

Personal Narrative as a “Breeding Ground” for Higher-Order Thinking Talk in Early Parent–Child Interactions

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Personal narrative is decontextualized talk where individuals recount stories of personal experience about past or future events. As an everyday discursive speech type, narrative potentially invites parents and children to explicitly link together, generalize from, and make inferences about representations—that is, to engage in higher-order thinking talk (HOTT). Here we ask whether narratives in early parent–child interactions include proportionally more HOTT than other forms of everyday home language. Sixty-four children (31 girls; 36 White, 14 Black, 8 Hispanic, 6 mixed/other race) and their primary caregiver(s) ($M_{\text{income}} = \$61,000$) were recorded in 90-minute spontaneous home interactions every 4 months from 14–58 months. Speech was transcribed and coded for narrative and HOTT. We found that parents at all visits and children after 38 months used more HOTT in narrative than non-narrative, and more HOTT than expected by chance. At 38 and 50 months, we examined HOTT in a related but distinct form of decontextualized talk—pretend, or talk during imaginary episodes of interaction—as a control to test whether other forms of decontextualized talk also relate to HOTT. While pretend contained more HOTT than other (non-narrative/non-pretend) talk, it generally contained less HOTT than narrative. Additionally, unlike HOTT during narrative, the amount of HOTT during pretend did not exceed the amount expected by chance, suggesting narrative serves as a particularly rich “breeding ground” for HOTT in parent–child interactions. These findings provide insight into the nature of narrative discourse, and suggest narrative potentially may be used as a lever to increase children’s higher-order thinking.

Keywords: personal narrative, higher-order thinking, pretend, language socialization, naturalistic observation

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A wide body of research implicates the language interactions children have in the early home environment as a source of individual variation in their later academic outcomes. Much of the

previous research on children’s early language environments has focused on support for vocabulary and other linguistic skills (e.g., Hart & Risley, 1995; Huttenlocher et al., 1991; Rowe & Goldin-Meadow, 2009). However, in order to succeed in school, children also need to know how to use language to link ideas together and support complex thought. In other words, they must be able to use their language for *higher-order thinking*.

Higher-order thinking is the cognitive capacity to make inferences and generalizations, use classifications and taxonomies, and broadly go beyond the information given (Bruner, 1973; Resnick, 1987). Higher-order thinking has been increasingly recognized as crucial for academic and employment success in the 21st century (Koenig, 2015; National Research Council, 2012). Previous research suggests that early participation in talk about and with relations—*higher-order thinking talk*, or HOTT—can help prepare children for the kinds of higher-order thinking skills they are expected to use in school (Frausel et al., 2020). Understanding the contexts in which HOTT is routinely used by parents and children may help us understand how to support the development of higher-order thinking skills, and how to decrease disparities in these skills and academic outcomes.

In this article, we ask whether parents and children are particularly likely to use HOTT in their personal narratives. For comparison, we also examine HOTT in a similar but distinct form of talk, *pretend*, to

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clarify the aspects of everyday talk that encourage parents and children to use HOTT, and to determine whether other forms of decontextualized discourse are equally likely to support HOTT. Personal narrative and pretend share many theoretical similarities in that both require speakers to use their imagination and memory to think about ideas outside the present context. However, narrative and pretend potentially differ in their affordances for higher-order thinking, particularly regarding their relation to the speaker's environment. In this study, we examine rates of HOTT use in narrative and non-narrative contexts in spontaneous parent-child interactions, recorded every 4 months between 14 and 58 months. At 38 and 50 months, we also examine HOTT use in pretend. These analyses offer an in-depth understanding of the conditions under which HOTT is used by parents and children in everyday home environments.

Importance of Decontextualized Talk in Early Parent-Child Interactions

To clarify our definitions, we focus specifically on personal narrative, operationalized as talk in which individuals recount true stories of personal experience about past, future, or recurring events. Our control, pretend, is operationalized as talk during imaginary episodes of interaction (e.g., Demir et al., 2015; Rowe, 2012). Narrative and pretend are both often positioned in the literature as types of *decontextualized talk*, or talk that is not grounded in the present or immediate context (Rowe, 2013; Snow & Ninio, 1986; Tabors et al., 2001). Personal narrative is decontextualized because it involves describing internal representations of events—memories of past events, plans for the future, or generalized routines—rather than the current or present context, and has been implicated in the development of children's memories (Valentino et al., 2014). Pretend is decontextualized because it treats the current environment in a nonliteral way (e.g., by pretending a banana is a phone).

Our focus here is on narrative. We use pretend as an important comparative context, and we acknowledge that other types of decontextualized talk (including book reading; see Demir-Lira et al., 2019) are also argued to be vital for children's later language abilities and academic achievement.

Prior research has demonstrated that early exposure to and participation in decontextualized talk matters for children's later cognitive and linguistic outcomes (Demir et al., 2015; Dickinson & Tabors, 2001; Rowe, 2012). Importantly, children's use of decontextualized talk is fostered by their communicative experiences with caregivers (e.g., Haden et al., 1997; Haight & Miller, 1993; Reese et al., 2010); although early in development, most of the talk that children hear and produce is contextualized; that is, focused on persons, objects, or events in the present environment (Rowe, 2012). However, decontextualized talk—as when speakers discuss personal experiences about the past or future, or treat the environment in a nonliteral way through pretend play—requires speakers to create meaning through language itself, rather than rely on non-verbal cues and the present environment to convey meaning.

There are at least two hypotheses to explain why decontextualized talk matters for children's later academic skills. First, decontextualized talk could serve as a precursor to *academic language* (Uccelli et al., 2019). Academic language is the language of instruction used in formal education settings (Cummins, 1983; Snow, 2010; Snow & Uccelli, 2009); understanding and producing the more formal register of academic language can be challenging

if children have little or no exposure to talking and thinking about ideas removed from the present context.

Second, decontextualized talk might promote *emergent literacy*, the development of literacy-related skills before formal reading instruction (e.g., Curenton et al., 2008; Dickinson & Snow, 1987; Snow & Ninio, 1986). Certain features of decontextualized language make it ideal for facilitating emergent literacy skills, including its lexical and syntactic complexity relative to more contextualized talk (Demir et al., 2015); and much research supports the idea that decontextualized language skills relate to later literacy (Cummins, 1983; Snow, 1983, 1991; Snow et al., 1991).

We suggest a third possibility—that early decontextualized talk might also matter for children's later academic outcomes because it naturally affords the opportunity to engage in generalizable and relational higher-order thinking skills, such as inference and comparison. Personal narrative may be a particularly strong context for HOTT, and it may differ not only from non-narrative talk, but also other forms of decontextualized talk, such as pretend. In the following sections, we compare narrative and pretend by highlighting four affordances of these decontextualized types of talk to explain why they might encourage families to invoke HOTT—their story-like structure, their relative salience, their very status as decontextualized, and their ability to promote metacognition. We clarify why these affordances might encourage HOTT use, and note differences between the ways the affordances are known to manifest in narrative versus pretend, leading us to predict different likelihoods of HOTT.

Affordances of Narrative for Encouraging Higher-Order Thinking Talk

Story-Like Structure

Both narrative and pretend are structured into story-like forms, and are examples of extended discourse (Tabors et al., 2001). In spontaneous talk, narrative and pretend both generally occur in long strings of interconnected utterances, and both involve, to some extent, the use of story. “Good” stories, whether about a person's personal experiences or make-believe, require the storyteller to coherently link story elements to a cause-and-effect framework (Stein & Albro, 1997). In effect, they require the storyteller to use higher-order thinking to describe relationships between representations.

But young children do not yet produce reliably good, coherent stories and, as a result, their narrative and pretend utterances do not necessarily contain HOTT. Importantly, narratives tend to be more organized and structured than pretend play at ages 4–5, simply because “plotted” narratives take place more frequently in storytelling contexts than in play contexts (Benson, 1993). We theorize that the push toward grounding narratives in stories may encourage children to produce more instances of HOTT in narrative than in pretend.

Relative Salience

Personal narrative and pretend are also both relatively salient and relevant to the self, compared to other kinds of talk, although personal narrative is, by definition, even more personally salient than pretend. For example, parents in informal conversation with their children at museums have been shown to enhance their

children's comprehension of scientific concepts by drawing comparisons between their children's past experiences and the concepts they are discussing (Valle & Callanan, 2006); this is comparable to effects shown in the cognitive self-referencing literature (Burnkrant & Unnava, 1995).

However, make-believe pretend is also salient. Empirical research demonstrates that embedding abstract concepts into fictional storytelling contexts can facilitate learning these concepts (Casey et al., 2008; Leech et al., 2020). Similarly, providing children with mathematics problems that are more story-driven and relevant can increase performance (Gerofsky, 1996). When logical syllogisms are embedded into fantasy contexts (e.g., "Dogs live in trees. Rex is a dog. Does Rex live in a tree?"), as opposed to realistic settings, children generally perform better (Dias & Harris, 1988, 1990; Hawkins et al., 1984; Kuczaj, 1981; Richards & Sanderson, 1999). Fantasy is thought to encourage children to more carefully consider the premises (Harris & Leever, 2000).

People may be more motivated to do more complex thinking when the topic is more relevant, interesting, or salient to them. Consequently, parents and children may be motivated to incorporate HOTT into both narrative and pretend talk, because both types of talk are particularly salient in early childhood. However, because personal narrative concerns the self, we posit that narrative may be *more* salient or self-relevant than pretend, potentially resulting in more HOTT use in narrative relative to pretend.

Removed From "Here-and-Now"

Both narrative and pretend are decontextualized, meaning they frequently refer to times and places removed from the present communicative context, sometimes described as the *there-and-then* rather than the *here-and-now* (Demir et al., 2015). Using decontextualized talk to communicate means that speakers cannot rely as much on present environmental cues to scaffold their language, and relationships between representations may be less explicit in decontextualized talk than in contextualized talk. To compensate, speakers may be forced to use more precise syntactic markings, or more specific language, to indicate the exact nature of events (Curenton & Justice, 2004).

At the same time, narrative and pretend differ in the extent to which they are divorced from the communicative context. Narrative refers to displaced actions or events that either happened in the past or will happen at some point in the future. In contrast, pretend draws upon familiar features of the surrounding context, but treats the current environment in a nonliteral way; in other words, pretend is decontextualized by creating a new contextualization. Participants may use objects in the environment in new ways (e.g., using a leaf as a boat), but they are still interacting with objects in their present space. As a result, pretend may rely on the here-and-now more than narrative does (although it is a nonliteral here-and-now). Because narrative relies on the there-and-then more than pretend does, we theorize that narrative may contain more HOTT.

Promote Metacognition

Finally, both narrative and pretend make use of metacognitive skills. Metacognition, the act of thinking about one's cognition (Kitchner, 1983), lies at the heart of problem-solving and higher-order thinking skills (Brown & Campione, 1978); and programs

seeking to enhance students' higher-order thinking skills often include metacognition as a significant component (e.g., Nickerson et al., 1985; Zohar & Dori, 2003). When children engage in narrative talk about the past or future, they are encouraged to make explicit their cognition as they reflect, predict, question, hypothesize, build awareness, identify goals, and anticipate consequences and reactions—all of which involve higher-level thinking and problem-solving skills (National Research Council, 2012). Furthermore, metacognitive reflection on these processes consolidates knowledge, enabling thinkers to generalize to other situations (Epstein, 2003).

Pretend also relates to metacognition (Whitebread, 2010). When individuals engage in pretend, they often take on another role or persona, and use perspective-taking skills to imagine another's thoughts and feelings, skills central to both metacognition and theory of mind (Bergen, 2002; Leslie, 1987; Whitebread & O'Sullivan, 2012). In this way, children engaging in pretend are practicing the metacognitive skills that are crucial for higher-order thinking, much as narrative promotes these same skills.

The reliance of narrative and pretend on metacognition could invite parents and children to use HOTT. However, narrative supports story-like structure, salience, and decontextualization more than pretend does. We therefore predict that narrative is likely to contain more HOTT than pretend. At the same time, pretend may contain more HOTT than other talk (i.e., non-narrative and non-pretend talk), because other talk is more likely to be less story-driven, less salient, less reliant on metacognition, and more contextualized.

The Current Study

Previous research has found that the rate at which children use, grow, and change in HOTT across development predicts academic achievement for children, including text-based inferencing and analogical reasoning (Frausel et al., 2020). In this article, we expand on these prior findings and examine the particular talk contexts in which parents and children invoke HOTT. We ask whether decontextualized talk such as personal narrative and pretend contain proportionally more HOTT than baseline, and whether these proportions change across development. Our specific research questions are: (a) How frequently do parents and children incorporate HOTT into personal narrative, compared to non-narrative talk, and does this frequency change over development? (b) How frequently do parents and children incorporate HOTT into pretend at 38 and 50 months, and does this pattern differ from personal narrative or other non-narrative and non-pretend talk?

Method

Participants

This study was approved by the Institutional Review Board (IRB) at the University of Chicago (Environmental Variation and Language Growth, Protocol Number 02-942). All parents provided written consent for their and their child's participation.

Participants were 64 typically developing, monolingual English-acquiring children and their primary caregiver(s), who were taking part in a longitudinal study of language development (Goldin-Meadow et al., 2014). Families were recruited to represent the

demographic and racial/ethnic diversity characteristic of the Chicago area, as reported on the 2000 U.S. Census. The sample includes 31 girls and 33 boys (36 first-born or only children). The participants are racially and ethnically diverse, including 36 White non-Hispanic, eight White Hispanic or Latino/a, 14 Black/African American, and six children of mixed/other race. At the beginning of the study period, five families reported incomes of less than \$15,000; 13 had incomes between \$15,000 and \$34,999; eight had incomes between \$35,000 and \$49,999; 13 had incomes between \$50,000 and \$74,999; 11 had incomes between \$75,000 and \$99,999, and 14 reported incomes greater than \$100,000. Using the midpoint of each income category as an estimate for each family's income, the sample had a mean income of \$61,000 ($SD = \$32,000$).

Procedure

Children were videotaped by an experimenter (using a video camera with mini-DV tapes) interacting spontaneously with their primary caregiver(s) during 90-minute home visits recorded every 4 months from 14 months to 58 months. Recording took place between 2002 and 2007. During these home visits, experimenters were instructed not to interact with the families, and no guidance was given to families about what activities to engage in. Parents and children were instructed to behave as they normally would, so the videos capture typical, every day, spontaneous parent-child interactions, such as playing with toys, preparing and having meals, putting together puzzles, playing board games, and watching TV, as well as moments of noninteraction when children play by themselves.

Not all families completed every visit; on average, families completed 11.3 sessions ($SD = 1.8$ sessions, range 4–12 sessions). Out of a possible 768 session visits (64 subjects \times 12 visits), a total of 726 visits were completed; that is, only 5.5% of visits were missing. Of the 64 participants, all have at least four visits, and 50 have all 12 visits. Using binomial logistic regression, we tested whether any demographic covariates (child gender, child first-born status, child race/ethnicity, family income, and parent education) predicted likelihood of missing at least one visit. We found that, after controlling for other covariates, Black families were more likely than White non-Hispanic families to have at least one missing visit ($\beta = 1.82$, $SE_{\beta} = .83$, $p = .04$, $OR = 6.19$), which limits our ability to draw conclusions about ethnic/racial differences, although that is not a focus of this article.

Transcribing and Coding Spontaneous Interactions

After digitizing mini-DV tapes, all talk from the focal child was transcribed into an Excel template. All child-directed talk from the primary caregiver(s) was transcribed, including all talk directed to the focal child, as well as talk directed to siblings or other children living in the home under age 13. Talk was divided into *utterances*, defined as any sequence of words preceded or followed by a pause, change in conversational turn, or change in intonational pattern; a total of 1,015,569 utterances were transcribed ($n = 646,685$ for primary caregivers and $n = 368,884$ for children). Reliability was established by having a second coder transcribe 20% of videos. Reliability was assessed at the utterance level and was achieved when the coders agreed on 95% of transcription decisions.

Although reading verbatim text from picture and chapter books was initially transcribed and included in the transcripts of spontaneous interactions, these utterances ($n = 11,370$ for primary caregivers and $n = 375$ for children) were removed from analyses so that we could focus on parents' and children's use of spontaneous language. Utterances that were elicited in book-reading interactions, but were not verbatim reading of text (e.g., labeling or describing pictures; see Demir-Lira et al., 2019), were retained in analyses. Some of these utterances were coded as personal narrative (what Demir-Lira et al., 2019, called *extending the topic*, e.g., "Do you remember the last time we went to the zoo?"). Other utterances elicited by book-reading activities were coded as non-narrative (e.g., "What color is that?" "What do you think will happen next?"). In the present analyses, we make no distinction between utterances that took place during book-reading interactions and those that did not.

The unit of analysis for all coding was the utterance. Each utterance was coded along two independent and orthogonal dimensions: the context of the talk in which the utterance appeared (narrative or pretend), and whether the utterance contained higher-order thinking talk. Each is defined in more detail below.

Context of Talk

Each utterance produced by parents and children at all 12 age points was coded as being part of a narrative or not. This code was designed to allow us to answer our primary research question—does narrative facilitate HOTT? We compare the proportion of utterances that displayed HOTT in narrative versus non-narrative talk. Our second research question was—does narrative facilitate HOTT over and above other types of decontextualized talk? To address this question, we coded all utterances produced at two visits for pretend. The two visits selected for this secondary analysis were 38 and 50 months; this choice was informed by the results of the first analyses (to be described in more detail below) and due to the prominence of pretend at these ages (Haight & Miller, 1993). At these two visits, we compared rates of HOTT in three types of talk: narrative, pretend, and (as a baseline) other (i.e., any utterance not coded as either narrative or pretend).

Personal Narrative Coding. Personal narrative was operationalized as language used to recount stories of personal experience about past, future, or habitual recurring events. In order to count as a personal narrative, the utterance had to contain an action or event that was associated with orienting information, either a spatial location (e.g., "at school") or time (e.g., "last Christmas"). In order to capture descriptions of events that were removed from the here-and-now, we considered an event to be in the past or future if it was at least a few hours away from the time of the utterance (e.g., Shin et al., 2020). Narratives could be about the child, members of the child's family, other people in the child's life (e.g., neighbors/friends), or other people known to the teller of the narrative. See Table 1 for example personal narrative utterances.

We coded all parent and child utterances between 14 and 58 months for personal narrative using the written transcripts. One hundred and three transcripts (which represents 14.2% of the 726 transcripts in the corpus) were coded by two or more people for reliability. Pooling together each pair of coder's reliability transcripts, average interrater percent agreement for identification of utterances as narrative or not was 97.6% (range: 95.6–99.2%;

Table 1
Definitions and Examples of Narrative and Pretend Utterances

Talk context	Definition	Example utterances
Narrative	Language used to recount stories of personal experience about the past, future, or recurring events	Remember when we got those cars on our vacation? Did you have fun yesterday at Ben's house? We're going to take the choo-choo next summer when we go to California. Mom is going to go to the foot doctor tomorrow.
Pretend	Language during imaginary episodes of interaction including making an object represent another; attributing actions, thoughts, or feelings to inanimate objects; and assuming a role or persona	Do I have to pay you money now for cutting my hair? Can you roar really loud? You're going to be the evil witch. This pillow is a magic carpet!

average Cohen's $\kappa = .73$; range .63–.83). Disagreements were resolved through discussion or by the more experienced coders.

Pretend Coding. Pretend was operationalized as language during imaginary, nonliteral, or imitative episodes of interaction. We took a behavioral approach to symbolic pretend play, and included talk where parents or children used one object to represent or substitute for another; took on the role or persona of another; attributed actions, thoughts, or feelings to inanimate objects; told stories about fictional or made-up characters; and negotiated or communicated about any of the above. Some aspects of construction pretend play were also included if additional details in talk or action were deemed sufficient to "dramatize" the play (e.g., discussing what "the people" in the tower are doing). Games with rules (such as hide-and-seek) were not coded as pretend play. See Table 1 for example pretend utterances.

Pretend was coded only at the 38- and 50-month visits. Because aspects of our coding manual relied on paralinguistic cues such as voicing, as well as other aspects of how parents and children were interacting with their surrounding environment (e.g., holding and moving toys), coding of pretend was done on the written transcripts in conjunction with the video. Twenty-two transcripts (18% of transcripts at these two age points) were coded by two or more coders for reliability. Average interrater percent agreement for identification of utterances as pretend was 94.0% (range 93.4–95.3%; average Cohen's $\kappa = .79$, range .76–.83). Disagreements were resolved through discussion or by the more experienced coders. A small number of utterances ($n = 190$ for parents and $n = 146$ for children) were coded as both narrative and pretend,¹ and were removed from analyses so that narrative and pretend were mutually exclusive.

Higher-Order Thinking Talk Coding

HOTT was broadly operationalized as talk that links ideas and concepts into a more complex framework. Based on literature reviews, as well as data-driven pilot analyses, talk was categorized as HOTT if it explicitly invoked one of four types of higher-order thinking: *inferences*, *comparisons*, *hierarchies*, and *abstractions* (Frausel et al., 2020; see also Holyoak & Morrison, 2012; Markman & Gentner, 2001). These four related skills are relevant to educational application (Halford et al., 2010; Speed, 2010), where HOTT is integral to both formal and informal teaching and learning. Children and parents very likely engaged in other forms of higher-order thinking not represented in their language, and they also very likely used language in complex ways that required

sophisticated thinking not involving higher-order thinking (e.g., using a double negative construction). However, our goal was to explore higher-order thinking expressed in talk, be it in simple or complex constructions. For this reason, our results can be understood as exploring the linguistic context for higher-order thinking talk, not higher-order thinking cognition more broadly.

HOTT was coded when parents and children made statements using HOTT (e.g., "They're laughing because he fell down"), when parents and children asked others to reason using HOTT (e.g., "Why were they laughing?"), and when parents and children responded to HOTT-eliciting questions (e.g., "Because he fell down"). In Table 2, we provide definitions of the four types of HOTT, and present examples of each type occurring in narrative, pretend, and other talk (see Frausel et al., 2020; for additional coding criteria and examples). Because HOTT was relatively infrequent in the overall sample, we collapse across the four HOTT types in all our analyses.

All parent and child utterances from each visit between 14 and 58 months were coded for HOTT using the written transcripts. Ninety-seven transcripts (approximately 8 from each age point), constituting 13.4% of the 726 transcripts, were coded by two or more people for reliability. Average interrater percent agreement for identification of utterances as HOTT was 98.1% (range: 96.0–99.3%; average Cohen's $\kappa = .81$, range .73–.87). Disagreements were resolved through discussion or by the more experienced coders.

Measures

For every parent and child at each of the 12 age points, we calculated the following for each transcript: total number of utterances, total number of narrative and non-narrative utterances, total number of HOTT and non-HOTT utterances, and total number of HOTT utterances occurring in narrative and non-narrative contexts. Using these measures, we calculated the proportion of total utterances, as well as the proportion of narrative and non-narrative utterances, that contained HOTT. At 38 and 50 months, we also calculated total number of pretend utterances; total number of HOTT utterances occurring in pretend and other (i.e., non-narrative and non-pretend) talk contexts; as well as the proportion of pretend and other utterances containing HOTT. Because session lengths varied slightly ($M = 88.6$ minutes long, $SD = 4.8$ minutes,

¹ In these instances, the child's talk met the criteria for narrative, although the events they described were more fantastical and had elements of pretend; for example, "Do witches come in your room at night?"

Table 2*Definitions and Examples of HOTT Utterances in Narrative, Pretend, and Other Talk*

HOTT type	Definition	Example utterances
Inference	Deriving a conclusion not otherwise given by using known or logical premises.	Narrative He put the birds in the bucket so no cats could get to them. Why didn't you take a nap at school today? Pretend I have no power until I find my magic wand. Daddy, get the barbies, or else Swiper will swipe them. Other How come you're getting upset? If you're not going to do it now, then we'll put it away.
Comparison	Demonstrating similarities or differences between entities by analogy or by example.	Narrative When the bee stung me, Grandma said I looked like a monster. One day, you'll go to the same school as your brother. Pretend You're both looking for dinosaurs. Read your book to your baby like Mommy read to you. Other Are you dancing like the teddy bear? These are both pink.
Hierarchy	Using hierarchical taxonomies (pointing to an arrangement of categories with a superordinate/subordinate framework) or paronomies (pointing out the relation between parts and wholes).	Narrative What kind of bird did we have on Thanksgiving? That's part of your Halloween costume from last year. Pretend What kind of icing should we have on our cake? The town got all sorts of disasters. Other Persian is a type of cat. This is the only sort of cookies we have right now.
Abstraction	Pointing out mental frameworks or models that could facilitate thinking; making definitions that attempt to describe the meaning of a word or concept, beyond giving a label.	Narrative We're going to the arboretum, which is where there's trees and plants and flowers. Didn't we discuss yesterday that it's impolite to talk during movies? Pretend A spell is where you put fire everywhere. Regular people can't see invisible people, only invisible people can see other invisible people. Other People go to sleep when the sun goes down. Cows say "moo".

Note. Other and Pretend together constitute non-narrative utterances. HOTT = higher-order thinking talk.

range 44–97 minutes), for some descriptive analyses we transformed raw numbers of utterances to number of utterances per hour.

Results

Findings are presented in two major sections corresponding to our research questions. To answer our first research question, we compared rates of HOTT in narrative and non-narrative talk from 14–58 months, and to answer our second research question, we compared rates of HOTT in narrative, pretend, and all other non-narrative and non-pretend talk at 38 and 50 months.

Use of HOTT and Narrative Across Development

We first present descriptive statistics summarizing the number of HOTT and personal narrative utterances used by parents and children across development, as well as the intersection of HOTT and personal narrative (i.e., HOTT utterances occurring

in narrative). As a baseline, we also report total number of utterances.

Table 3 presents means and standard deviations for each speaker at each session. Not surprisingly, as children developed, they produced an increasing number of utterances per hour; at the same time, the number of utterances produced by parents decreased. Both personal narrative and HOTT were relatively infrequent, but both increased across development. Children used fewer than five HOTT utterances per hour between 14 and 30 months, but by 58 months, they were producing almost 20 HOTT utterances per hour on average. Parents speaking to 14-month-old children used fewer than 15 HOTT utterances per hour, but increased to more than 30 HOTT utterances per hour when addressing children at 58 months. When extrapolated over the course of a child's typical home discourse experiences, these numbers become substantial.

Personal narrative was similar to HOTT in frequency per hour. Parents and children produced fewer than 10 personal narrative

Table 3
Frequency of Different Types of Utterances Produced by Parents and Children per Hour

Child age (months)	Parents					Children				
	<i>N</i>	Total <i>M</i> (<i>SD</i>)	Narrative <i>M</i> (<i>SD</i>)	HOTT <i>M</i> (<i>SD</i>)	HOTT in narrative <i>M</i> (<i>SD</i>)	<i>N</i>	Total <i>M</i> (<i>SD</i>)	Narrative <i>M</i> (<i>SD</i>)	HOTT <i>M</i> (<i>SD</i>)	HOTT in narrative <i>M</i> (<i>SD</i>)
14	64	681.3 (290.3)	6.8 (8.1)	12.8 (8.7)	0.8 (1.4)	64	33.9 (42.4)	0.3 (0.9)	0.3 (1.2)	0.0 (0.0)
18	63	685.7 (298.2)	9.1 (10.1)	13.6 (7.8)	1.1 (1.5)	63	120.2 (103.0)	0.6 (1.9)	0.6 (1.4)	0.0 (0.0)
22	62	657.3 (314.8)	17.6 (22.2)	16.4 (11.6)	1.7 (2.5)	62	240.5 (161.8)	3.8 (7.6)	1.0 (1.9)	0.1 (0.3)
26	61	643.1 (299.7)	24.5 (34.0)	21.7 (16.3)	2.6 (3.4)	61	356.7 (187.2)	9.7 (19.5)	2.2 (5.7)	0.2 (0.6)
30	61	630.2 (278.0)	28.8 (22.4)	26.2 (17.7)	2.6 (2.5)	61	390.1 (166.8)	12.9 (16.8)	4.4 (6.3)	0.2 (0.7)
34	62	573.6 (290.9)	27.6 (31.2)	28.1 (18.4)	2.9 (4.0)	62	439.4 (176.9)	13.4 (16.5)	9.9 (12.6)	0.8 (2.5)
38	61	650.7 (322.0)	28.8 (22.4)	32.7 (20.1)	3.4 (3.2)	61	462.3 (141.1)	16.1 (13.0)	13.9 (11.1)	1.2 (1.7)
42	60	591.7 (317.2)	29.8 (36.5)	31.4 (20.8)	3.5 (4.6)	60	439.2 (167.8)	17.0 (23.0)	15.7 (13.0)	1.6 (3.2)
46	58	545.1 (358.3)	35.3 (42.8)	37.9 (25.8)	5.4 (6.9)	59	446.7 (199.9)	19.3 (19.7)	19.5 (13.4)	2.3 (3.6)
50	58	540.9 (307.7)	33.3 (28.3)	38.3 (28.9)	5.1 (5.3)	59	424.8 (163.1)	22.6 (20.0)	18.8 (14.1)	2.2 (2.3)
54	54	487.9 (309.4)	28.5 (23.9)	36.0 (27.0)	4.6 (5.2)	56	397.7 (170.8)	17.4 (17.0)	20.7 (14.7)	1.7 (2.2)
58	58	452.3 (334.0)	34.0 (31.7)	33.2 (29.9)	4.5 (4.4)	58	403.8 (154.5)	25.3 (21.3)	19.7 (11.0)	2.8 (3.2)

Note. On four occasions (once each at the 46- and 50-month visits and twice at the 54-month visit), the parent did not talk during the 90-minute taping. On these occasions, we analyze only children's talk and record the parent as missing; variability in parent talk to children may therefore be underrepresented. Number of non-narrative utterances may be calculated by subtracting narrative from total utterances, and non-narrative HOTT utterances may be calculated by subtracting HOTT in narrative utterances from HOTT utterances. HOTT = higher-order thinking talk.

utterances per hour at 14 and 18 months. At 58 months, however, parents produced almost 35 personal narrative utterances per hour, and children produced close to 25. As hypothesized, there was some overlap of these utterances, though the numbers are low due to the relative rarity of both HOTT and narrative. By the end of the study period, close to five of parents' HOTT utterances occurred in narrative contexts, and for children, close to three HOTT utterances occurred in narrative contexts.

Onset of HOTT and Narrative Talk

We also calculated the age when children began to regularly engage in narrative talk, their *narrative onset*. Narrative onset was calculated as the first session in which children used narrative utterances in two sessions back-to-back—although for most children, once they started using narrative, they used it in the majority of subsequent sessions. Sixty-one children had a measurable narrative onset (two children dropped out of the study before their narrative onset was established, and one child did not have a narrative onset because he only used narrative in one session). Using the session in which onset occurs as an estimate for children's "true" age of onset, mean age of narrative onset was 26.9 months ($SD = 8.2$ months, range 14–50 months). Given the 4-month gap between observation sessions, we cannot be more precise. However, our data suggest that personal narrative talk emerges sometime between 23 and 27 months. This is in line with and extends a previous longitudinal analysis of five children's language development (although coded differently, Miller & Sperry, 1988), as well as theoretical and empirical studies of autobiographical memory produced in early discourse narratives about the past (Haden et al., 1997; Nelson & Ross, 1980; Peterson & McCabe, 1992).

As reported in other studies (Frausel et al., 2020), children's HOTT onset using these same criteria is 27.0 months. Importantly, this co-occurrence reveals that narrative and HOTT begin to emerge around the same point in development. However, when we examined the age at which children began to regularly incorporate HOTT into their narrative talk—calculated when children used at

least one HOTT utterance in a narrative context in two sessions back-to-back—we found that regular use of HOTT in narrative occurred later in development. Forty-eight children had a measurable HOTT-in-narrative onset using these criteria, and the mean age of onset was 40.6 months ($SD = 7.4$ months, range 22–54 months), approximately a year after they first began using narrative and HOTT talk independently. This finding suggests that these uses were not simply artifacts of parent talk or linguistic constructions of either narrative or HOTT, but rather, that co-occurrence of these language practices was meaningful as an indicator of cognitively rich narratives.

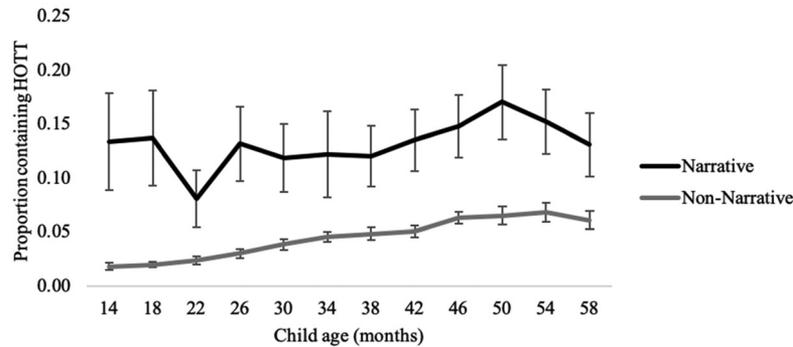
Proportion of Narrative and Non-Narrative Talk Containing HOTT

To answer our first research question, we calculated the frequency with which HOTT was used in narrative and non-narrative contexts. Because parents and children differed in total number of utterances, as well as number of narrative and HOTT utterances, we report the proportion of narrative and non-narrative utterances that contained HOTT. Since the majority of utterances are non-narrative, the proportion of non-narrative utterances containing HOTT is very similar to baseline HOTT rates in talk overall.

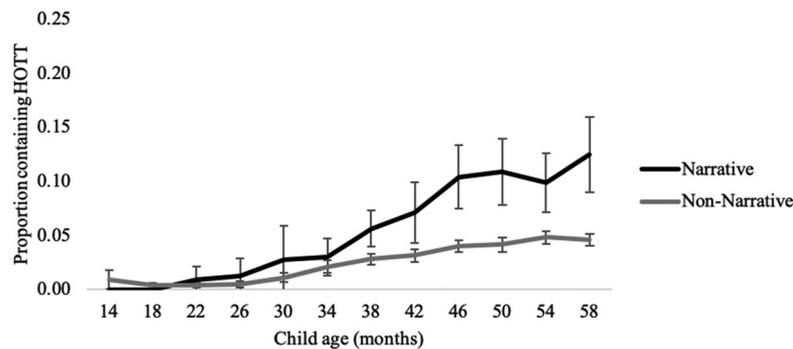
HOTT use in narrative and non-narrative contexts is reported in Figure 1, in panel (a) for parents and panel (b) for children. For parents, a greater proportion of narrative utterances contained HOTT than non-narrative utterances, and this pattern held from 14 to 58 months. At 38 months, for example, 12.0% of parents' narrative utterances contained HOTT, compared to 4.8% of parents' non-narrative utterances. Furthermore, parents' rates of HOTT use in narrative utterances was fairly stable across development (around 10–15%, with more noise earlier in development due to infrequent HOTT and narrative use), whereas rates of HOTT in non-narrative utterances gradually increased. For children, this same pattern—narrative utterances containing proportionally more HOTT than non-narrative utterances—emerged starting at 38 months. Thus, HOTT appears to be a

Figure 1
 Mean Proportion of (a) Parents' and (b) Children's Narrative and Non-Narrative Utterances Containing HOTT

(a) Parents



(b) Children



Note. Error bars $\pm 2 SE$. On eight occasions (1 parent of a 14-month-old; 1 parent of an 18-month-old; 2 parents of 26-month-olds; 1 parent of a 42-month-old; 1 parent of a 50-month-old; and 2 26-month-old children), speakers produced only a single narrative utterance, and that utterance contained HOTT; their proportion of narrative utterances containing HOTT was therefore 100%. These occasions were removed from the figures. HOTT = higher-order thinking talk.

relatively stable feature of adults' narrative talk with children during this period, with children becoming increasingly active after 38 months.

To test these effects statistically, we used a two-level hierarchical linear model (HLM; Raudenbush & Bryk, 2002), with age points at Level 1 nested in individual dyads at Level 2. HLM flexibly allows for missing data at Level 1, and incorporates all participants who have been observed at least once (Raudenbush & Bryk, 2002, p. 199). The outcome ($HOTT_{it}$) is number of HOTT utterances produced for dyad i at time t , using a Poisson distribution (i.e., log-link function, appropriate for low-probability events), and we use total number of utterances ($Utterances_{it}$) as the exposure variable. At Level 1, we include an intercept term (π_{0i}), as well as age in months centered at 38 months (π_{1i} , referred to as *growth*; 38 months was selected because it is the point in development at which children appear to use more HOTT in narrative than non-narrative, see Figure 1). We also included a quadratic term for age (π_{2i} , or *acceleration*) to better

fit the empirical data, and because the inclusion of this term improved model fit ($\chi^2(6) = 984.37, p < .001$). At Level 1, we also include fixed effects of speaker (π_{3i} , with children as the reference category) and narrative² (π_{4i} , with non-narrative as the reference category). The residual e_{it} is the portion of dyad i 's HOTT utterances at age point t not predicted by age, speaker, or narrative status. At Level 2, we include random effects for the intercept (r_{0i}), growth (r_{1i}), acceleration (r_{2i}), speaker (r_{3i}), and narrative (r_{4i}).

In the mixed model, a dyad's number of HOTT utterances relative to total utterances produced is thus predicted by an intercept term (β_{00} , interpreted as children's rate of HOTT in non-narrative talk at 38 months, or when all other predictors are set to 0), differences by linear age (β_{10}), differences by quadratic

² We tested several interactions we theorized to be of interest, including parent by narrative and parent by growth, but found there was too much collinearity among the fixed effect predictors for the model to be estimated.

age (β_{20}), the effect of the parent compared to children (β_{30}), and the effect of narrative compared to non-narrative (β_{40}), as well as random effects (r_{0i} through r_{4i}), which allow these to vary by each dyad.

Level 1 Model.

$$E(HOTT_{ti}|\pi_i) = \lambda_{ti} \times Utterances_{ti}$$

$$\log[\lambda_{ti}] = \eta_{ti}$$

$$\eta_{ti} = \pi_{0i} + \pi_{1i} \times (Age_{ti} - 38) + \pi_{2i} \times (Age_{ti} - 38)^2 + \pi_{3i} \times (Parent_{ti}) + \pi_{4i} \times (Narrative_{ti}) + e_{ti}, e_{ti} \sim N(0, \sigma_i^2)$$

Level 2 Model.

$$\pi_{0i} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

$$\pi_{2i} = \beta_{20} + r_{2i}$$

$$\pi_{3i} = \beta_{30} + r_{3i}$$

$$\pi_{4i} = \beta_{40} + r_{4i}$$

Mixed Model.

$$\eta_{ti} = \beta_{00} + \beta_{10} \times (Age_{ti} - 38) + \beta_{20} \times (Age_{ti} - 38)^2 + \beta_{30} \times Parent_{ti} + \beta_{40} \times Narrative_{ti} + r_{0i} + r_{1i} \times (Age_{ti} - 38) + r_{2i} \times (Age_{ti} - 38)^2 + r_{3i} \times Parent_{ti} + r_{4i} \times Narrative_{ti} + e_{ti}, e_{ti} \sim N(0, \sigma_i^2)$$

Results for the fixed and random effects of the model are reported in Table 4, and critically, suggest that narrative contains proportionally more HOTT than does non-narrative (see estimate for β_{40}). At 38 months, the model predicts parents use HOTT in 11.19% of narrative utterances ($e^{-3.76 + .66 + .91}$) and 4.50% of non-narrative utterances ($e^{-3.76 + .66}$), and children use HOTT in 5.78% of narrative utterances ($e^{-3.76 + .66}$) and 2.33% of non-narrative utterances ($e^{-3.76}$).

Use of HOTT in Narrative, Pretend, and Other Talk at 38 and 50 Months

We have found that personal narrative contained proportionally more HOTT than non-narrative, for parents from child age 14–58 months and for children from 38 months on. However, non-narrative talk is a fairly broad category. To unpack these findings further and to understand whether all decontextualized talk contexts function similarly with regard to HOTT, we examined rates of HOTT use in utterances coded as pretend. To answer our second research question, we examined HOTT use in pretend at 38 months (the first session at which children use more HOTT in narrative than in non-narrative), as well as a year later at 50 months, and compared these rates to HOTT use in narrative. As a baseline, we continue to report HOTT use in all other (non-narrative and non-pretend) utterances.

In Table 5, we report the frequency of pretend and HOTT in pretend utterances produced by parents and children at the two age points; to facilitate comparison, we also include narrative (from Table 3) and other utterances. Interestingly, while pretend is more common than narrative in both parents’ and children’s talk, it declines slightly at 50 months compared to 38 months. This developmental pattern is in contrast to narrative, which becomes more frequent at 50 months compared to 38 months. As with HOTT in narrative, HOTT in pretend utterances are relatively infrequent, although when extrapolated over the course of a child’s everyday talk and input, they become more meaningful.

Proportion of Narrative, Pretend, and Other Talk Containing HOTT

Next, we examined rates of HOTT use in pretend at 38 and 50 months, and compared it to rates of HOTT use in narrative (using the same data reported in the previous section) and all other non-narrative and non-pretend talk. Figure 2 displays the mean proportion of personal narrative, pretend, and other utterances that contain HOTT for parents and children at 38 and 50 months, showing that while narrative contains more HOTT than other talk, pretend

Table 4
Hierarchical Linear Model to Predict HOTT Utterances Relative to All Utterances

Fixed effects	Coefficient	SE	t-ratio	df
β_{00} (intercept)	-3.76***	0.07	-57.06	63
β_{10} (slope)	0.04***	0.002	22.99	63
β_{20} (acceleration)	-0.0006***	0.0001	-4.84	63
β_{30} (parent)	0.66***	0.04	14.80	63
β_{40} (narrative)	0.91***	0.04	21.00	63
Random effects	SD	Variance component	χ^2	df ^a
r_0 (intercept)	0.41***	0.26	1,741.66	49
r_1 (slope)	0.01***	0.0001	572.55	49
r_2 (acceleration)	0.0009***	0.000001	578.86	49
r_3 (parent)	0.34***	0.11	653.10	49
r_4 (narrative)	0.30***	0.09	305.47	49
Goodness of fit -2 log likelihood	38,890.91 (20)			

Note. We report fixed effects from the unit-specific model with robust standard errors.

^a The chi-square statistics are based on only 50 of 64 dyads who had sufficient data for computation. Fixed effects and variance components are based on all the data. HOTT = higher-order thinking talk.

*** $p < .001$.

Table 5
Frequency of Different Types of Utterances Produced by Parents and Children at 38 and 50 Months

Utterance type	Parents		Children	
	38 months <i>M</i> (<i>SD</i>) (<i>N</i> = 61)	50 months <i>M</i> (<i>SD</i>) (<i>N</i> = 58)	38 months <i>M</i> (<i>SD</i>) (<i>N</i> = 61)	50 months <i>M</i> (<i>SD</i>) (<i>N</i> = 59)
Pretend	53.2 (64.8)	36.7 (63.3)	62.8 (64.2)	52.9 (66.0)
HOTT in pretend	2.9 (3.9)	2.8 (4.6)	1.8 (2.9)	2.9 (4.3)
Narrative ^a	28.8 (22.4)	33.3 (28.3)	16.1 (13.0)	22.6 (20.0)
HOTT in narrative ^a	3.4 (3.3)	5.1 (5.3)	1.2 (1.7)	2.2 (2.3)
Other	568.8 (297.0)	471.0 (275.2)	383.4 (120.4)	349.3 (142.5)
HOTT in other	26.5 (18.4)	30.5 (23.5)	11.0 (8.7)	13.7 (10.8)

Note. Pretend, narrative, and other sum to total utterances in Table 3; HOTT in pretend, HOTT in narrative, and HOTT in other sum to HOTT utterances in Table 3. HOTT = higher-order thinking talk.

^aReplicated from Table 3.

seems to occupy a liminal space between them, containing more HOTT than other yet less HOTT than narrative talk.

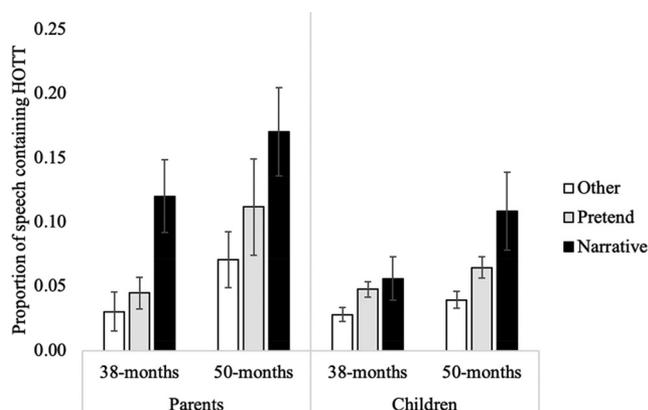
We conducted a generalized linear mixed-effects rate model with a binomial distribution to test whether rates of HOTT use differed for parents and children at each visit in each of the three talk contexts (narrative, pretend, other). We included fixed effects of session (using 38 months as the reference category), speaker (using parents as the reference category), talk context (using pretend as the reference category), and their interactions (two-way: Session \times Speaker, Session \times Narrative, Session \times Other, Speaker \times Narrative, Speaker \times Other; three-way: Speaker \times Session \times Other, and Speaker \times Session \times Narrative), with a random effect for each dyad. We found an interaction between speaker, session, and other ($\beta = -.38$, $SE_{\beta} = .15$, $p = .01$), such that children's rates of HOTT use differed between other and pretend between the 38- and 50-month sessions. There was also a marginal speaker by other interaction ($\beta = .20$, $SE_{\beta} = .10$, $p = .07$), such that parents and children differed in HOTT use in other talk. The interaction between speaker and session was also significant

($\beta = .41$, $SE_{\beta} = .14$, $p = .003$), suggesting that rates of HOTT use overall differed between parents and children at the two visits. There were also main effects of speaker ($\beta = -.67$, $SE_{\beta} = .10$, $p < .001$), session ($\beta = .32$, $SE_{\beta} = .09$, $p < .001$), and narrative ($\beta = .78$, $SE_{\beta} = .09$, $p < .001$), as well as a marginal main effect of other ($\beta = -.13$, $SE_{\beta} = .07$, $p = .06$).

Because speaker interacted with so many variables, we conducted two follow up analyses, one for parents and one for children, to more precisely test whether rates of HOTT use in narrative, pretend, and other talk differed at the two sessions for each speaker. In each model, we included fixed effects for session, talk context (using pretend as the critical reference category), and their interaction, with a random effect for each participant. Results for each model are reported in Table 6.

For both parents and children, there was a main effect of session, suggesting overall HOTT use increased between 38 and 50 months. For parents, there was no interaction between session and talk context, indicating similar patterns across the two visits. Parents differed in rates of HOTT use in pretend versus other, as well as in pretend versus narrative—narrative contained more HOTT than pretend, which contained more HOTT than other talk. For children, in addition to main effects of session and narrative, there were interactions between session and both other talk and narrative talk, indicating that patterns for children differed at 38 and 50 months.

Figure 2
Mean Proportion of Parents' and Children's Other, Pretend, and Narrative Utterances Containing HOTT



Note. Error bars ± 2 SE. One parent at 50 months who produced only a single pretend utterance that contained HOTT has been removed from the figure. HOTT = higher-order thinking talk.

Table 6
Results From Generalized Linear Mixed-Effects Rate Models With a Binomial Distribution to Predict Rates of HOTT Use

Effects	Parents β (SE_{β})	Children β (SE_{β})
Fixed effects		
Intercept	-2.987*** (0.080)	-3.737*** (0.108)
Session	0.333*** (0.094)	0.689*** (0.105)
Other	-0.135* (0.068)	0.038 (0.088)
Narrative	0.772*** (0.089)	0.857*** (0.131)
Session \times Other	-0.039 (0.099)	-0.379*** (0.114)
Session \times Narrative	-0.074 (0.124)	-0.343* (0.165)
Random effects		
Participant	0.126 (0.355)	0.291 (0.540)
Deviance	2,076.1 (328)	1,874.9 (344)

Note. HOTT = higher-order thinking talk.

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

To determine exactly how children's patterns of HOTT in narrative and pretend differed between 38 and 50 months, we conducted two additional follow-up generalized linear mixed-effects rate models for children at 38 and 50 months, with fixed effects for talk context (using pretend talk as the critical reference category), with a random effect for each participant. Results are reported in Table 7.

For children at 38 months, there were no differences in rates of HOTT use in pretend versus other, but there were differences in pretend versus narrative—narrative contained more HOTT than pretend. At 50 months, children's patterns looked similar to parents—narrative contained more HOTT than pretend, which contained more HOTT than other talk.

Expected and Observed Occurrence of HOTT in Narrative and Pretend

We employed a second analytical approach to consider the robustness of the relationship between HOTT and narrative versus pretend, this time by comparing each individual's "expected" occurrence of HOTT in narrative versus pretend (based on their average rate across all talk), to their "observed" occurrence. We calculated the "expected," or chance, values by multiplying, for each individual, their base rate for narrative by their base rate for HOTT. For example, at 38 months, one parent used narrative in 9.7% of her talk and pretend in 12.3% of her talk (so 78% of her talk is other). This parent used HOTT in 8.9% of her talk (so 91.1% of her talk is non-HOTT). If HOTT is unrelated to talk context, and only appears in narrative and pretend by chance, as a result of her natural rate of HOTT use, we would expect that HOTT in narrative utterances would comprise .86% of her total utterances ($9.7\% \times 8.9\%$), and HOTT in pretend utterances would comprise 1.09% of her total utterances ($12.3\% \times 8.9\%$). This parent spoke 546 utterances per hour; we therefore would expect about five of her utterances per hour to display HOTT in a narrative context, and about six of her utterances per hour to display HOTT in a pretend context.

Next, we calculated the "observed" occurrence rate of HOTT in narrative and in pretend, by dividing the actual number of HOTT in narrative and HOTT in pretend utterances by the total number of utterances used by the parent. This example parent actually used 15 HOTT in narrative utterances per hour, which accounted for 2.74% of her total talk—almost 3 times the value expected by chance. In contrast, she used only seven HOTT in pretend utterances, representing 1.28% of her total utterances—almost the same value expected

by chance. We performed these same calculations on all parents and children at 38 and 50 months; means for expected and observed (a) proportion of all utterances and (b) total number of utterances are reported in Figure 3.

Because pretend makes up a greater proportion of parent's and children's everyday talk than narrative (see Table 5), frequency of HOTT in pretend utterances was sometimes greater than HOTT in narrative utterances, particularly for children. Nevertheless, as evident in Figure 3, parents and children incorporate HOTT into their narrative talk at higher rates than predicted by chance, whereas HOTT occurs in pretend only about as often as predicted by chance.

For HOTT in narrative, the observed values are greater than the expected values, whereas for HOTT in pretend, the observed and expected values are not reliably different. Both parents and children were more likely to incorporate HOTT into their narrative talk than into their pretend talk. The statistics to support these observations are available in the [online supplementary materials](#).

Discussion

In this article, we examined whether different talk contexts provide different opportunities for parents and children to use HOTT. We highlighted personal narrative as a potentially rich context for higher-order thinking in parents' and children's spontaneous talk between 14 and 58 months, and compared rates of HOTT in narrative to non-narrative. We found that, for parents between child ages 14- and 58-months and for children beginning at 38 months, narrative contained proportionally more HOTT than non-narrative. Narrative also contained more HOTT than expected by chance, based on speakers' base rates of HOTT and narrative talk. This finding points to narrative as a particularly rich communicative context in which parents and children naturally invoke higher-order thinking.

At 38 and 50 months, we compared use of HOTT in narrative to HOTT use in a theoretically-similar form of talk, pretend. At 38 months, children used more HOTT in narrative than either pretend or other talk, whereas pretend and other talk contained similar amounts of HOTT. For less mature speakers, pretend may rely more on the present environment, potentially resulting in more contextualized pretend play that makes less use of HOTT. By contrast, in children's talk at 50 months, and for parents at both 38 and 50 months, the proportion of pretend containing HOTT lay between the proportion of other and narrative containing HOTT. Parents' pretend play may be more complex and decontextualized than children's at both ages, whereas children's pretend at 50 months may have matured, and come to rely more on language or theory of mind, rather than the surrounding environment. This more mature pretend talk may occupy a liminal space on the continuum between the here-and-now (as reflected in other talk), and the there-and-then (as reflected in narrative talk).

However, unlike HOTT incorporated into narrative, the expected occurrence of HOTT incorporated into pretend is not different from the observed value. Although pretend may be a talk context where parents and children invoke HOTT more frequently than they do in baseline "other" talk, they are not doing so at rates greater than expected by chance. These findings point to a particularly privileged relationship between HOTT and narrative.

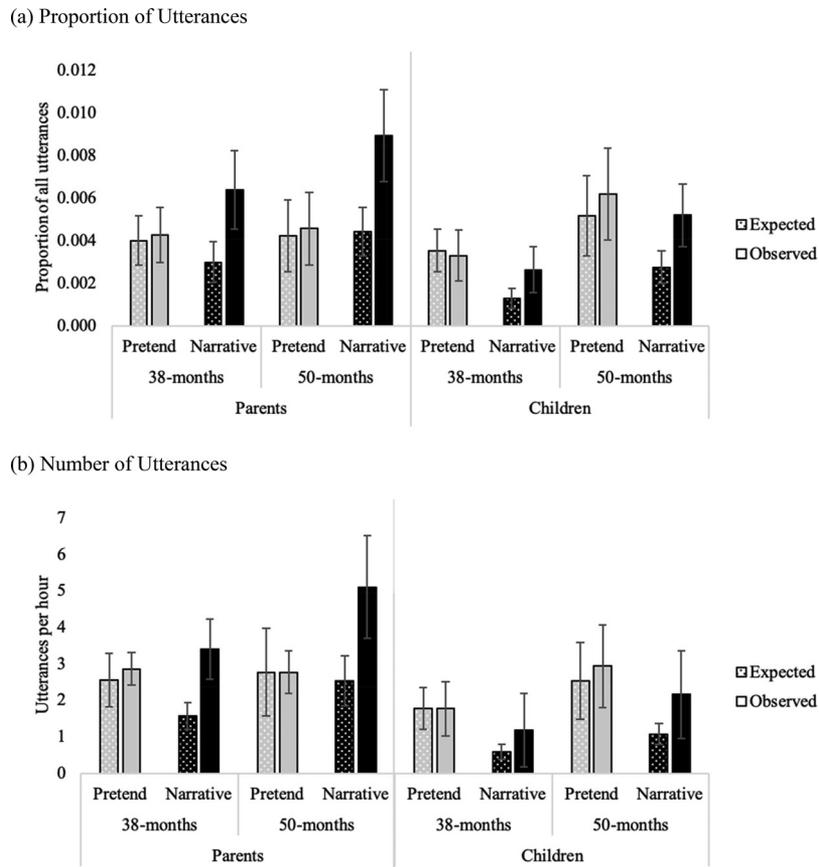
Table 7

Results From Follow-Up Analyses of Children's Talk Using Generalized Linear Mixed-Effects Rate Models With a Binomial Distribution

Effects	Children at 38 months β (SE_{β})	Children at 50 months β (SE_{β})
Fixed effects		
Intercept	-3.795*** (0.123)	-3.090*** (0.100)
Other	-0.042 (0.090)	-0.281*** (0.076)
Narrative	0.759*** (0.133)	0.577*** (0.106)
Random effects		
Participant	0.592 (0.769)	0.284 (0.533)
Deviance	818.2 (179)	893.2 (173)

*** $p < 0.001$.

Figure 3
Mean Expected (Patterned Bars) and Observed (Solid Bars) (a) Proportion and (b) Number of HOTT in Narrative (Black Bars) and HOTT in Pretend (Gray Bars) Utterances



Note. HOTT = higher-order thinking talk. Error bars $\pm 2 SE$.

Implications

Some qualities of language may make it easier for parents and children to use higher-order thinking, particularly when children are very young. These qualities include being story-driven, being salient or relevant to the self, being decontextualized, and relying on metacognition. Narrative is one kind of talk that displays all of these qualities, to a stronger extent than non-narrative talk, and arguably to a stronger extent than pretend. Theoretically, this fact enhances our understanding of the nature of higher-order thinking by suggesting that it frequently appears in decontextualized talk, particularly when that talk serves a narrative function. These findings offer another potential mechanism—in addition to exposure to academic language and the promotion of emergent literacy skills—to explain why narrative talk is beneficial for children's later academic outcomes. The study also enhances our understanding of the nature of narrative by suggesting higher-order thinking makes up a vital (and potentially requisite) component of it.

Practically, our findings can be leveraged in interventions with parents and families that seek to enhance the quality of children's early language environments to boost their school-readiness skills. Although much research has focused on variations in the early

home environment as providing support for children's linguistic outcomes, a growing body of research suggests parents may also socialize children into educationally relevant thinking skills, such as higher-order thinking. In support of this hypothesis, our previous work (Frausel et al., 2020) demonstrates that children's early use of HOTT between 14 and 58 months predicts their performance on standardized assessments of higher-order thinking administered years later in grade school, including text-based inferencing and analogical reasoning. Thus, HOTT during the preschool years serves as an early index of, and potential training opportunity for, later higher-order thinking outcomes.

Despite the importance of HOTT, little empirical work has examined how to support its use in early home environments (as opposed to classroom contexts, where more is known; e.g., Miri et al., 2007). Early interventions targeting parents' use of HOTT is one strategy to support school readiness and build on parents and children's already-occurring discourse. To have an impact, though, interventions must be clearly understood by their audience, and although higher-order thinking is a concept familiar to many educators and researchers, lay individuals may not have as many intuitions as to how to support the development of these important

skills. In contrast, families may more readily grasp that telling personal stories can build children's academic skills. Encouraging personal storytelling may be flexibly adapted to families' unique cultural contexts, a possibility that is important to explore in future work. Moreover, even though the results of this study suggest that pretend at 50 months has some promise for encouraging HOTT, pretend use tends to decline across the life span (Smith & Lillard, 2012), whereas narrative use increases and continues into adulthood (Singer, 2004). An intervention targeting narrative could serve as an important leverage point through which HOTT can be encouraged and stimulated in children.

Indeed, prior work has established that it is possible to intervene with respect to parent's use of decontextualized talk with children from diverse backgrounds (Morgan & Goldstein, 2004; Reese et al., 2010; Valentino et al., 2019; Van Bergen et al., 2018). For example, Leech et al. (2018) conducted a randomized control trial with 36 children and their parents, with parents randomly assigned to either a training condition (in which parents were told about the importance of decontextualized talk) or a control condition. Trained parents increased the amount of decontextualized talk they gave their children, compared to baseline—particularly talk about past personal events—and parents maintained these gains for the duration of the study. Decontextualized input is malleable, and thus encouraging families to share stories of personal experience might serve as a way to influence children's later higher-order thinking skills and outcomes.

Limitations

Although rich in theoretical and practical significance, this study has a number of limitations. First, it is unclear the extent to which the findings, which came from families recorded in the first decade of the 21st century, would generalize to more contemporary populations who have ready access to technology. The advent of smart phones, smart speakers, and other technological advances in the past two decades means parenting and child rearing may have changed significantly since this study was initiated, which may change the ways in which parents and children interact (e.g., Kelly et al., 2019). For example, in our corpus, parents and children sometimes looked at old family photos in albums, and discussion of events in the photos were included as narrative talk. The fact that parents now have constant access to the camera and photos on their phones might mean parents and children engage in more of this kind of talk now, compared to the early 2000s. Alternatively, parents and children might engage in this kind of talk less frequently because access to these photos is now ubiquitous and looking at photos is no longer a novel event. Nonetheless, this study still presents an intensive examination of parent-child talk during a fairly recent time period.

Another more general limitation to observational studies such as ours is that parents could be changing their behavior because they know they are being filmed. Parents might have been responding to demand characteristics based on the presence of the experimenter. Even if this were the case, however, parents would likely be purposefully emphasizing aspects of their talk and behavior they felt were important for the child's development, providing us insight into the linguistic practices they wanted to be using regularly in their home talk. In addition, it is very difficult to maintain unnatural behavior for an extended period of time (Gardner, 2000;

Jewitt, 2012). With the long, repeated testing observations (12 90-minute sessions over a 4-year period), and the high variability we observed among families, we have confidence that we are capturing a realistic range in children's home language contexts.

Finally, an unexpected by-product of the experimenter's presence might have been to provide a new "audience" for personal narrative talk. Occasionally in the corpus, parents and children appear to engage in narrative talk for the benefit of the experimenter. This practice, in part, explains the approach taken by Burger and Miller (1999), who examined spontaneous personal narrative talk in naturalistic situations at home for 12 families, recorded when children were 2½ and 3 years old. The experimenter in this study was instructed to act as a "family friend who had stopped by for a visit," rather than to adopt a "silent stance" or to act invisible, as was done in this study. Ultimately, it is unknown the extent to which the presence of the camera influenced people's behavior, or whether children's "true" early experiences are accurately being captured on the videotapes.

Future Research

The findings from this study inspire many avenues for future research. One important area of future research includes examining relations between parent and child talk. Do parents who frequently tell rich narratives, with many examples of HOTT, inspire their children to do the same? How stable across development is speakers' use of HOTT, narrative, and HOTT in narrative? Now that narrative has been highlighted as a rich context for HOTT, future research can also examine whether there are any effects of different levels of exposure to higher-order thinking in narrative and non-narrative talk on children's later educational outcomes.

Additionally, pretend was only coded at 38 and 50 months; future work can examine whether the relationship between HOTT and pretend is different at different age points. Related to this point, pretend has been treated in these analyses as a singular form of talk, but there are many different ways in which parents and children pretend: play while using one object to represent or stand for another; play while using object replicas; and telling or retelling stories about fictional characters. There are also differences in children's play partners: collaborative versus solo pretend play; play with parents versus play with siblings; and play with objects versus play that relies more on language. Each of these different ways or types of pretending may differentially affect use of HOTT. Pretend that is more story-driven (such as telling or retelling stories about fictional or made-up characters without enactment), or that is particularly salient, or that relies less on the here-and-now, or that makes use of metacognition, may (like narrative) increase HOTT. These types of pretend play may be more common in later developmental stages.

Future research can also examine differences in HOTT use in different kinds of personal narratives by examining the salience of the events discussed and the ecological context in which the narratives are situated. Children tend to produce more complex and coherent stories when telling stories about negative, rather than positive, events (Fivush et al., 2008). Narratives concerning more emotional events may encourage parents and children to use even more instances of HOTT. In line with ecological theory, narrative talk could be coded for whether speakers are describing shared or unshared experiences (Fivush & Merrill, 2016). Talking about a

shared experience potentially gives parents more opportunities for scaffolding. But when telling stories about unshared experiences, children are challenged to more clearly articulate the order and nature of events, which may provide more opportunities for children to use HOTT. Additional analyses of different types of narrative and pretend could lead to greater insights into what makes these kinds of talk so relevant for children's later educational outcomes.

Finally, although this paper focuses on narrative (and uses pretend as a close comparison), other forms of decontextualized talk are prevalent in early parent-child interactions, including nonimmediate talk during book reading. A well-replicated finding in the developmental psychology literature is the relationship between shared parent-child book reading and children's later cognitive and linguistic outcomes (for a meta-analysis, see Bus et al., 1995). Although some work focuses on frequency of book reading (Payne et al., 1994; Sénéchal & Lefevre, 2002), other work focuses on qualitative differences, finding, for example, that talk extending the topic of the book (including story predictions, evaluations, or inferences, as well as comparing the content of the book to the child's own experiences) predicts children's receptive vocabulary at second grade, reading comprehension at third grade, and internal motivation to read at fourth grade (Demir-Lira et al., 2019). In future research, book-reading talk (most of which was included in this study as non-narrative/non-pretend "other" talk), as well as the verbatim text of children's picture books (Montag et al., 2015), can be explored as another rich context that naturally invites parents and children to use higher-order thinking talk. Moreover, picture books have the potential to serve as a prompt for eliciting personal narratives (Hindman et al., 2014).

Conclusion

In sum, in this paper, we have examined parents' and children's use of spontaneous higher-order thinking talk in narrative and pretend early in development. We interpret these data to show that narrative serves as a rich linguistic context where parents and children frequently invoke higher-order thinking in talk, proportionally more than in the related talk context of pretend play, and proportionally more than in other non-narrative, non-pretend everyday talk. By heightening personal narrative talk in childhood, teachers, educators, parents, and researchers might potentially foster the development of the higher-order thinking skills that are so crucial for later academic success, making the language they will need for later expression and interpretation of academic content taught in school available to them early, from those who care for and about them.

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