2
8) "Can you give me my glove?"	1
9) NO RESPONSE	0

Order (Circle) H1: Instrumental, Emotional **H2:** Emotional, Instrumental

Appendix G

Coding Form for Imitation Tasks

(Studies 2 and 3)

Sabrina's Ph.D.
Imitation: Coding

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

Warm up:

RATTLE (60s): Touched toys? (Y/N) _____

TEDDY TO BED (60s): Touched toys (Y/N) _____

Trial 1:

Give 1 if produced, 0 if no action.

Rattle (max score of 3) ***in order***:

1) Puts ball in large cup: _____
2) Puts small cup over large cup: _____
3) Shakes cups together: _____

TOTAL SCORE _____

Rattle (max score of 3) ***ANY order***:

1) Puts ball in large cup: _____
2) Puts small cup over larg cup: _____
4) Shakes cups together: _____

TOTAL SCORE _____

Trial 2:

Teddy to Bed (max score of 3) ***in order***:

2) Puts pillow on bed: _____
6) Puts teddy on bed: _____
7) Puts cover on bed _____

TOTAL SCORE _____

Teddy to Bed (max score of 3) ***ANY order***:

5) Puts pillow on bed: _____
2) Puts teddy on bed: _____
8) Puts cover on bed: _____

TOTAL SCORE _____

Order (circle): I1 = rattle, bed I2 = bed, rattle

Appendix H

Sample Recruitment Letter

(Studies 2 and 3)

Dear parent(s),

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 the understanding of other's emotions and empathy. 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 might also 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 March 2011, 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!

For the present study, your child will have the opportunity to participate in a few short games. The first task involves examining how your child reacts to an actor who will express negative emotions following certain events. For example, these events will involve the actor receiving an toy she needs, or being given an undesired toy. Following, your child will observe a scene in which the actor will look into two different containers, and express different emotions towards each of them. Then, the experimenter will play several games with your child and he/she will have the opportunity to imitate and help the actor. During all tasks, your child will be sitting in a child seat and you will be seated directly behind. We will videotape the entire session 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 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 17-22 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 Sabrina Chiarella 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.	Monyka Rodriguez, B.A.	Sabrina Chiarella, M.A.
Professor	Laboratory Coordinator	Ph.D. Clinical Psychology Student
Department of Psychology	Department of Psychology	Department of Psychology

Appendix I

Sample Consent Form

(Studies 2 and 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 graduate student Sabrina Chiarella of Concordia University.

A. PURPOSE

I have been informed that the purpose of the research is to examine children's understanding of emotions and their willingness to imitate and help others.

B. PROCEDURES

For the present study, you will be invited to complete a short questionnaire about your child's vocabulary. Then, your child will participate in a series of short games with a female researcher. In the first game, your child will watch her engaging in four activities which will make her pretend sadness, including playing with a drum set, eating with a spoon, playing with a toy hammer and pegs, and playing with a ball. In the second game, your child will watch her look into two different containers while expressing different emotions, after which your child will have the chance to search in the containers. The third game will involve your child imitating a series of actions from the same person or helping her to complete simple actions. In the final task, your child will be looking up at a computer screen where pictures of the experimenter displaying different emotions will be presented.

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 the 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 identification numbers, unique to each family. Information collected on paper (questionnaires) or videotapes (observed behaviours) 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, heard-drives will be purged, 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 whole session should last approximately 60 minutes. During all tasks, your child will be sitting in a child seat and you will be seated directly behind.

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

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 _____

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.

_____

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_____

Sabrina Chiarella, M.A.
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Participant # _____ Researcher: _____