

“But What Does Fido Think?”

The Association Between the Presence of a Pet and Maternal use of Mind-Related Language

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Abstract

The goal of the present study was to explore the relation between the presence of a companion animal and maternal use of mind-related language, which has been associated with the development of theory of mind and empathy in children. In order to investigate this intersection, a sample of 19 mothers and their children each participated in two, five-minute, filmed free-play interactions, conducted in a laboratory playroom, one of which also included the family dog. The films were then coded for maternal use of mind-related language. Although rates of maternal use of mind-related language did not differ significantly based on whether the dogs were present or absent, mothers did use mind-related language to refer to their dogs. Findings suggest that involvement with a dog, rather than simply the presence of a dog, may be associated with differences in maternal use of mind-related language. The results of this exploratory study point to the need for continued investigation of the relation between interaction with companion animals and maternal use of mind-related language, with particular attention to the possibility of implications for intervention development.

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When you play Candy Land with a three-year-old, the rules can change at any moment, for any reason, and in some instances, without reason. Attempts to clarify this confusing state of affairs may result in tears and up-turned boards. To the three-year-old, this arrangement is fair. Conversely, a six-year-old player is likely to be upset by the lack of consistent rules, and by the failure of the younger child to consider the feelings and perspectives of the other players. It is this understanding, that the other individuals involved in the game have their own perspectives, which sets the six-year-old's understanding apart from that of the three-year-old. The six-year-old has already developed a social understanding predicated on basic theory of mind (ToM). This child is aware that every person at the table wants to have a turn, that they would all like to win, and likely even that they are also upset when the rules are broken. In other words, the six-year-old is able to theorize not only about the perspectives of the other people, but about how each person's actions may be motivated and influenced by his or her perspectives (Baron-Cohen, 2001).

Although frustrating to fellow game-players, the three-year-old's failure to demonstrate ToM is to be expected (Wellman, Cross, & Watson, 2001). However, we can anticipate that over the next few years this child will develop and demonstrate ToM (Wellman et al., 2001). This successful development of ToM will be essential for typical social functioning and healthy social and emotional learning (Collaborative for Academic, Social, and Emotional Learning, 2005).

The Collaborative for Academic, Social, and Emotional Learning (CASEL) identifies five core social and emotional competencies, the first two of which directly address a developing understanding of the child's own mind, and the minds of others (CASEL, 2005). The first of

these competencies is termed “self-awareness,” and as the name suggests, it refers to the child’s recognition and understanding of his or her own emotions. The second competency, “social awareness,” refers to a similar understanding as it is applied to others (CASEL, 2005). The fact that these characteristics, which bear striking similarities to aspects of ToM, are identified as two of the five core social and emotional competencies necessary for social, emotional, and academic health, highlights the importance of ToM in social functioning.

Cases where children demonstrate deficiencies in ToM emphasize the importance of this understanding. Such deficiencies are a hallmark of autism spectrum disorders (Baron-Cohen, 2001). Simon Baron-Cohen, a leading expert on the cognitive deficiencies associated with autism, has termed these difficulties with ToM “mindblindness” (Baron-Cohen, 1997). A child who demonstrates mindblindness is unable to understand why a fellow classmate might not share his or her own interests, or why the classmate would want to have a turn to choose an activity. Without an understanding that those other children *have* interests, preferences, and motivations, the child with mindblindness cannot comprehend how those mental states might motivate or influence the other children’s actions. The reasoning behind social conventions such as sharing, turn-taking, and respecting the opinions and feelings of others—an understanding of which comes with development for most children—is thus difficult for children with mindblindness to grasp. According to Baron-Cohen, mindblindness and deficiencies in ToM contribute heavily to problems with “social intelligence,” which “encompasses our abilities to interpret others’ behavior in terms of **mental states (thoughts, intentions, desires, and beliefs)**, to interact both in complex relationships, to **empathize** with others’ **states of mind**, and to predict how **others will feel, think**, and behave” (Baron-Cohen, 1999, p. 4).

The critical role of ToM understanding in social functioning, illustrated by the atypical social behavior of children with autism, emphasizes the importance of influences that may contribute to ToM development. In the present study, I examined two such influences, as well as the potential for a relation between them. In recent years, a growing body of research on mind-mindedness has provided strong support for the role of social interaction, particularly interaction with the mother, in the development of ToM (e.g., Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Laranjo, Bernier, Meins, & Carlson, 2010; Meins, 1997; Meins et al., 2003, Meins & Fernyhough, 1999; Meins, Fernyhough, Wainwright, Das Gupta, Fradley, & Tuckey, 2002). At the same time, previously unrelated theory and research on human-animal interaction (HAI) suggests a link between HAI in early childhood, and the development of ToM and empathy (e.g., Baron-Cohen, 1999; Griffin, McCune, Maholmes, & Hurley, 2011; Melson, 2001; Wood, 2011).

Although research on mind-mindedness has focused on ToM as an outcome (e.g., Meins et al., 2003), and research on HAI has focused on a relation with empathy development (e.g., Wood, 2011), the suggestion that ToM is an important component of empathy development (Hooker, Verosky, Germine, Knight, & D'Esposito, 2008) provides a link between these two areas of research, and highlights the need to consider the associations among HAI, mind-mindedness, ToM development, and empathy development. A direct connection also has been drawn between HAI and ToM development, highlighting the importance of considering those connections (e.g., Melson, 2001; Myers, 2007). Notably, researchers studying both mind-mindedness and HAI have suggested implications for interventions intended to promote the development of empathy and/or ToM (e.g., Demers, Bernier, Tarabulsky, & Provost, 2010; Thompson & Guillone, 2003; Walker, Wheatcroft, & Camic, 2011). The idea that both mind-

mindfulness and HAI may be useful in the promotion of empathy and ToM development underscores the potential value of connections between HAI, mind-mindfulness, ToM, and empathy.

In the present study I examined the association between HAI and maternal mind-mindfulness, with specific attention to the possibility that this association could suggest an explanation for one method by which HAI contributes to positive development, namely, the development of ToM and/or empathy. In this way, I explored one possible “explanatory mechanism” for some of the observed positive influences of HAI on child development (Thorpe, Serpell, & Suomi, 2011, p. 221).

Maternal Mind-Mindfulness and Theory of Mind

The possibility that maternal and/or animal interactions can influence the development of ToM rests on the idea that ToM development is, at least in part, the result of socialization. In 1991, Dunn and colleagues suggested that individual differences in ToM, and other aspects of cognitive development, might result from variations in socialization, emphasizing the role of mothers in that socialization. In recent years, the construct of “mind-mindfulness” has been presented as a critical aspect of that socialization process, providing a mechanism by which mothers “teach” ToM to their children (Meins & Fernyhough, 1999). Since Dunn and colleagues initially suggested the role of socialization in the development of ToM, the crucial role of maternal mind-mindfulness in ToM development has been extensively supported (e.g., Symons, 2004).

The very definition and measurement of maternal mind-mindfulness suggest an association with ToM. Mind-mindfulness is explained as a mother’s tendency to hold and express the view that her infant or young child has an independent mind (Meins, 1997). Mind-

mindfulness is evaluated by consideration of a mother's references to, or comments on her child's thoughts, feelings/emotions, and desires (Meins & Fernyhough, 2010). Two measures of maternal mind-mindedness have been established. The first is typically used to examine mother-child interactions during the first year of life (Meins & Fernyhough, 2010). Referred to as the "interactional" or "observational" measure, this method looks for maternal use of language that refers to the emotions, desires, or cognitions of the child during free-play interactions with the child. This language, which is used to measure mind-mindedness, is termed "mind-related" language (Meins & Fernyhough, 2010, p. 2). Mothers are instructed, "please play with your baby as you would do if you had some free time together at home" (Meins & Fernyhough, 2010, p. 3). Interactions are recorded, and videos are subsequently coded for the presence of mind-related utterances (Meins & Fernyhough, 2010).

The second measure of mind-mindedness is a representational measure, examining maternal use of mind-minded speech in descriptions of, rather than in interactions with, children (Meins & Fernyhough, 2010). In this measure, which is typically administered in an interview setting, mothers are prompted, "can you describe your child for me?" (Meins & Fernyhough, 2010). The observational measure is traditionally administered before children turn one, but the representational measure is intended to be administered with children of preschool age or older. Although used at different times, and in slightly different settings, both measures of maternal mind-mindedness are intended to capture the tendency of the mother to hold and express the view that her child has his or her own mental life (Meins, 1997).

These requirements for the demonstration of mind-mindedness bear striking similarities to the requirements for ToM. As was described above, ToM refers to an individual's comprehension of the mental states of others, and how those mental states may influence and/or

motivate behavior (Baron-Cohen, 2001). Both mind-mindedness and ToM thus require recognition of the mental states of others. In the case of the definition of ToM, examples of such mental states include “beliefs, desires, intentions, imagination, emotions” (Baron-Cohen, 2001, p. 3). Four of these five examples of mental states recognized through ToM are explicitly identified as indicative of mind-mindedness in the *Mind-Mindedness Coding Manual, Version 2.0* (Meins & Fernyhough, 2010). Meins and Fernyhough (1999) suggested that it is through exposure to this mind-minded language that children develop an understanding of concepts relevant to an understanding of other minds; in other words, ToM (Meins & Fernyhough, 1999).

Meins and colleagues (2002) have proposed an explanation for how exposure to mind-mindedness translates into children’s development of ToM. According to this explanation, when used appropriately, mind-minded speech supplies children with “representational reference[s]” for their own mental states (p. 1717). Children thus develop a sense of their own minds and intentions, which may eventually be extrapolated to enable the children to develop that crucial understanding of other minds. This idea was initially developed as a potential explanation for the association between security of attachment and ToM development, based on the finding that mind-mindedness (which predicts security of attachment) is associated with later ToM development (Meins et al., 2002).

In order to investigate the possibility that it is mind-mindedness, and not security of attachment, which predicts later ToM development, Meins and colleagues (2002) examined the relation between maternal mind-mindedness during infancy and performance on tests of ToM at about four years of age. The authors found that maternal mind-mindedness does uniquely predict later ToM, supporting the idea that maternal mind-mindedness contributes to ToM development

(Meins et al., 2002). It is this association that suggests the potential utility of maternal mind-mindedness in interventions designed to promote ToM development (Walker et al., 2011).

A second study provides further support for the link between mind-mindedness and ToM development. Building on the associations that have been found between mind-mindedness and ToM, as measured by the traditional “false-belief” test of ToM (e.g., Meins et al., 2002), Laranjo and associates (2010) found a relation between mind-mindedness in the first year of life, and children’s ToM at just two years of age. Although it is commonly accepted that ToM does not begin to develop until around four years of age (e.g., Meins, 1997), recent research suggests that certain more subtle aspects of ToM may begin to develop in younger children (Onishi & Baillargeon, 2005). Laranjo and colleagues made use of recently-developed measures of ToM, which focus on behavioral, rather than verbal, expressions to measure children’s understanding of the “informational and motivational states” of others (p. 314).

Laranjo and colleagues (2010) found that maternal mind-mindedness was related to children’s later ToM, as demonstrated by performance on behavioral assessments of ToM. High maternal mind-mindedness was associated with the child’s understanding of which book the experimenter would prefer to read, as demonstrated by the child’s decision to offer that book to the researcher, even when the child did not share the researcher’s preference. Mind-mindedness was also associated with success on a task requiring each child to acknowledge his or her mother’s inability to see an object, even when the child was able to see the object. Both of these tasks require that the children separate their own perspectives from those of others. The repeated finding that maternal mind-mindedness is related to children’s understanding of other minds emphasizes the importance of exposure to mind-related language in early socialization.

Maternal Use of General Mental State Language and Theory of Mind Development

A second body of research, which is closely related to research on mind-mindedness, further underscores the importance of early socialization in the form of exposure to mind-related language. Building on research on mind-mindedness, with the intention of providing a more systematic examination of maternal use of mind-related language (Peterson & Slaughter, 2003), this second body of research emphasizes the value of what researchers call simply “mental state language” (Ruffman, Slade, & Crowe, 2002, p. 734). Like mind-mindedness, exposure to mental state language has been causally linked with ToM development (Ruffman, et al., 2002). Research on maternal use of mental state language bears important similarities to, as well as differences from the research on maternal mind-mindedness. This body of research thus allows us to both support and refine our understanding of the role of socialization in ToM development. Because the similarities between research on mind-mindedness and research on mental state language provide further support for the link between maternal use of mind-related language and ToM development, I will focus first on these similarities.

Like mind-mindedness, maternal use of more general mental state language has been associated with children’s development of ToM, and is considered to be one of the variables that contributes to individual differences in the rate of acquisition of ToM (Peterson & Slaughter, 2003; Ruffman et al., 2002). Both constructs also emphasize language, and specifically, maternal use of “mental state” language as an agent in the socialization of ToM. Accordingly, measures of each construct rely on the interpretation of maternal speech (Meins & Fernyhough, 1999, p. 364; Ruffman et al., 2002, p. 734). With this shared emphasis on the interpretation of maternal language that refers to minds and/or mental states, and the use of similar (and sometimes the

same) terminology by researchers in both areas, the two constructs and their respective measures may be easily confused.

Although these similarities may give the impression that the focus of the research on maternal use of mental state language is the same as that of the research on mind-mindedness, there are two noteworthy differences between them. The first of the two differences has to do with the fact that Meins and colleagues have focused primarily on the value of mind-related language as an indicator of an underlying attitude toward the child, the mother's "mind-mindedness" (e.g., Meins, 1997; Meins & Fernyhough, 2010). The idea that the mind-related language itself may have a socializing influence was secondary to that initial interest in mind-mindedness. However, the research on maternal use of mental state language has focused not only primarily, but exclusively on the value of the "mental state language" in the development of ToM (e.g., Ruffman et al., 2002). The dedication of an entire line of research to this specific area underscores the importance of the role of maternal use of mental state language in ToM development, which was suggested and supported by Meins and colleagues (e.g., Meins et al., 2002).

The second difference between research on mind-mindedness and research on mental state language is that the latter is more general and inclusive. Although researchers focusing on mind-mindedness restrict their inquiries to references to the mind of the target child (Meins & Fernyhough, 2010), researchers interested in mental state language have considered reference to any mind (e.g., Ruffman et al., 2002). In evaluating a mother's use of mental state language then, it is not important that the language address the child's mind specifically, a feature which is essential to the demonstration of mind-mindedness (Meins, 1997; Meins & Fernyhough, 2010). Instead, all of the emphasis is placed on whether the language the mother uses with her child has

to do with mental states, regardless of who those mental states belong to, allowing for consideration of the value of a larger portion of maternal speech (Ruffman et al., 2002).

It is important to note that although research on mind-mindedness has focused on the use of mind-related language to refer to the child's mind, this emphasis does not necessarily reflect a belief that the use of similar language to describe other minds does not have value. In fact, Meins and colleagues have included a category of "other minded" in their coding scheme (E. Meins, personal communication, July 2, 2012). All comments made by the mother that referred to a mind other than that of the child would fall into this category. These comments would not, however, be included in the total count of mind-related language, and in the traditional version of the mind-mindedness paradigm, such comments are rare (E. Meins, personal communication, July 2, 2012). Because only the mother and child are included in the free play session, and because the child is not yet old enough to talk, the conversation consists primarily of the mother speaking to the child (E. Meins, personal communication, July 2, 2012). Meins has speculated that the frequency of such comments might increase with observations of older toddlers and children (E. Meins, personal communication, July 2, 2012). This suggestion is supported by Ruffman et al.'s (2002) investigation of the more general use of mental state language with children aged two through six.

The greater frequency of use of mental state language to describe other minds in studies of maternal use of mental state language (as compared to studies of mind-mindedness,) may be due to the involvement of older children, as was suggested by Meins (E. Meins, personal communication, July, 2, 2012). It is also likely, however, that the difference in the nature of the paradigms used may contribute to this variation. The traditional mind-mindedness observation is conducted in a laboratory setting, with a child who is in the first year of life (Meins &

Fernyhough, 2010). When the child is over six months of age, toys are provided for the mother and child to play with (Meins & Fernyhough, 2010). Given the controlled nature of the laboratory setting, there are few opportunities for encounters with “other” minds. Although observations used to examine the use of mental state language are similarly structured and controlled, there is a crucial difference between these settings and those used to examine mind-mindedness.

A free-play interaction has traditionally been used to code for mind-mindedness, while mothers in studies examining the use of mental state language have been given a more specific task involving the description of pictures. For example, in the study by Ruffman and associates (2002), mothers were given a series of pictures and instructed to look through them with their children in the same way that they would if they were looking through the pictures in a book. In comparison with the mind-mindedness paradigm, which presents relatively few opportunities to encounter and/or discuss other minds, these pictures include characters. Mothers consequently have ample opportunity to discuss the thoughts, intentions, and other mental states of those characters. Studies of maternal use of mental state language thus present opportunities to examine the socializing influence of mental state language used to refer to a host of characters, as well as to the child.

Although the literature supporting the role of mind-mindedness as an agent in the socialization of ToM is more extensive, the association between the more general measure of maternal use of mental state language and ToM allows us to expand our understanding of the value of maternal use of mind-related language to include mind-related language that addresses minds other than that of the child. In other words, the relation between maternal use of general mental state explanations and ToM development suggests that children may learn from mind-

related language even when that language is directed at others. Thus, we need not limit our consideration of maternal use of mind-related language exclusively to language addressing the child's mind. This is a crucial point, given that, outside of the laboratory setting, mothers and children are likely to be presented with many opportunities to discuss other minds. For similar reasons, we may be unwise to limit our consideration of maternal mind-mindedness to its use exclusively within the mother-child dyad.

Mind-Related Language Outside of the Mother-Child Dyad

Although to this point the studies of the role of exposure to mind-mindedness and general mental state language in early socialization and education has focused largely on the role of the mother, researchers have begun to examine the possibility that other relationships, such as the father-child relationship, may also be important sources of exposure to mind-related input (e.g., Lundy, 2003; Laranjo, Bernier, Gagne, & Matte-Gagne, 2013). In fact, in the article by Dunn and colleagues (1991), which initially proposed the role of socialization in contributing to individual differences in the development of ToM, this socialization was discussed as taking place within the larger family dynamic, rather than exclusively within the mother-child relationship. Dunn and colleagues pointed to a mother's attempts to get one sibling to understand the perspectives of another as one way in which this critical socialization may occur. This illustration of maternal moderation of sibling interaction is only one example of how mind-related input can be provided outside of the exclusive mother-child dyad in which mind-mindedness has typically been examined. The authors emphasized the importance of studying the socialization process as it occurs within the family context in which children develop, rather than just in interactions with the mother (Dunn et al., 1991). Elizabeth Meins, who developed the construct of mind-mindedness, further identified the family as the "obvious" setting in which children gain critical

experience with other minds, emphasizing the importance of maternal moderation of familial interactions (Meins, 1997, p. 116).

The Modern American Family

The idea that familial interactions, and particularly maternal moderation of those interactions, play a critical role in the socialization of ToM may have implications for the study of the role of HAI in the development of ToM. Although Meins (1997) focused on mothers as the main providers of exposure to mind-related language, Meins did acknowledge the importance of the extended family in creating opportunities for children to be exposed to mind-related language, noting the relation between family size and mind-mindedness. Meins's emphasis on the importance of the family context is consistent with Bronfenbrenner's ecological systems theory, as it is applied to the child's immediate context. Ecological systems theory emphasizes the importance of considering interactions not only among dyads in the child's life (e.g., the mother-child dyad), but also among what Bronfenbrenner called, "n+2 systems": triads, tetrads, and so on (Bronfenbrenner, 1979, p. 5).

Recent research suggests that a complete consideration of all of the "n+2 systems" in a child's life may include not only the mother-child-human systems, but also those relationships and interactions that include non-human animals. To illustrate, in present day America, 65% of American families have at least one pet (American Pet Products Association, 2012), and 85% those pet owners call their pets family (Pew Research Center, 2006). Thus, it is possible that mother-child-pet relationships (as well as father-child-pet, or sibling-child-pet relationships) may be among the n+2 systems that make up the child's immediate context.

The idea that in modern American culture, pets are treated as and considered to be family members has been extensively supported. In a study by Albert and Bulcroft (1988), the majority

of participants strongly endorsed viewing their pets as family members. In a study conducted by Triebenbacher (1998), 98% of child participants reported that their pets were important members of their families. According to Melson (2003), in the face of such overwhelming evidence that pets are important family members, and in light of prominent developmental theories such as ecological systems theory, which emphasize the need to study children's development in the context of their relationships, families, and environments (e.g., Bronfenbrenner, 1979), our failure to consider the role of pets in children's development is "humanocentric" (Melson, 2001, p. 5). Melson insists that a complete study of child development must include a consideration of the role that pets may play in that development. This insistence, taken in combination with the large body of literature supporting the role of exposure to mind-related language in ToM development, emphasizes the importance of considering the role that pets play in children's exposure to mind-related language (Melson, 2001).

In discussing the role of family size and interactions with family members in ToM development and exposure to mind-related language, Meins (1997) emphasized the importance of maternal moderation of familial interactions. The fact that pets are so often viewed and treated as family members suggests that for purposes of the discussion of exposure to mind-related language, pets may serve to increase family size. By increasing family size, pets may increase opportunities for mothers to moderate interactions, providing exposure to mind-related language. The observation that pets are most common in families with one child, as compared to families with two or more children (Rost & Hartmann, 1994), suggests that may pets play a role in increasing family size. Although the causality of this association has yet to be investigated (it is conceivable, for example, that families choose to have pets when they might otherwise have more children), it is possible that some families that choose not to have a second child, might

choose to acquire a pet. In such cases, a pet may present opportunities for discussion of minds and practice with perspective-taking that might otherwise be unavailable or else in short supply.

Human-Animal Interaction (HAI) and Mind-Mindedness

The potential for pets to increase effective family size and thus promote exposure to mind-related language is indicated by parallels between maternal moderation of sibling interactions and maternal moderation of child-pet interactions. In her explanation of the role of family interactions in exposure to mind-mindedness, Meins (1997) referenced Dunn and colleagues' (1991) example of a mother's moderation of sibling conflict, in which the mother references the minds and perspectives of the conflicting individuals. Similarly, Griffin and colleagues referred to the potential for interaction with a pet dog or cat to "teach children that those around them have their own thoughts and feelings (e.g., when the dog or cat does not want to be petted and runs away)" (2011, p. 4). As in the case of the sibling interaction, if the mother elects to use mind-related language to help the child understand why the pet has run away, this interaction may provide an opportunity for the mother to expose her child to mind-minded language.

In each of these interactions, there is the possibility that the mother will decline to become involved, or that, once involved, she will use language other than mind-related language to moderate the interaction. According to Baron-Cohen however, for those who have developed ToM, such explanations are difficult to produce, and thus, uncommon (Baron-Cohen, 1997). If the mother decides to involve herself in the interaction, a child's interaction with a pet, like an interaction with a sibling or other family member, may thus provide opportunities for a mother to expose her child to mind-related language. Although, theoretically, other individuals, including fathers, other caregivers, and siblings may also serve as mind-minded moderators of children's

interactions with others, I will focus on maternal moderation and use of mind-related language in order to maintain consistency with the existing literature.

Children's Interest in Animals

The influence of HAI on children's ability to learn from maternal use of mind-related language may go beyond the effect that HAI has on the frequency with which mind-related language is used. In their discussion of the role of parental moderation of sibling conflict (and the associated use of mind-related language) on children's development of ToM, Dunn and colleagues (1991) emphasized the importance of children's high level of interest in sibling interactions. The authors suggested that this interest increases the likelihood that children will give their full attention to moderation of sibling interactions, which may in turn increase the likelihood that they will learn from any mind-related language that is used. Considered in combination with children's clear fascination with animals (Melson, 2001), this emphasis on the importance of interest in children's learning provides further support for the idea that HAI may increase the likelihood that a child will not only be exposed to, but will actually learn from mind-related language. The idea that children may learn more from mind-mindedness when animals are involved in interactions is supported by theory and research on HAI, as well as by research on mind-mindedness.

The influential psychologist G. Stanley Hall asserted that, "love of animals is inborn" (Hall, 1896, p. 335). This statement reflects the widely held view that children are born with some kind of preference for, interest in, or love of animals (e.g., Kidd & Kidd, 1987; Wilson, 1984). Although such gene-centered and reductionist explanations are speculative and lack any kind of evidentiary support, the underlying behavior they seek to explain (that children may demonstrate a high level of interest in and/or attention to animals), has been empirically

demonstrated (e.g., Kidd & Kidd, 1987; Melson, 2001), and has important implications for the potential value of mind-related language used in reference to animals. For example, Melson (2001) found some evidence to suggest that children learn more, and are more likely to be engaged, when animals are used to introduce new concepts. Thus, although some explanations for *why* children seem to be more likely to attend to animal stimuli than to other, inanimate, stimuli have often been speculative and gene-centered, these controversial explanations should not detract from the importance of the observations regarding children's attentiveness to animal stimuli.

Because each proposed explanation for children's apparent interest in animals suggests a different reason why increases in mind-mindedness brought about through HAI may be particularly valuable, I will provide a brief survey of a few of these explanations. In order to underscore the importance that has been placed on observations relating to children's attention to animals, and in the interest of providing a complete account of the relevant literature, I will first provide an account of one of the aforementioned biologically-reductionist explanations.

Often the first to be cited (and just as quickly questioned) as an explanation children's and adults' attentiveness to animals, E.O. Wilson's concept of "biophilia" suggests that humans have a preference for all living things, including animals. According to Wilson, that "innate tendency" developed as an evolutionary adaptation (Wilson, 1984, p. 1), offering one explanation for increased attentiveness to animals (Wilson, 1984; DeLoache, Pickard, & LoBue, 2011). According to the Biophilia Hypothesis, then, children may be more likely to take away important messages about the minds of others from moderation of interactions with animals, as compared with similar moderations of interactions with siblings or peers. Wilson's explanation for children's attentiveness to animals thus has implications for the discussion of children's

ability to learn about other minds through interactions with animals. However, as I have described, Wilson's use of language like "innate" and "tendency" (Wilson, 1984, p. 1) ignores variations in children's development that occur based on context and experience, and implies that gene expression is fixed and pre-determined (Joblonka & Lamb, 2005).

Although Wilson's proposed explanation for children's attentiveness to animals is speculative, in a 1987 study, Kidd and Kidd provided empirical support for the suggestion that children are more attentive to animals than to other stimuli, and tested hypotheses regarding possible alternative explanations for that attentiveness. Kidd and Kidd first ruled out the possibility that tactile or auditory qualities might account for their observation that children 12 months of age and older prefer live animals over mechanical toy versions of the same animals. Kidd and Kidd then considered the novelty of animals as a possible explanation. In testing this hypothesis, however, Kidd and Kidd found that children were more interested in familiar pets than in novel toys. Based on this finding, Kidd and Kidd concluded that it is not the novelty of pets that is engaging to children.

In place of the novelty hypothesis, Kidd and Kidd (1987) suggested that the children in their study demonstrated a preference for live animals over inanimate objects because of the reciprocal movement offered by animals, whether familiar or not. This proposal was based on the observation that while both the mechanical toy animals and the live animals drew the children's interest and attention, it was only the live animals that were able to *sustain* the children's attention. After an initial investigation of the movement of the mechanical toys, the children quickly became susceptible to distraction. Based on this failure of the mechanical toys to sustain the children's attention, Kidd and Kidd proposed that it was the reciprocity of the animals' movement (which, unlike mechanical toys, can actively respond to the children's advances) that

held the children's attention. According to Kidd and Kidd, then, what sets animals apart as especially engaging stimuli for children is not only that they are attention-grabbing like other novel objects or individuals, but that they are able to hold children's attention beyond that initial moment of intrigue.

Although Kidd and Kidd (1987) suggested that reciprocal movement is primarily responsible for children's interest in animals, Myers (2007) asserted that it is the "optimally discrepant features (just right degrees of difference), which make the animal intrinsically engaging to the young child" (p. 15). In other words, according to Myers, it is the fact that non-human animals share certain characteristics with humans, while also exhibiting readily apparent differences from humans, which makes animals so compelling to children. This proposed explanation, if empirically supported, would be of particular importance to the discussion of ToM development and HAI, and consequently will be discussed in greater detail in a later section.

The number of proposed explanations for the idea that children tend to be interested in animals, combined with the initial empirical support that has been provided for this idea (e.g., Kidd & Kidd, 1987), suggests the need for further research investigating the possibility that children do in fact attend to animals more frequently, and sustain that attention longer, than they do to other stimuli. If further research does provide support for this idea, the implications for exposure to mind-related language are clear: children may pay more attention to, and thus learn more from, mind-related language presented through human-animal interaction than from similar language presented in other contexts and/or with other stimuli.

The potential for HAI to be associated not only with the amount of mind-mindedness that a mother demonstrates to her child, but also the child's responsiveness to and likelihood to learn

from that exposure, is one way in which interaction with animals may play a positive role in child development. Although the gene-centered view that children's attention to animals is the result of an "innate" (Wilson, 1984, p. 1) or "inborn" (Hall, 1896, p. 335) "tendency" (Wilson, 1984, p. 1) is relatively new and speculative, the idea that HAI is beneficial for developing children is not. In 1693, John Locke, a noted empiricist, spoke of the value of giving children "dogs, squirrels, birds, or any such things," emphasizing the potential for responsibility for those animals to teach children "diligence and good nature," as well as empathy towards other humans (Locke, 1693, p. 131). The theory and research supporting the idea that HAI is beneficial for children's development, and particularly for the development of ToM and empathy has changed considerably since that early proposal, but this idea is still widely held.

Human-Animal Interaction as a Positive Influence on Child Development

There is a considerable body of both anecdotal and empirical support for the positive effects of HAI. Up to this point, the literature on HAI has not directly addressed the possibility of an intersection with mind-mindedness, but as in the case of John Locke's writing, the language used to describe the specific benefits of HAI suggests that scholars, researchers and those interacting with children and their pets are acutely aware of the role that pets may be playing in ToM development and the associated exposure to mind-related language.

Boris Levinson, viewed as the father of pet-oriented child psychotherapy (now "animal assisted therapy") referenced the influence of pets on family dynamics. Levinson (1997) specifically identified the mother-child relationship as heavily influenced by the presence of a pet. Levinson suggested that, "where a pet is present in the home, it provides the parent with a 'golden' opportunity to explain to the children the reasons why the dog behaves the way he does" (Levinson, 1997, p. 156). We may interpret Levinson's suggestion to mean that if the

parent takes advantage of the opportunity presented by the pet, he or she may use it to provide the child with what Elizabeth Meins would classify as exposure to mind-mindedness, and Peterson and Slaughter (2003), who developed a measure of maternal use of mental state language, would call an “Elaborated Mental State” explanation (p. 404). Support for the possibility that parents are likely to use such mind-related language to explain animal behavior to children comes from an observation made by James Griffin (2011).

On the first page of the introduction to *Animals in Our Lives: Human-Animal Interaction in Family, Community, and Therapeutic Settings*, which explores the current research on HAI, Griffin (2011) explained that, “many pet owners tend to attribute many of their human thoughts and emotions to both domestic and wild animals as they interact with them and observe their behaviors” (p. 1). This explanation of a human proclivity to use emotion-related and thought-related language with animals resembles definitions of maternal mind-mindedness, which is concerned with a mother’s tendency to demonstrate a proclivity to attribute mental states (including desires, thoughts, and emotions) to her infant (Meins, 1997). In a second book, which provides a conceptual model for the scientific study of HAI, Griffin, and colleagues (2011) also explicitly referenced the capacity of animals to teach children to acknowledge and respect the existence of these mental states in others.

Identifying similar benefits of HAI as were highlighted by Griffin and colleagues (2011), Melson (2001) devoted an entire section of her book surveying the state of research on the role of animals in child development to the discussion of the role of HAI in ToM development. Melson specifically mentioned the development of an understanding of other minds as a possible benefit of HAI, and proposed that HAI may help children to successfully tackle the challenge of

“discovering the feelings and thoughts of others” during the preschool years (Melson, 2001, p. 50).

Although a less explicit example of a suggestion of a relation between HAI and ToM development, Wood (2011) commented that “a companion animal gives a child practice relating to someone different from him- or herself, gives the child an opportunity to show empathy, and teaches the child how to accommodate the needs of another” (p. 30). By connecting HAI and empathy development, Wood points to the need for an explanation of why and how that positive effect occurs, if it is indeed a causal relationship. One potential explanation for the “how” has already been discussed as the central theme of this paper. This suggestion thus emphasizes the need for an explanation of *why* HAI could play a positive role in the development of ToM and empathy. Evolutionary theory offers one such explanation.

Proposed Explanations for a Role of HAI in ToM Development

The idea is widely held that humans feel and express a heightened sense of empathy towards animals, and/or that they learn that empathy from animals (e.g., Angantyr, Eklund, & Hansen, 2011; Thompson & Guillone, 2003; Wood, 2011). In 1986, James Serpell built on Charles Darwin’s theory of evolution to suggest an evolutionary explanation for this association between HAI and the development of empathy. Like Wilson’s Biophilia hypothesis, however, Serpell’s assertions of an evolutionarily developed “tendency” reflects an overly simplistic and biologically reductionist view of human development, which fails to consider the contexts and experience of individual development (Joblonka & Lamb, 2005). Once again, in the interest of providing a complete account of the literature, and in order to acknowledge the relevance of Serpell’s evolutionary theory to the present discussion, I will give an overview of Serpell’s theory and the ways in which it may provide further support for the proposed association

between HAI and mind-mindedness. Such implications would be important should researchers test Serpell's suggestions and find empirical support for the idea that people demonstrate more perspective-taking with animals than with other stimuli.

According to Serpell (1986), humans developed a propensity to hypothesize about the perspectives and mental lives of animals. Serpell suggested that this tendency was evolved and maintained because it improved the ability of human hunters to understand their animal prey. Serpell further suggested that the result of this perspective-taking tendency was a related proclivity to empathize with animals, just as research on mind-mindedness suggests that exposure to, and practice with perspective-taking language is a precursor to ToM (and by association, the development of empathy) (Meins et al., 2002). Serpell's idea that humans have an evolutionarily developed tendency to use their perspective-taking skills with animals suggests that children who spend time with animals (i.e., have pets) may be more frequently exposed to mind-related language, because adults may be more likely to demonstrate such language when an animal is present, or even when discussing the animal. A child's own tendency to hypothesize about the mental lives of animals may also increase the likelihood that the child will practice perspective-taking when he or she reaches the appropriate age. In addition to providing support for the idea of a link between HAI and ToM development, Serpell's evolutionary explanation suggests the possibility of a direct causal link between HAI and increased exposure to mind-mindedness. Beyond the idea that interactions with animals increase the number of opportunities for the use of mind-minded language, Serpell's ideas allow us to consider the possibility that the presence of an animal may push mothers to employ their perspective-taking abilities when they otherwise might not. As was emphasized above, however, such notions can only be considered

speculative until such time as Serpell's ideas regarding the practice of perspective-taking with animals are empirically tested and supported.

Like Serpell, Burghardt (2009) endorsed the belief that humans have a "natural propensity" to practice perspective-taking with animals, ascribing characteristics of the mind to them, and hypothesizing about what those characteristics might be in a given instance (p. 511). Also like Serpell (and like Wilson), Burghardt oversimplified the role of genetics in human development, ignoring the role of experience. In Burghardt's use of it, the term "natural" refers to a biological basis—a specific part of the brain that is responsible for the tendency to practice perspective-taking with animals.

In support of his idea of a biological basis for the tendency to practice perspective-taking with animals, Burghardt cited the work of Heberlein and Adolphs (2004). According to Heberlein and Adolphs (2004), part of the amygdala is responsible for the assignment of intentions and other mental capacities to others. However, Heberlein and Adolphs found that this same part of the brain is activated whether the other whose perspective is to be adopted is human, animal, or even inanimate. According to Heberlein and Adolphs then, humans do have a part of the brain that is associated with hypothesizing about the perspectives of animals animals, but this same part of the brain is associated with perspective-taking with humans, and even inanimate objects (such as three geometric shapes, to which participants ascribed intentionality in the study). This finding, combined with the previously described ignorance of the role of context and experience, raises questions about the many claims that animals provide unique opportunities for practice with perspective-taking. If these claims are true, how do the opportunities presented by animals differ from those presented by other humans and inanimate objects, which activate the very same area of the brain? Thus, even if Burghardt's and Heberlein

and Adolphs' biological explanation for a "natural" tendency to hypothesize about the mental lives of animals could be considered plausible, the same evidence might be cited in support of a "natural" tendency to hypothesize about the perspectives of other people, and even geometric shapes. What then, if anything, makes us more likely to practice our perspective-taking skills with animals than with other humans or the geometric shapes of the Heberlein and Adolphs study?

Although we may choose not to accept Serpell's evolutionary explanation, which lacks empirical support, a simple idea proposed by Melson (2001) provides a compelling explanation for why children and parents may be more likely to practice their perspective-taking skills (exercising that critical area of the amygdala) with animals than with other humans or inanimate objects. Melson observed that many pet owners talk to their pets. This observation has been echoed by others, including Hart (2010), who asserted that, "people almost inevitably speak to their animals," and that animals, "provoke people to talk to them" (p. 59). Melson's and Hart's suggestions that pet owners talk to their pets are supported by the finding that 90% of child pet owners talk to their pets (Triebenbacher, 1998), and that 66% of adult dog owners, and 95% percent of adult bird owners talk to their pets (Melson, 2001). Melson further observed that because pets only respond nonverbally, they leave more explicit verbal interpretations open for their human companions, who may fill in the missing half of the conversation, hypothesizing about the pets' perspectives to do so. This notion, though compelling, has yet to be formally investigated.

Although not a formal investigation into the tendency of pet owners to fill in their pets' sides of conversations, Myers (2007) did observe that, "children sometimes 'put words in the mouth' of the animal" (p. 12). Unlike Melson, however, Myers did not view this behavior in a

positive light. According to Myers, speaking on behalf of a pet is a demonstration of a lack of understanding of the fact that animals cannot speak, rather than an attempt to interpret the animals' perspectives *in spite* of their lack of the capacity for speech. According to the *Mind-Mindedness Coding Manual* however, putting words in the mouth of an infant (or animal, as the case may be) is explicitly mind-minded (Meins & Fernyhough, 1999). In fact, it was through my recollection of my own tendency to put words into the mouths of my childhood pets that I initially came to consider the possibility of a link between mind-mindedness and HAI. At the same time that he identified this habit as a cognitive error, even Myers acknowledged that putting words into the mouth of a pet represents an attempt to comprehend the behavior of that pet.

In addition to the possibility that pet owners speak on behalf of their pets, Melson (2001) provided a second, related explanation for why people are likely to apply their perspective-taking skills to their pets. According to this explanation, even if owners are not explicitly "speaking" on behalf of, or conversing with their pets, the fact that domesticated animals rely on their owners to provide basic resources means that on some level, owners must take on the perspectives of their pets. Because of the emphasis on the animal's dependency on the pet owner, I will refer to this explanation as the "caregiver explanation." Here again, the crucial characteristic of companion animals, which pushes pet owners to practice their perspective-taking abilities, is the simple inability of animals to talk (Melson, 2001). That is to say that although, like animals, people have perspectives of their own, unlike animals, people can freely express those perspectives, often removing the need for perspective-taking. Inanimate objects, though similarly incapable of expressing perspectives verbally, do not have perspectives to interpret in the first place. Thus it is the dog's clear ability to demonstrate its own perspective (as when he or she barks at an open bag

of treats), coupled with its inability to verbally express that perspective, and its reliance on the owner to take on the role of interpreting its perspective, which creates a unique opportunity for pet owners to demonstrate their perspective-taking skills (Melson, 2001). When the adult is the animal's caregiver, this may translate into increased exposure to mind-related language for the child. When the child is the caregiver, this suggests that the child may be presented with opportunities to practice perspective-taking. Research and theory emphasizing the importance of exposure to mind-related language suggest, however, that the most valuable opportunities are likely to come when parents and children collaborate in the care of the pet. Such collaboration may provide unique opportunities for maternal moderation of child-pet interactions, in addition to opportunities for the demonstration and practice of perspective-taking.

Maruyama (2010) took Melson's idea a step further, suggesting that because animals require owners to practice perspective-taking on a daily basis (with a failure to do so potentially resulting in the death or injury of the pet), they increase the likelihood that children will practice the same skills in other situations, including with other humans. According to Maruyama, pets do not just teach children how to take on the perspectives of others, but by requiring regular caregiving they enable children to discover the importance of considering the perspectives of others, pushing them to put their abilities into practice. In this way, Maruyama proposed that regular interaction with an animal may translate into the promotion of ToM and empathy development, which may then be applied to both human and animal others. The caregiver explanation may thus be used to explain not only how interactions with pets promote practice with perspective-taking, but also to account for the generalization of that practice from animal minds to human minds. More research is needed, however to determine whether the child's role as caregiver for his or her pet does contribute to increased perspective-taking.

Because the focus of this paper is on the role of pets in promoting ToM development in parent-child-pet interactions, and not simply child-pet interactions, it is important to recall that the principles behind the caregiver explanation apply even when a parent is involved in the care-giving. For young children, parental moderation of these care-giving interactions through the use of mind-related language may even be necessary to prompt the child to think about the perspective of the pet. In this way, like Serpell's evolutionary explanation, the caregiver explanation suggests that interactions with pets may not only provide opportunities for the use of mind-related language as was described above, but also suggest that parents may be more likely to capitalize on these opportunities than on those presented by other humans.

Mind-Related Language Versus Anthropomorphism

The view held by Serpell, Melson, and Maruyama characterizes the tendency of humans to hypothesize about the perspectives of animals as not only positive, but adaptive. This perspective represents a shift from the view that has been held for nearly a century. In 1929, Piaget published *The Child's Conception of the World*, in which he identified animism and the associated anthropomorphism as one of the three core characteristics of the developing child's egocentrism. According to Piaget, anthropomorphism is an error in cognition, an over-attribution of human consciousness, personality, and other psychological characteristics to non-human creatures (Piaget, 1929/2007). Piaget suggested that this misunderstanding and the consistent assignment of these human-like characteristics to non-human animals, and even to inanimate objects, is a characteristic of the developing child who does not yet understand what it means to be living or conscious (Piaget, 1929/2007). The similarities between the vocabulary used by Piaget to describe the concept of anthropomorphism, and that used by Meins and Fernyhough to describe

the procedure for identifying mind-minded language, suggests a need to clarify the distinction between the two.

Although it may be tempting to hasten to the conclusion that there is indeed no distinction between the anthropomorphism Piaget described in children, and the use of mind-related language to refer to animals, contemporary writing on the subject suggests that the two uses of the language are different. Piaget himself identified the source of the child's animism and anthropomorphism as arising from a lack of understanding of consciousness, rather than the true belief that all beings are conscious in the same way. So, in contrast to hindering the child's development out of this cognitive error or being a demonstration of a similar error in an adult, if, as previous research suggests, the use of mind-related language can help a child to develop that understanding of the consciousness of others (e.g., Meins & Fernyhough, 1999), parental use of mind-related language to refer to animals may support a child in his or her movement away from indiscriminate animism and anthropomorphism. Children's use of the same type of language may then represent an attempt to practice the application of that understanding. The use of mind-related language with animals is not necessarily, then, a mother's support of her child's misunderstanding, but instead may represent an attempt to scaffold a new level of understanding.

The idea that the use of mind-related language to refer to animals is not simply an error in egocentrism is further supported by observations made about children's use of this type of language. Myers (2007) observed that children respond to the unique characteristics of every animal they encounter, using language that appropriately reflects the perspectives of each type of animal. Children's varying responses to different types of animals suggests that in using mind-related language with animals, children are not indiscriminately applying their own human

perspectives to those animals, but instead must be learning to respond to the animals themselves (Myers, 2007).

Offering a different explanation for why the use of mind-related language to refer to animals is distinct from anthropomorphism, some theorists and researchers have emphasized that non-human animals and humans are actually more similar than researchers typically acknowledge. From this perspective, Piaget's insinuation that the application of mind-related language to animals is anthropomorphic might itself be described as "humanocentric" (Melson, 2001, p. 5). In anticipation of accusations of anthropomorphism, Konrad Lorenz declared, "you think I humanize the animal?...I am not mistakenly assigning human properties to animals: on the contrary, I am showing you what an enormous animal inheritance remains in man" (Lorenz, 1952/2004, p. 144). This sentiment of Lorenz's can be seen as echoing the earlier perspective of Darwin, who emphasized that, "the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind" (Darwin, 1871/2004, p. 120).

The convictions of Lorenz and Darwin that the mental characteristics of animals and those of humans are less different than we tend to believe is supported by genetic studies of humans and other species (e.g., Diamond, 1991). As humans, we emphasize the ways in which we are different from our animal relatives (Melson, 2001). This belief in our own dissimilarity from other animals can be seen in the fact that we have categorized ourselves as belonging not only to a different species, but to an entirely different genus than our closest genetic relatives, the chimpanzees (Diamond, 1991). The reality, however, is that the genetic difference between humans and chimpanzees (1.6%) is smaller than that which exists between two kinds of gibbons (2.2%), which we identify as belonging to the same species (Diamond, 1991). If, as Darwin and Lorenz suggest and the research of Diamond supports, humans and animals are not so different

as we typically assume, it seems unwise to simply assume that all use of mind-related language to refer to animals is a cognitive error.

In an assessment of the current perspectives on animal consciousness, Burghardt (2009) endorsed the idea that the historical refusal of scientists to acknowledge the existence of an animal mind is too limited. In setting forth guidelines for the study of the consciousness and mental lives of other species, Burghardt emphasized that while we must indeed be cautious not to over-attribute human characteristics to animals, scientists must also be open to considering the perspectives of animals (Burghardt, 2009). We must therefore recognize that some of the mind-related language that parents and children use to refer to animals may actually be accurate and appropriate. We must also recognize, however, that until we develop a better understanding of the specific cognitive capacities of each species, we will be unable to fully evaluate the appropriateness of every comment made about an animal mind. However, we can feel secure in saying that it is overly restrictive to assert that the assignment of *any* mental state to an animal represents anthropomorphism.

A study by Barrett, Newman, and Richer (2003) provides support for the idea that the use of mind-related language with animals is distinct from Piaget's conception of anthropomorphism. In comparing children's developing understanding of other minds as it applies to humans, non-human animals, and other beings (e.g., spirits and gods), Barrett and associates found that, as Piaget described, children who are just beginning to understand the perspectives of others do at first demonstrate indiscriminate anthropomorphism, applying the same conception (or lack thereof) of consciousness regardless of species. However, based on their finding that children begin to understand the difference between their own knowledge and that of a dog *before* understanding the difference between their own knowledge and that of

another human, the authors emphasized that this error may result from a complete lack of understanding of other minds, and an over-extension of children's understanding of their *own* minds, rather than of human minds as a whole. The authors reasoned that children cannot be overextending their understanding of other human minds to animals, as occurs in Piaget's concept of anthropomorphism, if they have not yet developed an understanding of other human minds.

In this way, the authors took Piaget's explanation of children's egocentrism a step further to suggest that the children in their study who miss-attributed human knowledge to a dog were not likely to have been making an error specifically involving anthropomorphism, as much as they were making a general error in egocentrism. According to Barrett et al., these children, who were just developing an understanding of their own and other minds, may simply have been attributing their own background knowledge to all others; and the fact that such attribution happened to be correct for other humans, but not other animals, may have merely been a coincidence. According to this interpretation, as the children's understanding of their own and other minds developed and refined, they would learn that their own perspectives are not shared by all other creatures, enabling them to grow out of their "general theory of mind" (Barrett et al., 2003, p. 105).

Animals as "Optimally Discrepant Social Others"

In addition to providing evidence against the idea that the use of mind-related language with animals represents anthropomorphism (an error in cognition), the findings from the study by Barrett and colleagues (2003) further suggest the possibility that the use of mind-related language to refer to animals may support children's cognitive development, and particularly their understanding of other minds. This possibility is suggested by the same findings that Barrett and

colleagues cited as the basis for the argument against the anthropomorphism explanation. Based on the relative ease and consistency with which children understood the minds of other animals, as compared to other humans, Barrett and colleagues suggested that as the developing child learns more about other minds and how they differ from the child's own mind, the child will correct the inappropriate application of his or her own background knowledge to others, beginning with those minds that are more clearly distinct from the child's own. That is, the child will learn that an animal of another species (e.g., a dog,) does not have the same knowledge and understanding as the child, *before* learning that his or her mother (who is of the same species) does not share the same knowledge (Barrett et al., 2003). In this sense, learning about other animal minds may be easier for young children than learning about other human minds, because the differences between "self" and "dog" are more readily apparent than the differences between "self" and "mother" (Barrett et al., 2003).

Although further research is needed to explore whether this disparity holds up across other comparisons (for instance, the difference between "dog" and "self" versus the difference between an unfamiliar human other and "self"), the findings of the study by Barrett and colleagues do have interesting implications for the discussion of the development of ToM. Based on the findings of Barrett and colleagues, it may be plausible to suggest that instead of representing an indiscriminate assignment of human characteristics to animals, the use of mind-related language with and/or by young children may support and reflect a developing understanding that those animals have a mind that differs from children's own minds.

The idea that animals present a unique opportunity for children to discover the difference between self and other recalls Myers's idea that "animals appear to be optimally discrepant social others by the time of early childhood—offering just the right amount of difference from

the human pattern” (Myers, 2007, p. 10). Although Myers did not offer any evidence for this idea himself, the results of the study by Barrett and colleagues do offer some support. Like Barrett and colleagues, Myers suggested that this characteristic of animals, that they are similar enough to humans to be included in children’s initial egocentrism, but distinct enough to be excluded from that egocentrism before other humans, is important in providing children with crucial opportunities to begin to learn about the self, the other, and the differences and similarities between the two (Myers, 2007, p. 15). In other words, at the same time that animals are very clearly different from humans, they also share critical similarities with humans, namely those associated with animacy. According to Myers, those critical similarities between humans and animals are what Stern (1985) called the core senses of self. These are: agency (independent, volitional motion), coherence (wholeness), affectivity (emotion), and continuity (maintenance of a consistent character over time). Although all humans share these core senses of self, it is the combination of these shared characteristics with the marked differences between humans and animals that presents a unique opportunity for children to begin to explore and understand the idea of other minds (Myers, 2007).

Even before Myers proposed that animals offer “just right degrees of difference” (Myers, 2007, p. 15), a similar suggestion was made by Boris Levinson, the aforementioned father of animal assisted therapy. Levinson emphasized that the differences between the child’s own mind and the animal other’s mind may be more readily apparent to the young child than the differences between the child’s own mind and the human other’s mind (Levinson, 1997).

Although like Levinson, Myers did not offer empirical support for these hypotheses, Barrett and colleagues’ finding that children become aware of the differences between their own background

knowledge and that of a dog *before* developing the same awareness with their mothers does provide preliminary support for this apparently widely held idea.

If, as Barrett et al., Levinson, and Myers have suggested, it is easier for a child to understand the distinction between his or her own mind and the mind of an animal, as compared with the distinction between his or her own mind and the mind of a fellow human, it may be that the understanding of animal minds represents a preliminary step in the development of ToM. According to Vygotskian theory, maternal use of mind-related language to refer to pets would not be a demonstration of anthropomorphism, but would instead be a demonstration of effective scaffolding (Berk & Winsler, 1995). While the understanding of human minds is still outside the child's zone of proximal development, the understanding animal minds may fall inside of it (Vygotsky, 1978/1997).

This interpretation based on Vygotskian theory emphasizes the importance of investigating not only the influence of the presence of the pet on the amount of mind-related language that mothers use, but also the question of whether mothers use this language with pets at all. Even in the case of a mother who uses the same amount of mind-related language regardless of whether or not her pet is present, it may be that, at least when the child is first developing his or her ToM, mind-related language used in reference to animals is more accessible to the child than the same language used in reference to people. Thus, although the evolutionary-based hypothesis presented by Serpell (1986) suggests one disputed explanation for why the use of mind-related language with animals might be beneficial for the survival and proliferation of humans as a species, the observations made by Barrett and colleagues (2003) suggest the individual developmental benefits and motivations for the use of this language.

The Use of Animals in Tests of Theory of Mind Understanding

Although it has yet to be tested empirically, the possibility that it is easier for young children to demonstrate ToM and related abilities in regard to animals than in regard to other people raises important questions about the way in which we test for ToM. To this point, many false-belief tasks (commonly used to test ToM) have required children to demonstrate an understanding of the minds of animal characters. As a relevant example, many of the ToM tests used in studies examining the predictive role of mind-mindedness have used animal characters. In one such instance, Meins and colleagues (2002) tested for ToM by asking children to demonstrate an understanding of what Freddy the Frog thinks is inside a candy tube, after the child has been told that the tube actually holds a pencil. The child is thus required to separate his or her own understanding and knowledge from that of another character, which children in the Barrett and colleagues (2003) study did more consistently and at an earlier age when the problem involved an animal mind, as opposed to a human mind.

In a second test used in the Meins and colleagues (2002) study, children were asked about Charlie the Crocodile's knowledge of the location of his chocolate, which had been hidden by Cheeky Monkey. Again, each child has to separate his or her own knowledge of the new location of the candy from the crocodile's lack of that knowledge. We must ask whether this task is easier than it would be if Charlie the Crocodile and Cheeky Monkey were humans. Similar tests of ToM used by Meins and Fernyhough (1999), and Meins and associates (2003) also tested children's understanding of animal minds. Although not explicitly examining whether families use mind-related language to refer to animals, each of these studies may serve as an informal investigation into children's understanding of the use of mind-related language as it is applied to animals.

Although well beyond the scope of the present study, this use of animals in ToM tests raises the question of whether these tasks represent an “easier” version of similar tasks involving human minds. It follows from this that we must ask whether, if it is the case that these tasks are easier, we can use them to identify distinct stages in the development of ToM, with the understanding that animal minds are distinct from one’s own, preceding the development of the understanding of other human minds.

Another question that comes from the possibility that perspective-taking with animals may be easier than perspective-taking with people is whether this difference manifests itself in one of the forums in which children commonly practice their perspective-taking: pretend play. In instances of pretend play, do young children play the role of animals before they take on those of other humans? Although again well beyond the scope of the present study, exploration of the question of animal role-playing may be particularly informative in light of Myers’s suggestion that children can convey a more sophisticated comprehension of animals through action/demonstration than through description alone (Myers, 2007). The idea that children can demonstrate their understanding of other minds behaviorally before they are able to express that understanding verbally receives support from the recent use of tests of ToM for young children, which tap into subtle aspects of ToM that can be measured through behavioral means (e.g., Laranjo et al., 2010). Results of these tests indicate that children as young as fifteen months may show early signs of ToM (Onishi & Baillargeon, 2005).

If children are able to demonstrate an understanding of other minds before they can express that understanding verbally, observation of children’s pretend play and role-play may allow for the study of children’s earliest explorations of other minds. In this way, observation of children’s role-play may be another way in which we may explore the possibility that children’s

understanding of animal minds precedes their understanding of other human minds. Although information on the progression of ToM development (and the specific chronology relating to the understanding of animal minds) may inform the discussion of the role of HAI in ToM development, for the purposes of the present study I am concerned only with exploring the relation between mind-related language and HAI.

Previous Studies Examining Mind-Mindedness with Animals

Although the specific relation between maternal use of mind-related language and HAI has not previously been investigated, the results of some relevant studies do inform the present research. One such study, conducted by Maruyama (2010), explored the association between HAI and ToM development through the use of questionnaire and interview methods. Although Maruyama was not looking at mind-mindedness *per se*, her finding that scaffolding by adults may mediate the relation between the presence of a pet and the development of perspective-taking abilities provides support not only for the possibility of a link between HAI and ToM development, but specifically for the idea of parental involvement (possibility through the use of mind-related language) in that link (Maruyama, 2010). Maruyama further pointed to the need to pursue the question of how parents can most effectively be taught to support interactions between pets and children to promote the development of ToM in the children. This emphasis on the need for educational interventions to promote positive interactions with pets, taken in combination with suggestions that interventions be designed to promote the use of mind-related language (Demers et al., 2010), opens up the possibility that interventions involving both pets and education on mind-related language may be maximally effective. In this way, the results of the Maruyama study support the idea that investigation into the interaction between the use of

mind-related language and HAI may be of value for intervention development (Maruyama, 2010).

A second study, conducted by Geerds and Van de Walle (2012) took a similar approach to the Barrett and colleagues (2003) study described above, viewing children's use of mind-related language with animals not as a sign of a lack of understanding of the differences between humans and non-human animals, but as a method of developing an understanding of precisely that difference. The authors did not set out specifically to investigate maternal mind-mindedness or maternal use of mental state language, and indeed the authors had no knowledge of those constructs at the time of the study. The study instead had the broader goal of examining the way that mothers and children speak when they are in the presence of animals (Geerds & Van de Walle, 2012). The authors were particularly interested in children's development of biological knowledge and how mothers' speech may differentially support that development. In addition, Geerds and Van de Walle's interest in the way that maternal speech influences children's developing cognitive understanding bears marked similarities to the idea that maternal mind-mindedness, expressed through the use of mind-related speech, contributes to children's developing cognitive understanding of their own and other minds. Both ideas recognize the potential importance of maternal behavior (particularly maternal speech) in children's cognitive development.

In addition to this conceptual similarity, the Geerds and Van de Walle study bears notable procedural similarities to studies of maternal mind-mindedness. Both studies looked at mothers' spontaneous speech to their children in order to measure maternal provision of support. Despite their lack of knowledge of the mind-mindedness paradigm, Geerds and Van de Walle (2012) instructed parents to "go about the visit as if [the researchers] weren't there," just as each

mother in the mind-mindedness interaction is told to play with her child as if the researcher was not there. The fact that animals were present during (though not actually involved in) the interactions in the Geerdtts and Van de Walle (2012) study is relevant given these procedural and conceptual similarities to studies of mind-mindedness. What makes the study especially notable in light of the present interests, however, is the fact that without knowledge of the construct of mind-mindedness, and with no hypotheses having to do with mind-related speech, Geerdtts and Van de Walle nevertheless noted the high frequency of “speculation on what the penguins were thinking or how they felt.” Although this recognition of mind-related speech made by mothers to their children when talking about animals was merely observational, and was not made in comparison to mothers and children interacting in the absence of an animal, it does support the idea that the involvement of an animal in mother-child interactions may encourage the use of mind-related language.

Although still exploratory in nature, a third study provided more direct support for the idea that humans tend to use mind-related language with animals. Intended as a descriptive, exploratory study of the intersection between mind-mindedness and HAI, this study investigated how adolescents used mind-related language when talking about their pets (Crossman & Mueller, 2012). This study used the representational measure of mind-mindedness, allowing for data collection via survey. An adapted version of the representational mind-mindedness prompt was used. Following the adaptation made by Meins, Harris-Waller and Lloyd (2008) for administration of the prompt in survey form (but with further adaptation to account for the description of an animal, rather than of a child), the prompt in this survey was included as an open-ended response item. The prompt read, “Think of the animal with which you have the closest relationship. Please use the space below to tell us about that animal.” Over 40% of

respondents used mind-related language to describe their pets (Crossman & Mueller, 2012). This high frequency of use of mind-related descriptors supports the idea that individuals do use mind-related language to refer to animals (even when those animals are not physically present), and suggests the value and feasibility of investigating maternal use of mind-related language during interactions with a pet.

The Present Study

The purpose of this preliminary study was to explore maternal use of mind-related language in the presence of a pet, and specifically to answer the question of whether interaction with a companion animal is positively associated with the amount of mind-related language that mothers use. I investigated this question through the use of filmed free-play interactions, which were coded for maternal use of mind-related language. I used a within subjects design to compare use of mind-related language in the presence of a pet to the use of mind-mindedness language in the absence of the pet, so that each participating mother-child dyad completed one free play interaction with their pet, and one without their pet.

Based on previous studies suggesting that people do use mind-related language when speaking about, and in the presence of animals (Crossman & Mueller, 2012; Geerdts & Van de Walle, 2012), and on the contested idea that humans may have a tendency to think about the mental lives of animals (e.g., Serpell, 1986), I expected that mothers would use more mind-related language when a pet was involved in the interaction, than when they were playing alone with their children.

The possibility of an association between the presence of a pet and rates of maternal use of mind-related language has clear implications for intervention development. However, the Barrett and colleagues (2003) study, which compared children's understanding of animal minds

and knowledge to their understanding of human minds and knowledge, in combination with research suggesting children pay more attention to animals than to other stimuli (e.g., Kidd & Kidd, 1987), emphasizes the importance of the use of *any* mind-related language used to discuss animals. Thus, a separate question of whether mothers use mind-related language specifically to discuss the minds of their pets (rather than using the presence of the pet as a prompt to discuss the child's mind, as in the instance of "what do you (child) think about Fido?") was also investigated.

Based on the same research and theory used to support the primary hypothesis, and particularly based on the survey results of Crossman and Mueller (2012), which found that many young adults use mind-related language when spontaneously describing their pets, it was expected that mothers would refer to the minds of their pets. Based on the Barret and colleagues (2003) study, it is possible that the use of such language could constitute an effective form of scaffolding. The possibility that children more easily understand the minds of other animals than they do the minds of other people is, however, entirely theoretical. The finding that mothers do use mind-minded language to discuss the minds of their pets would thus suggest the importance of further research to pursue the possibility that it is easier for children who are still developing ToM to understand the distinction between their own minds and animal minds, than it is for them to grasp the distinction between their own minds and other human minds.

Method

Participants

In order to reduce the potentially confounding influence of differences between types of pets, involvement in the study was restricted to families with dogs. Dogs were chosen specifically because they are common pets, and because children most often use language

indicative of the development of ToM with dogs, as compared with other pets (Myers, 2007).

Participation was also limited to families that had a child between the ages of three and six at the time of the study, and where the mother would be able to participate with the child.

A total of 20 triads participated in the study. Each triad consisted of a mother, her child, and their family dog (a total of 20 mothers, 20 children, and 20 dogs). The data from one triad was discarded because the mother spoke too softly for the microphone to pick up her voice, and the coders consequently could not reliably determine when she was speaking or what she said. Data from the remaining 19 participants were included in analyses.

Of the 19 mothers included in analyses, 16 (84%) identified their family ethnicities as White, and the remaining 3 (16%) identified as multiethnic. Mothers ranged in age from 34 to 49 years old ($M=40.06$, $SD=4.04$). One mother did not report her age. All mothers in the sample were college educated, and 14 of the mothers (74%) also completed graduate or professional school. All mothers lived in same homes as their participating children. The total number of people living in each household ranged from 2 (only the mother and target child) to 5 ($M=3.89$, $SD=0.74$). Other individuals reported as living in participants' households included fathers (16% of families), other children (84% of families) and grandparents (11% of families).

Child participants were 13 girls (69%) and 6 boys (32%), ranging in age from 3 to 6 years old ($M=4.3$, $SD=1.15$) at the time of participation. Although the original version of the mind-mindedness coding scheme is intended for use with children in the first year of life (Meins & Fernyhough, 2010), this preschool/kindergarten age group is consistent with the age group that has been used in past studies of maternal use of mental state language (e.g., Ruffman et al., 2002). In this case, the preschool age group was selected to ensure that the children would be able to actively engage with the dogs, thus affording the mothers the opportunity to moderate

those interactions. In addition, given Meins's proposal that it might be that maternal use of mind-related language to refer to other minds increases as the children age, it was expected that this use of an older age group would increase the likelihood that mind-related language would be used to discuss other minds, including those of the dogs (E. Meins, personal communication, July 2, 2012).

Of the 19 participating families, 16 (84%) reported that the target dog was the only pet in the home. Of the target dogs, 12 (63%) were mixes, 3 (16%) were working dogs, 2 were sporting dogs (11%), and 2 (11%) were herding dogs (Westminster Kennel Club, 2013). The amount of time target dogs had been with their respective families ranged from 0.70 years to 15.00 years, ($M=6.19$, $SD=3.77$). Including the target dogs, families reported having between one and nine pets in the home ($M=2.16$, $SD=2.12$), though only three families reported having two dogs, and none of the families reported having three or more dogs. Other pets reported included cats (reported by 26% of participants), fish (reported by 21% of participants), and rodents (reported by 5% of participants).

Each triad participated in both conditions: mother-child (child-only condition), and mother-child-dog (dog condition), with the order of the conditions randomized across participants. The use of a within subjects design, with mothers and children participating in the same room, on the same day, with the same materials available during each condition (with the exception of the small prize awarded after the completion of the first condition), enabled the greatest possible consistency across conditions, reducing the likelihood that variables specific to the participants and/or setting would contribute to differences between the "dog" and "child-only" conditions.

Sampling

The study was reviewed and approved by the Tufts University Institutional Review Board. In order to maximize the likelihood of reaching families that have children and dogs, participants were recruited through local preschools and childcare centers, as well as through Tufts University academic departments. Professionals and participants were contacted using email messages, social networking, and phone calls. Following their involvement, participants were contacted and asked to share the study information with any friends who might be interested in participating. Recruitment messages notified potential participants that in order to participate they would need to have a child between the ages of three and six, as well as a family dog. It was also specified that the mother would be required to bring the child and the dog to the study site on the day of participation. Families were required to bring their own dogs in order to prevent the risk associated with interacting with a strange animal, and because it has been suggested that those who have pets are more likely to attribute mental lives to animals than those who do not (Archer, 1997).

In the case of contact with professionals, the professionals were asked to share the study information with families in their programs. Interested families then contacted the research team by phone and/or email to inquire about the study and to schedule their participation. Interested families were assigned an ID number, which was then used to link each participant's survey information, recordings, and codes. The information linking participant names and ID numbers was kept in a password-protected spreadsheet on the principal investigator's password-protected computer. Several families inquired about whether the father could participate with the child in place of the mother. In these instances it was explained that previous studies in the area of interest (mind-mindedness) have focused primarily on mothers, and that for this reason only

mothers (and not fathers or other guardians) would be able to participate in this particular study. The hope was expressed that future studies would examine similar interactions with fathers.

In exchange for their participation, families were entered into a raffle for a chance to win \$100, which was awarded following the conclusion of the study. Children received one small prize (e.g., a toy car, Play-Doh, or a small stuffed animal) after each of the free play interactions (a total of two prizes per child). Following the conclusion of the dog condition each child was also permitted to choose a tennis ball for his or her dog. Because of the nature of the sampling methods, the demanding nature of participation (which required bringing both a child and a dog to the study site), and the fact that all participating families volunteered to take part (with no guarantee of compensation), it is important to note that participants represented a convenience sample, which likely self-selected based on interest in pets and/or child development, experience with previous studies at universities in the area, and other related factors.

Procedure

As is presented in the traditional mind-mindedness paradigm, a range of age-appropriate toys was provided to the families during the interactions (Meins & Fernyhough, 2010). The toys were spread out on a small table before each family's arrival at the study site. Toys included drawing materials (paper, markers, crayons), puzzles of various levels of difficulty, pretend construction tools, small blocks, Kapla building blocks, Tangrams, and Brio building materials. Because each family participated in two interactions, one of which involved the family dog, toys appropriate for play with dogs were also provided. Such toys included a rope pull toy, a dog ball, various squeak toys, a dog brush, and dog treats. Despite the instructions that the participants use the play time however they liked, there was some concern that the introduction of the dog toys during only the "dog" condition could suggest that the participants should focus the play during

that session on the dog, creating a demand characteristic. In order to minimize the likelihood of such a demand characteristic, and to keep conditions consistent across the two interactions, the dog toys were present during both interactions, whether or not the dog was present. An example of the layout of the toys before the family arrived can be seen in Figure 1. In addition to the small table holding the toys, several chairs (both child-sized, and standard sized), a large table, a second small table (left empty), and an armchair were present in the playroom. A dog bowl with water was also provided. The playroom had an observation with a two-way mirror. The room was located in a lab building on the Tufts University Medford campus.

Upon their arrival at the study site, participants were greeted by two members of the research team.¹ Participants were then escorted into the building and shown the study playroom. Once inside the playroom, one of the researchers engaged the child participant with the toys, while the other researcher reviewed the consent form with the mother at a nearby table. Mothers were offered the option to be left alone with the consent form for a period of fifteen minutes, but every participating mother declined this offer. All participants who came to the study site chose to participate and completed the consent form accordingly. The consent form included both personal and parental consent. Two copies of the consent form were completed for every participant so that the participants could keep a copy for their records. Completed consent forms were stored in a locked filing cabinet within the observation room. During the consent process the dog was permitted to wander the room off the leash so that it could acclimate to the playroom.

¹ It is important to note that although plural pronouns are used throughout the description of the study in order to avoid the use of gendered pronouns, only one triad (one mother, one child, and one dog) participated at a time, and no two families were present at the testing site simultaneously.

Upon the completion of the consent process, the nature of the task was explained. Mothers and children were told to play as they would on a normal day if they had some free time together. The participants were instructed to pretend that the researcher was not there, and were told that the film would run for five minutes. A Sony mini-DV video camera was used to film all of the interactions.

Although the interactions of the first nine participants were filmed from inside the playroom (requiring a member of the research team to remain in the room during the interaction), starting with the tenth participant it became possible to film from behind the two-way mirror. The change in the filming location was made in an attempt to make the participants feel more comfortable in the unfamiliar study room, and to make the presence of the researchers less intrusive so that the participants could more easily pretend that the researcher was not there. However, a temporary return to the earlier method of filming from inside the playroom was necessitated by an excess of feedback from the microphone in the observation booth. This feedback made the audio recordings difficult to hear and code (and was the reason that the data from one very quiet participant had to be discarded). The later addition of an auxiliary microphone in the playroom allowed for the remaining sessions to be filmed from behind the mirror. A total of 8 (42%) of the 19 sessions were filmed from behind the mirror. The filming position (behind the mirror or in the playroom) was documented for all participants.

Regardless of the filming condition, the camera was stopped at the end of the interaction and the participants were notified that the five minutes had elapsed. In some cases, families requested a moment to complete the activities they had been engaged in. Following the conclusion of the first session there was a short break, during which the child was given the

opportunity to choose a small prize. Examples of prizes included miniature stuffed animals, sticky frogs, pull-back racecars, bouncy balls, and Play Doh.

As was described above, the order of the conditions (dog or child-only) was randomized across participants. For example, the first triad to take part in the study completed the child-only condition first, with the following triad completing the dog condition first. In cases in which the child-only condition was to be first, one member of the research team took the dog into the hallway for the duration of the interaction. With the mother's permission, the researcher brought dog treats and a toy into the hallway in order to distract and/or comfort the dog.

In cases where the dog had been present for the first interaction, a member of the research team removed the dog during the break before the second interaction. In cases where the child-only condition was first, the second researcher brought the dog into the room before the second interaction. For the second interaction, participants were given the same instructions as in the first interaction. Following the completion of this interaction, the child was again permitted to choose a prize. Following the condition of the dog condition, each child was also permitted to choose a colored tennis ball for his or her dog.

When both interactions had been completed, the mother was asked to complete a brief online survey. The Qualtrics survey platform was used to create and administer the survey. Participants were presented with a certificate of participation, and debriefed. The mother was told that she would receive a report of the results of the study in May. Participants were then thanked for their participation, and the session was concluded. A careful log was kept to record the order in which participants completed the conditions in order to ensure that the order of the conditions could be reversed for the next participating family. Following each family's

participation in the study, the films of the interactions were uploaded onto a computer for coding and the toys and dog bowl were disinfected.

Coding

As was described above, an adapted version of the mind-mindedness free-play interaction established by Meins and Fernyhough (2010) was used to examine the association between the presence of a dog and maternal use of mind-related language during mother-child interactions. The templates for coding of the mother-child, and mother-child-dog conditions can be seen in Appendices A and B, respectively. Each video was coded for five minutes. If the video ran longer than five minutes, the clip was truncated so that the coders only saw the first five minutes of footage.

Unlike in the procedure used by Meins and Fernyhough, which used transcripts of the dialogue from the filmed interactions, coding in this study was done directly from the recordings of the interactions. Coders watched each interaction multiple times in order to record each “mind-related” comment made by the mother, and to perform a count of the total number of comments made by the mother throughout the interaction. In addition to this procedural deviation, two deviations from the traditional coding scheme were made.

The first deviation from the traditional coding scheme was that although in the traditional version mothers’ mind-related comments are evaluated to determine whether they are appropriate or “non-attuned,” the same classifications were not made in this study, because of challenges in determining the appropriateness of comments made about the mental lives of dogs. Due to the current controversy over the exact nature of the cognitive capacities of dogs (Burghardt, 2009), it would be impossible for coders to determine whether the mothers comments accurately reflected the mental states, if any, of the dogs.

A second deviation from the traditional coding scheme was made to accommodate the inclusion of the dogs. Although in the traditional version of the coding scheme comments are only classified as mind-related if they refer to the child's mind (e.g., "do you think think the dog is cute?"), comments made in reference to the dogs mind (e.g., "does Fido want a treat?") were also classified as mind-related. The decision to count comments made about the dogs' minds as "mind-related" rather than "other-minded" as in the traditional coding scheme (E. Meins, personal communication, July 2, 2012) is based on the finding that discussion of any mental states, not only those of the child, is valuable to the development of ToM (e.g., Ruffman et al., 2002). Further support for the value of comments made about the dogs' minds is provided by the possibility that discussion of animal minds may even be more beneficial than discussion of human minds, as suggested by Barret et al.'s (2003) finding that children were able to differentiate between their own minds and other minds earlier when the other was an animal, as opposed to a human.

The decision to include comments made about the dogs' minds in the count of mind-related utterances necessitated the addition of a variable not typically included in the mind-mindedness coding scheme. This variable was a classification of the subject of each mind-related comment. Following the classification of a comment as mind-related, the subject of the comment was recorded. Thus, in addition to the count of total mind-related utterances, each comment was included in the count of mind-related utterances made in reference to the child, or the total count of mind-related utterances made in reference to the dog. The distinction of whose mind was the subject of each comment was made in order to retain the ability to examine the amount of mind-related language used to refer to the children's minds (as in the traditional coding scheme), as

well as to answer the secondary research question of whether mothers use mind-related language to refer explicitly to the minds of their dogs.

It is important to clarify that “subject,” as it is used in the context of the present study does not refer to the target of the comment (whether the mother is talking to the child or the dog), but the individual whose mind the mother is talking about. For instance, a comment made to the child about the dog’s mind, such as, “what does Fido want to play with?” references the dog’s mind, even though it is directed at the child. If however, the mother referenced both minds, “what do *you* [the child] think *Fido* wants to play with?” the mind-minded comment made to the child would take precedence, and the subject of the comment would be the child. As in the case of the dichotomous code used by Crossman and Mueller (2012) to evaluate whether or not an adolescent used any mind-minded language to refer to his or her pet, a dichotomous variable was used to indicate whether or not any of each mother’s mind-related language referred specifically to the dog’s (rather than the child’s) mind. A visual depiction of the procedure for coding and determining the subject of a comment can be seen in Figure 2.

In addition to the dichotomous code indicating the subject of each mind-related utterance, a code for the dog’s level of involvement in the interaction was added to the coding scheme. This code was intended to capture each dog’s level of interaction with its human companions, rather than simply the dog’s general level of activity. In other words, a dog that was highly active, but that was content to be active on its own, apart from the play of the mother and child, would receive a low involvement score. A relatively low energy dog that managed to maintain a high level of interaction with the mother and child would, in contrast, receive a high involvement score.

The dog involvement score was added after the first few interactions had been filmed, and notable differences in how much the dogs participated and were included in the play sessions were observed. It was hypothesized that in order for the dog's presence to be associated with differences in maternal use of mind-related language, the dog would have to be engaged in the play session, and this variable was added in order to allow for the consideration of these differences during analysis. The scale ranged from one to five, with one assigned when the human and dog participants seemed to actively avoid interaction with each other, and five assigned when the dog was actively involved in and/or the focus of most interactions. Interrater reliability was high for the coding of this variable, as indicated by the intraclass correlation coefficient of .90 for the 9 cases (47% of total cases) that were double coded. The complete activity/involvement scale is presented in Appendix B.

The coders were two trained members of the research team who were blind to the hypotheses. Regular coding meetings were held to go over questions and review videos. Coders were trained using films from the present study. Of the 38 videos that were included in analyses (two videos per participating triad), 20 (53%) were double coded. Inter-rater reliability was calculated using the intraclass correlation. High inter-rater reliability was found, as indicated by the intraclass correlation coefficients of .92 for the total number of mind-related comments, .94 for the total number of comments, and .97 for the total number of mind-related comments made in reference to the dog's mind.

Survey

The online survey was used to gather basic demographic information including family ethnicity, age and level of education of the mother, and age and sex of the child. Given the suggestion that the family provides a major setting for exposure to mind-mindedness (Meins,

1997), families were also asked to provide information on the size and composition of their households. In addition to information on their families, participants were asked to report basic information about the target (participating) dog. Questions about the target dogs asked participants to report the age and type of the dog, as well as the length of time the dog had been with the family. Participants were also asked to report what kinds of pets they had in their households, as well as the total number of pets in their households. A summary of the demographic characteristics of the sample can be seen in Table 1. A summary of the demographic characteristics that are represented by categorical variables (including race, maternal education, and child sex) is depicted in Table 2.

Results

Participants were recruited between September 28, 2012 and February 28, 2013. All participants completed both the child-only and dog conditions. The free play sessions for both the dog and child-only conditions were five minutes in length. As was described above, the number of comments, and the number of mind-related comments made by each mother were recorded for each of the two interactions in which she participated. Based on these sum scores, a proportion score representing the proportion of total speech that was mind-related was calculated for each mother during each interaction. Each mother also received both a sum score and a proportion score representing her use of mind-related speech in reference to the dog's mind, and a separate score indicating the same variables, but in reference to the child's mind. Each triad also received a score representing their dog's involvement level. A summary of the descriptive information for the variables of interest can be seen in Table 3. The frequencies for the dichotomous variables of interest are depicted in Table 4.

Of the 19 mothers who participated, 18 used mind-related language in the child-only condition. All nineteen mothers used mind-related language in the dog condition. The number of total comments made by mothers during the child-only condition ranged from 36 to 140 ($M=73.89$, $SD=27.10$). The total number of comments in the dog condition ranged from 46 to 127 ($M=73.74$, $SD=21.95$). None of the dogs in the sample scored a one (dog avoids interaction with mother and child OR mother and child avoid interaction with dog) for the dog involvement variable. Of the 19 dogs in the sample, 6 received a score of 2 (dog is not active, plays minimal role in mother-child interaction), 4 received a score of 3 (dog is involved in some of interactions), 5 received a score of 4 (dog is actively involved in most interactions), and 4 received a score of 5 (dog is focus of all/most interactions, play centers around dog). The frequencies for the dog involvement variable are depicted in Table 5.

Analysis for Hypothesis 1: The Association between the Presence of a Dog and Maternal Use of Mind-Related Language

A within-subjects analysis was used to test the primary hypothesis that the presence of the dogs would be positively associated with rates of mind-related language. The paired samples t -test comparing the total number of mind-related comments made by mothers during the child-only condition ($M=10.42$, $SD=6.02$) to the total number of mind-related comments made by mothers during the dog condition ($M=11.63$, $SD=8.36$) did not show a significant difference ($p=.46$). When rounded, the means for the proportion of mind-related comments used by mothers during the child-only and dog conditions were equal ($M=.14$, $SD=.07$), indicating that the proportion of mothers' total language that was mind-related did not differ between the child-only and dog conditions. The results of the paired samples t -test were not significant, indicating the pattern of results may be different in the larger population ($p=.79$).

Analysis for Hypothesis 2: The Use of Mind-Related Language to Refer to the Minds of the Dogs

Of the 19 mothers in the sample, 17 used mind-related language to refer to the minds of their dogs during the dog condition. Unexpectedly, three of the mothers also used mind-related language to refer to the dogs' minds during the child-only condition. Further examination of those participants' videos indicated that those references to the minds of the dogs were made when the mothers were able to hear the dogs through the door of the study room, suggesting that these utterances were not true examples of reference to the minds of the dogs in the dogs' "absence." The total number of mind-related comments made in reference to the mind of the dog during the dog condition ranged from 0 to 15 ($M=4.42$, $SD=4.05$). The proportion of mind-related comments made in reference to the mind of the dog during the dog condition ranged from .00 (no comments made in reference to the mind of the dog) to 1.00 (all mind-related comments made by the mother refer to the mind of the dog) ($M=.39$, $SD=.24$). For comparison, the proportion of mind-related comments made in reference to the mind of the child during the dog condition also ranged from .00 (no comments made in reference to the mind of the child) to 1.00 (all mind-related comments made by the mother refer to the mind of the child) ($M=.61$, $SD=.24$). Although no causal conclusions can be drawn on the basis of this observation, it is interesting to note that both of the mothers who failed to refer to the minds of their dogs had dogs who scored a 2 (the lowest score assigned in the present study) for the dog involvement variable, because this observation suggests that the dog's involvement in the interaction may be related to whether or not the mother refers to the mind of the dog.

Dog Involvement

A between subjects analysis was used to examine differences in maternal use of mind-related language based on the level of the dog's involvement in the play session. Given that none of the dogs received an involvement score of one (dog avoids interaction with mother and child OR mother and child avoid interaction with dog), comparisons could not be made between the amounts or proportions of mind-related language used when the dogs were present but uninvolved, and when the dogs were completely absent. The results of the one-way ANOVA comparing the total number of mind-related comments based on the dog involvement score showed significant differences between groups $F(3, 15) = 6.94, p < .01$. Post-hoc analysis using the Tukey HSD test revealed significant differences ($p < .01$) between those triads in which the dog scored a five (dog is focus of all/most interactions, play centers around dog) ($M=22.25, SD=6.55$) and those in which the dog scored a two (dog is not active, plays minimal role in mother-child interaction) ($M=6.33, SD=2.88$) or a three ($p < .05$) (dog is involved in some of interactions) ($M=6.75, SD=4.27$). No other significant differences in maternal use of mind-related language were found between groups based on dog involvement scores. Differences in mean total numbers of mind-related comments based on dog involvement scores can be seen in Table 6 and Figure 2.

The results of the one-way ANOVA comparing the proportion of mind-related comments based on the dog involvement score did not show significant differences between groups ($p = .06$). Offering an explanation for this lack of significant differences in proportion scores, despite the significant differences found in the number of total mind-related comments made, were the results of the one-way ANOVA comparing the total comments made by mothers based on dog involvement score, which did show significant differences between groups, $F(3, 15) = 7.23$,

$p < .01$. As in the case of the analysis of total number of mind-related comments, post-hoc analysis using the Tukey HSD test showed significant differences ($p < .01$) between those triads in which the dog scored a five ($M=103.00$, $SD=19.44$) and those in which the dog scored a two ($M=59.50$, $SD=13.72$) or a three ($p < .05$) ($M=63.00$, $SD=4.32$). No other significant differences in total maternal comments were found between groups based on dog involvement scores.

Exploratory Analysis: Dog Involvement and Maternal use of Mind-Related Language

Based on the finding that the dog's level of involvement in the mother-child interaction was significantly related to the number of mind-related comments made by the mothers, a follow-up to the within-subjects analysis used to test the primary hypothesis was conducted. Only those triads in which the dog scored a five (dog is focus of all/most interactions, play centers around dog) were included in this follow-up analysis ($n=4$), in order to explore the possibility that it is the dog's active involvement (rather than simply the dog's presence) that is associated with increased use of mind-related language. The results of the paired samples t -test comparing the total number of mind-related comments made by mothers whose dogs scored a five for the dog involvement variable during the child-only ($M=14.50$, $SD=3.87$) and dog ($M=22.25$, $SD=6.55$) conditions were not significant, $p=.06$. However, the results of the paired samples t -test comparing the *proportion* of mind-related comments made by mothers whose dogs scored a five for the involvement variable during the child-only ($M=.13$, $SD=.01$) and dog ($M=.21$, $SD=.03$) conditions were significant $t(3) = 5.13$, $p < .05$.

In order to explore the possibility that it is the dog's active involvement (rather than simply the dog's presence) that is associated with increased use of mind-related language in a slightly larger sample than the sample of four participants whose dogs received a score of five, additional paired samples t -tests were conducted including all those participants whose dogs

scored either a four or a five on the activity/involvement scale ($n=9$). Differences in the total number of mind-related comments used in the two conditions were not, however, significant ($p=.20$). Differences in the proportion of mind-related comments used in the two conditions were also not significant ($p=.45$).

Discussion

The goal of the present study was to explore the intersection of the literatures on human-animal interaction and maternal mind-mindedness. In order to achieve that goal, I attempted to answer two main research questions. The first of those questions had to do with whether the presence of a dog is positively associated with the *amount* of mind-related language that mothers use, and the second had to do with the association between the presence of a dog and the *kind* of mind-related language that mothers use. The relevant results are discussed below.

Primary Hypothesis: The Presence of a Dog Will be Positively Associated with the Amount of Mind-Related Language that Mothers Use

The primary aim of the study was to explore the relation between the presence of a dog and maternal use of mind-related language, and specifically to determine whether the presence (as compared to the absence) of the dogs in mother-child interactions was positively associated with maternal rates of mind-related language. It is important to note that although theory and research suggest that companion animals may increase rates of mind-related language, because the present study is cross-sectional, all conclusions are correlational, and no causal conclusions can be drawn. Regardless, the question of causality may be premature given that neither the amount nor the proportion of mind-related language used in the dog condition differed significantly between conditions. The results of the study thus failed to provide support for the primary hypothesis. There are, however, several possible explanations for the finding that

maternal rates of mind-related language were not significantly different in the dog and child-only conditions.

The most apparent explanation for the lack of support for the primary hypothesis was the small sample size. Given the time and financial constraints that are characteristic of a senior thesis project, I was only able to obtain a sample of twenty triads, one of which had to be dropped from analysis, leaving a total of only 19 triads. Had I obtained the goal sample size of 50 triads, the observed differences in the amounts and/or proportions of mind-related language used in the two conditions might have been significant, if such differences do exist in the population.

Although it is possible that the size of the study sample could account for the lack of a significant difference in maternal use of mind-related language between the two conditions, there are also several other factors that may have contributed to the lack of support for the primary hypothesis. One such explanation is the possibility of a ceiling effect during the child-only free play session. Given that I was looking to see whether the presence of a dog increases maternal use of mind-related language, if mothers already used as much mind-related language as would be reasonable to use in the child-only session, there would be no room for improvement based on the presence of the dogs, thus making it appear as though the dogs' presence was not associated with mothers' rates (proportions of total speech and/or total number of comments) of mind-related language.

The question of a possible ceiling effect is particularly important to consider in light of the implications of research on maternal use of mind-related language for intervention. Given the exploratory nature of this study, I tested the primary hypothesis using a convenience sample of mothers who were willing and able to bring their children and dogs to Tufts University. The

result was a self-selected sample of very highly educated (all having completed an undergraduate degree at the minimum) mothers and their children. Considering that maternal education has been associated with maternal use of mind-related language (Meins, Fernyhough, Fradley, & Tuckey, 2001), it is reasonable to expect that this sample of highly educated mothers might use more mind-related language than the population of women who would be the recipients of an intervention intended to promote maternal mind-mindedness.

In addition to the possibility that high rates of use of mind-related language during the child-only condition restricted mothers' room for improvement with the addition of the dogs, it is also important to raise the question of whether all of the dogs were truly absent during the child-only condition. Although all of the dogs were removed from the playroom during the child-only condition, because the study site was located in a building shared by several projects, the dogs did have to remain in the area of the hall surrounding the playroom. As a result, a few of the participants were able to hear their dogs through the door of the playroom, prompting speech about the minds of the dogs. For example, in response to the dog barking, one mom said, "[Dog name] wants to come in here with you...She wants to come in here with us." The count of mind-related comments in this case was thus elevated by two as a result of the participation of the dog, despite the fact that the purpose of this interaction was to measure use of mind-related language in the *absence* of the dog. This intrusion of the dogs during the child-only condition raises the question of whether the child-only condition can be considered an effective comparison condition. Although the idea of a ceiling effect suggests the possibility that high rates of mind-related language in the child-only condition may have obscured the association between the presence of the dogs and rates of mind-related language, the intrusion of the dogs when they

were intended to be absent undoubtedly obscured any association that may have existed, contributing to the lack of significant differences between the two conditions.

Although the procedural factors that have been described likely contributed to the lack of a significant difference in maternal use of mind-related language between the two conditions, one of the most interesting possible explanations has to do with the hypothesis itself. As indicated in my primary hypothesis, and by the title of this paper, I expected that the presence of a dog would be associated with maternal use of mind-related language. In order to test this hypothesis, mothers were instructed that they need not play with their dogs during the dog-condition, but that they could if they wanted to do so. As was described, I hoped that this instruction would serve to reduce the likelihood of a demand characteristic, which might cause an unusually high amount of interaction with the dogs, thus presenting more opportunities for the use of mind-related language with the dogs than the mothers would usually have. However, observation of the first few interactions suggested that it might not be the *presence* of the dogs during the play sessions that would be important, but rather their *involvement* in the play sessions.

In response to the observation that some dogs were almost completely inactive and uninvolved in the interactions, while others were the focus of the interactions, I added the dog involvement variable. This variable allowed for the recording and examination of differences in the dogs' involvement, and removed the need to restrict analysis to the differences associated with the presence versus the absence of the dogs. Exploratory analysis demonstrated that mothers did differ significantly on their use of mind-related language based on the involvement of their dogs. The finding that rates of mind-related language differed based on dog involvement is admittedly limited by a very small sample size, and the fact that the finding was based on an ad-

hoc hypothesis. However, this finding does suggest the possibility that a significant difference was not found between the dog and child-only conditions because it is the involvement, more than the presence, of the dogs that is important.

Because 6 of the 19 dogs in the sample received a score of 2 (dog is inactive, plays minimal role in the mother-child interaction) on the involvement variable, it is possible that a lack of involvement on the part of those dogs brought down the average rates of mind-related language. When rates of mind-related language were compared including only those participants whose dogs scored a five (dog is focus of all/most interactions, play centers around dog) on the involvement scale, the difference in the proportion of mind-related language used by mothers during the two conditions was significant. Although this finding is again characterized by the problems of post-hoc analysis and an extremely small sample size, it does suggest the plausibility of a lack of dog involvement as an explanation for the lack of support for the primary hypothesis, and points to the need for further research in this area. The importance of dog involvement may be explained by the idea that increased involvement on the part of the dog provides increased opportunities for mothers to moderate interactions, and help their children to understand the actions and reactions of the dogs. That the analysis including those participants whose dogs scored a five showed significant differences on the total number of mind-related comments used in each condition, but the analysis including those whose dogs received either a four or a five did not, highlights the need for further exploration of the importance of dog involvement, including the possibility that there be a minimum level of involvement that is necessary to reveal an association with maternal use of mind-related language.

Although there are numerous possible explanations for the lack of support for the primary hypothesis, it is also important to acknowledge that the presence of a dog may not have the

hypothesized relation with maternal use of mind-related language. However, the possible explanations I have described point to the need for further research involving replication with larger and more diverse samples, more effective removal of the dogs during the child-only condition, and a clear instruction that mothers and children should play with their dogs, before concluding that the presence (and/or involvement) of dogs is not associated with rates of maternal use of mind-related language.

Secondary Hypothesis: Mothers Will Refer to the Minds of their Dogs when the Dogs are Present.

While the primary hypothesis addressed the association between the presence of a pet dog and the amount of mind-related speech that mothers would use, the secondary hypothesis addressed the association between the presence of the dogs and the type of mind-related language that mothers use. Although the results of the present study do not provide support for the primary hypothesis that the presence of a pet dog would be positively associated with rates of maternal use of mind-related language, the finding that nearly all of the mothers in the study used mind-related language to refer to the mental states of their dogs provides clear support for the secondary hypothesis.

That nearly all of the mothers in the sample made reference to the mental lives of their dogs provides further support for the idea that pet owners do use mind-related language in reference to their pet dogs when in the presence of their dogs (Crossman & Mueller, 2012). As was expected, a higher proportion of participants in this study (90%) used mind-related language to refer to their pets than did so in the survey of undergraduates, where just over 40% made reference to the minds of their pets (Crossman & Mueller, 2012). Although this difference could be due to any number of differences between the two studies and their respective samples (for

example, the sample sizes or the ages and education levels of the participants, or the fact that all of the pets in the present study were dogs, while a range of different pets were described in the study by Crossman and Mueller), one of the likely contributing factors was that the survey used a representational (descriptive) measure of mind-mindedness, while the present study used an observational (interactive) measure.

That more than double the proportion of participants referenced the minds of their dogs in the present study (when the dogs were present) than when participants were merely describing their pets (Crossman & Mueller, 2012), suggests that it is not merely the idea of the pets that provokes this kind of speech, but something about the act of interacting with them that promotes the use of mind-related language. Although it is not possible to conclude that it is the involvement of the dogs, rather than the mere presence of the dogs in the room that was associated with a high proportion of mothers referring to the minds of their dogs, the observation that the only two mothers who did not reference the minds of their dogs in the present study had dogs that were minimally involved provides support for the possibility that it is the involvement, rather than the presence of the dogs, that is associated with that behavior.

The idea that it is the active interaction with the dogs that promotes the use of mind-related language recalls the finding that mothers whose dogs were more involved in their play sessions used more mind-related language than mothers whose dogs were minimally involved. Thus, the secondary hypothesis again points to the possible need for a refinement of the primary hypothesis in future research; it may be more prudent to examine the involvement, rather than the presence, of pets. Whatever the reason for the relatively high frequency of use of mind-related language to refer to the minds of dogs, however, the potential importance of this observed

frequency of mothers using mind-related language to refer to the minds of their dogs is highlighted by two areas of research.

The importance of the use of mind-related language in reference to animal minds for ToM development is suggested by the finding that children prefer animals to inanimate stimuli (Kidd & Kidd, 1987). If children attend to animals more than they attend to other stimuli, children may be more likely to benefit from the mind-related input that is provided in reference to animals, than from input that is provided in reference to other stimuli. Thus, even if a mother uses the same amount of mind-related language when her dog is present as when the dog is absent, a child who is still developing ToM may be more likely to attend to that language, and thus more likely to benefit from it, when the mind-related language is used in reference to the dog.

The value of mind-related language used in reference to dogs is further suggested by the finding that children are able to recognize the difference between their own background knowledge and that of a dog before making the same distinction between their own background knowledge and that of and their mothers (Barrett et al., 2003). If future research provides support for the idea that children develop ToM with respect to other animal minds before developing ToM with respect to other human minds, maternal use of mind-related language to refer to the minds of animals might then represent an appropriate and effective form of scaffolding. While a child who is still developing an understanding of other minds may find it difficult to understand or express the perspective of another person, the child may be able to understand the perspective of another animal, particularly if the child receives support from his or her mother. Although the present study does not provide any evidence to support the reality of these potential benefits, the high proportion of mothers who used mind-related language to refer to the minds of their dogs in

the present study suggests the importance of future research exploring the use of mind-related language in reference to animal minds.

Future Directions

Given the exploratory and cross-sectional nature of the present study, which is the first to pursue the intersection of the literature on maternal mind-mindedness and human-animal interaction, I emphasize that all of the findings that have been discussed are preliminary. Future research is needed to draw more definite conclusions about the association between interaction with companion animals and maternal use of mind-related language, and to draw causal conclusions about the influence (or lack thereof) of interaction with pet dogs. Although no causal conclusions can be drawn regarding the *influence* of the dogs based on the results of the present study (which is cross-sectional), because I hope that future studies will examine the influence of pets using longitudinal methods, I will refer to the hypothesized “influence” of pets in my discussion of the directions for future research.

The results of the present study are promising in that they suggest that the presence of companion animals is associated with the kind, and possibly the amount, of mind-related language that mothers use. However, as has been described, the results also suggest the need for a reformulation of the main hypothesis relating to this association. For example, future research should compare the influence of the presence of a pet to the influence of the *involvement* of the pet. That pet owners also use mind-related language when describing their pets (Crossman & Mueller, 2013) and that some mothers in the present study referred to the minds of the dogs during the child-only condition, suggests that it may additionally be important to consider the influence that the idea of a pet has on the use of mind-related language.

Recognizing that pets may influence human behavior and have therapeutic value even in their absence, Zilcha-Mano, Mikulincer and Shaver (2011) have distinguished between a pet's physical presence (when the pet is actually present with the person) and its "cognitive presence" (when the person thinks about the pet) (p. 554). Zilcha-Mano et al.'s practice of including cognitive presence of a pet, physical presence of a pet, and absence of a pet as separate conditions in their studies of attachment to pets may be useful as a model for the design of future studies that attempt to elucidate the influence of different kinds and levels of pet involvement (e.g., Zilcha-Mano, Mikulincer, & Shaver, in press). For example, it may be valuable for future studies examining the influence of pets on maternal use of mind-related language to include four conditions: pet absence, pet cognitive presence, pet physical presence (low involvement), and pet physical presence (high involvement). The representational measure of maternal mind-mindedness used in the aforementioned survey of adolescents (Crossman & Mueller, 2012), which asks pet owners to describe their pets, may be useful in comparisons of maternal use of mind-related language in the physical and cognitive presence of animals, particularly given that the representational and observational measures (used to evaluate influence of the physical presence of pets in the present study) of mind-mindedness have already been examined concurrently (e.g., Meins et al., 2003).

Although a comparison of the proportion of pet owners who referred to the minds of their pets in the present study to the proportion who did so in the Crossman and Mueller (2012) study (which used the representational measure) suggests the superiority of physical presence over cognitive presence in terms of associations use of mind-related language, the results of the present study raise the question of whether physical presence is superior to cognitive presence when the dog that is physically present is only minimally involved. The possibility of an

association between the cognitive presence of a dog and maternal use of mind-related language has important implications for intervention, given the relative ease and cost-efficiency of thinking about a dog, as compared to arranging an interaction with a dog. However, the only study to look at the association between the cognitive presence of pets and use of mind-related language to date only considered this association when in a sample of participants who were thinking about their own pets (Crossman and Mueller, 2012). The advantages of the cognitive presence of dogs are only relevant if the association between the cognitive presence of a dog and use of mind-related language hold up when individuals are thinking about unfamiliar and/or fictional dogs. However, even if cognitive presence is demonstrated to be more strongly related to use of mind-related language than is minimally involved physical presence, the results of the present study still point to the superiority of highly-involved physical presence over cognitive presence.

If future research does support the superiority of the involvement of dogs over the presence of dogs in terms of the influence on maternal use of mind-related language, that finding would support the plausibility of the lack of involvement of some of the dogs during play in the present study as an explanation for why the differences in the rates of mind-related language used in the two conditions in the present study were not significant. More importantly, evidence supporting the importance of the involvement of the dogs would point to the need for future studies examining the influence of companion animals on maternal use of mind-related language and children's ToM and empathy development to focus on the role of the involvement, rather than the presence, of those animals.

In order to effectively examine the influence of the involvement of dogs in future studies, a reliable and externally valid measure of dog involvement must be developed. Although

measures of attachment to pets (e.g., Johnson, Garrity, & Stallones, 1992), commitment to pets (e.g., Staats, Miller, Carnot, Rada, & Turnes, 1996), and even human engagement with various stimuli including animals (e.g., Cohen-Mansfield, Dakheel-Ali, & Marx, 2009) already exist, I was unable to find any measures designed to evaluate the level of involvement of a dog (or other pets) in the context of a specific interaction. Although the reliability between the two coders on the involvement variable used for the present study was high, it is important to note that the involvement variable was added after several participant sessions had already been completed. In addition, that no participants in the present sample received a score of 1 (dog avoids interaction with mother and child OR mother and child avoid interaction with dog) points to the need not only to evaluate whether the variable is an appropriate measure of dog involvement in mother-child interactions, but also the need to evaluate the utility of the variable in a more diverse sample of interactions.

In addition to evaluating the dog involvement scale in a more diverse sample, future studies should look to explore all of the questions relating to maternal use of mind-related language addressed in the present study in larger and more diverse samples. As I described earlier, the mothers in the present sample, all of whom completed an undergraduate degree or higher and demonstrated relatively high rates of use of mind-related language, are not representative of the population of mothers who would be the recipients of an intervention intended to increase rates of maternal use of mind-related language. In addition, it is also possible that there are factors endogenous to mothers who own dogs and/or who would volunteer to participate in a study about dogs, which would make them especially likely to use mind-related language during interactions with their dogs. The use of larger and more diverse samples

in future studies will help to ensure the generalizability of those studies, as well as the applicability of any implications for intervention.

Although findings in support of the influence of dogs on maternal use of mind-related language would suggest the utility of dogs in interventions intended to promote maternal use of mind-related language, future research should first examine whether differences in the amount and type of mind-related language used are indeed associated with later development of ToM and empathy. Although it would be possible to examine these long-term outcomes as part of the evaluation of an intervention, investigation into this association before an intervention is developed would help to ensure that interventions are maximally effective, avoiding wasted efforts and/or expenses.

Closely related to the need to examine whether the involvement of dogs is associated with long-term developmental outcomes is the need to examine whether the understanding of animal minds does represent a preliminary stage in the development and refinement of ToM understanding. As was discussed earlier, several versions of the false belief test of ToM that are already in use involve the use of animal characters (e.g., Meins et al., 2002; Meins et al., 2003). As a preliminary investigation into the relative difficulty of understanding other animal minds as compared to other human minds for children who are just developing ToM, researchers could compare the accuracy of children who are tested using the animal versions of the false belief task to the accuracy of children who are tested using the more traditional human versions. It may be necessary to make some minor adjustments to the animal versions in order to make the animal characters less similar to people, thereby enabling them to play their hypothesized role as “optimally discrepant” others (Myers, 2007, p. 10). However, the high frequency with which children are administered false belief tasks (both with animal and human characters) for various

research and practical purposes suggests the feasibility of this method of exploring the possibility of a preliminary stage in the development of ToM. If children show the ability to pass a false belief task at an earlier age and/or more reliably when the characters in the task are animals, this finding would highlight the importance of the high proportion of mothers who used mind-related language to refer to the minds of their dogs in the present study, and would also provide further support for the possible utility of interventions involving the use of animals to promote ToM development.

The goal of involving HAI in intervention efforts suggests the importance of exploring maternal use of mind-related language in the presence of visiting animals (as opposed to families' own pets). In addition to being unlikely to use high rates of mind-related language, individuals who are the recipients of interventions aimed at increasing the use of mind-related language may not necessarily (or may even be unlikely to) have their own pets. Because of the numerous ethical and economical challenges associated with giving families pets to keep, it will be important for future research to examine whether or not a visiting companion animal, which is owned by a volunteer or organization, would influence the kind and amount of mind-related language used by mothers in the same ways as an individual's own pet. The finding that children's attachment to their pets is associated with better perspective-taking abilities (Maruyama, 2010), suggests that the relationship that the mother and child share with the pet may be an important factor in determining the influence of the pet on the mother's use of mind-related language. However, Geerdt's finding that whether or not children own a pet is not associated with the likelihood that the children will ascribe psychological properties to animals (Geerdt, 2012), suggests that the fact that a mother does not own a visiting animal may not necessarily mean that her use of mind-related language would not be influenced by that animal.

It is also important to note that the fact that a family does not have a dog does not necessarily mean that it does not have another kind of companion animal, or even a non-companion animal, such as an animal that is kept for agricultural or other working purposes. The possibility that families may have animals besides dogs points to the need for future research to examine the influence of other kinds of animals on maternal use of mind-related language. Research examining the influence of smaller and/or lower maintenance animals such as fish, insects, and small rodents may be of particular value, given the relatively low commitment they require in terms of time and financial resources. However, the association between ownership of a cat or dog and an increased likelihood that an individual will think that animals think (Maust-Mohl, Fraser, & Morrison, 2012) casts doubt on the likelihood that interaction with and/or ownership of other animals will have as much of an influence on the use of mind-related language. Providing further reason to question whether non-companion animals will have the same influence on mind-related language as dogs, cats, and other companion animals is the finding that companion animals are more commonly perceived as having cognitive abilities than are non-companion animals, such as those kept as livestock (Maust-Mohl et al., 2012). This tendency to perceive companion animals as having greater cognitive ability than other animals does suggest that companion animals may be more likely to influence the use of the mind-related language. However, considering the wide variety of animals that may be kept as companion animals, the likelihood of differences in the ways in which dogs and other animals are viewed across cultures, and the possibility of the same kinds of animals taking on different roles (e.g., a Labrador may be a hunting partner, a service animal, or a pet, to name but a few), an investigation into the varying influences of different kinds of animals is still warranted.

In addition to exploring the influence of the presence of visiting animals and other types of pets on maternal use of mind-related language, future studies should also explore the influence of interaction with animals on children's own use of mind-related language and practice with perspective-taking. Here again, research showing that children pay more attention to animals (e.g., Kidd & Kidd, 1987), and that children may more easily understand the minds of animal others before they understand the minds of human others (Barrett et al., 2003) suggests that children may be especially likely to use mind-related language when interacting with animals. All of the theory and research that has been discussed as suggesting the influence of animals on mothers, including evolutionary theory (Serpell, 1986), the Biophilia Hypothesis (Wilson, 1984), the caregiver explanation (Melson, 2001), and the idea of animals as "optimally discrepant social others" (Myers, 2007, p. 10) also support the idea that children, like their mothers, may be especially likely to practice perspective-taking with animals. Although such an exploration was beyond the scope of the present study, it would be possible to explore children's use of mind-related language in the presence of pet dogs using the films of the interactions from this study.

In addition to examining the influence of interaction with companion animals on the perspective-taking tendencies of mothers and children, future studies should also explore the influence of companion animals on other important individuals and relationships in children's lives. At the same time that it is important to avoid a "humanocentric" perspective (Melson, 2001, p. 5), it is important not to leave out important humans when studying children's development. The repeated inquiries by potential participants as to whether fathers or other caregivers could participate in the study underscores the importance of ensuring that future research does not focus exclusively on the maternal-child relationship. The consideration of

other relationships may be particularly important when the mother is not the primary caregiver (either of the child, of the pet, or of both).

Limitations

In addition to pursuing the numerous areas for future research, future studies should attempt to address some of the notable limitations of the present study. Although I have already touched on a number of these limitations in the discussion of the hypotheses and directions for future research, it is important to explicitly acknowledge those factors and their potential effects. For example, although I have already discussed the limitations of the sample size and sampling method used in the present study, the importance of these factors cannot be overstated. Wilson and Netting (2012) have specifically identified the problems of convenience and snowball sampling, both of which were used in the present study, as being common limitations of human-animal interaction research. In the context of this specific study, the use of convenience sampling resulted in a fairly homogenous sample of highly educated mothers and their children.

Although homogeneity may be an optimal sample characteristic in order to minimize potentially confounding sources of variance in exploratory studies such as this one (Kazdin, 2011), the fact that the sample was so consistently highly educated presents issues for the generalizability of the findings to less highly educated populations. That all of the mothers in the sample had completed at least an undergraduate degree is particularly important to note in the context of the current research given the finding that individuals who are college-educated are more likely to think that animals think (and thus more likely to ascribe mental states to them) (Maust-Mohl et al., 2012). Thus, while nearly all of the mothers in the sample in the present study used mind-related language to refer to the minds of their dogs, this finding will not

necessarily generalize to populations that would be the likely recipients of an intervention intended to promote ToM, where such high levels of education would be less common.

Although no measure of attachment or commitment to pets was included in the present study, it is likely that in addition to a sample of very highly educated mothers, the use of convenience sampling resulted in a sample of mothers and children who were highly attached and committed to their dogs. Given the demanding and time-consuming nature of participation, which required participants to bring their dogs and their children to the study site with no guarantee of compensation, it is likely that those mothers who responded to the call for participants either believed in, or were curious about the role of dogs in child development. A number of the participating mothers did indeed express their personal or familial love for and/or attachment to their dogs.

The finding that high attachment to pets is associated with better perspective-taking abilities in children (Maruyama, 2010) suggests the possibility that attachment to pets may be involved in the tendency to hypothesize about the mental lives of those pets. Thus, if the participants in sample in the present study were especially highly attached to their dogs, those participants may have been especially likely to use mind-related language when interacting with their dogs.

Even if those mothers who volunteered for participation were not necessarily more likely to be highly attached to their dogs, they were without question all pet owners. The importance of this shared characteristic comes from the suggestion that there may be important and consistent differences between parents who choose to own dogs and those who do not (Endenburg & Baarda, 1995). In the context of the present study, the possibility of such systematic differences raises the question of whether there may be some characteristic of mothers who would

voluntarily obtain a pet (as the mothers in the sample had all done), which makes them more susceptible to the influence of that pet's presence on their use of mind-related language.

Suggesting that such a confounding variable may be at work, Archer (1997) has proposed that pet owners are more likely to attribute mental lives to animals than are those who do not have pets. The possibility of a confounding variable associated with pet ownership emphasizes the importance of the question of whether the results of the present study would generalize to other populations where the mothers either would not, or could not volunteer to own a pet.

In addition to the generalizability issues that are associated with the human participants, there are certain limitations associated with the sample of pets involved in the present study. Although the sample was limited to participants' own pets in order to prevent the danger, liability, and ethical issues associated with having children interact with unfamiliar companion animals, as was described above, this limitation means that the findings of the present study may not necessarily generalize to mothers and children when they interact with a visiting animal. Similarly, the findings of the present study are limited to dogs, as other companion animals (and non-companion animals, such as animals that are kept for agricultural purposes) were not included.

Besides the limitations associated with the sample, the present study is also limited by the fact that the interactions took place in a laboratory setting. Although the use of the laboratory setting in the present study did help to minimize possible sources of variation between participants, the use of the laboratory setting also limits the generalizability of the results to real-life settings. It is likely that the participants (whether the mothers, the children, or the dogs) behaved differently in the laboratory setting than they do in their daily lives. However, participants did complete both the child-only and dog conditions in the laboratory, thus

subjecting them to the influence of that artificial setting during both conditions. Although every effort was made to make participants feel comfortable in the playroom, a few of the mothers did mention an awareness that they were being filmed or else feeling that they were not behaving as they might normally behave with their children at home. Mothers did not seem to report these feelings after the switch was made to filming behind the two-way mirror, suggesting the possible superiority of that method of filming in terms of its capacity to reduce the artificial feeling associated with the laboratory setting. However, it cannot be ignored that switching between filming methods caused a degree of inconsistency between participants, and thus represents a clear limitation in its own right.

Although the method of filming of from behind the two-way mirror may have been an effective method of reducing some of the discomfort mothers felt about playing with their children in the laboratory setting and/or being on camera, the majority of participants' (58%) had their sessions filmed from within the room. Even in the cases of those participants whose sessions were filmed from behind the mirror, the participants were still aware that they were being filmed and that they were taking part in a study, and the change in the filming technique also did not reduce the unfamiliar nature of the study room. Thus, it is likely that the laboratory setting influenced even those participants whose sessions were filmed from behind the two-way mirror.

Because the influence of the laboratory setting may have become less overt as participants became accustomed to the room, the order of the two conditions was randomized across participants. This randomization was intended to eliminate the influences of any order effects. However, the possibility that participants may have become more used to, and thus less

affected by the unfamiliar laboratory setting over time points to an additional limitation of the present study.

The fact that the first five minutes of each play session were used in coding suggests that if participants did indeed habituate to the study setting and the nature of the task over time, the films that were used may have shown the mothers (and possibly the children) when they were most aware of, and potentially most influenced by the nature of the setting and the task. Had longer films been coded, or had the first portion of each session been considered the habituation period, leaving a later 5 minute segment to be used for coding, it is possible that the effect of the laboratory setting may have been less influential. That the length of the play sessions and the lack of a habituation period were limitations of the present study is supported by mother reports of feelings of discomfort.

In addition to describing feelings of discomfort in the playroom, a couple of mothers also reported, either to the researchers after their participation, or to their children during their play sessions, that they felt obligated to play with the dog during the dog condition. As was described above, participants were instructed that they did not have to play with their dogs during the dog condition, but that they could if they wanted to. This instruction was given in order to reduce the likelihood of a demand characteristic, which may have been caused by participants' knowledge that the focus of the study was the role of dogs in child development. However, some mothers expressed the belief that they were supposed to involve the dog in the play during the dog condition suggests that a demand characteristic may have influenced the results by causing of some mothers to focus more on the dogs than others, or by causing the mothers to pay more attention to the dogs than they would typically have paid them. The possibility of a demand characteristic again points to the importance of considering dog involvement, rather than simply

the presence or absence of the dog, as owner perceptions of the study may have been another influence on dog involvement in the play sessions.

In addition to the inconsistencies in the level of the dog involvement during the dog condition, the present study was limited by the lack of consistency in how “absent” dogs were during the child-only condition. Although all dogs were technically absent from the playroom, as was described above some mothers and children were able to hear their dogs through the playroom door. In some cases mothers and children responded to the sounds their dogs made (whether those sounds were barking, walking on the tile floor, pawing, or other sounds associated with playing) by speculating about what the dog was thinking or feeling, or otherwise referring to the mental states of the dogs. This use of mind-related language in response to the behavior of the dogs during the condition when the dogs were supposed to be absent suggests that the lack of complete and consistent absence for some of the dogs was a clear limitation of the present study. That the dogs were not all completely absent raises the question of whether the child-only play session cannot be considered an effective control condition.

Another variable that may have had a confounding influence was the kind of toy(s) participants selected for play. Although all of the same toys were provided to all participants during both conditions, many participants used different toys in each of the two conditions. In addition, different participants naturally selected different kinds of toys. This variation in the kind of toy selected is problematic given that it is possible that certain toys might be more likely to invite the use of mind-related language than others. For example, mothers might be especially likely to ask children what they “think” when constructing a puzzle, in an effort to guide the children as they attempt to place the pieces correctly.

If certain toys do tend to present more opportunities for the use of mind-related language than others, the choice of which toy to use could have had a confounding influence. Had mothers been the ones to select the toys, their decisions about whether or not to select toys that presented more opportunities for the use of mind-related language may have been related to their general tendency to use mind-related language, but in this study children seemed to be the ones to select the toys. Thus, the potentially confounding influence of the wide variation in the kinds of toys presented and selected for play is another clear limitation of the present study. A more effective control/comparison might have been to give all participants one toy that bears some similarity to the dogs (i.e., a stuffed or robotic toy dog). Given time to habituate to the new toy (in order to reduce the influence of the novelty of the toy), such a comparison group might reduce possible sources of variation associated with differences in the kinds of toys used, better revealing the specific association between rates of mind-related language and the involvement of the dogs.

Although the present study is limited by a number of factors, its value as a preliminary exploratory study comes, at least in part, from the fact that it clearly points to the next steps that must be taken in future studies. In addition to improving on the methodological limitations of the present study, future studies must attempt to clarify the influence of companion animals on maternal use of mind-related language, and then to explore the long-term effects and therapeutic value of that influence. Such an exploration will allow for more concrete conclusions regarding the role of companion animals in the development of ToM and empathy.

Conclusions

In the first written work on pet-oriented child psychotherapy (which would later become what is now known as “animal assisted therapy”), Boris Levinson wrote of the importance of exploring any technique that might be useful in the prevention of negative outcomes for children,

proposing that HAI might be such a method (Levinson, 1997). I have already explained how the literature supports Levinson's suggestion of the value of HAI and animal assisted therapy, as well as how a separate literature supports the idea that maternal use of mind-related language may similarly present important opportunities for intervention (e.g., Demers, Bernier, Tarabulsky, & Provost, 2010). The results of the present study now suggest the value of continued exploration of the intersection of the previously unrelated areas of HAI and mind-mindedness, with the literature on mind-mindedness and maternal use of mind-related language offering one plausible "explanatory mechanism" (Thorpe, Serpell, & Suomi, 2011, p. 221) for the role of HAI in the development of social cognition. The present study thus begins to fill the gap in the research that is created by the lack of research on the role of HAI in cognitive development (Endenburg & Baarda, 1995), and proposes one method of "articulating why and how the presence of animals can enhance or lead to change" (Kazdin, 2011, p. 42).

References

- Albert, A., & Bulcroft, K. (1988). Pets, families, and the life course. *Journal of Marriage and Family*, 50(2), 543-552.
- American Pet Products Association. (2012). *National Pet Owners Survey: 2011–2012*.
Greenwich, CT: American Pet Products Association, Inc.
- Angantyr, M., Eklund, J., & Hansen, M. (2011). A comparison of empathy for humans and empathy for animals. *Anthrozoos*, 24(4), 369-377.
- Archer, J. (1997). Why do people love their pets? *Evolution and Human Behavior*, 18, 237-259.
- Baron-Cohen, S. (1997). *Mindblindness: An essay on autism and theory of mind*. Cambridge, MA: The MIT Press.
- Baron-Cohen, S. (1999). Social intelligence in the normal and autistic brain: An fMRI study. *The European Journal of Neuroscience*, 11, 1891-1898.
- Baron-Cohen, S. (2001). Theory of mind and autism: A review. *Special Issue of the International Review of Mental Retardation*, 23(169).
- Barrett, J.L., Newman R.M., & Richert, R.A. (2003). When seeing is not believing: Children's understanding of humans' and non-humans' use of background knowledge in interpreting visual displays. *Journal of Cognition and Culture*, 3(1), 91-108.
- Berk, L., & Winsler, A. (1995). *Scaffolding children's learning: Vygotsky and early childhood education*. Washington: National Association for the Education of Young Children.
- Burghardt, G.M. (2009). Ethics and animal consciousness: How rubber the ethical ruler? *Journal of Social Issues*, 65(3), 499-521.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

- Cohen-Mansfield, J., Dakheel-Ali, M., & Marx, M.S. (2009). Engagement in persons with dementia: The concept and its measurement. *Geriatric Psychiatry, 17*(4), 299-307.
- Collaborative for Academic, Social, and Emotional learning. (2005). *The Illinois edition of safe and sound: An educational leader's guide to evidence-based social and emotional learning programs*. Collaborative for Academic, Social, and Emotional Learning: Chicago, IL.
- Crossman, M.K., Easterbrooks, M.A., & Carusso, A. (2013). "What do you think you are doing?" Maternal cognitive constructs and children's development in an at-risk population. Poster presented at the Proceedings of the Biennial Meeting of the Society for Research in Child Development, Seattle, WA.
- Crossman, M.K., & Mueller, M.K. (2012). "She is very afraid of strangers": Human-animal relationships and the development of empathy. Poster presented at the Proceedings of the 52nd Annual Meeting of the New England Psychological Association, Worcester, MA.
- Darwin, C. (2004). *The descent of man and selection in relation to other species*. Whitefish, MT: Kessinger Publishing. Original work published 1871.
- DeLoache, J.S., Pickard, M.B., & LoBue, V. (2011). How very young children think about animals. In P. McCardle, S. McCune, J.A. Griffin, & V. Maholmes (Eds.), *How animals affect us: Examining the influence of human-animal interaction on child development and human health*. Washington, D.C.: American Psychological Association.
- Demers, I., Bernier, A., Tarabulsky, G.M., & Provost, M.A. (2010). Maternal and child characteristics as antecedents of maternal mind-mindedness. *Infant Mental Health Journal, 31*(1), 94-112.
- Diamond, J. (1991). *The rise and fall of the third chimpanzee*. London, UK: Radius.

- Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development*, 62(6), 1352-1366.
- Endenburg, N., & Baarda, B. (1995). The role of pets in enhancing human well-being: Effects on child development. In I. Robinson (Ed.), *The Waltham book of human animal interactions: Benefits and responsibilities*. Waltham, MA: Butterworth-Heinemann Medical.
- Geerds, M. (2012). The effects of daily animal exposure on children's biological concepts [Abstract]. Unpublished manuscript.
- Geerds, M., & Van de Walle, G.V. (2012). *Parent child interaction about biological entities in informal learning environments*. Poster presented at the Meeting of the Association for Psychological Science, Chicago, IL.
- Griffin, J.A. (2011). Introduction. In P. McCardle, S. McCune, J. Griffin, L. Esposito, & L.S. Freund (Eds.), *Animals in our lives: Human-animal interaction in family, community, & therapeutic settings*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Griffin, J.A., McCune, S., Maholmes, V., & Hurley, K. (2011). Human-animal interaction research: An introduction to issues and topics. In P. McCardle, S. McCune, J.A. Griffin, & V. Maholmes (Eds.), *How animals affect us: Examining the influence of human-animal interaction on child development and human health*. Washington, D.C.: American Psychological Association.
- Hall, G.S. (1896, July). Need of nature study in our schools. *Current Literature: A Magazine of Contemporary Record*, 20, 334-335.

- Hart, L.A. (2010). Positive effects of animals for psychosocially vulnerable people: A turning point for delivery. In A.H. Fine (Ed.), *Handbook on Animal Assisted Therapy: Theoretical Foundations and Guidelines for Practice* (3rd ed.). San Diego, CA: Academic Press.
- Heberlein, A.S., & Adolphs, R. (2004). Impaired spontaneous anthropomorphizing despite intact perception and social knowledge. *Proceedings of the National Academy of Sciences*, 101(19), 7487-7491.
- Hooker, C.I., Verosky, S.C., Germine, L.T., Knight, R.T., & D'Esposito, M. (2008). Mentalizing about emotion and its relationship to empathy. *Scan*, 3, 204-217.
- Joblonka, E., & Lamb, M.J. (2005). Evolution in four dimensions: Genetic, epigenetic, behavioral, and symbolic variation in the history of life. Cambridge, MA: MIT Press.
- Johnson, T.P., Garrity, T.F., & Stallones, L. (1992). Psychometric evaluation of the Lexington Attachment to Pets Scale (LAPS). *Anthrozoos*, 5(3), 160-175.
- Kazdin, A.E. (2011). Establishing the effectiveness of animal-assisted therapies: Methodological standards, issues, and strategies. In P. McCardle, S. McCune, J. A. Griffin, & V. Maholmes (Eds.), *How animals affect us: Examining the influence of human-animal interaction on child development and human health* (pp. 35-51). Washington, D.C.: American Psychological Association.
- Kidd, A.H., & Kidd, R.M. (1987). Reactions of infants and toddlers to live and toy animals. *Psychological Reports*, 61, 455-464.
- Laranjo, J., Bernier, A., Gagne, C. & Matte-Gagne, C. (2013). Paternal contributions to child impulse control capacities: The role of paternal mind-mindedness. Paper presented at the biennial meeting of the Society for Research in Child Development, Seattle, WA.

- Laranjo, J., Bernier, A., Meins, E., & Carlson, S.M. (2010). Early manifestations of children's theory of mind: The roles of maternal mind-mindedness and infant security of attachment. *Infancy*, 15(3), 300-323.
- Levinson, B.M. (1997). *Pet-oriented child psychotherapy* (2nd ed.). Springfield, IL: Charles C. Thomas.
- Locke, J. (1693). *Some thoughts concerning education*. London: A. and J. Churchill.
- Lorenz, K. (2004). *King Solomon's Ring*. London, UK: Taylor and Francis. Original work published 1952.
- Lundy, B. (2003). Father- and mother-infant face-to-face interactions: Differences in mind-related comments and infant attachment? *Infant Behavior and Development*, 26, 200-212.
- Maruyama, M. (2010). *The effects of animals on children's development of perspective-taking abilities*. (Unpublished doctoral dissertation). Portland State University: Portland, OR.
- Maust-Mohl, Fraser, J., & Morrison, R. (2012). Wild minds: What people think about animal thinking. *Anthrozoos*, 25(2), 133-147.
- Meins, E. (1997). *Security of attachment and the social development of cognition: Essays in developmental psychology*. East Sussex, UK: Psychology Press Ltd. And the Taylor & Francis Group.
- Meins, E. & Fernyhough, C. (1999). Linguistic acquisitional style and mentalizing development: The role of maternal mind-mindedness. *Cognitive Development*, 14, 363-380.
- Meins, E., & Fernyhough, C. (2010). *Mind-mindedness coding manual, Version 2.0*. Unpublished manuscript. Durham University, Durham, UK.
- Meins, E., Fernyhough, C., Fradley, E., & Tuckey, M. (2001). Rethinking maternal sensitivity: Mothers' comments on infants' mental processes predict security of attachment at 12

- months. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42, 637-648.
- Meins, E., Fernyhough, C., Wainwright, R., Clark-Carter, D., Das Gupta, M., Fradley, E., & Tuckey, M. (2003). Pathways to understanding mind: Construct validity and predictive validity of maternal mind-mindedness. *Child Development*, 74(4), 1194-1211.
- Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2002). Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development*, 73, 1715-1726.
- Meins, E., Harris-Waller, J., & Lloyd, A. (2008). Understanding alexithymia: Associations with peer attachment style and mind-mindedness. *Personality and Individual Differences*, 45, 146-152.
- Melson, G.F. (2001). *Why the wild things are: Animals in the lives of children*. Cambridge, MA: Harvard University Press.
- Melson, G.F. (2003). Child development and the human-companion animal bond. *American Behavioral Scientist*, 47(1), 31-39.
- Myers, G. (2007). *The significance of children and animals: Social development and our connections to other species* (2nd ed.). West Lafayette, IN: Purdue University Press.
- Onishi, K.H., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science*, 308(5719), 255-258.
- Peterson, C., & Slaughter, V. (2003). Opening windows into the mind: Mothers' preferences for mental state explanations and children's theory of mind. *Cognitive Development*, 18, 399-429.
- Pew Research Center. (2006). *Gauging family intimacy: Dogs edge cats (dads trail both)*. Washington, DC.

- Piaget, J. (2007). *The Child's Conception of the World: A 20th-Century Classic of Child Psychology* (J. Tomlinson & A. Tomlinson, Trans.). Lanham, MD: Rowman and Littlefield Publishers, Inc. Original work published 1929.
- Rost, D.H., & Hartmann, A. (1994). Children and their pets. *Anthrozoos*, 7(4), 242-254.
- Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between children's and mothers' mental state language and theory-of-mind understanding. *Child Development*, 73(3), 734-751.
- Serpell, J. (1986). *In the company of animals: A study of human-animal relationships*. Cambridge, UK: Cambridge University Press.
- Staats, S., Miller, D., Carnot, M.J., Rada, K., & Turnes, J. (1996) The Miller-Rada Commitment to Pets Scale. *Anthrozoos*, 9(2/3), 88-93.
- Stern, D. (1985). *The interpersonal world of the infant: A view from psychoanalysis and developmental psychology*. New York, NY: Basic Books.
- Symons, D.K. (2004). Mental state discourse, theory of mind, and the internalization of self-other understanding. *Developmental Review*, 24, 159-188.
- Thompson, K.L., & Guillone, E. (2003). Promotion of empathy and prosocial behavior in children through humane education. *Australian Psychologist*, 38(3), 175-182.
- Thorpe, R., Serpell, J.A., & Suomi, S.J. (2011). In P. McCardle, S. McCune, J. Griffin, L. Esposito, & L.S. Freund (Eds.), *Animals in our lives: Human-animal interaction in family, community, & therapeutic settings*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Triebenbacher, S.L. (1998). Pets as transitional objects: Their role in children's emotional development. *Psychological Reports*, 82, 191-200.

- Vygotsky, L. (1997). Interaction between learning and development. In M. Gauvain & M. Cole (Eds.), *Readings on the Development of Children: Second Edition* (pp. 29-36). (Reprinted from *Mind and Society*, pp. 79-91, 1978).
- Walker, T.M., Wheatcroft, R., & Camic, P.M. (2011). Mind-mindedness in parents of pre-schoolers: A comparison between clinical and community samples. *Clinical Child Psychology and Psychiatry*, 17(3), 318-335.
- Wellman, H.M., Cross, D., & Watson, J. (2001). Meta analysis of theory-of-mind development: The truth about false belief. *Child Development*, 72(3), 655-684.
- Westminster Kennel Club (2013). Breed information. Retrieved from <http://www.westminsterkennelclub.org/breedinformation/>.
- Wilson, C.C., & Netting, F.E. (2012). The status of instrument development in the human-animal interaction field. *Anthrozoos*, 25, S11-S55.
- Wilson, E.O. (1984). *Biophilia: The human bond with other species*. Cambridge, MA: Harvard University Press.
- Wood, L.J. (2011). Community benefits of human-animal interactions...the ripple effect. In P. McCardle, S. McCune, J. Griffin, L. Esposito, & L.S. Freund (Eds.), *Animals in our lives: Human-animal interaction in family, community, & therapeutic settings*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Zilcha-Mano, S., Mikulincer, M., & Shaver, P.R. (2011). Pet in the therapy room: An attachment perspective on Animal-Assisted Therapy. *Attachment and Human Development*, 13(6), 541-561.
- Zilcha-Mano, S., Mikulincer, M., & Shaver, P.R. (in press). Pets as safe havens and secure bases: The moderating role of pet attachment orientations. *Journal of Research in Personality*.

Table 1

Summary of Sample Demographic Characteristics

Characteristic	Descriptive Statistic			
	Minimum	Maximum	Mean	SD
Age of Mother (years)	34	49	40.06	4.04
Age of Child (years)	3	6	4.26	1.15
Age of Dog (years)	0.75	16.00	7.24	3.86
Time Dog in Family (years)	0.70	15.00	6.19	3.77
Number of People in House	2	5	3.89	0.74
Number of Dogs in Family	1	2	1.16	0.38
Total Pets in Family	1	9	2.16	2.12

Note. The demographics reported represent the 19 participants included in analysis. The demographics for the participant whose films were excluded from analysis are not included.

Table 2

Frequencies for Participant Demographics

Variable	Frequency	%
Race/Ethnicity		
White	16	84
Multiethnic	3	16
Mother Education		
College	5	26
Graduate/Professional School	14	74
Child's Sex		
Male	6	32
Female	13	68
Involvement In Care		
Somewhat Involved	14	74
Very Involved	5	26
Kind of Dog ^a		
Sporting	2	11
Working	3	16
Herding	2	11
Mix	12	63

Note. Mother Education = Mother's highest completed level of education; Involvement in Care = child's involvement in the care of the pet (not to be confused with dog involvement during the

interaction), as reported by the mother. ^aWith the exception of the “mix” category, classifications of kinds of dogs are based on the Westminster Kennel Club standards: Westminster Kennel Club (2013). Breed information. Retrieved from

<http://www.westminsterkennelclub.org/breedinformation/>.

Table 3

Descriptive Statistics for the Variables of Interest

Characteristic	Child-Only Condition		Dog Condition	
	Mean	SD	Mean	SD
Total Comments	73.89	27.10	73.74	21.95
Total MR	10.42	6.02	11.63	8.36
MR/Total Comments (Proportion)	.14	.07	.14	.07
Proportion of MR That Refer to Dog	.02	.06	.39	.24

Note. MR = Maternal use of mind-related comments.

Table 4

Frequencies for Dichotomous Mind-Related Language Variables

Child-Only Condition			Dog Condition	
Subject of Mind-Related				
Language	Frequency	%	Frequency	%
Any				
No	1	5	0	0
Yes	18	95	19	100
Child's Mind				
No	1	5	1	5
Yes	18	95	18	95
Dog's Mind				
No	16	84	2	11
Yes	3	16	17	90

Note. No = Mother does not use this kind of mind-related language; Yes = Mother does use this kind of mind-related language.

Table 5

Frequencies for the Dog Involvement Variable

Dog Involvement Score	Frequency	%
1 (Avoids Interaction)	0	0
2 (Inactive/Minimal Role)	6	32
3 (Some Involvement)	4	21
4 (Actively Involved)	5	26
5 (Focus of Interaction)	4	21

Note. Abbreviated versions of the labels for the various levels of the dog involvement variable are presented. For the complete labels, see Appendix B.

Table 6

Means and Standard Deviations of Total Numbers of Mind-Related Comments Based on Dog Involvement Scores

Dog Involvement Score	Condition					
	Child-Only			Dog		
	n	Mean	SD	n	Mean	SD
2 (Inactive/Minimal Role)	6	7.00	5.06	6	6.33	2.88
3 (Some Involvement)	4	9.00	5.72	4	6.75	4.27
4 (Actively Involved)	5	12.40	7.37	5	13.40	8.68
5 (Focus of Interaction)	4	14.50	3.87	4	22.25	6.55

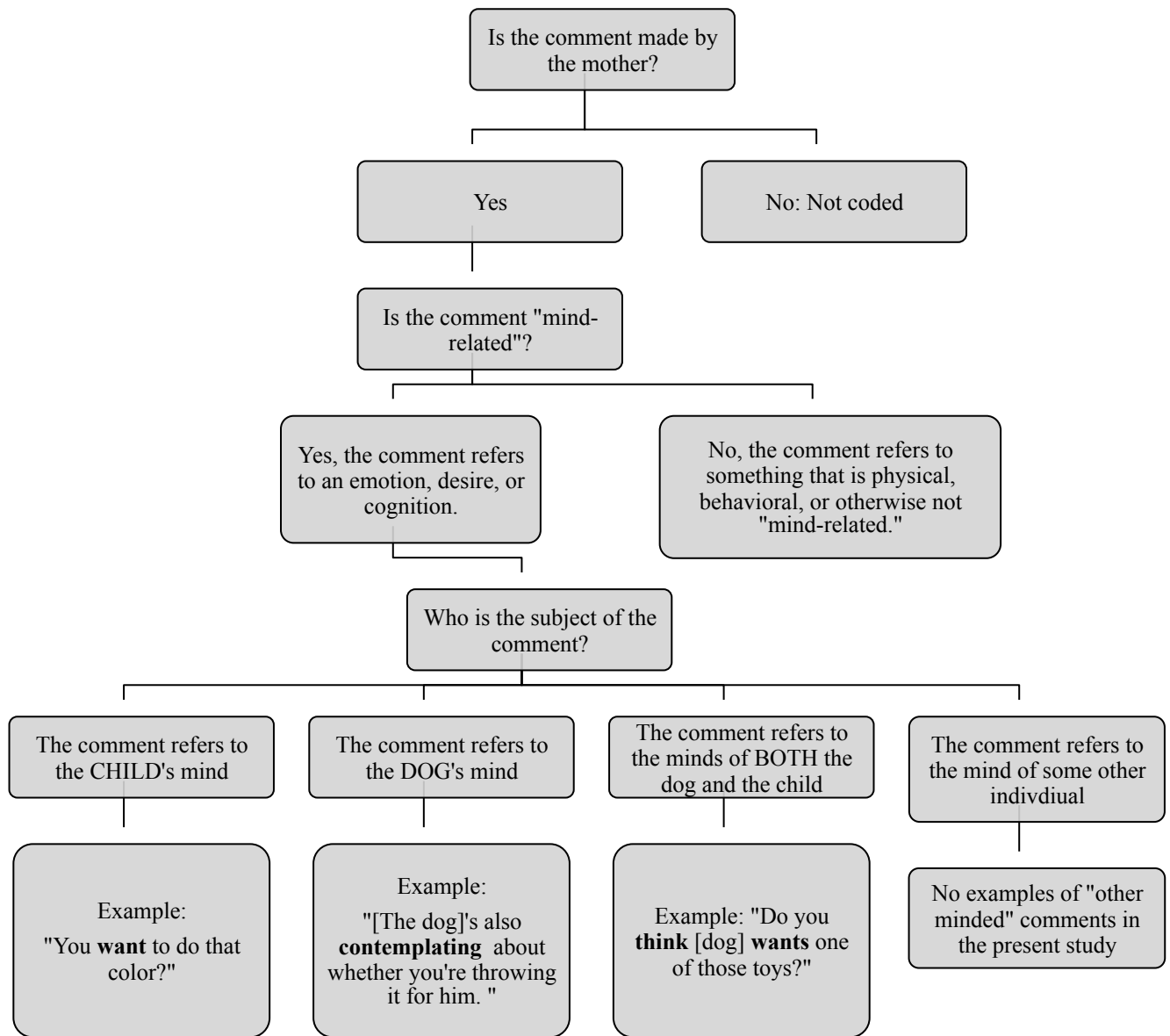


Figure 2. A depiction of the procedure for coding maternal comments.

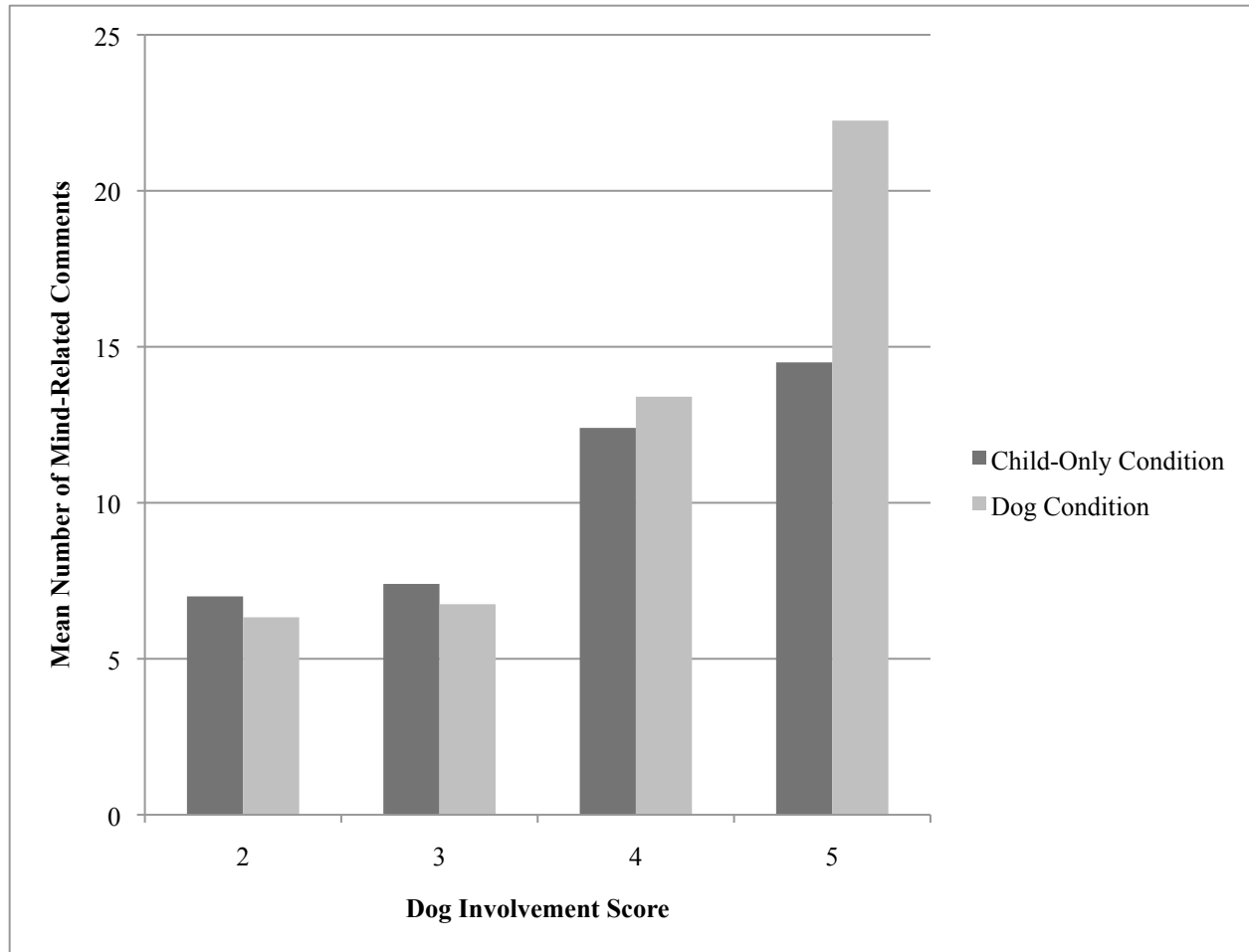


Figure 3. Mean total numbers of mind-related comments made by mothers based on dog involvement score.

Appendix A: Mind-Mindedness Coding Sheet for Mother-Child Condition

Study ID:
Date of video:
Coder:

Traditional Maternal Mind-Mindedness

Comment Tally (including Minded):

Total Comments _____

Mind-Minded Comments:

Comment	Time	Subject of Comment (Dog or Child) Subject refers to the “mind” the mother is talking about-is she talking about the child’s mind, or the dog’s?

Total Maternal Mind-Minded Comments:

Total Comments about DOG’s mind:

NOTE: THIS MEASURE SHOULD BE INCLUDED ON THE MOTHER-CHILD ONLY CONDITION IN CASE THE MOTHER AND CHILD TALK ABOUT THE DOG EVEN WHEN THE DOG IS ABSENT

Appendix B: Mind-Mindedness Coding Sheet for Mother-Child-Dog Condition

Study ID:
Date of video:
Coder:

Comment Tally (including Minded):

Total Comments:

Mind-Minded Comments:

Comment	Time	Subject of Comment (Dog or Child) Subject refers to the “mind” the mother is talking about—is she talking about the child’s mind, or the dog’s?

Total Mind-Minded Comments:

Total Comments about DOG’s mind:

Dog Involvement Score (choose one and enter number value here):

- 1: Dog avoids interaction with mother and child OR mother and child avoid interaction with dog
- 2: Dog is not active, plays minimal role in mother-child interaction
- 3: Dog is involved in some of interactions
- 4: Dog is actively involved in most interactions
- 5: Dog is focus of all/most interactions, play centers around dog