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The Impact of Household Pets on Children's Daily Lives: Differences in Parent–Child Conversations and Implications for Children's Emotional Development

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Living with a pet is related to a host of socioemotional health benefits for children, yet few studies have examined the mechanisms that drive the relations between pet ownership and positive socioemotional outcomes. The current study examined one of the ways that pets may change the environment through which children learn and whether childhood pet ownership might promote empathy and prosocial behavior through parent–child conversations about emotions and mental states in the presence of a pet dog. Participants included 123 parent (118 mothers, four fathers) and child (65 female, 58 male, $M_{age} = 39.50$ months, 75 White, not Hispanic, nine Asian/Pacific Islander, seven Hispanic, five Black/African American, two South Asian/Indian, two American Indian/Alaska Native, two "other," 21 more than one race, 111 residing in the United States) dyads currently living with a pet dog ($n = 61$) or having never lived with a pet dog ($n = 62$). As hypothesized, we found that parents used a greater proportion of emotion and mental state language with their children when playing with their pet dog than with a lifelike toy, suggesting that the presence of a household pet may be one context used to promote conversations about emotions and mental states.

Public Significance Statement
Childhood pet ownership has been linked to a host of emotional benefits, yet few studies have examined the underlying mechanism driving these relations. The present study examined the ways in which pet dogs can serve as one context for social learning. We found that children heard more emotion and mental state language when playing with their pet dog than with a lifelike toy, suggesting that pets may provide one context in a child's social environment that might promote empathy and prosocial behaviors.

Keywords: pet ownership, parent–child conversations, emotional development, emotion and mental state language

Supplemental materials: https://doi.org/10.1037/dev0001595.supp

Household pets play an important role in children's everyday lives. Recent surveys suggest that over half of the U.S. population has at least one pet at home, most commonly a dog (Applebaum et al., 2023). Furthermore, within the first year of life, over 60% of parents report having a pet in the home with their infants, and these numbers increase over the course of early childhood (Christian et al., 2020; Hurley & Oakes, 2018; Melson, 2003). Importantly, both children and adults consider their pets to be part of the family, with children often reporting having better relationships with their pets than with their siblings (Cassels et al., 2017; Cohen, 2002). Given the commonality of household pets and their importance to the family system, it is crucial to examine the impact of household pets on children's daily lives and development.

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We have no known conflicts of interest to disclose. All procedures were approved by the Institutional Review Board at Rutgers University.

Lori B. Reider served as lead for conceptualization, data curation, formal analysis, investigation, methodology, project administration, validation, visualization, writing–original draft, and writing–review and editing. Emily Kim contributed equally to methodology and served in a supporting role for formal analysis, investigation, validation, writing–original draft, and writing–review and editing. Elise Mahaffey contributed equally to investigation and served in a supporting role for formal analysis, methodology, validation, writing–original draft, and writing–review and editing. Vanessa LoBue served as lead for funding acquisition, resources, and supervision, contributed equally to validation, and served in a supporting role for methodology, writing–original draft, and writing–review and editing. Emily Kim, Elise Mahaffey, and Vanessa LoBue contributed equally to conceptualization.

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A large and growing literature has already linked childhood pet ownership with a host of physical and socioemotional health benefits (e.g., Melson, 2020; Purewal et al., 2017). Indeed, self-report studies have demonstrated links between pet ownership in childhood and higher self-esteem (Van Houtte & Jarvis, 1995), enhanced emotion regulation (Bryant & Donnellan, 2007), and greater empathy and theory of mind (e.g., Christian et al., 2020; Daly & Morton, 2006, 2009; Jacobson & Chang, 2018; Svensson, 2014). Furthermore, longitudinal work has shown that living with a pet dog at 6 months of age was associated with a lower risk of showing developmental delays at 12 months in communication, gross motor, fine motor, problem-solving, and personal–social domains as measured via parent report (Minatoya et al., 2020). At age 3, having lived with a pet dog remained associated with a lower risk of developmental delays in the communication, gross motor, problem-solving, and personal–social domains (Minatoya et al., 2021).

While these studies demonstrate a link between household pets and children's socioemotional development, most of this work is correlational, often relying on self- and parent-report measures, many of which are retrospective. Given the financial and emotional commitment of pet ownership, it is not feasible to randomly assign families to adopt a pet into their home, making it difficult to conduct experimental research that establishes a causal link between the introduction of a household pet and better socioemotional functioning. As a result, most of the literature has been unable to address whether owning a pet promotes the development of socioemotional skills like empathy or prosocial behavior in children, or whether highly empathetic and prosocial individuals are just more likely to own a pet.

Only a handful of studies have attempted to manipulate the presence/absence of a pet in the short term to study its effects on children's socioemotional skills (e.g., Hergovich et al., 2002; Kotrschal & Ortbauer, 2003). For example, one study reported that the presence of a pet dog buffered perceived stress in 7- to 10-year-old children more than the presence of a parent during a difficult task (Kertes et al., 2017). Likewise, another study found that 9- to 11-year-old children who completed a stressful task alongside their pet dog reported greater positive affect than those who completed the task alone (Kerns et al., 2018).

In one of the only studies to examine whether introducing a pet would influence children's empathy, Hergovich et al. (2002) randomly assigned first-grade classrooms to care for a class pet dog for 3 months, or to a control condition where there was no pet dog in the classroom. Children with the class pet dog showed better teacher-reported social integration in the classroom and greater self-reported empathy toward animals over time when compared to the no dog control group. This study provides some promising evidence of a potential causal link between interactions with pets (specifically pet dogs) and increased empathy. However, this study introduced a pet into the classroom, and findings may be complicated by the influence of peers, teachers, or other aspects of the school setting in ways that might be different from the experience of living with a pet at home. Furthermore, the study did not provide data on the potential *mechanisms* underlying the influence of pets on children's empathy. Thus, while exposure to a pet might promote the development of empathy in children over time, it remains unclear *why* or *how* pet exposure enhances socioemotional functioning.

Several hypotheses have been proposed to explain the link between pet ownership and socioemotional outcomes. For example, pets may provide a social bond which serves as a nonjudgmental source of emotional support for children and adults (see Melson, 2020 for a review). An alternative, but not mutually exclusive hypothesis is that the presence of household pets may provide socioemotional benefits to children through opportunities to learn about emotional concepts. Specifically, pet ownership might elicit conversations between parents and children about their pets in a way that promotes the development of empathy and emotion understanding. Since pets are living things who cannot communicate their thoughts, needs, or desires, conversations about household pets can serve as a natural context for learning about emotions, developing empathy, and engaging in prosocial behaviors. Even mundane, everyday talk about how pets are fed, how to groom them, or their likes and dislikes might encourage perspective-taking and talk about emotions and mental states, precisely because pets themselves cannot provide this information. Emotion and mental state (EMST) language in this context might help children develop their theory of mind skills, especially in the infancy and preschool years when these skills are first developing (Sodian et al., 2020; Wellman, 2017), and help children apply those skills toward individuals (both animal and human) who need compassion and support.

Research has already established that conversations between children and caregivers about the emotions and mental states of others are important for children's developing understanding of the self-other distinction, social competence, and theory of mind (Symons, 2004). Previous research has also demonstrated that increased use of EMST language in parent–child conversations early in life is related to greater empathy and prosocial behaviors (e.g., Aram & Shapira, 2012; Brownell et al., 2013; Drummond et al., 2014). In one study, researchers reported that parents' talk about mental states was related to 18- to 30-month-old children's helping behavior (Brownell et al., 2013). A similar study reported that mothers' mental state and emotion talk while reading books was related to 18- to 30-month-old children's empathy (Aram & Shapira, 2012). In another study, Drummond et al. (2014) found that parents who labeled emotions and mental states more often during a free play session and who elicited EMST talk more frequently during a book reading had 18- to 30-month-old children who helped more quickly during an empathic helping task. Taken together, these findings suggest that hearing more EMST language may be linked to empathy and prosocial development.

In addition to research on the impact of EMST language on children's empathy and prosocial behaviors, there is also evidence that parents use more EMST language in the context of a live animal versus a lifelike toy. In one study, Jipson et al. (2016) examined conversations between parents and 3- to 5-year-old children during a brief play session with a rodent (live animal), a robotic toy dog (lifelike toy), and a toy car (inanimate toy). They found that parents talked more about biological, psychological, and sensory properties when interacting with the live animal than lifelike toy or the inanimate toy, and more for the lifelike toy than the inanimate toy. Furthermore, parents' talk about psychological properties of the lifelike robotic toy dog was related to children's reasoning about the psychological and sensory attributes of the robot, linking the input children receive to their conceptual understanding of a toy that resembles a lifelike entity. This suggests that the presence of a live animal may be one context where greater talk about lifelike qualities is encouraged compared to conversations around similar lifelike toys or even inanimate toys, and that the language provided by parents during these interactions may influence children's thinking.

The primary aim of the current study was to examine differences in EMST language during parent–child conversations in the presence versus absence of a pet dog. We first compared parent–child conversations in the presence of the family pet dog to conversations between the same parents and children in the presence of an anthropomorphized, or lifelike toy (e.g., doll, stuffed animal), which could potentially elicit some of the same EMST language during parent–child conversations as with their pet dog. We hypothesized that parents and children living with a pet dog would use more EMST language in the context of interactions with their pet dog, compared to their interactions with a lifelike toy. Next, we compared the conversations of parents and children who currently live with a pet dog and parents and children who have never lived with a pet dog in the presence of a lifelike toy. We examined whether families living with a pet dog use more EMST language in general when compared to families without a pet dog, or whether these differences are specific to the context in which the conversations take place. We hypothesized that EMST language during interactions with a lifelike toy would not differ between families with and without a pet dog, as we expected more of this language to be used specifically within the context of the household pet.

As a secondary aim, we also examined whether children would demonstrate differences in empathy and prosocial behavior based on whether or not they lived with a pet dog, and whether they heard more EMST language from parents. We hypothesized that, consistent with previous research (e.g., Daly & Morton, 2006, 2009), living with a pet dog would be positively related to empathy and prosocial behaviors. Furthermore, we hypothesized that EMST language by both parents and children would positively predict children's empathy and prosocial behaviors. Finally, we explored relations between parents' previous and current pet ownership and their self-reported empathy and prosocial behavior.

Method

Transparency and Openness

Our study design, sample size, and main analytic procedures were preregistered on aspredicted.org (#43820). All data can be found on Databrary (LoBue et al., 2020). Data were analyzed using SPSS Version 27 (IBM® SPSS® Statistics: IBM Corp. Released, 2020).

Participants

Families completed an online eligibility form to participate in the current study. To be eligible for participation, families must have endorsed having a child between 18 and 66 months of age, and they must either currently live with a pet dog (pet dog group) or have never lived with a pet dog or cat (no dog group). Participants who have only previously lived with a pet dog or cat or who currently live with only a pet cat (as cats are commonly owned pets that offer similar types of interactions) were excluded from participation so that we could compare families who currently live with a pet dog to those who have never lived with a comparable pet. Families who have never lived with a pet dog or cat but have lived with other kinds of animals (e.g., lizards, gerbils, fish) were placed in the no dog group. The reasoning for this decision was twofold. First, animals like lizards, gerbils, and fish arguably have a lower capacity to engage in social and emotional interactions with humans when compared to dogs and cats. Second, previous research suggests that children are less attached to pets that are less phylogenetically similar to humans than they are to pets that are more phylogenetically similar such as dogs and cats (Hirschenhauser et al., 2017; Muldoon et al., 2019).

Participants included 123 children (65 females, 58 males) and their primary caregiver (119 mothers, four fathers) who belonged to one of four groups based on a targeted age range (younger: 18–35 months of age vs. older: 36–66 months of age) and whether they lived with a pet dog at the time of the study (pet dog group) or had never lived with a dog or cat (no dog group). Of those who currently lived with a pet dog ($n = 61$), 35 (57.4%) only lived with a pet dog, 15 (24.6%) had a dog and a cat, six (9.8%) had a dog and another pet, and five (8.2%) had a dog, cat, and another pet. Of those who reported having no dog or cat (no dog group, $n = 62$), 14 families reported living with other kinds of pets, which were mostly fish (22.6%), but also included lizards, crabs, frogs, gerbils, and chickens. The sample size was preregistered and determined based on previous research coding EMST language during parent–child interactions (Drummond et al., 2014; $n = 44$ dyads between two age groups), as well as research using similar vignette tasks with older children (Weller & Hansen Lagattuta, 2013; $n = 76$ between four conditions). The age ranges for the current study were selected because of their developmental relevance, as previous literature suggests that significant developments in theory of mind—a key component in the ability to attribute mental states to the self and others—emerges between 3 and 5 years of age (Wellman et al., 2001). In the current study, we aimed to explore whether relations between dog ownership and EMST language differ around the time that such concepts are also undergoing substantial developmental change.

The final sample included 30 younger children who live with a pet dog (18 female, $M_{age} = 25.72$ months, $SD_{age} = 5.05$, $range_{age} = 16.99$), 31 older children who live with a pet dog (20 female, $M_{age} = 49.22$, $SD_{age} = 10.00$, $range_{age} = 30.39$), 31 younger children who had never lived with a pet dog (13 female, $M_{age} = 28.39$, $SD_{age} = 9.44$, $range_{age} = 51.88$), and 31 older children who had never lived with a pet dog (14 female, $M_{age} = 54.22$, $SD_{age} = 9.93$, $range_{age} = 35.09$). Two children's and two parents' proportion of EMST scores were determined to be outliers (defined as greater than 3 *SD*s from the mean) and were excluded from the remaining analyses. This included two parents' and one child's EMST language when playing with the lifelike toy, and one child's EMST language when playing with their pet dog. Three parents' empathy scores (as measured by the Toronto Empathy Questionnaire [TEQ]; Spreng et al., 2009) were also determined to be outliers and were excluded from all analyses. These participants' data were retained for all other analyses.

The majority of parents reported their child's race/ethnicity as White, not Hispanic ($n = 75$, 61.0%), with parents also reporting their child's race/ethnicity as Asian/Pacific Islander (n= 9, 7.3%), Hispanic ($n = 7$, 5.7%), Black/African American ($n = 5$, 4.1%), South Asian/Indian ($n = 2$, 1.6%), American Indian/Alaska Native ($n = 2$, 1.6%), other ($n = 2$, 1.6%), or more than one race ($n = 21$, 17.1%). Most families ($n = 111$, 90.2%) reported residing in the United States of America, with an additional six (4.9%) families in Canada, two families in the United Kingdom (1.6%), one family each residing in Ireland (.8%), Israel (.8%), and the Philippines (.8%), and one additional family (.8%) who did not provide this information. Parents also reported that most of their children had at least one sibling ($n = 91$, 74.0%) and attended daycare or preschool ($n = 66$, 53.7%). Note that the responses of daycare/preschool attendance were inconsistently reported by caregivers, and it was unclear

whether the amount of time caregivers reported reflected their current or previous time spent in daycare due to the impact of the COVID-19 pandemic, and this variable should be interpreted with caution. The majority of children only heard English in the home ($n = 86$, 69.9%). Most parents reported having an advanced degree ($n = 84$, 68.3%), with parents additionally reporting having some college or trade school ($n = 4$, 3.3%), or an AA/BA degree ($n = 33$, 26.8%). Parents also reported their average household income in the last three years (in U.S. dollars) of less than $20,000 ($n = 4$, 3.3%), $20,000–$40,000 ($n = 8$, 6.5%), $40,000–$60,000 ($n = 10$, 8.1%), $60,000–$100,000 ($n = 37$, 30.1%), or more than $100,000 per year ($n = 62$, 50.4%). Two (1.6%) parents did not report their household income or education level.

Procedures

Parents and children were invited to take part in this study through advertising on our lab website, childrenhelpingscience.com, and social media platforms. All data were collected during the COVID-19 pandemic, and the entire study took place online using Zoom, a video conferencing platform. All procedures were approved by the Institutional Review Board at Rutgers University-Newark. Informed consent was obtained at the start of the call. Participants in the no dog group completed a single free-play session with a lifelike toy, while participants in the pet dog group completed two free-play sessions during the same testing session (one with their pet dog and one with a lifelike toy) in a counterbalanced order. Children in the older age group (36 months and older) completed an age-appropriate prosocial vignette task following the free-play session(s). Parents also completed questionnaires regarding their own and their child's empathic and prosocial behaviors, as well as demographic information. Participants were debriefed about the nature of the study at the conclusion of the session. All participants received a small compensation ($10 gift card) for their participation.

Measures

Free-Play Sessions. All parent–child dyads engaged in a 5-minute free play session with an anthropomorphized, or lifelike toy (e.g., doll, stuffed animal). Dyads living with a pet dog completed an additional 5-minute free play session with their dog in a counterbalanced order. Parents were instructed to play with one of their child's favorite lifelike toys or their pet dog as they would normally play at home. During each free play session, the researcher was not visible to the parent and child. Free-play sessions were recorded for offline transcription and coding of EMST language (see "Coding Conversations" section).

Prosocial Vignette Task. To assess children's prosocial behavior, children responded to four prosocial dilemma vignettes using a series of interview style questions, adapted from a study of 5- to 13-year-old children (Weller & Hansen Lagattuta, 2013). Given the need for expressive vocabulary and the heavy processing demands necessary to complete this kind of task, the vignette task was only run with the older age group (36 months and older). The characters in each vignette matched the biological sex of the child participant. Each vignette involved a character either currently engaged or about to engage in a fun activity when the character is met by an unfamiliar, same-aged, same-sex child who needs help or wants to play with something fun owned by the focal character (see Weller & Hansen Lagattuta, 2013 for additional details about the vignettes).

The original task had 10 vignettes, including six prosocial moral dilemmas, two prohibitive moral dilemmas, and two simple desire stories. The six prosocial vignettes were further categorized by high-need (character's physical well-being is at stake), medium-need (child's personal belongings are at risk), and low-need (child wants to play with a new item). To keep the current study at a reasonable length for young children, we used a subset of the vignettes that included one high-need, one medium-need, and two low-need prosocial moral dilemmas. Specifically, we selected two vignettes in which the focal character needs help (helping scenarios), and two vignettes in which the focal character wants the other character to share a toy (sharing scenarios). In the two helping scenarios, an unfamiliar child needs help (e.g., fell off a bike and is hurt, drawing and trading cards blew out of a backpack), and in the two sharing scenarios, an unfamiliar child wants to play with the main character's new toy (e.g., new kite, video game). Vignettes were presented via prerecorded videos with the same speaker describing each vignette. Following each vignette, children were asked two comprehension questions about each character in the vignette to ensure that the child was paying attention and understood each story. Next, children were asked what "most boys/girls" would do in each situation using two response options including a prosocial response (e.g., stop to try and help) and a selfish response (e.g., go straight to the movies). Participants were then asked what they themselves would do in this same situation using the same response options. Following their selection, children were asked whether they would feel good or bad about their decision, and then answered a follow-up item about how good or bad they would feel using a 3-point Likert scale (little, medium, or very good/bad). The order of response choices were randomized.

Parent Self-Report Measures. Parents completed self-report questionnaires regarding their perceived empathy and prosocial behavior, as well as information regarding their current and previous pet ownership, pet bonding (if applicable), and basic demographic information. All parents completed the TEQ. The TEQ is a 16-item self-report measure primarily targeting affective empathy, with each item scored using a 5-point Likert scale from 0 (*never*) to 4 (*always*). The TEQ has shown good internal validity and test–retest reliability (Spreng et al., 2009). Parents also completed the Prosocialness Scale for Adults (Caprara et al., 2005), a 16-item measure of self-reported tendency to engage in prosocial behaviors, including sharing, helping, and caring. Items were scored using a 5-point Likert scale: 1 (*never/almost never true*) to 5 (*almost always/always true*). The Prosocialness Scale for Adults has demonstrated good internal validity and test–retest reliability (Caprara et al., 2005, 2010). Parents who currently live with a pet dog also completed the Companion Animal Bonding Scale, an eight-item measure assessing the frequency of interactions with a pet (Poresky et al., 1987). Participants responded with the frequency they engage in various caretaking interactions with the pet dog that took part in the study (e.g., responsible for the dog, petting the dog), using a 5-point Likert scale from 1 (*never*) to 5 (*always*). This scale has shown good reliability and test–retest reliability (Angulo et al., 1996; Poresky et al., 1987). Finally, all parents completed a demographics form, which asked about racial/ethnic background, the biological sex of the child (as assigned at birth), relationship of the parent to the child, household education, and income. We also asked parents to report the number of siblings in the home, as well as the amount of time their children spent in daycare or preschool facilities.

Parent Report of Child Measures. Parents also completed questionnaires regarding their child's empathy, vocabulary production (for children younger than 36 months), and pet attachment (pet dog group only). All parents completed the Griffith Empathy Measure (GEM), a 23-item measure of children's empathy (Dadds et al., 2008a, 2008b). While this measure aims to distinguish between cognitive and affective components of empathy, studies have noted concerns with these distinctions and have noted poor reliability when using this distinction (Kimonis et al., 2016; Murphy, 2019). We therefore used the overall average of all the items as the outcome measure. Prior studies have shown good test–retest reliability of the overall GEM score (e.g., Dadds et al., 2008a; Kimonis et al., 2016).

Parents of children in the younger age group (younger than 36 months) completed an adapted version of the MacArthur–Bates Short-Form Vocabulary Checklist: Level II (Fenson et al., 2000), which included 90 single word items. Parents endorsed whether their child says each word, and the total number of words that parents endorsed were used as the outcome measure to assess language ability in the younger age group. This measure was included specifically to ensure that the younger age group did not differ in overall language ability for children with and without a pet dog. Children with and without a pet dog in the younger age group did not differ in their language production ability, as assessed using the number of items endorsed on the MacArthur–Bates Short-Form Vocabulary Checklist: Level II (Fenson et al., 2000), $t(59) = .77$, $p = .16$, $d = .36$, 95% confidence interval (CI) [−.15, .87].

Finally, parents who currently live with a pet dog also answered questions about their child's attachment to their dog. Five items were selected from the Child's Attitudes and Behaviors Towards Animals questionnaire (Guymer et al., 2001). The original measure was developed to measure children's attitudes and behaviors toward animals and asks about children's relationship with animals and specifically with their pets. We selected the four items that specifically asked about pets ("my child has a good relationship with our pet," "my child acts in a caring manner towards our pet," "my child shows responsibility for our pet," and "my child plays nicely with our pet"), as well as one additional reverse scored item ("my child is rough with animals"). For each item, parents responded using a 5-point Likert scale from 1 (*never*) to 5 (*always*), and the total was used as a measure of children's pet attachment. However, when internal reliability was determined using Cronbach's α, reliability was low for all five items ($\alpha = .28$). Alphas were then recalculated with each item deleted, and we determined that removing the reverse scored item that asks about animals generally ("My child is rough with animals") improved reliability to an acceptable standard ($\alpha = .76$). Thus, for the remaining analyses, the sum of only the four reliable items was used to assess children's attachment to their pet dog.

Data Preparation

Coding Conversations. For each free play session, conversations were transcribed in Excel by trained researchers verbatim by utterance and speaker from recorded videos and were then checked by another trained researcher for accuracy. An utterance was defined as an uninterrupted stream of language distinguished based on (a) clear, lengthy pauses indicating the end of a stream of speech, (b) grammatical structure indicating the end of a stream of speech (e.g., clear end of a sentence), and (c) changes in vocal intonation indicating a shift from the previous utterance (Drummond et al., 2014; Slaughter et al., 2007). Transcripts were then coded for EMST language from seven different categories (primarily from Drummond et al., 2014, though see Brownell et al., 2013; Ruffman et al., 2006; Symons et al., 2006). These included utterances containing the following content: simple affect, desire, emotion explanations/elaborations, mental state, empathy, prosocial, and other internal states (see Table 1 for a full description of the coding scheme). For all categories except empathy statements, we further coded whether the statement was a production statement (e.g., labeling or explaining) or an elicitation statement (e.g., asking a question or otherwise eliciting a response). Four primary composite proportion score variables were created for analysis, calculated as the total number of EMST utterances divided by the total number of utterances during each play session (dog, toy) by each speaker (parent, child). We opted to examine the proportion of overall EMST language provided by each speaker during each play session because we did not have a priori hypotheses about the specific kinds of EMST language used by parents and children. Similar approaches have been used in previous studies using related coding schemes (e.g., Drummond et al., 2014).

Reliability. One trained researcher coded all transcripts. To establish interrater reliability, an additional trained coder independently coded 33% of the transcripts ($n = 40$, 10 from each age group and pet dog/no dog group). Cohen's Kappa (κ) was used to calculate reliability, with values between .60 and .79 (moderate agreement) to be considered acceptable, and values above .80 considered to be strong agreement between raters (Landis & Koch, 1977). We obtained an average Cohen's κ of .95 (κ range = .83–1.00, 98% agreement), indicating a high level of agreement. As mentioned above, for each speaker (parent, child) and play session (dog, toy), the total number of utterances within each EMST coded category were then summed and divided by the total number of utterances to create a proportion score of EMST language used by each speaker in each play session. The primary coder's data were used for all analyses to follow.

Coding Prosocial Vignettes. Children 36 months and older completed the prosocial vignette task. As a measure of children's prosocial behavior, we assessed the proportion of trials that children claimed that most boys/girls would act prosocially (prosocial–other) and the proportion of trials that children claimed they themselves would act prosocially (prosocial–self). Trials were excluded if the child failed to correctly answer at least one of the two comprehension checks provided at the start of each trial (e.g., [a] Right now, where does Alex really want to go? and [b] And what happened to Drew?). Of the 62 children who attempted the task, three were excluded from analyses including two participants who did not provide responses to any of the questions following each vignette and one participant who failed all comprehension checks across all four vignettes. Of the 59 remaining participants included in the analysis, most children answered both comprehension items accurately following each vignette (78%–86% of children across all four vignettes, see Table 2). For all further analyses using the vignette data, we relied on proportion scores for ease of interpretation to only examine responses to vignettes in which children passed the comprehension checks to ensure we only included data from vignettes that children understood.

Data Analysis Plan

We first provide an initial preliminary examination of key variables of interest. This includes an examination of differences in parents' and children's empathy, prosocial behaviors, and EMST

Table 1
Coding Scheme of EMST Language

Category	Function and examples	
	Production	Elicitation
Simple affect Nouns, verbs, adjectives, or adverbs naming emotional feelings or behaviors, or states of preference, desire, or intention without expansion or emotion imitation	Production (SAP) • The dog is happy. • The dog loves his toy. • You like this toy.	Elicitation (SAE) • Is he happy or sad? • How is he feeling? • Are you happy?
Desire References to wanting, needing something concrete	Production (DP) • He wants his ice cream. • You want that toy. • Help me.	Elicitation (DE) • Does he need a hug? • What do you want to play with?
Elaboration/explanation Phrases or statements that explain or clarify the reason or possible cause for a particular mental state, or that provide background or context to help the child understand it, or that elaborate or explain how one infers or knows that a given mental state is being experienced	Production (EP) • He is sad because he does not have a hug. • He is scared because there was a loud noise. • You are excited because we get to play with these toys.	Elicitation (EE) • Why is he sad? • How do you know he is angry? • Why are you upset?
Mental state References to the past, or to thinking, knowing, wondering, remembering, pretending	Production (MSP) • I think that's a cat. • You know this color. • Do you think he's hungry?	Elicitation (MSE) • What do you think he's doing? • Do you remember reading about dogs in our story?
Other internal state References to other internal states that are not affect- or mental state-related (e.g., physiological states)	Production (OISP) • He is hungry. • You seem tired.	Elicitation (OISE) • Did she get tired? • Are you hungry?
Empathy statements Statements or emotion-related sounds that promote empathy with a character's emotion	Production (EMPP) • Aww. • Poor monkey.	
Prosocial statements Statements that promote prosocial behaviors during the interaction with the people, dog, or toy. These can refer to rewarding/encouraging the child for prosocial behaviors or asking someone to engage in prosocial behaviors or avoid/discouraging antisocial behaviors.	Production (PP) • Nice touches. • Be gentle. • Oh that is so nice of you … good.	Elicitation (PE) • Can you be nice to her? • Can you be gentle with her? • Don't be mean to the dog/toy. • Don't hit him. • You wanna give him a hug? • Can I get a kiss?

Note. EMST = emotion and mental state; SAP = simple affect production; SAE = simple affect elicitation; DP = desire production; DE = desire elicitation; EP = elaboration/explanation production; EE = elaboration/explanation elicitation; MSP = mental state production; MSE = mental state elicitation; OISP = other internal state production; OISE = other internal state elicitation; EMPP = empathy statements production; PP = prosocial statements production; PE = prosocial statements elicitation.

language use during the toy play session by dog ownership using independent samples *t*-tests. We also conducted correlations to examine relations between children's empathy, children's prosocial behaviors, children's EMST language use in each play session, parent's EMST language use in each play session, children's pet attachment, and children's age in months.

Next, we examined our main preregistered aims. The primary aim was to examine differences in EMST language during parent–child conversations in the presence versus absence of their pet dog. To address this aim, a 2 (child age: older group vs. younger group) by 2 (play session: dog vs. toy) mixed effects analysis of variance (ANOVA) was used to examine differences in both parent and child use of EMST language during play with their pet dog compared to the lifelike toy (note these analyses were only done using data from the pet dog group). We hypothesized that parents and children living with a pet dog would use more EMST language in the context of interactions with their pet dog when compared to their interactions with a lifelike toy.

The next aim was to examine whether families with a pet dog use more EMST language in general when compared to families with no dog, or whether these differences are specific to the context in which the conversations take place. To address this aim, a 2 (child age: younger group vs. older group) by 2 (dog ownership: pet dog group vs. no dog group) ANOVA was used to examine differences in both parent and child use of EMST language during play with a lifelike toy. We hypothesized that EMST language would not differ between families with and without a pet dog while playing with a lifelike toy, as we expected more EMST language to be used specifically in the context of a live household pet. We also explored whether parent and child EMST language overall, across contexts, differed based on dog ownership. A 2 (child age: younger group vs. older group) by 2 (dog ownership: pet dog group vs. no dog group) ANOVA was used to examine differences in both parent and child overall use of EMST language.

Table 2
Prosocial Vignette Task: Number of Children Who Passed the Comprehension Checks

Vignette type	Number of comprehension checks passed, *n* (%)		
	Neither	One	Both
Helping-1	3 (5)	5 (8)	51 (86)
Helping-2	2 (3)	8 (14)	49 (83)
Sharing-1	3 (5)	8 (13)	49 (82)
Sharing-2	6 (10)	7 (12)	46 (78)

It is important to note that in our preregistration and study protocol, we aimed to compare children before (18- to 35-month-old children) and during the preschool years (36- to 66-month-old children) where significant changes typically occur in the development of mental state understanding. However, we acknowledge the vast individual variability that exists in the timing and development of these concepts, as well as research suggesting that children younger than age 3 may have some understanding of mental states when measured using nonverbal or implicit tasks (e.g., see Carlson et al., 2013 for a review). As such, as additional exploratory analyses, we re-ran the 2 (child age: older group vs. younger group) by 2 (play session: dog vs. toy) mixed effects ANOVA (with pet dog owners only) and the 2 (child age: younger group vs. older group) by 2 (dog ownership: pet dog group vs. no dog group) ANOVA on EMST language use by parents and children as analyses of covariance (ANCOVAs) by collapsing across age groups, and instead used age in months as a covariate.

As a secondary aim, we examined whether dog ownership was related to children's empathy and prosocial behaviors using point–biserial correlations. We hypothesized that living with a pet dog would be positively related to children's empathy and prosocial behaviors. We also conducted a series of linear regressions to examine whether parent and child use of EMST language was related to children's empathy and prosocial behaviors, and whether these relations differed based on dog ownership. We hypothesized that EMST language by both parents and children would be positively related to children's empathy and prosocial behaviors. We also explored relations between parent and child EMST language use during each play session (dog, toy) on children's empathy and prosocial behaviors, including children's age in months in the model. Finally, we explored whether *parents*' empathy and prosocial behaviors differed as a function of their own childhood pet ownership.

Results

Descriptive Statistics

Table 3 provides the means and standard deviations for parents' and children's empathy, prosocial behavior, EMST language, and pet attachment across the entire sample and as a function of current dog ownership (pet dog vs. no dog). Table 4 provides results for independent samples *t*-tests comparing these same variables by dog ownership, and we summarize the results here. Parents in the no dog group used a significantly greater proportion of EMST language than parents in the pet dog group when playing with a lifelike toy, $t(120) = 2.04$, $p = .04$, $d = .37$, 95% CI [.01, .73]. Children's empathy, children's prosocial self- and other scores, parents' empathy, parents' prosocial behavior, and children's EMST language use while playing with a lifelike toy did not significantly differ based on current dog ownership ($ps > .40$).

Table 5 provides correlations between children's age in months, parents' and children's empathy, parents' (self-report) and children's (self- and other-vignette scores) prosocial behaviors, parents' and children's EMST language, and children's pet attachment. Children's age in months was significantly correlated with children's prosocial–self scores, $r(57) = .30$, $p = .02$, children's own production of EMST language when playing with a lifelike toy, $r(121) = .32$, $p < .001$, and when playing with their pet dog if they had one, $r(58) = .32$, $p = .01$. Children's empathy was significantly correlated with children's pet attachment, $r(55) = .33$, $p = .01$. Children's prosocial–other scores were correlated with children's prosocial–self scores, $r(57) = .60$, $p < .001$, and children's pet attachment, $r(25) = .52$, $p = .01$. Children's EMST language while playing with a lifelike toy was correlated with children's EMST language while playing with their pet dog, $r(58) = .39$, $p = .002$, and parents' EMST language while playing with a lifelike toy, $r(120) = .34$, $p < .001$. Parents' EMST language while playing with a lifelike toy was correlated with parents' EMST language while playing with their pet dog, $r(58) = .47$, $p < .001$. All other relations were not significant ($p > .05$).

Table 6 provides information about the kinds of lifelike toys (animal or human) that parents and children played with during the free-play session with the lifelike toy. The percentage of participants that played with an animal-like and human-like toy did not differ based on dog ownership and age group, $\chi^2(3) = 7.01$, $p = .07$, $V = 0.24$. We also examined whether EMST language provided by parents or children differed based on whether they played with an animal-like or human-like toy, and there were no differences based on the type of toy for both parents' use of EMST language, $t(120) = .16$, $p = .88$, $d = .03$, 95% CI [−.33, .39], or children's use of EMST language, $t(121) = .36$, $p = .72$, $d = .07$, 95% CI [−.30, .43].

Dog Owners' Use of EMST Language

To examine differences in parents' use of EMST language for families living with a pet dog, we conducted a mixed effects ANOVA with play session (dog vs. toy) as a within-subject factor and child age group (younger group vs. older group) as a between-subjects factor (see Table 7 for results and Figure 1 for visualization). We found a significant main effect of play session, $F(1,58) = 11.67$, $p = .001$, $\eta^2 = .17$, 95% CI [.03, .33]. Overall, parents provided a greater proportion of EMST language when playing with their child and pet dog ($M = .27$, $SD = .13$), than playing with a lifelike toy ($M = .21$, $SD = .10$). There was no significant effect of child age group and no age group by play session interaction ($ps > .62$). We then examined differences in parents' use of EMST language for families living with a pet dog across play sessions (dog vs. toy), controlling for age in months, instead of comparing our preregistered age groups as a between-subjects factor. To do so, we ran an ANCOVA examining differences in parents' EMST language with play session (dog vs. toy) as a within-subject factor and age in months as a covariate (see Table S1 in the online supplemental materials for results). Age in months was mean centered prior to being entered into the repeated measures ANCOVA (Schneider et al., 2015). The main effect of play session remained significant after controlling for the effect of age, $F(1, 58) = 11.99$, $p = .001$, $\eta^2 = .17$, 95% CI [.03, .34]. The covariate of age was not significantly related to the proportion of EMST language used by parents in the pet dog group, $F(1, 58) = .40$, $p = .53$, $\eta^2 = .01$, 95% CI [.00, .01]. Thus, the main effect of play session remained significant above and beyond any potential effects of age.

We then examined children's production of EMST language using a mixed effects ANOVA with play session (dog vs. toy) as a within-subject factor and child age group (younger group vs. older group) as a between-subjects factor (see Table 8 for results and Figure 2 for visualization). We found a significant main effect of age group, $F(1, 58) = 10.02$, $p = .002$, $\eta^2 = .15$, 95% CI [.02, .31]. Unsurprisingly, children in the older age group provided a greater proportion of EMST language overall ($M = .10$, $SD = .01$) compared to

Table 3
Sample Descriptives

Measure	Overall sample		Pet dog group		No dog group	
	M	*SD*	*M*	*SD*	*M*	*SD*
Child empathy (GEM)	4.92	0.62	4.88	0.55	4.97	0.68
Child prosocial–self (vignettes)	.61	.38	.61	.39	.61	.39
Child prosocial–other (vignettes)	.63	.36	.63	.36	.62	.37
Child pet attachment			15.14	2.52		
Child EMST (toy)	.07	.08	.07	.08	.06	.07
Child EMST (dog)			.07	.08		
Parent empathy (TEQ)	47.82	2.87	47.80	2.69	47.83	3.08
Parent prosocial (PSA)	63.94	7.57	63.63	6.61	64.24	8.46
Parent pet bonding			31.51	4.61		
Parent EMST (toy)	.23	.11	.21	.10	.25	.11
Parent EMST (dog)			.27	.15		

Note. GEM = Griffith Empathy Measure; EMST = emotion and mental state; TEQ = Toronto Empathy Questionnaire; PSA = Prosocialness Scale for Adults.

the younger age group ($M = .05$, $SD = .01$). There was no effect of play session and no age group by play session interaction ($ps > .27$). We then ran a repeated measures ANCOVA examining differences in children's EMST language with play session (dog vs. toy) as a within-subject factor and age in months (mean centered) as a covariate (see Table S2 in the online supplemental materials for results). The covariate of age was significantly related to the proportion of EMST language used by children in the pet dog group, $F(1, 58) = 10.58$, $p = .002$ $\eta^2 = .15$, 95% CI [.02, .32]. There were no other significant effects ($ps > .72$). Thus, the main effect of age remained significant above and beyond any potential effects of play session.

Relation Between Dog Ownership and Overall EMST Language

Next, we compared the use of EMST language during play with a lifelike toy in families with and without a pet dog. We ran a 2 (child age: younger group vs. older group) by 2 (dog ownership: pet dog group vs. no dog group) ANOVA on both parent and child use of EMST language (see Table 9 and Figure 3 for parent results, and Table 10 and Figure 4 for child results). For parents, we found a non-significant effect of dog ownership that was approaching statistical significance, $F(1, 118) = 4.10$, $p = .05$, $\eta^2 = .03$, 95% CI [.00, .11]. Parents in the no dog group provided a higher proportion of EMST language ($M = .25$, $SD = .11$) when compared to parents in the pet dog group ($M = .21$, $SD = .10$) when playing with a lifelike toy. There were no significant effects of age group or a significant age group by dog ownership interaction ($ps > .55$). This result was unexpected, so as a follow-up, we explored whether the proportion of EMST language used by parents overall, in any play session, differed by child age group and dog ownership. To do this, we first calculated the proportion of EMST language used by dog owning parents across both play sessions (dog + toy), as well as the proportion of EMST language used by families with no dog during the toy play session. Next, we ran a 2 (child age: younger group vs. older group) by 2 (dog ownership: pet dog group vs. no dog group) ANOVA on parent's proportional use of EMST language during the toy (no dog group) or toy and dog (pet dog group) play sessions (see Table S3 in the online supplemental materials for results). We found no main effect of child age group ($p = .77$), dog ownership ($p = .85$), or age by dog ownership interaction ($p = .43$), suggesting that overall, parents living with a pet dog used similar amounts of EMST language during play interactions with their children ($M = .25$, $SD = .12$) when compared to parents without a dog ($M = .25$, $SD = .11$). We then ran an ANCOVA examining differences in parents' use of EMST language based on current dog ownership (pet dog group vs. no dog group) while controlling for age in months (mean centered; see Table S4 in the online supplemental materials for results). We found a main effect of dog ownership, $F(1, 119) = 4.20$, $p = .04$, $\eta^2 = .03$, 95% CI [.00, .12]. Parents in the no dog group used a greater proportion of EMST language while playing with a lifelike toy ($M = .25$, $SD = .11$) when compared to parents in the pet dog group ($M = .21$, $SD = .10$). The covariate of age was not significantly related to the proportion of EMST language used by parents, $F(1, 119) = .08$, $p = .78$, $\eta^2 = .001$, 95% CI [.00, .04]. Thus, the main effect of dog ownership remained significant above and beyond any potential effects of children's age.

Finally, we examined differences in children's EMST language as a function of dog ownership and found a main effect of age group, $F(1, 119) = 21.93$, $p < .001$, $\eta^2 = .16$, 95% CI [.05, .27]. Children in the older age group provided more EMST language ($M = .10$, $SD = .08$) overall than the younger age group ($M = .04$, $SD = .05$) when playing with a lifelike toy. There were no significant effects of dog ownership or a significant age group by dog ownership interaction ($ps > .57$). Although this was expected, we also explored

Table 4
Differences Between Pet Dog and No Dog Participants on Key Measures of Interest

Measure	*df*	*t*	*p*	*d*	95% CI
Child empathy (GEM)	120	0.82	.41	.62	[−.21, .50]
Child prosocial–self (vignettes)	57	0.04	.97	.01	[−.50, .52]
Child prosocial–other (vignettes)	57	−0.10	.92	−.03	[−.54, .48]
Child EMST (toy)	121	−0.56	.58	−.10	[−.45, .25]
Parent EMST (toy)	120	2.04	.04	.37	[.01, .73]
Parent empathy (TEQ)	117	0.05	.96	.01	[−.35, .37]
Parent prosocial (PSA)	120	0.44	.66	.08	[−.28, .44]

Note. CI = confidence interval; GEM = Griffith Empathy Measure; EMST = emotion and mental state; TEQ = Toronto Empathy Questionnaire; PSA = Prosocialness Scale for Adults.

Table 5
Correlations Between Key Measures of Interest

Measure	1	2	3	4	5	6	7	8	9
1. Age (in months)	—								
2. Child empathy (GEM)	.16	—							
3. Child prosocial–self (vignettes)	.30*	.25	—						
4. Child prosocial–other (vignettes)	.23	.16	.60**	—					
5. Child EMST (toy)	.32**	.12	−.03	.05	—				
6. Child EMST (dog)	.32*	.17	.21	.20	.39**	—			
7. Parent EMST (toy)	−.01	−.07	−.21	−.15	.34**	.09	—		
8. Parent EMST (dog)	−.11	−.01	−.08	−.22	.04	.04	.47**	—	
9. Child pet attachment	.02	.33*	.14	.52**	.25	.04	.09	−.05	—

Note. GEM = Griffith Empathy Measure; EMST = emotion and mental state.
* $p < .05$. ** $p < .001$.

whether the proportion of EMST language used by children overall, in any play session, differed by child age group and dog ownership. To do this, we first calculated the proportion of EMST language used by dog owning children across both play sessions (dog + toy), as well as the proportion of EMST language used by families without a pet dog during the toy play session. Next, we ran a 2 (child age: younger group vs. older group) by 2 (dog ownership: pet dog group vs. no dog group) ANOVA on children's proportional use of EMST language during the toy (no dog group) or toy and dog (pet dog group) play sessions (see Table S5 in the online supplemental materials for results). We found a main effect of age group, with children in the older age group providing a greater proportion of EMST language overall ($M = .10$, $SD = .08$) than children in the younger age group ($M = .04$, $SD = .05$), $F(1, 118) = 24.03$, $p < .001$, $\eta^2 = .17$, 95% CI [.06, .29]. We found no main effect of dog ownership ($p = .38$), or age group by dog ownership interaction ($p = .94$), suggesting that overall, children in the older age group use more EMST language when compared to children in the younger age group. We also ran an ANCOVA examining differences in children's use of EMST language based on current dog ownership (pet dog group vs. no dog group) while controlling for age in months (mean centered; see Table S6 in the online supplemental materials for results). The covariate of age was significantly related to the proportion of EMST language used by children, $F(1, 119) = 14.45$, $p < .001$, $\eta^2 = .11$, 95% CI [.03, .22]. Thus, the main effect of children's age remained significant above and beyond any potential effects of dog ownership.

Relations Between Dog Ownership, EMST, and Children's Empathy and Prosocial Behavior

Next, we examined whether dog ownership was related to children's empathy (parent report) and prosocial behaviors (prosocial–self and prosocial–other scores) using point–biserial correlations. Dog ownership was not related to children's empathy or prosocial behaviors ($ps > .40$; see Table S7 in the online supplemental materials). We also used a series of linear regressions to examine whether parent and child EMST language during each play session predicted children's empathy and prosocial behaviors. None of these relations were significant ($ps > .10$). One potential reason we found no significant relations between children's production or exposure to EMST language and children's empathy or prosocial behaviors is that we tested a large age range, including younger children who may not yet engage in many empathic or prosocial behaviors assessed in the current study. Thus, we ran additional exploratory analyses on the relations between parents' production of EMST language and children's production of EMST language during each play session (dog, toy) on children's empathy and prosocial behaviors (prosocial–self and prosocial–other scores), including children's age in months. Tables S8 and S19 in the online supplemental materials show all results, and we summarize the results here.

The overall models of parent EMST language or child EMST language and child age in months predicting children's empathy were not statistically significant when playing with the lifelike toy ($ps > .14$; see Tables S8 and S9 in the online supplemental materials). For the models examining parent and child EMST language use while playing with the pet dog, though the overall models were not significant ($ps = .07$ for each overall model), we found that age in months was a significant predictor of children's empathy ($p = .02$ for parent EMST language and $p = .05$ for child EMST language) in both models (see Tables S10–S11 in the online supplemental materials).

Next, we examined the impact of parent and child EMST language in each play session on children's prosocial–self scores (see

Table 6
Type of Toy Used During Play Session (Animal vs. Human Lifelike)

	Younger (18- to 35-month-old)		Older (36- to 66-month-old)		Overall sample	
Toy type	Pet dog	No dog	Pet dog	No dog	Pet dog	No dog
Animal	14	16	24	19	38	35
Human	16	15	7	12	23	27

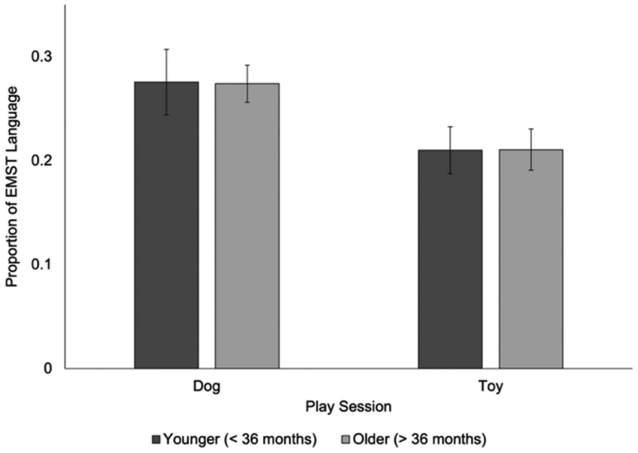
Table 7
Results for Play Session (Dog vs. Toy) by Age Group (Younger vs. Older) Mixed Effects ANOVA on Parent's Use of EMST Language (Pet Dog Group Only)

Predictor	*df*	*F*	*p*	η^2	95% CI
Between-subjects					
Age group	1	0.10	.76	.002	[.00, .07]
Error	58				
Within-subject					
Play session	1	11.67	.001**	.17	[.03, .33]
Play by age group	1	0.24	.63	.004	[.00, .09]
Error (play session)	58				

Note. ANOVA = analysis of variance; EMST = emotion and mental state; CI = confidence interval.
* $p < .05$. ** $p < .01$.

Figure 1

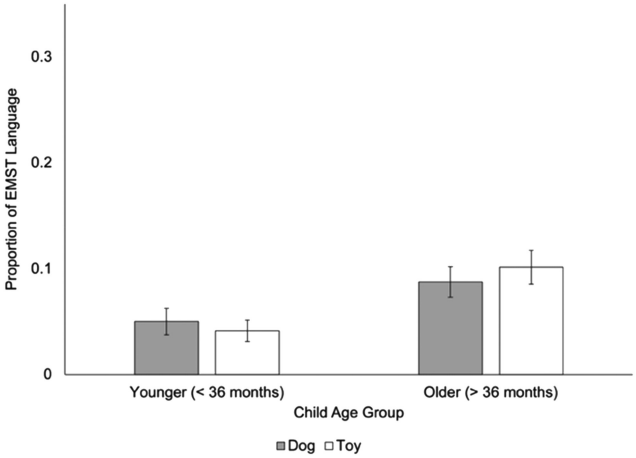
Parent Use of EMST Language by Play Session and Child Age Group (Pet Dog Group Only)



Note. Error bars represent standard errors. EMST = emotion and mental state.

Figure 2

Child Use of EMST Language by Play Session and Child Age Group (Pet Dog Group Only)



Note. Error bars represent standard errors. EMST = emotion and mental state.

Tables S12–S15 in the online supplemental materials). For all models, child age was a significant factor in children's prosocial–self scores, above and beyond EMST language (by parents or children) from each context (dog vs. toy). The overall model examining the impact of parent EMST language while playing with a lifelike toy and child age in months on children's prosocial–self scores was significant, $F(2, 56) = 3.61$, $p = .03$ (Table S12 in the online supplemental materials). Similar trends were found when looking at parent's EMST language and child age in months during the dog play session ($p = .09$), children's EMST language during the toy play session and age in months ($p = .07$), and children's EMST language during the dog play session and age in months ($p = .05$). When we examined the effect of parent and child EMST language and child age in months on children's prosocial–other scores, none of the models reached statistical significance ($ps > .14$), though we saw similar nonsignificant effects of age on children's prosocial–other scores (see Tables S16–S19 in the online supplemental materials).

Another possible reason we did not find significant relations between pet dog ownership and children's empathy or prosocial behaviors is that these behaviors, along with theory of mind abilities, undergo significant developmental change within our target age range. As a result, relations between dog ownership and children's empathy and prosocial behaviors might also undergo significant developmental change during this time, and thus may not fully emerge statistically until later in development. We did however collect data on parents' own pet ownership as children; of the 123 parents in the study, 95 parents reported having a childhood pet that was important to them, and 28 parents did not report having a childhood pet that was important to them. Of the 123 parents in the study, 78 reported having a pet dog that was important to them during childhood. Accordingly, we ran additional exploratory *t*-tests examining whether *parents*' empathy and prosocial behavior differed as a function of their own childhood pet ownership, as well as childhood dog ownership specifically. Analyses examining any pet ownership yielded nonsignificant differences in the expected direction, such that parents who had an important childhood pet reported slightly higher empathy (childhood pets: $M = 48.08$, $SD = 2.72$; no childhood pets: $M = 46.88$, $SD = 3.24$), $t(117) = -1.89$, $p = .06$, $d = 2.84$, 95% CI [−2.44, .06], and prosocial behavior (childhood pet: $M = 64.44$, $SD = 8.10$; no childhood pets: $M = 62.19$, $SD = 8.10$),

Table 8

Results for Play Session (Dog vs. Toy) by Age Group (Younger vs. Older) Mixed Effects ANOVA on Children's Use of EMST Language (Pet Dog Group Only)

Predictor	*df*	*F*	*p*	η^2	95% CI
Between-subjects					
Age group	1	10.02	.002**	.15	[.02, .31]
Error	58				
Within-subject					
Play session	1	0.11	.75	.002	[.00, .07]
Play by age group	1	1.22	.28	.02	[.00, .14]
Error (play session)	58				

Note. ANOVA = analysis of variance; EMST = emotion and mental state; CI = confidence interval.
* $p < .05$. ** $p < .01$.

Table 9

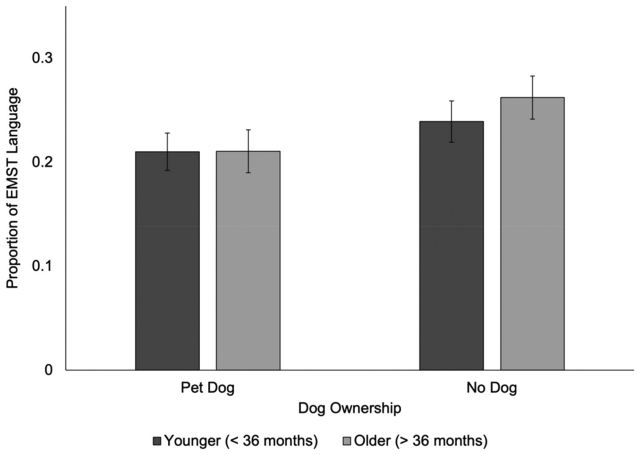
Results for Dog Ownership (Pet Dog Group vs. No Dog Group) by Age Group (Younger vs. Older) ANOVA on Parents' Use of EMST Language During the Lifelike Toy Play Session

Predictor	*df*	*F*	*p*	η^2	95% CI
Between-subjects					
Age group	1	0.35	.56	.003	[.00, .05]
Dog ownership	1	4.10	.05	.03	[.00, .12]
Age group by dog ownership	1	0.32	.57	.003	[.00, .05]
Error	118				

Note. ANOVA = analysis of variance; EMST = emotion and mental state; CI = confidence interval.
* $p < .05$. ** $p < .01$.

Figure 3

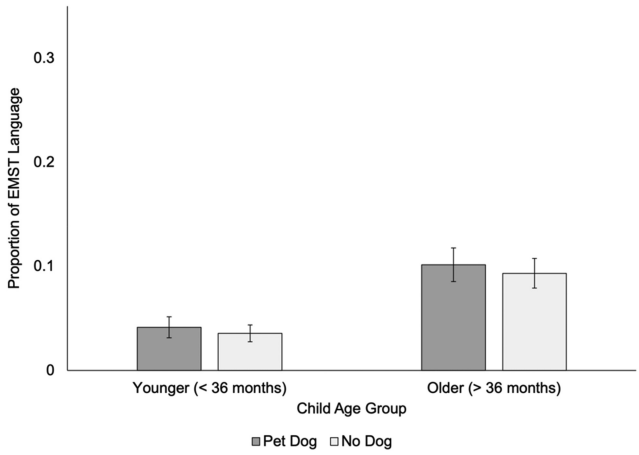
Parent Use of EMST Language During Play With the Lifelike Toy by Dog Ownership and Child Age Group



Note. Error bars represent standard errors. EMST = emotion and mental state.

Figure 4

Child Use of EMST Language During Play With the Lifelike Toy by Dog Ownership and Child Age Group



Note. Error bars represent standard errors. EMST = emotion and mental state.

$t(120) = -1.37, p = .17, d = 7.54$, 95% CI [−5.51, 1.01]. When we explored whether parents' empathy and prosocial behavior differed as a function of childhood dog ownership, parents who grew up with a pet dog reported significantly higher empathy ($M = 48.23$, $SD = 2.84$) than parents who did not grow up with a pet dog ($M = 47.05$, $SD = 2.80$), $t(117) = -2.19$, $p = .03$, $d = -.42$, 95% CI [−.80, −.04]. We found no significant differences in prosocial behavior (childhood pet dog: $M = 64.49$, $SD = 7.43$; no childhood pet dog: $M = 62.95$, $SD = 7.78$), $t(120) = -1.08$, $p = .28$, $d = -.20$, 95% CI [−.57, .17].

General Discussion

Living with a pet is common among homes with young children in the United States (Applebaum et al., 2023; Hurley & Oakes, 2018). Despite the prevalence of pet ownership in children's daily lives, we still know very little about the ways in which a household pet changes the environment children grow up in, and how living with a pet may influence socioemotional development. The present study examined whether living with a pet dog promotes empathy and prosocial behaviors through parent–child conversations about emotions and mental states. Our main research question was whether parents and children use more EMST language while playing with their pet dog compared to a lifelike toy. We hypothesized that parents and children who live with a pet dog would use more EMST language during interactions with their pet versus a lifelike toy. Consistent with this prediction, parents of children living with a pet dog used a greater proportion of EMST language when playing with their child in the presence of their dog compared to a lifelike toy. For children living with a pet dog, older children used a greater proportion of EMST language regardless of whether they were playing with their dog or a lifelike toy. This suggests that the context through which parent–child conversations take place may influence *parents*' use of EMST language with their children. Specifically, parents may incorporate more EMST language when playing with their child and pet dog than when playing with their child and a lifelike toy.

We also examined whether there were differences in parents' and children's EMST language use while playing with a lifelike toy based on whether families currently lived with a pet dog or did not live with a pet dog. We anticipated no differences in parents' and children's EMST language use while playing with a lifelike toy based on dog ownership. In the presence of a lifelike toy, we found marginal differences in parents' use of EMST language, with parents who *did not own a pet dog* using slightly more EMST language than parents living with a pet dog. For children, we found that EMST language use while playing with a lifelike toy was greater among older children regardless of dog ownership. These findings suggest that parents in the pet dog group were not more likely to use more EMST language overall, but rather used more of this language in the *context* of interactions with their child and pet dog. Taken together, these results provide some initial evidence that the presence of a pet dog provides an everyday context where conversations with greater EMST language among parents and children are possible.

Interestingly, we found no significant relations between dog ownership and children's empathy and prosocial behaviors. Furthermore, we did not find a link between EMST language, dog ownership, empathy, and prosocial behaviors. This was surprising, as several studies in the

Table 10

Results for Dog Ownership (Pet Dog Group vs. No Dog Group) by Age Group (Younger vs. Older) ANOVA on Children's Use of EMST Language During the Lifelike Toy Play Session

Predictor	*df*	*F*	*p*	η^2	95% CI
Between-subjects					
Age group	1	21.93	<.001**	.16	[.05, .27]
Dog ownership	1	0.31	.58	.003	[.00, .04]
Age group by dog ownership	1	0.01	.93	<.001	[.00, .01]
Error	119				

Note. ANOVA = analysis of variance; EMST = emotion and mental state; CI = confidence interval.
* $p < .05$. ** $p < .01$.

literature have demonstrated associations between both childhood pet ownership (e.g., Daly & Morton, 2006) and EMST language (e.g., Brownell et al., 2013) with children's empathy and prosocial behaviors. However, there are several possible explanations for why we did not see these relations in the current sample.

First, given that our goal was to examine the impact of pet ownership on parent–child conversations, our sample size was much smaller than previous studies examining relations between pet ownership and socioemotional outcomes, which commonly rely on large, questionnaire-based data sets (e.g., Christian et al., 2020; Wenden et al., 2021). It is possible that the link between pet ownership, empathy, and prosocial behaviors is small or fragile and the present study was only sufficiently powered to address our primary question about EMST language in the presence versus absence of a pet dog. In a recent review, Purewal et al. (2017) reported that while most studies have linked childhood pet ownership to several positive outcomes, about one-third of the reviewed studies failed to find such effects. Inconsistencies in both methodological designs and empirical rigor vary considerably in this research area, as do the pets that participants report owning (e.g., cat, dog, etc.). Future studies examining the relation between pet ownership and children's socioemotional outcomes are important to further clarify the nature of these relations in early childhood.

An alternative possibility is that we targeted a much younger age group when compared to previous studies examining the relation between pet ownership and empathy or prosocial behavior, which have most commonly reported relations with older children or have relied on adult report of childhood pet ownership experiences (e.g., Daly & Morton, 2006, 2009; Jacobson & Chang, 2018; Vidović et al., 1999). Indeed, theory of mind—which is important for both the development of empathy and prosocial behavior—is undergoing rapid developmental change between the ages of 3 and 5 (Wellman et al., 2001). Likewise, it is possible that pet ownership and child EMST language could both be related to other factors (e.g., empathy, prosocial behavior) at older ages. Here, we found trending relations between EMST language and children's prosocial behavior when controlling for age. For parents, when we looked at childhood pet dog ownership specifically, we found that parents who owned a pet dog during their childhood reported more empathy as adults compared to parents without a childhood pet dog. Thus, despite the lack of significant relations between pet ownership, EMST language, and prosocial behavior in the early childhood sample, the current study opens the door for future longitudinal investigations that can determine how both EMST language as well as pet ownership in the preschool years interact and shape the development of empathy and prosocial behavior in later childhood.

It could also be the case that the link between pet ownership and empathy or prosocial behavior only holds for some pets and not for others, or that this relation depends on other characteristics of both the individual and the pet, such as the strength of the bond between children and their pet. The current study compared children who currently live with a pet dog or have never lived with a dog or cat, not accounting for the presence of other pets (e.g., birds, hamsters, fish, etc.) in the home. It is possible that owning other kinds of pets, owning more than one pet, or simply the bond between children and any pet in the home may also influence children's socioemotional development. Previous research has already documented relations between pet owners' attachment to their pets and empathy, including dogs, cats, and even other animals in adults and children (e.g., Daly & Morton, 2006; Khalid & Naqvi, 2016). Studies have also shown that children who live with both a cat and a dog show more empathy than children with only a cat or only a dog (e.g., Daly & Morton, 2006), suggesting that the presence of more than one pet may also impact these relations, potentially through more frequent interactions with pets and opportunities for socioemotional learning. Interestingly, while children's attachment to their pet dog was not related to children's or parents' production of EMST language in the current study, children's pet attachment was related to empathy and prosocial–other behaviors, suggesting the potential role of the socioemotional bond between children and pets on children's developing empathy and prosocial skills. Future studies are needed to address the role of the number and type of pets on parent–child conversations and socioemotional outcomes in early childhood.

Although the current study provides an important insight into the role of living with a pet dog on parent–child conversations and children's socioemotional development, there are several limitations and areas of future directions. First, while we attempted to provide a comparison group of both families who have never lived with a pet dog as well as conversations surrounding play with a lifelike toy, we did not control for the type of lifelike toy that families chose to interact with. It is possible that certain kinds of lifelike toys (e.g., a stuffed animal dog) elicit similar kinds of conversations as those surrounding play with real life dogs. While we did not find any differences in EMST language based on whether the toy was human-like or animal-like, future studies may benefit from a more systematic selection of the toy to better address this question.

Another limitation is that we did not assess characteristics of the pet itself, such as the temperament of the pet, the age of the pet, when the pet was acquired, the amount of time spent living with and caring for the pet, and we did not vary the kinds of pets with which parents and children interacted. We also did not measure some characteristics of the parent or child, such as temperament, which may play a considerable role in the benefits of owning pets. Future studies examining how different characteristics between pets and their owners (parents and children) relate to their interactions and children's emotional outcomes are needed. Furthermore, we only examined parent–child interactions with their pet in the context of a brief play session; such an experience may not represent a typical interaction between parents, children, and their pets. Rather, children might experience conversations around their pets in all sorts of contexts—from daily feeding, walks, and other brief interactions with their pets where use of EMST language may be more likely to occur in children's daily lives. All of these factors may contribute to how children interact with their pets and how their relationship with pets unfolds and impacts their development over time.

Future work should also examine how learning from EMST language is impacted by the context of a pet. Here, we found that dog owners and non-dog owners did not differ in the *total* proportion of EMST language they used overall. Instead, parents who own a pet dog differed in the *context* with which they used more EMST language, with parents using more of this language during interactions with their child in the presence of their pet dog than a lifelike toy. This opens up the possibility that learning from EMST language might differ when used in the context of a pet versus in the context of a lifelike (though not actually living) object. Indeed, preschool-aged children likely already know that inanimate objects do not have thoughts and feelings, and as a result, they might apply and learn from EMST language differently when used in the context

of a live pet versus a lifelike toy. Future research examining this possibility is an important next step to uncovering the mechanisms that shape the relation between childhood pet ownership and empathy or prosocial behavior over time.

Taken together, the current study provides evidence that the presence of a household pet may impact the child's environment by providing an additional context where parental use of EMST language can be heard by children in their home. Specifically, we found that children with a pet dog heard more EMST language from their parents during interactions with their pet dog than in interactions with lifelike toys. While we did not find that hearing or producing EMST language or dog ownership was related to children's empathy or prosocial behaviors, other studies have provided evidence that greater use of EMST language is linked to greater empathy and prosocial behaviors (e.g., Ruffman et al., 2002). It is thus possible that these relationships may be better captured later in development, after children have undergone substantial changes in theory of mind. Collectively, this work opens the door for future programs of research that examine how interactions with pets in the preschool years and beyond may provide a unique context for socioemotional learning.

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