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Beyond Counting Words: A paradigm Shift for the Study of Language Acquisition

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ARTICLE

Child Development Perspectives

Beyond counting words: A paradigm shift for the study of language acquisition

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Abstract

The 30-million-word gap, the quantified difference in the amount of speech that children growing up in low-resourced homes hear compared to their peers from high-resourced homes, is a phrase that has entered the collective consciousness. In the discussion of quantity, the complex and nuanced environments in which children learn language were distilled into a singular metric—number of words. In this article, we propose examining children's language environments by focusing on *what* caregivers communicate to children and *how* they communicate it. Focusing on the features of the language environment promotes a more inclusive approach to understanding how children learn and the diverse contexts in which that learning occurs.

KEYWORDS
caregiver-child interaction, early childhood, language input

In 1995, Hart and Risley, in a groundbreaking study, reported a projected 30-million-word gap in words heard by age 4 between children growing up in low-resourced homes and their peers growing up in high-resourced homes, with corresponding differences in children's language skills. The simple and parsimonious message that children who hear more words know more words infiltrated the public sphere, influencing researchers, policymakers, and caregivers. However, the benefits associated with exposure to language are nuanced and complex, and language input is about more than the number of words that pass a child's senses. The *features* of the language, often referenced as quality, addressed to children may be more important for language development than the amount of talk per se. *What* words caregivers use and *how* they use them vary greatly. Several researchers have recognized the value of measuring features of language input (Cartmill, 2016; Kuchirko, 2019; Rowe & Snow, 2020). In this article, we argue that this focus further promotes a more inclusive approach to understanding how children learn, which is crucial as the field moves away from a focus on Western, educated, industrialized, rich, and democratic (WEIRD) populations and toward a more global science.

QUANTIFYING SPEECH INPUT

Decades after Hart and Risley's report (1995), the quantity of speech in children's environments continues to be a major area of focus (see Kuchirko, 2019, for a review). Indeed, even research that has focused on debunking

Abbreviations: ADS, adult-directed speech; IDS, child- or infant-directed speech; LENA, Language Environment Analysis; WEIRD, Western, educated, industrialized, rich, and democratic.

word gap claims has focused primarily on examining the quantity of speech. For example, one study examined the amount of talk directed to children in a culturally diverse group of families from low-resourced communities in the United States (Sperry et al., 2019). Although incorporating more diverse samples is an important addition, by focusing solely on the amount of talk, this work missed the opportunity to capture more fully children's rich and nuanced language environments.

Recent technological advances, such as the Language Environment Analysis (LENA) device, have encouraged researchers to continue examining children's linguistic environments through the lens of quantity of speech. The LENA device is a small wearable audio recorder that captures up to 16 h of a child's auditory environment and automatically generates estimates of adult word counts, child word counts, and adult–child conversational turns. Such data traditionally required hours of manual coding; the LENA device has led to a resurgence of research on the amount of language input (e.g., Gilkerson et al., 2018). Although it can be argued that the LENA captures communicative style in its counts of conversational turns, data suggest that conversation turns identified by the LENA are not necessarily consistent with those identified by human researchers (e.g., Cristia et al., 2021); furthermore, the LENA cannot measure nonverbal responses (e.g., head nods and gestures). To understand how the full breadth of the linguistic landscape children experience affects their language development, we must use methods that allow for a richer understanding of language input.

A RICHER UNDERSTANDING OF LANGUAGE INPUT

Research on the features of the language environment has historical roots (e.g., Bruner, 1983), with increased interest recently in how these features, variously defined, relate to language learning (e.g., Cartmill, 2016; Rowe & Snow, 2020). Here, we propose a way of examining the features of language input that considers the broad variations in language environments across cultures: what caregivers say (the *content* of talk) and how they say it (the *communicative style* of talk).

The content of talk

The content of caregivers' talk is *what* the caregiver discusses with the child. Words label concepts and as such, exposure to a variety of words introduces children to a variety of concepts. Knowing information about dogs allows children to both extend the category of *dog* to include Dachshund and Great Dane, and differentiate *dog* from *cat*. In a U.S.-based study (Borovsky et al., 2016), 2-year-olds recognized a novel nonsense word more effectively when it was a part of a familiar category (e.g., *boba* is a *drink*), suggesting that learning new word meanings is related to children's familiarity with the domain. Introducing a range of content feeds into children's language skills, school readiness, and general knowledge of the world (e.g., Fisher et al., 2015).

One way content of talk is evaluated is by measuring *lexical diversity*, or the number of distinct words caregivers use. For example, "Look at that big old brown dog" contains seven different root words, whereas "Look at that doggy! Doggy! Wow! Dog!" contains only five. Although the word *dog* appears more frequently in the latter sentence, the former sentence is more lexically diverse. In an economically, educationally, and ethnically diverse, U.S.-based study, lexical diversity predicted children's language skills more effectively than the number of words addressed to them (e.g., Rowe, 2012; Silvey et al., 2021), in part because children produced more diverse words when caregivers used more diverse words (Huttenlocher et al., 2010). This suggests that when caregivers expose children to a wide range of words, children have more opportunity to learn words. Although use of diverse vocabulary captures diverse content in English, it may not measure content well in other languages. For example, Changana, a Bantu language, can convey in one word what languages such as Dutch, Portuguese, and English need many words to convey (Vogt et al., 2015). To understand *what* caregivers say to their children across cultural contexts, researchers must look beyond the word as the unit of measurement and examine content more broadly.

Another way researchers have measured the content of talk is through *decontextualized talk,* or talk that extends the conversation beyond the here and now. This type of talk encompasses pretend play, talk about past or future events, and narrative. In a study conducted in the United States, decontextualized talk to preschoolers predicted language outcomes better than did the number of words (Rowe, 2012). When caregivers use decontextualized talk, the discussion is not limited to the immediate environment. For example, a caregiver can talk about dragons breathing fire on castles while knights ride to the rescue, both introducing new words and feeding the child's imagination. Indeed, symbolic and pretend play are a rich fount for decontextualized talk. In a recent meta-analysis of 35 studies with participants from around the globe, including Australia, Finland, the United Kingdom, and the United States, symbolic play was robustly related to language development (Quinn et al., 2018), suggesting that the rich content offered by symbolic play promotes learning.

Book sharing also expands the variety of content in caregivers' talk. Like pretending, books allow children

to engage in content that is novel or even fanciful. Across cultures, sharing books benefits children's language skills (e.g., Mol et al., 2008), in part through caregivers' speech (Farver et al., 2013). However, the provision of books, whether books are shared, and the specific content emphasized during book sharing vary across cultures. For example, in a study of ethnically diverse families in New York City, when mothers engaged their children with a wordless picture book, African American mothers were most likely to emphasize characters' goals, Chinese mothers were most likely to emphasize negative consequences of misbehavior, and Mexican and Dominican mothers were more likely to emphasize the protagonists' emotions (Luo et al., 2014). This suggests that within the overall benefit of book sharing, the specifics that caregivers discuss look different across cultural contexts.

Content can be explored in several other ways. For example, in one study, Dutch caregivers discussed more cognitive topics, such as factual statements, and Mozambican caregivers discussed more socioemotional topics, such as family relations (Vogt et al., 2015). Researchers are just beginning to unravel the complexities of what caregivers convey to their children. Regardless of the specific type of talk, caregivers' provision of rich, meaningful content allows children to build connections between concepts and develop a deeper understanding of the world around them. An exclusive focus on the quantity of the language fails to recognize the variability in the content of caregivers' talk and its role in learning.

The communicative style of talk

Language learning involves understanding how labels relate to concepts and how to use those labels to communicate. This process is scaffolded by caregivers, but considering only the number of words misses an integral part of the language learning process. *How* caregivers communicate with children, or the *communicative style* of their talk, is crucial to language development. Caregivers could use equally diverse words and rich talk but convey the information differently. The communicative style can be captured by features of parental speech, such as prosody and accompanying gesture, and by features of the interaction, such as joint attention, contingency, and routines.

The communicative style of talk: Speech

One aspect of the communicative style of speech is *prosody*, the patterns of stress, pitch, and intonation in language. Compared to adult-directed speech (ADS), child- or infant-directed speech (IDS) is characterized by higher, more variable pitch, hyperarticulation, exaggerated vowels, and simpler speech (Golinkoff et al., 2015). When using IDS, adults often emphasize novel words through prosodic features such as pitch (e.g., Fernald & Mazzie, 1991). These prosodic features draw infants' attention to the speech, facilitate interactions between infant and adult, and emphasize important distinctions in the language (Golinkoff et al., 2015). Prosodic differences between ADS and IDS are found in a wide range of spoken languages (e.g., Thai and English; Kitamura et al., 2001) and across cultures (e.g., Fijian, Kenyan, and North American; Broesch & Bryant, 2015). However, cultures vary significantly on the extent to which IDS is used.

Child- or infant-directed speech is common in countries such as the United States and Canada (e.g., Bergelson et al., 2019). However, some societies, including a Tsimane community (Cristia et al., 2019), the people of Rossel Island, Papua New Guinea (Casillas et al., 2021), and a Tzeltal Mayan community (Casillas et al., 2020), appear to use less IDS. Yet children in these smaller, more traditional communities meet language milestones at rates similar to children from the United States (Casillas et al., 2020, 2021). This raises the question of whether the amount of IDS children are exposed to relates to language development. In one study that looked at within-culture variation, higher amounts of IDS related positively to children's language in a Yucatec Mayan community (Shneidman & Goldin-Meadow, 2012). In another study, for Spanish-speaking families in the United States, IDS in both one-on-one and group settings related to children's language outcomes; however, for English-speaking families, only IDS in one-on-one settings related to language (Ramírez-Esparza et al., 2017). These findings suggest that understanding the role of IDS in language development requires a broad examination of children's language environment that is not captured by the amount of speech alone.

Communicative style also includes how caregivers convey their message, or the pragmatics of language. Depending on the context, "It's hot!" could be a statement or a prohibition. Of particular focus in research on language development is referential language, which functions to give or elicit information. In a study of ethnically diverse families in the United States, caregivers' use of referential language when children were 14-month-olds related to infants' expressive vocabulary at 24 months (Tamis-LeMonda et al., 2012). Referential language may relate to language development because it contains a higher proportion of nouns and adjectives than does regulatory language, which contains more pronouns and functions to direct children's behavior. The pragmatics of caregivers' language vary within and across cultures. In a U.S.-based study, African American, Mexican, and Dominican mothers overall used more

regulatory language than referential language; however, looking at variation within regulatory talk, Mexican and Dominican mothers used more attention directives (e.g., "Look, ball!") than African American mothers when their children were 14- and 24-month-olds (Kuchirko et al., 2020). These findings suggest that the pragmatics of caregivers' language are nuanced, and these different aspects of pragmatics need to be explored further to fully understand how they relate to language development.

Another aspect of the communicative style of speech is the use of gesture. The relation between caregivers' gestures and children's language development is well documented (e.g., Goldin-Meadow et al., 2014). Adult gesture facilitates language learning in part by guiding infants' attention to the important features of the referent. In a U.S.-based study, when gestures accompanied speech, infants were more likely to attend to the referent when it was labeled and to learn the label (de Villiers Rader & Zukow-Goldring, 2010). Like IDS, research suggests that adults use simplified and exaggerated gestures with infants, which may further promote infants' attention to the referent and highlight relevant aspects of an object or action (Brand et al., 2002). Use of gesture in speech varies across cultures. In a small study, Italian infants had a larger repertoire of gestures but smaller spoken vocabularies than U.S. infants (Iverson et al., 2008), revealing cultural differences in gesture use that may relate to how infants learn to communicate. When researchers consider only the words a caregiver says, they overlook this nonverbal communication.

The communicative style of talk: Interaction

Beyond caregivers' speech, language development is facilitated by features of interaction style. *Joint attention* occurs when a caregiver and child share focus on the same object or event, such as when a caregiver talks about a toy as a child plays with it. In research on U.S.-based populations, joint attention between adults and toddlers facilitated language learning in the moment and throughout development (e.g., Adamson et al., 2004; Tomasello & Farrar, 1986). Talk that aligns with the child's attentional focus saves the child from the task of searching the environment to identify what the caregiver is describing. Thus, children may be more likely to link new words to the referents. Indeed, in a U.S. study, greater referential clarity during interactions between parents and toddlers predicted more optimal language outcomes more than 3 years later (Cartmill et al., 2013). However, findings on joint attention do not always replicate across cultures. For example, in a study comparing children from urban and rural Mozambique, coordinated joint attention related positively to vocabulary for urban children, whereas actively observing and imitating the caregiver related more strongly to vocabulary for rural children (Mastin & Vogt, 2016).

Beyond joint attention, *contingency*—prompt and meaningful responses that facilitate back-and-forth exchanges between a child and an adult—is a powerful driver of language. For example, a contingent exchange can occur when a child pushes a toy car, and the adult provides a timely and related response, such as "Where's the car going?" and the child answers "home." In U.S.-based studies, contingency helped infants to preschool-aged children learn a wide range of language skills (e.g., Kuhl et al., 2003; Roseberry et al., 2014), and predicted toddlers' language ability up to 10 years later (Gilkerson et al., 2018). By talking about children's interests, contingent conversation both establishes joint attention and supports referential clarity. This type of conversation also supports children's understanding of communicative intent—that the speaker intends to convey a message to the listener (Tamis-LeMonda et al., 2014). Indeed, in U.S.-based studies, children often failed to learn from input that was not embedded in a contingent exchange (Kuhl et al., 2003; Roseberry et al., 2014) or when the contingency was interrupted (Reed et al., 2017). However, like IDS, the extent to which infants and adults engage in contingent turn-taking varies significantly across cultures (Casillas et al., 2021), suggesting that the interactional features of communicative style that promote language development may not be universal across cultural contexts.

Finally, if children hear language as part of a routine, such as talking about clothes while getting dressed, the conversation embeds the words in a familiar, predictable context, facilitating children's learning (Benitez & Saffran, 2018; Tamis-LeMonda et al., 2019). Researchers have long emphasized the importance of regular routines for language learning (e.g., Bruner, 1983). In a U.S.-based study, 13-month-olds were more likely to be exposed to certain words during certain activities, such as food names during feeding and body parts during grooming (Tamis-LeMonda et al., 2019). For children in the United States, these patterns increase the predictability of specific words during particular activities, making them appear early in children's comprehension (Bergelson & Swingley, 2012). In another U.S.-based study, toddlers learned words most successfully when they could predict when they would hear the word paired with the referent, suggesting that the predictable nature of routines promotes language learning (Benitez & Saffran, 2018). Although most of these studies have been conducted with children in the United States, researchers speculate that the scaffolding provided by daily routines may facilitate language learning across cultures. Indeed, researchers in one study speculated that engagement in daily routines (e.g., mealtimes) may help explain the similarity in language development between children from Rossel Island, Papua New Guinea, and children from the United States, despite differences

in the frequency of IDS and contingent turn-taking (Casillas et al., 2021).

Overall, features of communicative style facilitate attention to relevant features of language, narrow the possible referents being discussed, emphasize the communicative nature of language, and increase predictability in language input. How these different features manifest in children's language environments across cultures, and the implications of these differences for language development, is an important area of ongoing research. Nevertheless, when only the amount of talk is considered, none of these communicative features, or the possible opportunities they provide for learning, are the focus of investigation.

IMPLICATIONS FOR RESEARCH

Focusing on the features of the language environment shifts the way the field approaches the study of language development in several ways. A focus on the amount of talk supports a model of language learning that emphasizes adults' provision of input when in fact, children play an active role in language acquisition. During interactions, children seek information from adults about language (e.g., Lucca & Wilbourn, 2019). Examining the content of adults' input and the conversations that ensue regards children as more active contributors to their own language learning, not just vessels waiting to receive input.

Focusing on features of the language environment is also concordant with the view that different features affect children's language learning differentially, depending on where children are in the process. In one study that compared quantity of talk and content of talk, the quantity of language input was more important to language development at 18 months and lexical diversity was more important at 30 months (Rowe, 2012). Likewise, in another study, the number of conversational turns between adults and infants predicted children's outcomes up to 10 years later, but this effect was specific to 18- and 24-month-olds, not younger or older children (Gilkerson et al., 2018). Furthermore, features of input relate differentially to different language skills. In another study, caregivers' use of diverse vocabulary when children were *both* 14 and 30 months predicted kindergarten vocabulary, but an *increase* in caregivers' syntactic complexity between 14 and 30 months predicted kindergarten syntax skills (Silvey et al., 2021). By looking at the many dimensions of input, researchers can begin to understand how language learning changes across development.

Finally, investigating the features of language input allows for a more inclusive understanding of children's language environments. Across all cultures, the way language is used with children varies (e.g., Luo et al., 2014; Vogt et al., 2015). Similarly, the communicative style adults use with children varies (e.g., Casillas et al., 2021; Shneidman & Goldin-Meadow, 2012). By broadly examining *what* caregivers say (content) and *how* they say it (style), researchers can capture more completely the variability in children's language environments. This more inclusive lens not only diversifies the historically WEIRD field of language development, but it also disentangles those mechanisms for learning that are general across contexts and those that are specific to culture.

CONCLUSION

Advances in the understanding of language input have changed how researchers approach the study of language development. Hart and Risley's (1995) groundbreaking study emphasized the importance of children's early language environments and started the conversation about cultural differences, but later interpretations led to an overemphasis on the amount of talk. Subsequent studies put a greater focus on the features of caregivers' talk in terms of both the content and the communicative style. This shift allows for a more nuanced and inclusive view of the early language environment that moves the field forward. Of course, features of language input cannot be separated completely from the quantity of talk since there can be no rich content or communicative style with no input at all, but it is important to focus on more than just the amount of talk. To understand how children in a wide range of environments accomplish the extraordinary task of extracting linguistic information from the language around them, researchers must consider the what and the how of communication, and how these features of language are embedded in how much is said.

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