Exploring the impact of parental education, ethnicity and context on parent and child mental-state language

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A B S T R A C T

The mental-state language used in parent-child interactions relates to many aspects of early socio-cognitive development and thus it is important to understand the factors that influence this talk. This study investigated three such factors: socioeconomic status (measured via parental education), ethnicity (Hispanic, non-Hispanic), and interaction context. 55 parents and their 3-year-olds (29 female) participated in two semi-structured interactions (picture-book sharing, free play), and their mental-state language (cognition, emotion, and desire terms) was coded. Context impacted both parent and child mental-state language, though the nature of this effect varied across type of mental-state term, parental education, and ethnicity. We also found that higher-educated parents produced more cognition talk than lower-educated parents and this difference was larger for non-Hispanic dyads. These results suggest multiple factors interact to impact parent and child mental-state language and underscore the importance of examining this language in diverse samples and interactive contexts.

1. Introduction

The language used during parent-child interactions is related to many aspects of child development (Drummond, Paul, Waugh, Hammond, & Brownell, 2014; Fivush, Haden, & Reese, 2006; Rowe, 2012; Ruffman, Slade, & Crowe, 2002). One important category of talk is mental-state language: talk that refers to the psychological states of thoughts (*think*; cognition terms), feelings (*happy*; emotion terms), and desires (*want*; desire terms). Mental-state language is associated with the development of several social cognition abilities during the toddler (Drummond et al., 2014; Newton, Goodman, & Thompson, 2014; Roby & Scott, 2018; Taumoepeau & Ruffman, 2008), preschool (Adrian, Clemente, Villanueva, & Rieffe, 2005; Adrián, Clemente, & Villanueva, 2007; Brown, Donelan-McCall, & Dunn, 1996; Devine & Hughes, 2018; Ruffman et al., 2002) and elementary-school years (Bianco, Lecce, & Banerjee, 2016; Ornaghi & Grazzani, 2013). For instance, both parent and child use of mental-state language is positively correlated with children's false-belief understanding (Adrian et al., 2005; Adrián et al., 2007; Ensor & Hughes, 2008; Roby & Scott, 2018; Ruffman et al., 2002; Tompkins, Benigno, Kiger Lee, & Wright, 2018) and emotion understanding (Ornaghi & Grazzani, 2013; Taumoepeau & Ruffman, 2008). Parents' use of mental-state language is also associated with more helping and prosocial behavior in toddlers (Drummond et al., 2014; Newton et al., 2014), and preschoolers who use more mental-state language demonstrate more cooperative behaviors with peers (Brown et al., 1996). Associations between mental-state language and social cognition abilities have been demonstrated concurrently (Adrian et al., 2005; Brown et al., 1996) and longitudinally (Symons, Fossum, & Collins, 2006; Taumoepeau & Ruffman, 2008) in both laboratory

(Roby & Scott, 2018; Ruffman et al., 2002) and naturalistic contexts (Brown et al., 1996; Ensor & Hughes, 2008).

Given the abundant evidence for relations between mental-state language and early socio-cognitive development, it is important to understand the sources of variation in this type of talk. In the present study, we focused on three factors that might influence parent and child use of mental-state language: socioeconomic status, ethnicity, and the context in which talk occurs. We examined the influence of these factors on a broad measure of mental-state language that included cognition, emotion, and desire terms, and explored whether the impact of these factors differed across these three sub-types of mental-state talk.

1.1. Socioeconomic status and mental-state language

One potential source of variability in early parent-child talk is socioeconomic status (SES). Socioeconomic status refers to an individual or family's economic access to resources in relation to others. It is commonly measured by examining income, education, occupation, or a combination of these variables. Research suggests that parents in lower-SES homes produce less child-directed speech than higher-SES parents (Hart & Risley, 1995; Hoff, 2003; Pace, Luo, Hirsh-Pasek, & Golinkoff, 2017; Schwab & Lew-Williams, 2016; though see Sperry, Sperry, & Miller, 2019). Studies have also reported SES differences in the nature of parents' child-directed speech: higher-SES parents use more complex sentences and a greater diversity of words and syntactic structures than lower-SES parents (Hoff, 2003; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Rowe, 2012). These socioeconomic differences in the quantity and nature of parent input predict children's language development, with lower-SES children lagging behind in measures of vocabulary knowledge (Hoff, 2003; Rowe, 2012), language processing speed (Fernald, Marchman, & Weisleder, 2013), and the lexical and syntactic diversity of the speech they produce (Huttenlocher et al., 2010).

In light of these findings, one might predict similar effects of SES on mental-state language: if higher-SES children are exposed to a greater amount and diversity of child-directed speech, they might also hear and use more mental-state language. However, some work suggests that mental-state information might be emphasized in parent-child interactions in lower-SES households (Blake, 1993; Burger & Miller, 1999; Miller, Cho, & Bracey, 2005). For instance, research by Miller and colleagues examining narrative practices of parents and their 2- to 3-year-olds in the home has found that relative to middle-class families, working-class families engage in more co-narration about emotional events and hence produce more emotion talk during co-narration (Burger & Miller, 1999; Miller et al., 2005). These findings raise the possibility that even if children from lower-SES homes hear less child-directed speech, the language they are exposed to and produce might be rich with social content, including the discussion of mental states. Alternatively, lower-SES homes might be rich in specific subtypes of mental-state content, such as emotion talk (Burger & Miller, 1999). Thus, prior literature suggests three potential ways that SES might relate to mental-state talk: (1) SES might be positively correlated with the quantity of mental-state talk (cognition, desire, and emotion terms) that parents and children produce, (2) there might be no association between SES and parent or child mental-state talk, and (3) there might be a mixed pattern of associations between SES and different categories of mental-state talk, with higher SES children hearing and using more of some categories but not others.

Evidence regarding these three possibilities is limited and mixed. Relatively few studies have directly investigated the relation between SES and parent mental-state language, and fewer still have examined SES and children's mental-state language. Instead, much of the evidence regarding these relations comes from research on links between mental-state language and child outcomes (e.g., false-belief understanding) in preschool-aged children, where information on family SES is sometimes reported and controlled for. Although these studies vary in their measure of family SES, the majority have focused on parental education. Some of these studies have reported positive associations between measures of SES and mental-state language (e.g., Adrian et al., 2005; Adrián et al., 2007; Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003; Ruffman, Slade, Devitt, & Crowe, 2006), while others find no such relation (e.g., Meins et al., 2003; Symons et al., 2006; Tompkins, 2015). However, because SES was not the focus of these studies, these relations were not examined in detail. In particular, in most cases, only correlations between SES and summary measures of mental-state talk were reported, making it difficult to determine whether SES is differentially associated with different categories of mental-state talk.

Of the studies that have directly investigated relations between SES and mental-state talk, most have examined only one category of mental-state talk, such as just emotion talk (Eisenberg, 1999; Flannagan & Perese, 1998; Garner, Jones, Gaddy, & Rennie, 1997; Garrett-Peters et al., 2011) or just cognition talk (Brown et al., 1996). To our knowledge, only three studies have directly investigated the relation between SES and broad measures of parent mental-state language that include cognition, emotion, and desire terms, and these studies produced conflicting results (Álvarez, Cristi, Del Real, & Farkas, 2019; Degotardi & Torr, 2007; Ebert, Peterson, Slaughter, & Weinert, 2017). Two of these studies found positive correlations between SES and mothers' use of mental-state language during semi-structured interactions with their child (Álvarez et al., 2019; Degotardi & Torr, 2007). For instance, Degotardi and Torr (2007) examined mother-infant dyads during a semi-structured free-play session when infants were 12, 18, and 24 months old. Several dimensions of mothers' language use were coded, including non-belief mental-state talk (e.g., references to emotions, desires, etc.) and belief mental-state talk (e.g., references to thinking, knowing, pretending, etc.). Results showed that mothers with higher levels of education used significantly more of both types of mental-state talk than mothers with lower levels of education did, though this effect was larger for belief than non-belief mental-state talk. These findings suggest a positive association between SES and parent mental-state talk, but the strength of this association might differ across categories of mental-state talk.

In contrast, Ebert et al. (2017) found no relation between SES (measured via parent occupation) and parent mental-state talk. In this study, mothers' mental-state language was measured using a shortened version of the Maternal Mental State Input Inventory (MMSII; Peterson & Slaughter, 2003), a self-report questionnaire that consisted of short vignettes depicting everyday interactions between a mother and a four-year-old child. For each situation, parents were asked to rank a set of response options from the response they would be most to least likely to produce. The options included an elaborated mental-state response (i.e. reference to a mental state elaborating on its cause or nature), a non-elaborated mental-state response (mental-state reference without further information), and two

non-mental state responses (elaborated and non-elaborated). Higher- and lower-SES mothers did not differ in their preferences for the elaborated or the non-elaborated mental-state responses, suggesting that perhaps there is no association between SES and parent mental-state talk. However, the MMSII was specifically designed to assess parents' tendency to *elaborate* on mental-state references (Peterson & Slaughter, 2003; Slaughter & Peterson, 2012), rather than the frequency of their mental-state talk. It is thus unclear whether these findings are directly comparable to studies that have examined the relationship between SES and the frequency of parent mental-state language in the context of parent-child interactions (e.g., Álvarez et al., 2019; Degotardi & Torr, 2007).

Given these mixed findings, it remains unclear whether, and to what extent, SES is associated with parent use of mental-state language. Moreover, no study has directly examined the relation between SES and a broad measure of child mental-state language that includes cognition, emotion, and desire terms. The present study sought to address these gaps in the literature by examining the relation between SES and both parent and child language using a broad measure of mental-state language obtained in live parent-child interactions.

1.2. Ethnicity and mental-state language

Much of the work on mental-state talk has focused on White families (e.g., Brown et al., 1996; Ensor & Hughes, 2008; Meins et al., 2003; Ruffman et al., 2002; Taumoepeau & Ruffman, 2008). However, a growing body of research suggests that the quantity and nature of mental-state language used in parent-child interactions varies across cultural and ethnic backgrounds (Blake, 1993; Carmiol & Schröder, 2019; Chang, Farkas, Vilca, & Vallotton, 2017; Doan & Wang, 2010; Doan, Lee, & Wang, 2019; Reynolds, Garrett-Peters, Bratsch-Hines, Vernon-Feagans, & Family Life Project Key Investigators, 2020; Taumoepeau, 2015; Taumoepeau, Sadeghi, & Nobilo, 2019). For instance, when describing a wordless picture book to their 3-year-old children, European American mothers used more mental-state terms than Chinese American mothers did, whereas Chinese American mothers were more likely to describe behaviors (Doan & Wang, 2010). Examination of specific categories of mental-state terms showed that European American mothers used more cognition and emotion terms than Chinese American mothers did, but the two groups did not differ in their use of desire terms. Other studies have also revealed cultural differences in the frequency with which parents refer to specific categories of mental states. For example, Taumoepeau et al. (2019) found that parents in Iran and New Zealand used similar amounts of mental-state language with their 4.5-year-olds, but New Zealand parents referred to cognitive states more often than Iranian parents did, while Iranian parents referred to desires more than New Zealand parents did. These patterns in mental-state language use likely reflect differences in cultural norms and parent socialization goals. For instance, the patterns of mental-state language used by Chinese American mothers – de-emphasizing individual thoughts and feelings while focusing on behavioral norms and the wants and needs of others – might reflect a cultural emphasis on group harmony and cohesion (Chan, Wang, Devine, & Hughes, 2020; Doan & Wang, 2010; Tao, Zhou, Lau, & Liu, 2013).

These findings underscore the need for additional research that examines mental-state language use in parents and children from a variety of cultural and ethnic backgrounds. In particular, little research has examined mental-state language use in Hispanic American families. Additional research in this area is important because Hispanic Americans are the largest and fastest growing minority population in the United States. Although Hispanic Americans are a diverse group of individuals, many ascribe to a set of cultural values that emphasize interpersonal relationships and connections with others, especially family members (e.g., *respeto, familismo*; Cauce & Domenech-Rodriguez, 2002; Cervantes, 2002; Grau, Azmitia, & Quattlebaum, 2009; Rivera & Dunsmore, 2011). These cultural values could result in an emphasis on social language, including mental-state language, in parent-child interactions in Hispanic American families.

The few studies on mental-state language that have been conducted with Hispanic American families have focused exclusively on emotion talk (Cervantes; 2002; Eisenberg, 1999; Flannagan & Perese, 1998; Luo, Tamis-LeMonda, Kuchirko, Ng, & Liang, 2014; Rivera & Dunsmore, 2011). For instance, Luo et al. (2014) found that when describing a wordless picture book to their 4-year-olds, Dominican American and Mexican American mothers discussed emotions more than Chinese American mothers did. Similarly, Flannagan and Perese (1998) found that when discussing interpersonal relationships with 4.5-year-old children, Mexican American mothers referenced emotions more than African American and European American mothers did. These studies suggest that Hispanic mothers may emphasize emotions in parent-child interactions. However, to our knowledge, no study has examined other categories of mental-state talk in Hispanic American families. One study contrasting European American mothers in the United States and mothers in Chile found that the two groups used similar amounts of emotion and desire talk with their infants, but European American mothers used more cognition language than Chilean mothers (Chang et al., 2017). These findings raise the possibility that Hispanic American parents and children in the United States might also emphasize some categories of mental-state language but not others. Thus, research that examine a broader range of mental-state language, including cognition, emotion, and desire talk, among Hispanic American families is needed.

Moreover, there is some evidence to suggest that ethnicity and SES interact to influence mental-state language. For example, Eisenberg (1999) examined emotion talk in a sample of Mexican American and European American families from working-class and middle-class backgrounds. Mothers' conversations with their 4-year-old children were audio recorded during a variety of everyday activities. Findings showed that middle-class Mexican American mothers used more emotion talk than middle-class European American mothers, but working-class Mexican American mothers used less emotion talk than either group. This suggests that the tendency for Hispanic American parents to emphasize mental-state language might interact with their SES and hence it is critical to consider both ethnicity and SES when examining their mental-state language use. Similarly, these results raise the possibility that the mixed findings on the relationship between SES and parent and child mental-state talk could stem in part from a failure to consider ethnicity in prior studies. If so, then examining these factors together, rather than in isolation, could help to clarify those mixed

findings.

1.3. Context and mental-state language

A third potential source of variability in parent and child mental-state language is the context in which their interaction takes place. Research suggests that context can influence both the quantity and nature of language used in parent-child interactions (Drummond et al., 2014; Farkas et al., 2018; Frausel, Richland, Levine, & Goldin-Meadow, 2021; Hoff-Ginsberg, 1991; Salo, Rowe, Leech, & Cabrera, 2016). For instance, several studies have found that mothers (Hoff-Ginsberg, 1991; Jones & Adamson, 1987) and fathers (Salo et al., 2016) talked more, used a greater diversity of vocabulary, and produced more complex sentences during shared book reading than during free play with toys. Other recent work suggests that personal narratives encourage more complex, higher order talk (e.g., inferences, comparisons, hierarchies, and abstractions) than pretend play (Frausel et al., 2021). Such effects might reflect in part the affordances of these interaction contexts: narrating the events of a story might encourage more diverse and complex language than engaging in free play.

Research also suggests that context effects on parent and child language interact with SES. For instance, Hoff-Ginsberg (1991) found fewer differences between upper-middle-class and working-class mothers' language during shared book reading with their 2-year-olds than in other contexts such as toy play and meal time. These findings suggest that some aspects of parents' speech are sensitive to both SES and the setting in which the interaction takes place. There is also evidence that context interacts with ethnicity to influence parent language. During shared book reading with preschoolers, Hispanic parents adopt a 'storytelling' style that focuses on providing information about the story to their children; children are asked few questions and are encouraged to be an attentive audience rather than participating in the storytelling process (Escobar, Melzi, & Tamis-LeMonda, 2017; Luo et al., 2014; Melzi, Schick, & Kennedy, 2011). In contrast, during shared reminiscing, Hispanic parents adopt an 'elicitor' style, encouraging their children's narration while rarely contributing novel narrative information themselves (Melzi et al., 2011). These styles contrast with those adopted by European-American parents, who in both contexts tend to act as co-narrators, encouraging their children to construct a story with them (Melzi et al., 2011). These findings suggest that context effects on parent and child language can arise due to the socialization goals that parents adopt in different settings, and these goals might differ across ethnic groups.

In light of these findings, it is possible that mental-state language also varies across different types of parent-child interactions, and that the particular interaction contexts that evoke mental-state talk might differ across SES and ethnic groups. If so, this would have implications for how parent and child mental-state talk should be assessed and raise questions regarding which parent-child interaction contexts are most supportive of socio-cognitive development and whether this differs based on children's socioeconomic and ethnic background.

Although mental-state language has been assessed in a variety of contexts (e.g., book reading, free play with toys, shared reminiscing, and natural observations in the home), most studies have observed parent-child dyads in just one of these contexts. The handful of studies that have observed dyads in multiple situations in the US (Drummond et al., 2014), Chile (Farkas et al., 2018), and Canada (Howe, Rinaldi, & Recchia, 2010) have found that parents produce more mental-state talk during book reading with their toddlers and preschoolers than during semi-structured free play, and that parents reference emotions more during book reading but reference desires more during free play. This limited collection of findings suggests that interaction context might influence both the amount of mental-state talk that parents produce and the specific types of mental-state terms that they use. Carmiol and Schröder (2019) also found that Costa Rican and German parents and their 4-year-old children produced more emotion talk during book reading than shared reminiscing, providing some initial evidence that children's mental-state language might also vary across interaction contexts.

To date, no study has examined whether contextual variation in parent or child mental-state language differs as a function of SES or across Hispanic and non-Hispanic American families (although Eisenberg's, 1999 study involved multiple contexts, differences across contexts were not examined). It is possible that SES differences in the amount or type of mental-state talk that parents and children produce emerge in some contexts but not others, much like has been shown for other aspects of parents' child-directed speech (e.g., Hoff-Ginsberg, 1991). Similarly, context might interact with ethnicity to affect mental-state language use due to the complex influence of both factors on parents' socialization goals (Melzi et al., 2011). Thus, additional work on potential interactions of SES, ethnicity, and context in parent and child mental-state language use is needed.

2. The present research

The present study had two goals. First, we sought to examine the potential influence of SES, ethnicity, and context on parents' mental-state language. As reviewed above, (a) the few studies that have directly examined the relationship between SES and broad measures of parent mental-state talk that include cognition, desire, and emotion terms have produced conflicting results (Álvarez et al., 2019; Degotardi & Torr, 2007; Ebert et al., 2017), (b) no study has examined broad measures of mental-state language use in Hispanic American parents, and (c) only a handful of studies have examined parent mental-state talk in more than one context. Not only is there limited work on each of these factors individually, but no study has examined how these three factors might interact to impact parent mental-state language use. This is problematic given prior evidence that such interactions emerge in several aspects of parents' child-directed speech (e.g., Eisenberg et al., 1999; Hoff-Ginsberg, 1991; Melzi et al., 2011). These findings suggest that in order to understand the influence of SES, ethnicity, and context on parent mental-state language, it is essential to examine them together, rather than in isolation.

Our second goal was to investigate the influence of SES, ethnicity, and context on children's own use of mental-state language

during interactions with their parents. Despite a growing body of research dedicated to understanding how children's mental-state language relates to their social cognition abilities, few studies have examined the factors that relate to children's use of such talk. Indeed, the majority of the studies reviewed above examined only parents' mental-state language and thus little is known about the influence of SES, ethnicity, or context on children's mental-state language use.

To address these questions, we examined the mental-state language used by a socioeconomically diverse sample of Hispanic and non-Hispanic parents and their 3-year-old children. More specifically, we focused on parental education as our indicator of family SES. Although family SES can be assessed in a variety of ways (i.e. parental education, parent occupation, family income), parental education is more accurately reported and more stable over time than other measures (Duncan & Magnuson, 2003) and some researchers have suggested that it is the best predictor of parents' speech (Hoff, 2003; Hoff, Laursen, & Bridges, 2012; Willms, 1999). Moreover, parental education is most commonly used in studies that have reported relationships between SES and mental-state language, including the two prior studies that reported effects of SES on broad measures of parent mental-state talk (Álvarez et al., 2019; Degotardi & Torr, 2007), and thus using the same indicator of SES in the present study facilitated comparison with this prior work.

Our choice of age range was motivated by two considerations. We sought to explore variation in children's early exposure to and use of mental-state language, which has been shown to predict their later performance on a range of social cognitive tasks in the preschool years (e.g., Brooks & Meltzoff, 2015; Ensor & Hughes, 2008; Meins et al., 2003; Ruffman et al., 2002) and beyond (e.g., Ensor, Devine, Marks, & Hughes, 2014). However, our study used a broad measure of mental-state language that included cognition terms, and previous research suggests that cognition terms do not emerge in child speech until 2.5 to 3 years of age (Bartsch & Wellman, 1995; Brooks & Meltzoff, 2015; Shatz, Wellman, & Silber, 1983). Testing 3-year-olds allowed us to examine variability in early exposure to and use of mental-state language while ensuring that the children were capable of using all three categories of mental-state language of interest in the current study.

In order to examine the influence of context on mental-state language, parents and children completed two interaction tasks together: viewing a wordless picture book and engaging in a semi-structured play interaction. These interactions were coded for both parent and child mental-state language. We then analyzed whether parent or child mental-state language varied with parental education, ethnicity, and interaction context. Due to the limited research in this area, our approach was exploratory rather than guided by specific hypotheses about how these factors, either individually or in combination, might relate to parent and child mental-state language use.

The findings from this study are potentially important for three reasons. First, this work would provide new insight into how parents and children from different socioeconomic and ethnic backgrounds talk about mental states in different settings. Second, it would clarify whether different contexts provide comparable estimates of parent and child mental-state talk, and whether this is something that differs with parental education or ethnicity. This in turn has the potential to inform the choice of interaction context in future work on mental-state talk, as well as the extent to which past findings generalize across contexts and socioeconomic and ethnic groups. Finally, this work could help identify contexts that might be particularly useful for fostering mental-state talk and understanding, which has potential implications for developing interventions focused on supporting parent-child interactions. This work thus has important theoretical, methodological, and practical implications.

3. Method

3.1. Participants

The final sample consisted of 55 parent-child dyads. An additional 6 dyads participated but were excluded because a sibling was present during the tasks and this could affect the dyads' speech patterns (3 dyads), the child had a speech delay (1 dyad), the child refused to complete the picture-book task (1 dyad), or the parent produced only 7 utterances in the play task, which was over 3 standard deviations below the mean of the sample (1 dyad).

When determining our sample size, there were few relevant effect sizes in the literature on which we could base a power analysis because few studies have directly examined the effects of parental education, ethnicity, or context on broad measures of parent and child mental-state language (either individually or in combination). However, Degotardi and Torr (2007) reported significant differences between lower- and higher-educated mothers for both belief and non-belief mental-state talk. A power analysis conducted in G*power (Faul, Erdfelder, Lang, & Buchner, 2007) using the smaller of these effects (non-belief mental-state talk) indicated that a total sample of 25 dyads would be sufficient to detect similar between-group differences with power of .95 at an alpha level of .05. To ensure we had sufficient power to examine both between-group differences and interactions, we chose to double this sample size, targeting a minimum of 50 dyads with at least 25 dyads in each education group and 25 dyads in each ethnic group. Our final sample size was comparable to Carmiol and Schröder (2019), who found significant between-group differences and interactions for parent and child emotion language using a sample of 52 parent-child dyads.

The children were 26 male and 29 female 3-year-olds (33.4 – 39.3 months, $M = 35.6$ months). All children were primarily exposed to English ($M = 95\%$ English exposure, $SD = 10.83\%$, range: 50–100%). The majority of children completed the tasks with their mother

($N = 41$); the remainder completed the tasks with their father ($N = 14$).[1]

Dyads were categorized as Hispanic or Latino ($N = 29$) or not Hispanic or Latino ($N = 25$) based on parent report.[2] One additional parent chose not to provide ethnicity information; this dyad was excluded from analyses that compared Hispanic and non-Hispanic dyads. Parents also reported on their child's race: 42 of the children were identified as White, 1 as Hawaiian or Pacific Islander, 1 as Asian, and 1 as African American; 5 parents chose 'other race', 4 selected 'more than one race', and 1 chose not to respond. The majority in each ethnic group identified as White (Hispanic: 58%; non-Hispanic: 96%). Children in the Hispanic group were somewhat more racially diverse, with the second most frequent race selection being "other race" (17%). Because the majority of participants identified as White, we lacked the power to examine potential intersections of ethnicity and race and thus collapsed across race in all analyses.

We recorded the highest education level of either parent: 11 completed high school, 16 had an Associate's degree, 15 had a Bachelor's degree, 7 had a Master's degree, and 6 completed a professional degree (MD or PhD). Dyads were categorized into a lower-educated group (high school or Associate's degree) and a higher-educated group (BA or higher; see Table 1). There was a trend towards more Hispanic dyads appearing in the lower-educated group, but this relationship did not reach significance in a chi-square test of independence, $\chi^2 (1, N = 54) = 2.75$, $p = .10$.

Data were collected between March 2016 and July 2017. Participants were drawn from Merced county California, a region with low levels of educational attainment (~14% of adults over 25 hold a Bachelor's degree or higher) and household income levels that are below the state average (local median income $56,330; state median income $78,672; U.S. Census Bureau, 2019. Moreover, 61% of the residents in the region identify as Hispanic or Latino (U.S. Census Bureau, 2019). Dyads were recruited from birth records provided by the California Department of Public Health and a database of local parents in Merced who had previously expressed interest in participating in research projects with their children. These procedures have been used in several prior studies to recruit socioeconomically and ethnically diverse samples (Pronovost & Scott, 2021; Roby & Scott, 2018; Scott, 2017).

Parents provided written informed consent for participation prior to the study. The university's Institutional Review Board approved all procedures.

3.2. Materials and procedure

Dyads participated in a laboratory visit lasting approximately 45 minutes. After parents provided informed consent, they completed questionnaires on demographics and their children's verbal ability. Children then participated in several cognitive tasks unrelated to the present study.

Dyads were then taken to a separate room to complete two interaction tasks: a picture-book task and a play task. These interaction tasks were selected because they have been used in prior research on mental-state language and were specifically designed to elicit such talk from parents and children (Brown et al., 1996; Hughes & Dunn, 1998; Nielsen & Dissanayake, 2000; Roby & Scott, 2018; Ruffman et al., 2002; Taumoepeau & Ruffman, 2006, 2008). Both tasks have successfully been used with children in the age range of interest in the current study (Hughes & Dunn, 1998; Nielsen & Dissanayake, 2000; Roby & Scott, 2018; Ruffman et al., 2002; Taumoepeau & Ruffman, 2008).

Approximately half the dyads completed the picture-book task first ($n = 29$) and the others completed the free-play task first ($n = 26$). Materials for each task were presented separately. Following the completion of the first task, the parent, child, and experimenter put away the materials from that task together and then the experimenter presented the next task. Two cameras on either side of the room recorded the dyad's speech and actions in both tasks.

3.2.1. Picture-book task

The picture-book task was adapted from the task devised by Taumoepeau and Ruffman (2006), which has been used in numerous studies on parent and child mental-state language (Roby & Scott, 2018; Ruffman et al., 2002; Taumoepeau, 2015; Taumoepeau et al., 2019; Taumoepeau & Ruffman, 2006, 2008). It consisted of 10 (20×28 cm) color photos in clear plastic sleeves in a plastic three-ring binder. The photos displayed images of adults and children engaging in a variety of activities (e.g., girl smiling while building with blocks, boy getting a shot at the doctor's office, girl sick at home in bed), and expressing a variety of emotions (e.g., happy, proud, scared, sad). The pages did not contain any words.

Dyads could either sit together on the floor or in a chair with the child on the parent's lap. Parents were instructed to look at the picture-book with their child as they normally would at home. The experimenter then left the room. The experimenter returned after 10 minutes or after the dyad stopped discussing the pictures, whichever happened first.

3.2.2. Play task

The play task was adapted from previous studies focused on parent and child use of mental-state talk (Brown et al., 1996; Hughes & Dunn, 1998; Nielsen & Dissanayake, 2000). Materials consisted of a variety of age-appropriate toys including a plastic barn set with a farmer and farm animals, a doctor's kit with play instruments such as a stethoscope and blood pressure cuff, a wooden tool set that

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[1] The fathers were relatively evenly split between the lower-educated ($N = 6$) and higher-educated ($N = 8$) groups and between the Hispanic ($N = 5$) and non-Hispanic ($N = 9$) groups. Controlling for parent gender did not change the pattern of results reported in the Results section.

[2] Although the terms Hispanic and Latino apply to a diverse range of individuals, in the state of California, the majority of Hispanic individuals (84%) identify as being of Mexican descent (Pew Research Center, 2014).

Table 1

Participant demographics separately by parental education group.

	Parental education	
	Lower-educated	Higher-educated
Ethnicity		
Hispanic or Latino	17	12
Not Hispanic or Latino	9	16
NA	1	0
Child age – Mean (range)	35.6 (33.4 – 38.0)	35.6 (33.4 – 39.3)
Child verbal ability[a] – Mean (range)	56.0 (17 – 117)	69.1 (14 – 121)
Child sex	16 male, 11 female	10 male, 18 female

[a] Composite score on the CDI-III.

included a small bench with holes in it, a hammer and nails, and a wrench with screws, and a kitchen set that included utensils, play food, and a small plastic stove top. The toys were stored in a large wicker basket (52 × 38 × 23 cm). These materials were selected to elicit discussion of parents' and children's mental states as well as to encourage discussion of the characters' mental states (e.g., farmer, animals, etc.) during pretend play.

Dyads were seated on the floor with the basket of toys. Parents were asked to play with the toys with their child as they would at home. The experimenter then left. The experimenter returned after 10 minutes or after the dyad stopped playing, whichever happened first. Dyads could play with the toys in whatever order they chose for the length of time they desired. They were not instructed to play with all of the toys or to clean up when switching to another toy. Dyads typically played with between 2 and 3 of the toy sets during the session.

3.2.3. Verbal ability

Because the amount and nature of parent and child speech could vary with children's language skills, children's verbal ability was measured using the MacArthur-Bates Communicative Development Inventory, Level 3 (CDI-III; Fenson et al., 2007). The CDI-III is a parental report measure with subscales that assess the child's productive vocabulary, the grammatical complexity of the sentences the child produces, and other aspects of the child's language use including comprehension ("Does your child understand the concept of 'one'?"), semantics ("If you asked your child 'What is a horse?', could he answer 'an animal'?"), and syntax ("Does your child give reasons for thing using the word 'because'?"). Scores on the three subscales were summed to create a composite measure of verbal ability (possible score range: 0–124).

3.3. Transcription and coding

Parent and child language during the interaction tasks was first transcribed verbatim. Non-verbal sounds and exclamations were not transcribed (e.g., gasps, sighs, groans, etc.). Three parents spoke in Spanish for a portion of the tasks. For these parents, the interaction was first transcribed verbatim by a native Spanish-English bilingual transcriber, and then the Spanish words were translated into English.

We used the CLAN program (MacWhinney, 2000) to identify utterances that contained mental-state terms. Specifically, we coded for three categories of mental-state terms: cognition, emotion, and desire. An initial list of mental-state terms in each category was created a priori based on Ensor and Hughes (2008). We then reviewed a complete list of the words used across all transcripts (extracted via CLAN) and identified several additional mental-state terms that were not coded in prior work (e.g., angry, bored, focus). Table 2 shows a complete list of the terms that parents and children used in each of these categories. The cognition category included words related to cognitive processes such as *think, know,* and *remember*. The emotion category included words that referred to an emotional state such as *happy*, *sad*, and *mad*. The desire category included the word *want* and all variations of this word. None of the other desire words or phrases previously identified by Hughes and colleagues (e.g., *wish, hope, would like, would love*) occurred in our transcripts. Note the word *like* can be used as an emotion term (e.g., Does she *like* the food?), a desire term (e.g., I would *like* to play with that), or in several additional ways that do not convey mental states including comparison (e.g., It looks *like* they're feeding the ducks in the lake) or as a filler word (e.g., These are *like*, their little stalls). Only mental-state uses of *like* were coded; in our sample, all uses of *like* as a mental-state term referred to emotions, hence *like* was categorized as an emotion term rather than a desire term. Consistent with previous research (e.g., Roby & Scott, 2018; Taumoepeau & Ruffman, 2008), utterances containing solely the phrase, "I don't know" were not counted as containing a mental-state term. Exact repetitions of a word or phrase (the parent repeating after the child or vice versa) were also excluded. Consistent with prior literature (Meins et al., 2003; Taumoepeau & Ruffman, 2008), our study focused on the number of utterances that contained a given type of mental-state term, rather than the raw number of mental-state terms.

Table 2
Mental-state words used by parents and children in the picture-book and play tasks.

Category	Words
Cognition	focus*, forgot, guess, idea, imagination*, interested*, know, mean, pretend, remember, remind*, think, wish*, wonder*
Emotion	afraid*, angry, bored*, disgusted*, enjoying, excited, feeling, fun, fussy*, glad*, grumpy, happy, hateˆ, hope, like, love, mad, sad, scare, sorry, surprised*, upset, worry
Desire	want

Note: All possible forms of a given word (e.g., *think, thinks, thinking*, etc.) were included. *word used only by parents; ˆword used only by children.

4. Results

4.1. Analytic approach

We examined potential differences within and across dyads in (a) the overall amount of talk, (b) the total amount of mental-state talk, and (c) the frequency of each sub-type of mental-state talk (cognition, emotion, desire) using a series of generalized linear mixed models (GLMMs). We used mixed effects models to account for the fact that task was repeated within participant. Separate models were fit for each parent and child talk variable. Because all talk variables were counts, models were specified with a Poisson distribution and a log link function. Each model included task (picture-book, play) as a within-subject factor and education (lower, higher) and ethnicity (Hispanic, non-Hispanic) as between-subjects factors. All models included participant as a random effect and task order (picture-book first, play first) and child verbal ability as covariates. Analyses of mental-state talk variables also included the total number of participant utterances on each task as a time-varying covariate to control for participant verbosity.

All statistical analyses were conducted in R (version 4.0.3; R Core Team, 2020). The *mixed* function of the *afex* package (Singmann, Bolker, Westfall, Aust, & Ben-Shacher, 2021) was used to obtain p-values for significant effects of interest via likelihood-ratio tests. For significant interactions, follow-up tests of simple effects were conducted using the *emmeans* package (Lenth, 2021).

Preliminary analyses revealed no effects of child sex (all $ps > 0.42$); we therefore collapsed across this variable in all analyses (potential differences between mothers and fathers were not examined due to the limited number of fathers in the sample). See the Supporting Information for correlations between children's verbal ability and talk variables (Table S1), cross-task correlations for parent and child talk (Table S2) and correlations between parent and child talk (Table S3).

4.2. Overall talk

4.2.1. Parent utterances

We first examined potential differences within and across dyads in the overall amount of talk that parents produced (see Table 3). A GLMM on the number of parent utterances revealed significant effects of ethnicity,[3] $\beta = .07$, $SE = 0.03$, $\chi^2(1) = 4.35$, $p = .037$, and task, $\beta = -0.21$, $SE = 0.01$, $\chi^2(1) = 592.63$, $p < .001$, and a significant interaction of ethnicity and task, $\beta = -0.06$, $SE = 0.01$, $\chi^2(1) = 45.38$, $p < .001$. Follow-up analyses of simple effects revealed that both parents in Hispanic dyads, $\beta = 0.54$, $SE = 0.02$, $z = 23.96$, $p < .001$, and parents in non-Hispanic dyads, $\beta = 0.31$, $SE = 0.03$, $z = 11.36$, $p < .001$, produced significantly more utterances in the play task than in the picture-book task (Fig. 1A). The two groups of parents produced similar numbers of utterances in the picture-book task, $\beta = -0.03$, $SE = 0.07$, $z = -0.41$, $p = .68$. However, in the play task parents in Hispanic dyads produced significantly more utterances than parents in non-Hispanic dyads, $\beta = -0.27$, $SE = 0.07$, $z = -3.75$, $p < .001$. This resulted in a larger difference between the two tasks for Hispanic parents than for non-Hispanic parents. There was also a marginal three-way interaction of education, ethnicity, and task, $\chi^2(1) = 3.16$, $p = .075$, reflecting the fact that for the play task, the difference between Hispanic and non-Hispanic dyads was larger for lower-educated parents than for higher-educated parents. No other effects in the model were significant, all $ps > 0.22$. Notably, there was no main effect of education, $\chi^2(1) = 0.44$, $p = .51$, indicating that lower-educated and higher-educated parents produced similar numbers of utterances.

4.2.2. Child utterances

The GLMM on the number of utterances that children produced (see Table 4) also revealed a significant effect of task, $\beta = -0.23$, $SE = 0.01$, $\chi^2(1) = 422.37$, $p < .001$, and a significant interaction of ethnicity and task, $\beta = -0.04$, $SE = 0.01$, $\chi^2(1) = 12.65$, $p < .001$. Like their parents, children in both ethnicity groups produced significantly more utterances in the play task than they did in the picture-book task; this task difference was larger in the Hispanic dyads, $\beta = 0.53$, $SE = 0.03$, $z = 17.60$, $p < .001$, than the non-Hispanic dyads, $\beta = 0.37$, $SE = 0.03$, $z = 11.40$, $p < .001$ (Fig. 1B). There was also a marginal three-way interaction of education, ethnicity, and task, $\beta = -0.02$, $SE = 0.01$, $\chi^2(1) = 3.18$, $p = .075$; similar to the pattern seen in parents, the difference between Hispanic and non-Hispanic dyads in the play task was numerically larger for children of lower-educated parents. There were no other significant effects in the model, all $ps > 0.21$. As with parent talk, there was a no main effect of education, $\chi^2(1) = 0.52$, $p = .47$, indicating that children of lower- and higher-educated parents produced similar numbers of utterances.

Thus, both parents and children talked more during the play task than the book task, and this difference between the two tasks was

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[3] Note that because the model used a log link function, all parameter estimates are on a log scale.

Table 3
Mean (SD) of parent talk variables, separately by task, ethnicity, and education group.

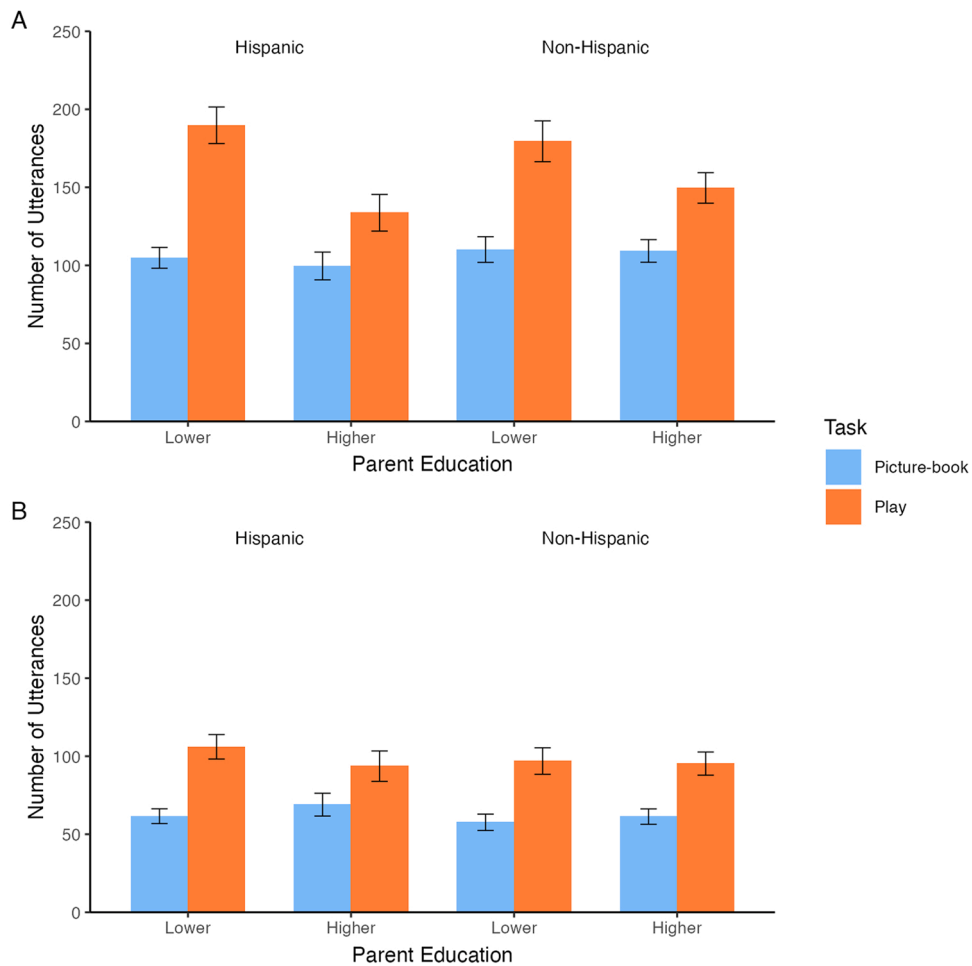| Parent talk	Lower-educated			Higher-educated		
	Hispanic	Non-Hispanic	Overall	Hispanic	Non-Hispanic	Overall
Picture-book task						
Number of utterances	110.35 (47.70)	101.89 (42.79)	104.60 (46.86)	111.00 (49.96)	111.25 (51.57)	111.14 (49.94)
Number of words	435.41 (198.29)	485.0 (296.01)	440.89 (235.38)	519.17 (223.64)	529.44 (258.39)	525.04 (239.78)
Mental-state talk						
Cognition	4.35 (3.92)	3.67 (4.21)	4.15 (3.88)	9.25 (8.56)	14.50 (10.50)	12.25 (9.91)
Emotion	4.47 (4.90)	5.22 (3.67)	4.56 (4.46)	8.17 (5.73)	6.44 (5.61)	7.18 (5.62)
Desire	4.94 (4.16)	4.00 (4.61)	4.52 (4.20)	2.25 (1.36)	4.00 (3.16)	3.25 (2.66)
Total	13.00 (9.64)	12.56 (8.03)	12.63 (8.85)	17.92 (11.43)	23.19 (14.70)	20.93 (13.43)
Play task						
Number of utterances	199.71 (61.46)	136.78 (22.58)	175.56 (59.40)	180.92 (31.14)	152.38 (28.49)	164.61 (32.45)
Number of words	770.65 (215.03)	610.00 (148.24)	702.59 (212.70)	796.25 (133.82)	678.44 (138.86)	728.93 (146.74)
Mental-state talk						
Cognition	5.24 (4.58)	3.11 (1.97)	4.41 (3.92)	6.33 (3.39)	8.75 (2.65)	7.71 (3.17)
Emotion	2.35 (1.90)	1.44 (1.24)	2.00 (1.71)	3.42 (2.88)	2.50 (1.37)	2.89 (2.15)
Desire	9.88 (6.97)	8.11 (7.10)	9.11 (6.84)	9.42 (4.48)	8.50 (4.80)	8.89 (4.61)
Total	16.59 (7.02)	12.00 (8.59)	14.74 (7.72)	18.25 (3.67)	19.00 (5.82)	18.68 (4.95)

Fig. 1. Estimated marginal means for the number of parent (A) and child (B) utterances, separately by task, ethnicity, and education group. Error bars represent one standard error of the mean.

Table 4

Mean (SD) of child talk variables, separately by task, ethnicity, and education group.

Child talk	Lower-educated			Higher-educated		
	Hispanic	Non-Hispanic	Overall	Hispanic	Non-Hispanic	Overall
Picture-book task						
Number of utterances	63.94 (36.46)	73.00 (33.23)	66.07 (34.69)	60.58 (28.42)	62.69 (29.81)	61.79 (28.70)
Number of words	149.88 (94.06)	154.67 (73.51)	149.15 (85.24)	153.42 (82.51)	165.88 (88.31)	160.54 (84.53)
Mental-state talk						
Cognition	.65 (1.73)	.22 (0.67)	.48 (1.42)	1.17 (1.64)	.63 (1.36)	.86 (1.48)
Emotion	.94 (1.09)	2.00 (2.00)	1.26 (1.51)	2.00 (1.76)	2.31 (3.36)	2.18 (2.75)
Desire	2.76 (4.16)	1.33 (2.55)	2.19 (3.65)	1.50 (1.62)	2.06 (2.02)	1.82 (1.85)
Total	4.29 (4.82)	3.56 (3.84)	3.89 (4.42)	4.58 (3.42)	4.87 (4.53)	4.75 (4.02)
Play task						
Number of utterances	110.12 (43.47)	99.11 (29.12)	107.33 (38.47)	101.83 (30.31)	97.38 (27.55)	99.29 (28.30)
Number of words	285.71 (157.09)	244.33 (100.56)	273.70 (137.22)	282.50 (124.46)	290.38 (117.06)	287.00 (118.07)
Mental-state talk						
Cognition	1.35 (2.23)	.33 (0.50)	1.00 (1.84)	.50 (0.91)	2.00 (2.81)	1.36 (2.30)
Emotion	1.88 (2.52)	1.22 (1.09)	1.67 (2.09)	1.25 (1.06)	2.25 (2.72)	1.82 (2.20)
Desire	2.47 (2.83)	3.22 (4.32)	2.81 (3.32)	2.75 (1.96)	3.13 (2.90)	2.96 (2.50)
Total	4.41 (4.06)	3.78 (4.92)	4.30 (4.24)	3.75 (2.83)	6.13 (4.99)	5.11 (4.31)

larger in Hispanic than non-Hispanic dyads. However, the overall amount of talk produced by parents and children did not differ across the lower- and higher-educated groups in either task.

4.3. Total mental-state language

4.3.1. Parent mental-state language

We next examined the total number of parent utterances that contained mental-state terms. The GLMM revealed a significant effect of education, $\beta = -0.16$, $SE = 0.05$, $\chi^2(1) = 8.34$, $p = .004$, reflecting the fact that higher-educated parents produced more mental-state utterances than lower-educated parents. There was also a significant effect of task, $\beta = 0.21$, $SE = 0.03$, $\chi^2(1) = 41.93$, $p < .001$. Parents produced more mental-state utterances in the picture-book task than they did in the play task. Finally, there was a marginal effect of ethnicity, $\beta = -0.10$, $SE = 0.05$, $\chi^2(1) = 3.39$, $p = .065$, reflecting the fact that parents in non-Hispanic dyads used marginally more mental-state utterances than parents in Hispanic dyads. No other effects in the model were significant, all $ps > 0.26$.

4.3.2. Child mental-state language

The model for the total number of child utterances that contained mental-state terms also revealed a significant effect of task, $\beta = 0.26$, $SE = 0.06$, $\chi^2(1) = 19.15$, $p < .001$, which was qualified by a significant interaction of ethnicity and task, $\beta = 0.11$, $SE = 0.05$, $\chi^2(1) = 4.60$, $p = .032$. Like their parents, both Hispanic children, $\beta = -0.75$, $SE = 0.16$, $z = -4.62$, $p < .001$, and non-Hispanic children, $\beta = -0.32$, $SE = 0.16$, $z = -2.03$, $p = .043$, produced significantly more mental-state utterances in the picture-book task than in the play task. The Hispanic and non-Hispanic children produced similar numbers of mental-state utterances in the book task, $\beta = -0.09$, $SE = 0.20$, $z = -0.47$, $p = .64$, but the non-Hispanic children produced marginally more mental-state utterances than Hispanic children did in the play task, $\beta = 0.34$, $SE = 0.20$, $z = 1.67$, $p = .094$. As a result, the difference between the tasks was larger for Hispanic than non-Hispanic children. No other effects in the model were significant, all $ps > 0.14$. In particular, unlike parent mental-state talk, children's overall mental-state talk did not vary with parental education, $\beta = -0.13$, $SE = 0.09$, $\chi^2(1) = 2.10$, $p = .147$.

4.4. Categories of mental-state language

To determine whether SES, ethnicity, or context was differentially related to different types of mental-state talk, we next analyzed each of the three categories of mental-state talk separately for parents and children.

4.4.1. Cognition terms

4.4.1.1. Parents. A GLMM on the number parent utterances that contained cognition terms revealed significant effects of education, $\beta = -0.37$, $SE = 0.09$, $\chi^2(1) = 15.70$, $p < .001$, and task, $\beta = 0.30$, $SE = 0.05$, $\chi^2(1) = 31.33$, $p < .001$, and a significant interaction of education and task, $\beta = -0.10$, $SE = 0.04$, $\chi^2(1) = 4.53$, $p = .033$ (Fig. 2A). Simple effect analyses revealed that both higher-educated parents, $\beta = -0.79$, $SE = 0.11$, $z = -7.32$, $p < .001$, and lower-educated parents, $\beta = -0.41$, $SE = 0.17$, $z = -2.47$, $p = .01$, produced significantly more cognition utterances in the book task than they did in the play task, but the difference between the two tasks was larger for higher-educated parents than for lower-educated parents. Moreover, higher-educated parents produced significantly more utterances containing cognition terms than lower-educated parents did in both the picture-book task, $\beta = 0.92$, $SE = 0.19$, $z = 4.82$, $p < .001$, and the play task, $\beta = 0.54$, $SE = 0.20$, $z = 2.76$, $p = .006$, and this difference was larger in the picture-book task than in the play task.
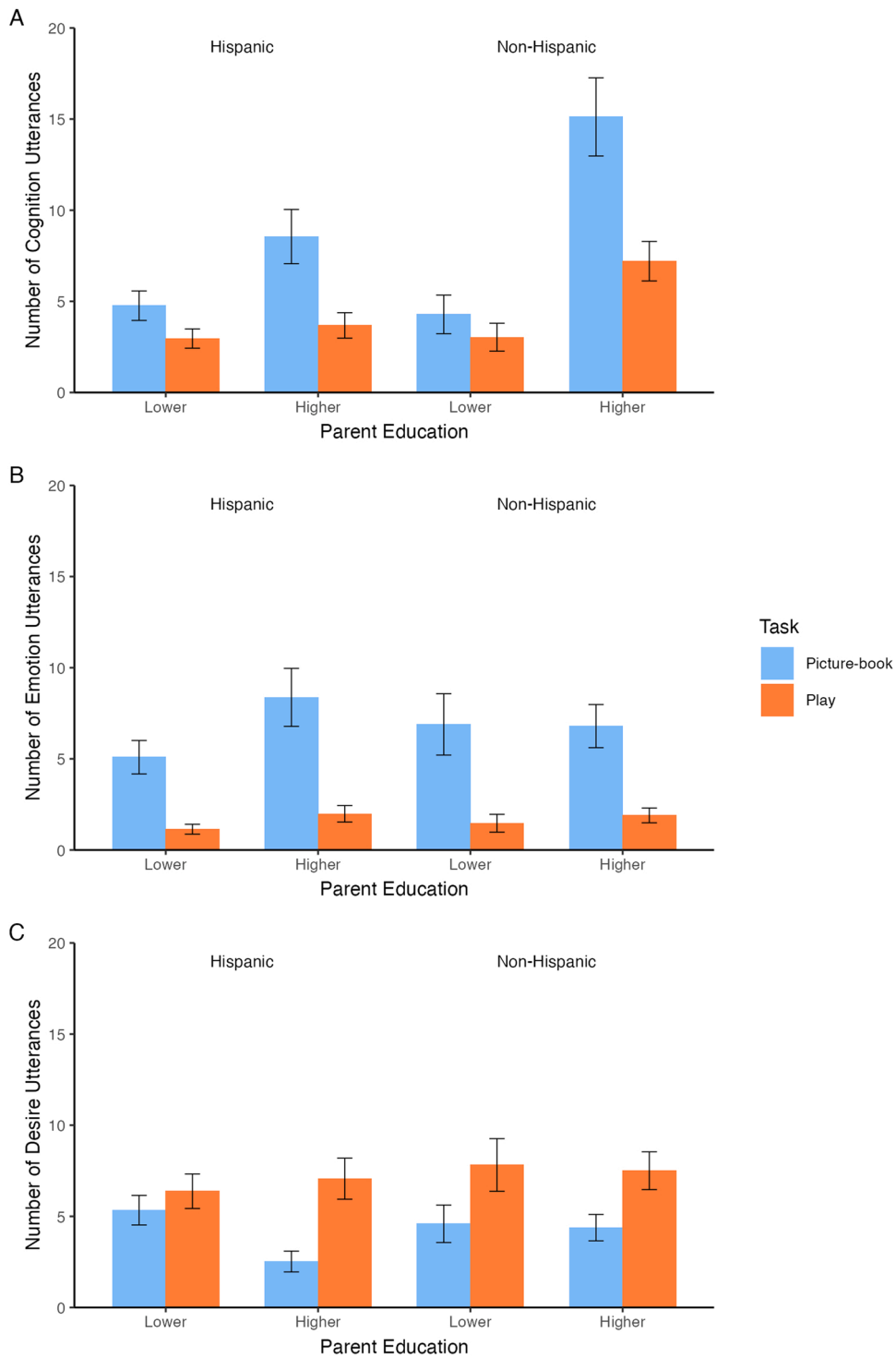
Fig. 2. Estimated marginal means for the number of parent utterances containing cognition (A), emotion (B), and desire (C) terms, separately by task, ethnicity, and education group. Error bars represent one standard error of the mean.

There was also a marginal effect of ethnicity, $\beta = -0.15$, $SE = 0.08$, $\chi^2(1) = 3.09$, $p = .079$, which was qualified by a significant interaction of education and ethnicity, $\beta = 0.17$, $SE = 0.08$, $\chi^2(1) = 3.99$, $p = .046$. The tendency for higher-educated parents to produce more utterances containing cognition terms was significant for non-Hispanic dyads, $\beta = 1.06$, $SE = 0.26$, $z = 4.11$, $p < .001$, but only marginal in Hispanic dyads, $\beta = 0.40$, $SE = 0.22$, $z = 1.85$, $p = .064$. Higher-educated parents in non-Hispanic dyads

produced significantly more cognition utterances than higher-educated parents in Hispanic dyads, $\beta = 0.62$, $SE = 0.21$, $z = 3.00$, $p = .003$, but the lower-educated parents in non-Hispanic and Hispanic dyads did not differ from each other, $\beta = -0.04$, $SE = 0.26$, $z = -0.16$, $p = .87$. No other effects in the model were significant, all $ps > 0.53$.
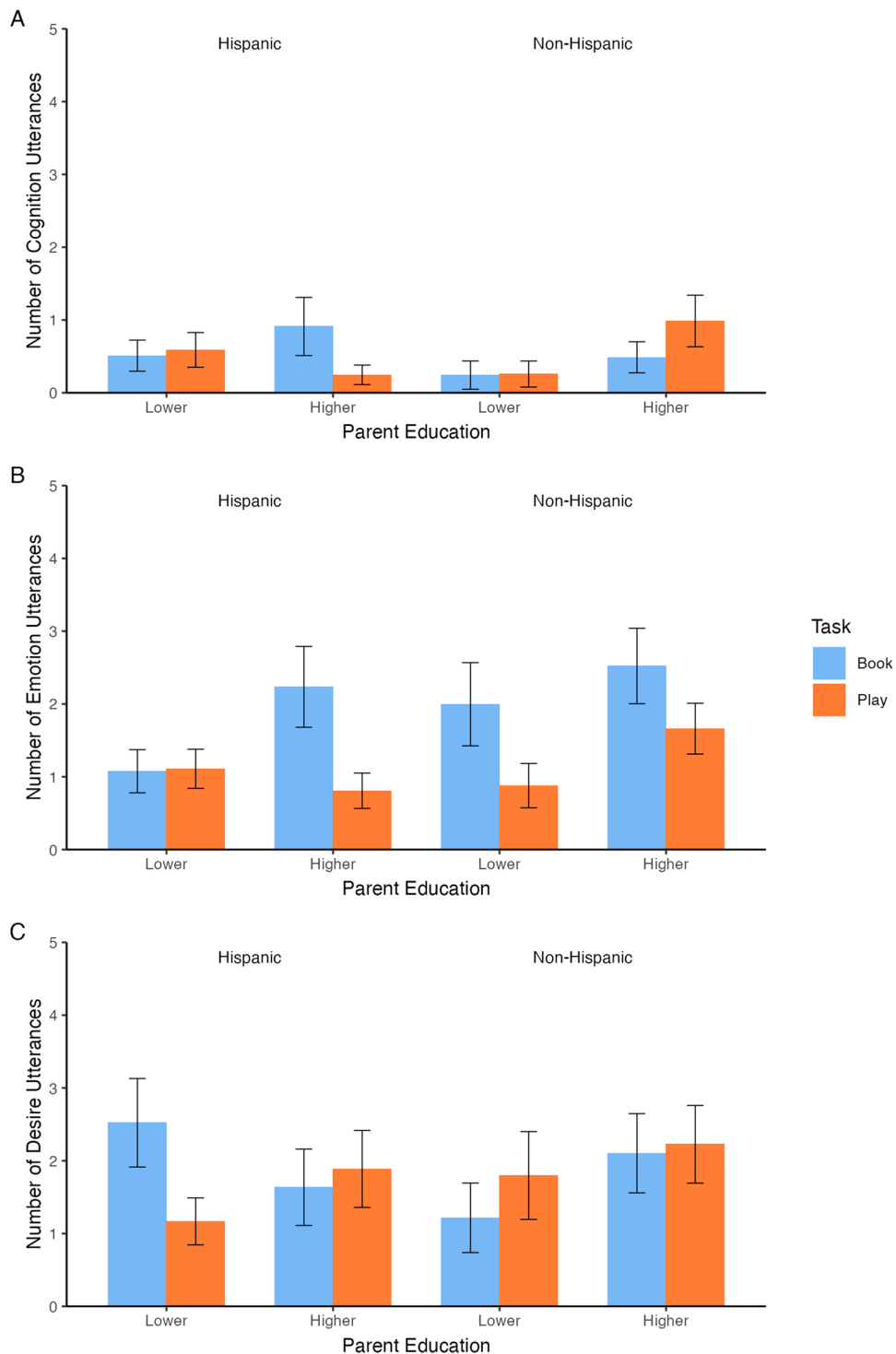

Fig. 3. Estimated marginal means for the number of child utterances containing cognition (A), emotion (B), and desire (C) terms, separately by task, ethnicity, and education group. Error bars represent one standard error of the mean.

4.4.1.2. Children. Examination of the number of children's utterances that contained cognition terms revealed only a marginal interaction of ethnicity and task, $\beta = 0.24$, $SE = 0.15$, $\chi^2(1) = 2.80$, $p = .094$, and a marginal three-way interaction of education, ethnicity, and task, $\beta = -0.26$, $SE = 0.15$, $\chi^2(1) = 2.93$, $p = .087$ (Fig. 3A). Among children of higher-educated parents, Hispanic children produced significantly more cognition utterances in the picture-book task than in the play task, $\beta = -1.31$, $SE = 0.53$, $z = -2.46$, $p = .014$, whereas non-Hispanic children produced marginally more cognition utterances in the play task than in the book task, $\beta = 0.71$, $SE = 0.41$, $z = 1.73$, $p = .084$. For children of lower-educated parents, the number of cognition utterances did not differ across tasks for either Hispanic or non-Hispanic children, both $ps > 0.74$. No other effects were significant, all $ps > 0.14$.

4.4.2. Emotion terms

4.4.2.1. Parents. A GLMM on the number of parent utterances that contained emotion terms revealed only a significant effect of task, $\beta = 0.72$, $SE = 0.07$, $\chi^2(1) = 118.28$, $p < .001$ (Fig. 2B). Parents produced more emotion utterances in the picture-book task than in the play task. There was a trend towards higher-educated parents producing more emotion utterances than lower-educated parents, but this did not reach significance, $\beta = -0.16$, $SE = 0.10$, $\chi^2(1) = 2.68$, $p = .102$. No other effects were significant, all $ps > 0.28$.

4.4.2.2. Children. For the number of children's utterances that contained emotion terms, there was also a significant effect of task, $\beta = 0.28$, $SE = 0.09$, $\chi^2(1) = 9.14$, $p = .003$. Like their parents, children produced significantly more emotion utterances in the picture-book task than in the play task. This effect was qualified by a significant three-way interaction of education, ethnicity, and task, $\beta = -0.18$, $SE = 0.08$, $\chi^2(1) = 5.18$, $p = .023$ (Fig. 3B). Examination of this interaction revealed the tendency to produce more emotion utterances in the picture-book task than the play task was significant for Hispanic children of higher-educated parents, $\beta = -1.02$, $SE = 0.35$, $z = -2.92$, $p = .004$, and non-Hispanic children of lower-education parents, $\beta = -0.82$, $SE = 0.39$, $z = -2.10$, $p = .036$, and marginal for non-Hispanic children of higher-educated parents, $\beta = -0.42$, $SE = 0.25$, $z = -1.68$, $p = .093$. However, Hispanic children of lower-educated parents produced similar numbers of emotion utterances on the two tasks, $\beta = 0.03$, $SE = 0.34$, $z = 0.09$, $p = .93$, and they produced significantly fewer emotion utterances in the picture-book task than Hispanic children of higher-educated parents, $\beta = 0.73$, $SE = 0.37$, $z = 1.97$, $p = .049$. No other effects were significant, all $ps > 0.13$.

4.4.3. Desire terms

4.4.3.1. Parents. A GLMM on the number of parent utterances that contained desire terms revealed a significant main effect of task, $\beta = -0.28$, $SE = 0.05$, $\chi^2(1) = 26.94$, $p < .001$, reflecting the fact that parents used more desire talk in the play task than in the picture-book task (Fig. 2C). This effect was qualified by a significant two-way interaction of education and task, $\beta = 0.11$, $SE = 0.05$, $\chi^2(1) = 5.73$, $p = .017$, and a significant three-way interaction of education, ethnicity, and task, $\beta = 0.11$, $SE = 0.05$, $\chi^2(1) = 5.62$, $p = .018$. The tendency to produce more desire utterances in the play task than the picture-book task was significant for both higher-educated non-Hispanic parents, $\beta = 0.54$, $SE = 0.16$, $z = 3.41$, $p < .001$ and lower-educated non-Hispanic parents, $\beta = 0.53$, $SE = 0.21$, $z = 2.57$, $p = .01$. For Hispanic dyads, the higher-educated parents produced significantly more desire utterances in the play task than the picture-book task, $\beta = 1.03$, $SE = 0.23$, $z = 4.52$, $p < .001$, but the lower-educated Hispanic parents produced similar numbers of desire utterances on the two tasks, $\beta = 0.18$, $SE = 0.17$, $z = 1.05$, $p = .29$. This was due to the lower-educated Hispanic parents producing significantly more desire utterances on the picture-book task than higher-educated Hispanic parents, $\beta = -0.75$, $SE = 0.27$, $z = -2.76$, $p = .006$. No other effects were significant, all $ps > 0.23$.

4.4.3.2. Children. Examination of the number of child utterances that contained desire terms revealed a marginal interaction of ethnicity and task, $\beta = 0.13$, $SE = 0.07$, $\chi^2(1) = 3.75$, $p = .053$, which was qualified by a significant three-way interaction of ethnicity, education, and task, $\beta = 0.16$, $SE = 0.07$, $\chi^2(1) = 5.18$, $p = .023$ (Fig. 2C). Similar to their parents, children of higher-educated parents and non-Hispanic children of lower-educated parents used numerically more desire utterances in the play task than in the picture-book task, although none of the simple effect comparisons were significant, all $ps > 0.27$. In contrast, Hispanic children of lower-educated parents used significantly more desire utterances in the picture-book task than in the play task, $\beta = -0.77$, $SE = 0.27$, $z = -2.84$, $p = .005$. No other effects were significant, all $ps > 0.30$.

5. Discussion

Numerous studies have shown associations between the exposure to and use of mental-state language and children's social cognition abilities, with positive findings spanning infancy through the elementary-school years (e.g., Adrian et al., 2005; Bianco et al., 2016; Devine & Hughes, 2018; Drummond et al., 2014; Ornaghi & Grazzani, 2013; Roby & Scott, 2018). Given this large body of evidence, it is important to understand the sources of variation in this type of talk. The present study explored the potential influence of three factors – parental education, ethnicity, and interaction context – by examining the mental-state language used by a socioeconomically diverse sample of Hispanic and non-Hispanic parent-child dyads as they took part in two activities, a picture-book task and a play task. Our findings showed a complex interplay of these three factors in relation to parent and child language.

We found a consistent effect of task context on both parent and child talk. Although parents and children talked more in the play task, they used more mental-state language in the picture-book task. Examination of individual categories of mental-state language showed that parents used more cognition and emotion terms in the picture-book task than in the play task. The opposite pattern

emerged for parents' desire language, with parents using more of this language in the play task than in the picture-book task. Moreover, the influence of context on parents' mental-state language interacted with parental education and ethnicity. Although both higher- and lower-educated parents produced more cognition talk in the picture-book task than in the play task, the difference between the two tasks was larger for higher-educated parents. For parents' desire language, higher-educated parents and lower-educated non-Hispanic parents produced more desire language in the play task than the picture-book task. Lower-educated Hispanic parents did not exhibit this context effect, instead producing equally high amounts of desire talk in both tasks. Significant interactions of context, education, and ethnicity also emerged for children's emotion and desire talk. Children of higher-educated parents and lower-educated non-Hispanic parents used more emotion talk in the picture-book task than in the play task, and more desire talk in the play task than in the picture-book task, mirroring the pattern found in parents. However, children of lower-educated Hispanic parents exhibited a different pattern: they used equal amounts of emotion talk in the two tasks, and more desire talk in the picture-book task than in the play task.

The context effects we observed are broadly consistent with several previous studies showing parents produce more mental-state talk and emotion terms while viewing books than during free play, but they produce more desire terms during play (Drummond et al., 2014; Farkas et al., 2018; Howe et al., 2010). Together with the present results, these findings suggest that interaction context influences both the overall quantity and the specific types of mental-state language that parents produce. Our results extend these findings by demonstrating that context also influences the amount and nature of children's mental-state language. Our study is also the first to show that context interacts with both parental education and ethnicity to influence parent and child mental-state language.

The task differences in mental-state language likely stemmed in part from the different affordances of the two interaction contexts. For instance, many of the images in the picture-book showed someone expressing an emotion (e.g., a girl smiling while holding a kitten; a boy scared while getting a shot). These overt depictions of emotions likely prompted discussions of emotions, resulting in parents and the majority of children using more emotion terms in the picture-book task. In contrast, the play materials were intended to invoke pretend play scenarios that warranted discussion of mental states, but they did not depict mental states directly. This likely contributed to overall lower levels of mental-state language in the play interaction. However, the play task did elicit more parent and child desire language, which could reflect the fact that this task was more open-ended and collaborative than the picture-book task. Engaging in collaborative play might have prompted more discussion of what pretend activities the dyad wanted to engage in (e.g., "You want to play doctor?") and what the pretend characters wanted to do ("[The cow] wants to come out."), resulting in more desire language.

However, differences in task affordances cannot explain the interactions we observed between context, parental education, and ethnicity, as the affordances were constant across dyads. Instead, it seems likely that these interactions reflect differences in how the dyads perceived the tasks and the goals and practices they adopted in each context. With regards to the interaction of context and parental education that emerged for cognition talk, it is possible that parents from different socioeconomic backgrounds might hold different beliefs regarding the purpose of sharing books with their child. Some evidence suggests that higher-SES parents are more likely to view sharing books as a context for teaching, including helping children to acquire knowledge and vocabulary (Curenton & Justice, 2008; Weigel, Martin, & Bennett, 2006). For instance, Curenton and Justice (2008) found that relative to lower-educated mothers, higher-educated mothers had higher scores on a measure of parental beliefs about shared reading, which assessed beliefs such as the importance of engaging children in reading as an active participant and shared reading as a teaching tool. The two groups of mothers did not differ in the frequency of home literacy activities, suggesting that education level influenced the content, rather than the amount, of parent-child book interactions. Vandermaas-Peeler, Nelson, Bumpass, and Sassine (2009) found similar differences in on observational study of parent-child reading: middle-income mothers engaged in more teaching behaviors than low-income mothers, including furthering the child's understanding of the activity or general knowledge, asking questions, and sharing information. The groups were similar on other measures, such as connecting the book to children's personal experiences, and no SES differences in teaching behavior emerged in a play interaction.

Thus, parents from high- and low-SES backgrounds may be equally engaging when sharing books with their child (Vandermaas-Peeler et al., 2009) and value reading as important for child development (Sonnenschein, Metzger, & Thompson, 2016). However, those with higher SES may view book sharing interactions as a form of teaching, even those involving wordless picture books such as the one used in our study. Although sharing a picture book and reading differ from one another, parents engage in many of the same behaviors during book sharing that they do while reading (e.g., asking questions, providing descriptions and facts, linking the stimuli to the child's life, and elaborating on themes; Ensor & Hughes, 2008; Ruffman et al., 2002; Sénéchal, Cornell, & Broda, 1995; Zevenbergen & Whitehurst, 2003), suggesting they may view these activities similarly.

Treating book sharing as a teaching opportunity has implications for the use of cognition talk specifically. Cognition terms can be used to elicit and provide knowledge and information (e.g., "What do you think she is doing?" "Do you remember what that's called?") in ways that other categories of mental-state terms such as emotion or desire cannot. If higher-educated parents perceived the picture-book task as a teaching context to a greater degree than lower-educated parents, this could have resulted in their greater use of cognition terms on this task.

Unlike their parents, children did not exhibit an increase in cognition talk in the picture-book task relative to the play task. This is consistent with the idea that parents, but not children, assumed a teaching role in the picture-book task, resulting in an increase in cognition terms for the former but not the latter. However, we offer this suggestion tentatively because the model for children's cognition talk did not reveal any significant effects (only marginal interactions) and children exhibited fairly low levels of cognition talk overall. Children of this age are just beginning to use cognition terms and their tendency to do so increases over the preschool years (Bartsch & Wellman, 1995; Taumoepeau & Ruffman, 2008, 2016; Shatz et al., 1983). It is possible that interactions of context and education would emerge in children's cognition talk if these relationships were examined at later ages.

Differences in how parents perceived the picture-book task could also explain the three-way interaction of context, education, and ethnicity that emerged for parent and child desire language. Unlike parents in other groups, who used more desire talk in the play than the picture-book task, parents in lower-educated Hispanic dyads used similar amounts of desire language in the two tasks. Examination of the transcripts suggested that the lower-educated Hispanic parents treated the picture-book as a cooperative activity, like the play task, and therefore used a greater number of desire terms to facilitate their children's engagement and participation (e.g., "Want to look at the ducks?" "Which one would you want?"). This in turn elicited higher levels of desire terms from their children (e.g., "I want that bunny."). The lower-educated Hispanic parents' inclusion of the child as an active participant in both tasks is consistent with prior evidence that Hispanic parents emphasize interactivity and cooperation during home literacy activities (Perry, Kay, & Brown, 2008) and play (Leaper, 2000) and they support children's active contributions to shared reminiscing (Melzi et al., 2011). These behaviors likely reflect the value that Hispanic families place on reciprocity, collaboration, and connection within the family (Cauce & Domenech-Rodriguez, 2002; Cervantes, 2002; Grau et al., 2009; Rivera & Dunsmore, 2011). It is possible that this pattern was specific to the lower-educated Hispanic parents because they were less acculturated to mainstream American values than the higher-educated Hispanic parents (Guinn, Vincent, Wang, & Villas, 2011) and hence their language use during the interactions was more aligned with traditional cultural values. This would be consistent with some prior evidence that Mexican American mothers' speech to their children varies as a function of their immigration status (Cervantes, 2002) and levels of acculturation and enculturation (Rivera & Dunsmore, 2011). Unfortunately, we did not collect information regarding parents' immigration status, acculturation, or enculturation, so we are unable to test this possibility directly.

The reason for the three-way interaction we observed for children's emotion language is somewhat less clear. Specifically, children in lower-educated Hispanic dyads did not exhibit a task difference in their use of emotion language, and they used significantly less emotion language in the picture-book task than children in higher-educated Hispanic dyads. The latter effect is somewhat consistent with Eisenberg's (1999) finding that middle-class 4-year-olds referred to emotions more often than working-class 4-year-olds did. However, in Eisenberg's study, this SES effect did not interact with children's ethnicity, and it is thus unclear why we only observed reduced levels of emotion language for the children in the lower-educated Hispanic group. One possibility is that this effect is related to the increased emphasis on and use of desire terms by parents and children in lower-educated Hispanic dyads, with children in these dyads focusing more on their desires than on emotions. Additional research with socioeconomically and ethnically diverse samples of children is needed to address this possibility.

In addition to the context effects reviewed above, our results also revealed several effects of parental education on parents' mental-state talk. Higher-educated parents produced more mental-state talk than lower-educated parents, and this effect was carried by cognition talk: although higher-educated parents produced more cognition talk than lower-educated parents, this difference did not emerge for emotion or desire talk. In the Introduction, we outlined three possibilities for the relation between SES and mental-state language: SES could be positively associated with mental-state language, unrelated to mental-state language, or associated with some categories of mental-state language but not others. Our finding that parental education was more strongly related to the quantity of parent cognition language than emotion or desire language is most consistent with the third possibility. This finding is also broadly consistent with Degotardi and Torr's (2007) finding that parental education was more strongly related to mothers' belief mental-state talk than their non-belief mental-state talk. However, our results suggest that the relationship between SES and mental-state language is even more complex. In addition to parental education being differentially associated with different types of mental-state talk, the relation varied as a function of context, with higher-educated parents emphasizing cognition language more when engaged in book sharing.

Our results also showed an interaction of parental education and ethnicity for parents' cognition talk. The difference between higher-educated and lower-educated parents in the amount of cognition talk was larger for non-Hispanic dyads than it was for Hispanic dyads, and higher-educated non-Hispanic parents produced more cognition talk than higher-educated Hispanic parents. These findings are consistent with those from Chang and colleagues (2017), who found that non-Hispanic White parents in the United States used more cognition language than Hispanic parents in Chile. Although Chang et al. (2017) collected data on parental education, this variable was only used as a covariate in their analyses, so it is unclear whether the ethnicity effect they observed varied with parental education, as we found here.

Given prior evidence that children's exposure to and use of cognition talk is positively correlated with their false-belief understanding (e.g., Adrian et al., 2005; Ensor & Hughes, 2008; Ruffman et al., 2002), one might wonder whether the parental education and ethnicity differences we observed in parent cognition talk could result in delayed socio-cognitive development in some populations. We believe this conclusion would be premature for two reasons. First, the parental education difference that we found in cognition talk was greater in the picture-book task than in the play task. This context difference suggests that exposure to and use of cognition language might not necessarily be globally lower for children from low-SES backgrounds. Instead, differences in cognition talk might be context specific, with children from low-SES backgrounds hearing and using similar levels of cognition talk, or perhaps more cognition talk, in contexts other than book sharing.

Second, the link between cognition talk and false-belief understanding comes from research that has focused primarily on middle- and high-SES White families. Ongoing work with low-SES Hispanic families suggests that although these mothers used little cognition language with their 30-month-olds, they did produce emotion language, and it was their use emotion talk that predicted their children's performance on a false-belief task (Roby et al., 2020). This suggests that different types of talk might support children's social-cognitive abilities in families from different socioeconomic and ethnic backgrounds. In our study, parents' use of cognition terms varied with parental education and ethnicity, but their use of emotion terms did not. This is consistent with prior work showing that Hispanic American parents emphasize emotion language during parent-child interactions (Flannagan & Perese, 1998; Luo et al., 2014) and that working class parents and their toddlers use more emotion language during co-narration than middle-class parent-child dyads

do (Burger & Miller, 1999; Miller et al., 2005). Together with our findings, these results support the hypothesis that Hispanic American households and lower-SES homes may be rich in specific subtypes of mental-state language, which could support the development of children's social cognition skills.

Thus, rather than suggesting a potential deficit in some families, we believe our results point to a need for greater consideration of the context in which discussions of mental states occur (see also Ilgaz & Allen, 2020). Our findings demonstrate that parents and children adjust how they use mental-state language in different settings in ways that interact with their socioeconomic and ethnic background. This finding has both theoretical and methodological implications. From a theoretical perspective, effects of parental education were more evident in the picture-book task than the play task, and these effects varied across sub-types of mental-state talk and ethnic groups. Our study thus suggests that the mixed findings in the literature regarding the relationship between SES and mental-state language likely stem in part from the inconsistencies in the task context used to elicit mental-state talk, the type of mental-state talk coded, and the consideration of participants' racial and ethnic background, and thus greater attention should be paid to these factors in future work. Moreover, our findings suggest that further research is needed to understand which parent-child interactions are most supportive of socio-cognitive development and whether this varies across populations. Methodologically, different contexts might yield different estimates of mental-state talk for parents and children of different backgrounds. Researchers need to be conscious of this when deciding how to measure parent and child language, and caution should be used when generalizing from a particular sample or interaction context.

These findings also have implications for interventions that seek to support parent-child interactions and children's social-cognitive development. In particular, if parents from different socioeconomic or ethnic backgrounds perceive different kinds of interactions as serving different socialization goals, then this should be considered when tailoring and optimizing interventions for particular populations. For instance, consider an intervention seeking to foster children's early social-cognitive development by supporting parent-child mental-state language use in low-SES Hispanic families. Supporting these parents' natural tendency to use emotion language during book sharing might have greater impact than focusing on other contexts, such as play, or other categories of mental-state language, such as cognition terms. This conclusion is well-aligned with strength-based and culturally-aligned intervention strategies (Dawson-McClure, Calzada, & Brotman, 2017; Powell, Batsche, Ferro, Fox, & Dunlap, 1997), which acknowledge and respect the capacities, skills, and cultural values of those served. Overall, our findings suggest that a 'one size fits all' implementation of interventions targeting mental-state language among socioeconomically and ethnically diverse families are not likely to be effective.

5.1. Child-directed speech

Although the primary focus of the present study was on parent and child mental-state language, we also examined whether parental education, ethnicity or context was related to the overall amount of talk that parents and children produced. Unexpectedly, we found that there was not a main effect of parent education on the number of utterances that parents or children used in the tasks. These findings are inconsistent with prior evidence that children from lower-SES homes hear less child-directed speech than higher-SES children (Hart & Risley, 1995; Schwab & Lew-Williams, 2016).

This departure from prior findings could be because the sample in the current study was diverse not only socioeconomically, but also ethnically. Indeed, we found that the amount of talk parents produced varied as a function of their ethnicity and the interaction context: Hispanic parents talked more than non-Hispanic parents in the play task, but the two groups did not differ in the book task. These findings are consistent with a large body of work showing cultural diversity in numerous aspects of parent-child interactions, including the amount and content of child directed-speech as well as other non-verbal aspects of communication and interaction style (e.g., Brown & Gaskins, 2014; Escobar et al., 2017; Melzi et al., 2011). They also complement recent evidence that the relationship between SES and the number of words parents produced in the home varied across different ethnic groups (Sperry et al., 2019). Together, these findings point to the importance of considering race, ethnicity, and culture when examining the relation between SES and child-directed speech.

5.2. Limitations and future directions

As noted above, one limitation of this work is that we did not collect detailed information regarding the background of the Hispanic participants. For instance, we did not have access to information regarding parents' immigration status, country of origin, length of time living in the United States, or levels of enculturation and acculturation, all of which are likely to affect parents' language use (Rivera & Dunsmore, 2011). If we had collected this information, it could potentially have clarified the cause of ethnic differences we found for parents' cognition and desire language. We also were not able to examine potential racial differences within the ethnic groups due to insufficient power. However, the lack of this information makes the ethnic differences we did find even more notable because each of these factors likely increased variability within the Hispanic dyads. Future research with Hispanic American families that includes more detailed measures of parents' cultural background and beliefs could help to shed light on within-group variability in the use of mental-state language.

A second limitation is that we did not have additional measures of SES such as family income or parent occupational level. As discussed in the Introduction, we chose to focus on parental education because this is the measure most commonly used in studies on parent mental-state language and it has been argued to be the most predictive of parents' speech (Hoff, 2003; Mercy & Steelman, 1982; Willms, 1999). However, others argue that different components of SES represent distinct constructs with unique linkages to parenting and child outcomes and therefore they should not be used interchangeably (Duncan & Magnuson, 2003). Parental education and family income might have different implications for children's everyday lived experiences, and the influence of these factors might

differ across racial and ethnic groups (e.g., Henry, Betancur Cortés, & Votruba-Drzal, 2020). In line with this perspective, some studies have shown that the relation between SES and parenting behaviors varies across different measures of SES (Davis-Kean, 2005). For instance, Davis-Kean (2005) found that parental education and family income showed similar correlations with some observed parenting behaviors such as warmth and expressing positive feelings to the child, but the two variables were differently related to the frequency of parent-reported child behaviors such as children's reading for enjoyment and parent-child interactions such as playing with arts and crafts materials. There is thus a need for further research that examines potential relationships between SES and parent and child mental-state language using a broader array of SES indicators.

Third, although a power analysis suggested that our current sample size was sufficient, it is still possible we would have observed additional significant effects with a larger sample size. In particular, as noted above, the analysis of children's cognition talk revealed only marginal interactions, and it is possible that some of these effects would be significant in a larger sample. Despite this potential limitation, we believe our study provides an important first step in examining how socioeconomic status, ethnicity, and interaction context together influence parent and child mental-state language, and we hope our findings lead to future work examining these issues with larger samples.

Findings from the current study also raise several questions for future research. First, our study examined the types of mental-state terms that parents and children used, but not whose mental state they referred to. Prior research has shown that referent of parents' mental-state language varies with their children's age (Adrián et al., 2007; Symons et al., 2006; Taumoepeau & Ruffman, 2006, 2008), and it has been suggested that these age-related shifts in referent are important for scaffolding children's social-cognitive development (Taumoepeau & Ruffman, 2006, 2008). However, less work has examined whether the referent of parent or child mental-state talk varies as a function of SES, ethnicity, or interaction context. One recent study by Taumoepeau and colleagues (2019) found that mothers in New Zealand referred more to their child's mental states than Iranian mothers did, and Iranian mothers referred more to the mental states of others (i.e. not the parent or the child) than New Zealand mothers did. These findings raise the possibility that in addition to the differences we found in the quantity and types of mental-state terms that parents and children use, the referent of those mental-state terms might also vary across socioeconomic and ethnic backgrounds and interaction contexts. Moreover, Taumoepeau et al. (2019) also found that in New Zealand, mothers' talk about their child's mental states predicted children's performance on a set of theory of mind tasks, whereas in Iran mothers' talk about other's mental states was correlated with their children's performance. Together with the current findings, these results suggest a need for further research examining the particular interaction contexts, types of mental-state terms, and mental-state referents that support social-cognitive development in children from different backgrounds.

A second, related question is how the conversational function of mental-state utterances varies across contexts and socioeconomic and ethnic backgrounds. Prior work on narration has shown socioeconomic, racial, and ethnic differences in how mothers participate in conversations with their child, such as whether mothers' utterances served to question, explain, interrupt, edit, elaborate, or evaluate (Burger & Miller, 1999; Cheatham & Jimenez-Silva, 2011; Melzi, 2000; Taumoepeau et al., 2019). Toddlers' from low-income backgrounds have also been shown to provide more elaborate and expressive narrations of past events than children from higher-income backgrounds (Miller et al., 2005). Thus, family background and interaction context might impact not only the quantity of mental-state terms but also how those mental-state terms are used. This in turn could have implications for children's social-cognitive development. More specifically, some conversational functions might provide opportunities for richer discussion of mental states (e.g., elaborations, evaluations), whereas others might be more likely to include mental-state terms that direct attention or control behavior (e.g., commands, interruptions). These differences could result in different experiences in children's exposure to mental-state language and its potential to scaffold their understanding of others mental states. Future research should include a more in-depth examination of the function of parents' and children's mental-state terms, and whether there are any socioeconomic, ethnic, or context differences in how mental-state terms are used.

5.3. Concluding remarks

The present study is the first to simultaneously examine the impact of parental education, ethnicity, and interaction context on both parent and child mental-state language, as well as the first study to explore potential differences between Hispanic and non-Hispanic American parent-child dyads on broad measures of mental-state language use. Our results suggest that the language used in interactions between parents and their 3-year-olds is affected by a complex interplay of these three factors. Together with other prior findings (Degotardi & Torr, 2007; Eisenberg, 1999; Hoff-Ginsberg, 1991), these results suggest that multiple factors impact the mental-state language used in parent-child interactions and thus future research on mental-state language should be conducted with socioeconomically and ethnically diverse samples tested in multiple interactive contexts.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.cogdev.2022.101169.

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