CHAPTER SEVEN

Language development in children's natural environments: People, places, and things

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Abstract

Our goal in this chapter is to describe young children's experiences with language by examining three domains—people, places, and things—that define and influence their language input. We highlight how features of each of these three domains could provide useful learning opportunities, as well as how differences in infants' and toddlers' experiences may affect their long-term language skills. However, we ultimately suggest that a full understanding of early environments must move beyond a

Advances in Child Development and Behavior, Volume 67
ISSN 0065-2407, https://doi.org/10.1016/bs.acdb.2024.07.004

focus on individual experiences and include the broader systems that shape young children's lives, including both tangible aspects of the environment, such as physical resources or locations, and more hidden factors, such as cultural considerations, community health, or economic constraints.

1. Introduction

To learn language, children need regular exposure to rich linguistic input, and children's early experiences with language can vary considerably (e.g., Hoff-Ginsberg, 1986; Rowe, 2008; Weisleder & Fernald, 2013). Recognizing this connection, researchers have sought to document the characteristics of different types of language environments and to probe specific features of the input that may facilitate children's learning. In this chapter, we review current findings that describe variability in early language experiences that are likely to shape how and what children learn.

In the first sections, we describe three immediate influences in infants' language environments: the people, places, and things that define their interactions and experiences. We discuss how infants attend to and learn from particular caregivers, locations, and objects and consider how differences in their experience at each of these levels could affect their knowledge and use of language. Current research emphasizes the high variability in young children's experiences, and by understanding more about the specific features of infants' environment that facilitate or interfere with learning, there may be opportunities to support language development for children from a wide range of backgrounds. However, while the examination of individual differences can provide insight into mechanisms of change and may predict some long-term outcomes (Potter & Lew-Williams, 2022), in the latter portion of the chapter, we suggest that it may be even more beneficial to try to understand children's experience as existing within a far larger system that includes not just the child's daily environment, but also larger societal influences and interactions (Bronfenbrenner, 1994). These structural systems may include sociocultural factors such as social networks and cultural attitudes, geographic factors such as local customs and neighborhood amenities, and economic factors such as family or community resources, all of which can affect children in obvious and less apparent ways (Zengilowski et al., 2023). Thus, we propose that children's environments may be best understood through a lens of interacting systems that include, but are not limited to, the people, places, and things that they encounter directly.

2. People

The foundation of children's language environments is the people who provide communicative input. From the first moments of life, infants appear to recognize that the people around them represent an important resource for learning. Newborn infants pay more attention to stimuli that resemble faces than to other similarly complex visual input (Johnson, Dziurawiec, Ellis, & Morton, 1991; Valenza, Simion, Cassia, & Umiltà, 1996), and they can tell apart different voices and languages (Floccia, Nazzi, & Bertoncini, 2000; Mehler et al., 1988). These early sensitivities quickly lead infants to develop specialized interest and expertise for human faces and speech over the first months of life (Lewkowicz & Ghazanafar, 2009; Pascalis, de Haan, & Nelson, 2002; Vouloumanos, Hauser, Werker, & Martin, 2010). As they gain experience, infants continue to prioritize signals linked to human communication (Rabagliati, Ferguson, & Lew-Williams, 2019). For instance, seven-month-old infants have been shown to learn simple patterns from human speech, but they seemingly fail to detect the same patterns when they occur in non-human tones (Marcus, Fernandes, & Johnson, 2007). However, when infants are first exposed to tonal stimuli in a communicative context where the sounds were associated with people, they successfully learn the patterns (Ferguson & Lew-Williams, 2016; Rabagliati et al., 2019). Thus, infants demonstrate that they are highly attuned to the sources of their language input.

With this heightened sensitivity to both auditory and visual cues related to humans, infants are able to track associations between specific people and the sounds that they produce. At just three months, infants are able to learn pairings between faces and voices (Brookes et al., 2001), and they continue to pay attention to the identity of the speaker as their understanding of language develops. At nine months, infants are more likely to show recognition of words that are produced by their own mothers compared to the same words produced by a different voice (Parise & Csibra, 2012). One reason that infants may learn to pay attention to particular speakers is that early in life, most of their experiences appear to be with a small group of people (Jayaraman, Fausey, & Smith, 2015). Though infants quickly learn to understand different talkers (e.g., Bergelson & Swingley, 2018), listeners of all ages encode information about the speaker when they are listening to language (e.g., Borovsky & Creel, 2014), further supporting the idea that young learners attend to the people providing their language input.

2.1 Caregivers adapt their behavior to infants

In addition to being frequently present, caregivers have been shown to provide language input that is tailored to infants' perceptual and linguistic capacities. Infants-directed speech differs from adult-directed speech in acoustic, structural, and content properties (see Cristià, 2013; Soderstrom, 2007) and reliably attracts infants' attention (Fernald, 1985; ManyBabies Consortium, 2020). Across cultures, there are similarities in how caregivers adjust and simplify their speech when communicating with infants, such as using higher and more variable pitch, shorter utterances, and fewer different words (e.g., Elmlinger, Schwade, & Goldstein, 2019; Elmlinger, Goldstein, & Casillas, 2023; Fernald & Morikawa, 1993). However, there are also individual, community, and cultural differences in the quantity and frequency of language input that is aimed at infants and young children (e.g., Casillas, Brown, & Levinson, 2020, 2021; Hoff-Ginsberg, 1991; Shneidman & Goldin-Meadow, 2012).

Many of the features widely found in infant-directed speech appear to be well-calibrated to infants' learning abilities. For example, the exaggerated prosody commonly used with infants has been suggested to help infants anticipate upcoming information, and infants are better able to detect regularities in infant-directed speech compared to adult-directed speech that includes the same linguistic content (Schreiner & Mani, 2017; Thiessen, Hill, & Saffran, 2005). Similarly, infants benefit from ways that speech may be simplified, such as the use of isolated words, or hearing the same word repeated in short succession (Lew-Williams, Pelucchi, & Saffran, 2011; Schwab & Lew-Williams, 2016b). Importantly, the use of infants-directed speech is not an all-or-nothing phenomenon, and caregivers dynamically adjust their speech to their own child's knowledge. The speech that caregivers use with young infants is different from what is directed at older infants or young children (e.g., Englund & Behne, 2006), and parents change their speech depending on whether they think their child knows the words that they are using (Leung, Tunkel, & Yurovsky, 2021; Tippenhauer et al., 2020). By changing their speech over time, caregivers can provide infants with language input that appears to be designed to support language learning.

Communicating with infants includes input beyond the linguistic content of speech, and caregivers engage in a variety of infant-directed behaviors, often at the same time (Brand, Baldwin, & Ashburn, 2002; Hoff & Naigles, 2002; Kosie & Lew-Williams, in press). Infants expect adults to engage and interact

with them, and they become upset when a caregiver is unresponsive (Tronick, Als, Adamson, Wise, & Brazelton, 1978). The use of social cues, such as eye gaze or emotional expressions, frequently accompanies language, and mothers in multiple cultures use different facial expressions when interacting with infants compared to other people (Baldwin, 1991; Chong, Werker, Russell, & Carroll, 2003). In addition, adults tend to adjust their gestures and actions in much the same way they adjust their speech in infant-centered interactions, such as making them simpler, more exaggerated, and more repetitive in ways that appear to attract infants' attention and support learning (Brand & Shallcross, 2008; Brand et al., 2002; Rowe & Goldin-Meadow, 2009). As infants gain experience in the world, the complexity of caregivers' input increases both in linguistic and non-linguistic ways (Dimitrova & Moro, 2013), allowing them to continue to learn from, engage with, and benefit from the people around them.

2.2 Infants' learning from individual people

While the general properties of infant-directed speech and communication have been suggested to promote learning, individual people differ in how they interact with infants, and infants' language skills have been linked to the input provided by the primary caregivers in their environments. Many studies have found robust correlations between the clarity, amount, and complexity of mothers' speech and measures of infants' language proficiency (e.g., Hoff, 2003; Liu, Kuhl, & Tsao, 2003; Newman, Rowe, & Ratner, 2016). When mothers use richer vocabulary and more varied grammatical structures when talking to their children, children are likely to develop more advanced language skills that enable them to continue learn and process language efficiently (Hoff & Naigles, 2002; Hurtado, Marchman, & Fernald, 2008; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Likewise, children whose mothers are more sensitive and responsive to their interests and needs are likely to have stronger language skills (Tamis-LeMonda, Bornstein, & Baumwell, 2001; Vallotton, Mastergeorge, Foster, Decker, & Ayoub, 2017), providing additional evidence that mothers are a crucial component of infants' early language environment.

While research has tended to emphasize the role that mothers play in guiding infants' learning, other caregivers also shape infants' early experiences with language. In the US, fathers may, on average, provide a lower proportion of the input that children hear compared to mothers (Bergelson et al., 2019; Shapiro, Hippe, & Ramírez, 2021), but the input that children receive from both mothers and fathers predicts their success in school

(Cabrera, Shannon, & Tamis-LeMonda, 2007; Reynolds, Vernon-Feagans, Bratsch-Hines, Baker, & Family Life Project Key Investigators, 2019). Similar to patterns observed with mothers, children whose fathers produce more complex speech during parent-child interactions are likely to have stronger vocabulary skills (Pancsofar, Vernon-Feagans, & Family Life Project Investigators, 2010; Salo, Rowe, Leech, & Cabrera, 2016). Fathers also adapt their speech in concert with infants' language skills, and children appear to benefit when fathers produce speech that is appropriate for their current abilities (Schwab, Rowe, Cabrera, & Lew-Williams, 2018), providing additional evidence that children are sensitive to and make use of a variety of parental input.

Equally importantly, many children regularly interact with people other than their parents (e.g., siblings, teachers, daycare providers, extended family members), yet input from these sources is not as widely discussed. There are reported associations between children's language skills and the language used by teachers (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002), demonstrating that experience with different people can contribute to children's learning. From a learning perspective, exposure to the variability found in speech produced by different people could support learning and generalization and allow children to better recognize words across different contexts (Graf Estes & Lew-Williams, 2015; Rost & McMurray, 2009). For example, toddlers are better able to understand words in an unfamiliar accent after they have had the opportunity to hear a variety of speakers with different accents (Potter & Saffran, 2017; Schmale, Seidl, & Cristià, 2015), suggesting that children can form more robust and flexible representations when they hear speech from a greater variety of people. Indeed, it has recently been shown that children who have close social bonds to more people tend to have larger vocabularies (Okocha et al., in press), suggesting that children may benefit from regular input from a variety of people in their immediate social networks. However, the introduction of additional people could also present challenges that might interfere with infants' learning. Young infants often struggle to recognize the same word or to generalize patterns produced by two different talkers (Bulgarelli & Bergelson, 2022; Graf Estes & Lew-Williams, 2015; Houston & Jusczyk, 2000), indicating that there could be costs associated with receiving input from a large number of people. Thus, it is important to consider the specific people with whom infants and young children regularly interact, in order to understand the likely impact of those experiences on their language development.

One frequent, yet poorly understood, source of input is that provided by other children, especially siblings. There is some evidence that older siblings may adjust their speech when talking with younger siblings in similar ways as adults (Dunn & Kentrick, 1982) and that older siblings may help younger children in the family learn relevant communicative conventions (Barton & Tomasello, 1991; Dunn & Shatz, 1989). At the same time, several studies have reported that children with older siblings tend to have weaker language skills compared to oldest or only children (Havron et al., 2019; Hippe & Ferjan Ramírez, 2022; Hoff-Ginsberg, 1998). It is typically assumed that these effects are due to the division of parents' attention, but it could also be that child speech itself supports or impedes language learning. In some cultural contexts, older children may play a significant role in caregiving for younger children, and infants and toddlers may hear a relatively high proportion of their language input from other children (Casillas et al., 2020; Shneidman & Goldin-Meadow, 2012), making it important for future research to consider the diversity of people who provide infants with language experience.

2.3 People as a source of variability in language experience

As children encounter more different people, they also have the opportunity to interact with people who speak differently, including using unfamiliar languages or accents. Young children consider the language someone speaks to be a meaningful social cue, and they show reliable preferences and positive associations for familiar languages and accents (Kinzler, Dupoux, & Spelke, 2007; Kinzler, Shutts, DeJesus, & Spelke, 2009; Pun, Ferera, Diesendruck, Kiley Hamlin, & Baron, 2018). For children raised in primarily monolingual environments, these preferences increase with age such that older children demonstrate greater tendencies to befriend individuals with accents that match their own (Creel, 2018). Children also show evidence that they have expectations that people's appearance and accent may be related; they assume that people with a similar accent may come from a similar background, and they make different interpretations about the speech of own-race vs. other-race speakers (Weatherhead & White, 2018; Weatherhead, White, & Friedman, 2016). These findings suggest that even in single-language environments, children are sensitive to the way that different people speak and could use that information to attend to some informants over others.

While monolingual children may prioritize one language or accent, children raised in bilingual or multilingual environments must be able to understand and communicate with speakers of different languages. Bilingual

environments tend to include significant input from non-native speakers of varying proficiency, often giving bilingual children regular exposure to a variety of accents (Place & Hoff, 2011). Like monolinguals, bilingual children are sensitive to language and accent and tend to both prefer and learn better from familiar-sounding speakers (Fennell & Byers-Heinlein, 2014; Mattock, Polka, Rvachew, & Krehm, 2010; Souza, Byers-Heinlein, & Poulin-Dubois, 2013). Importantly, bilingual environments are also highly variable in how children experience their two languages. For some children, the two languages may be relatively segregated, with different people speaking each language, while other children may interact with bilingual speakers who switch between languages freely (e.g., Byers-Heinlein, 2013; De Houwer, 2007; Place & Hoff, 2011). It has been suggested that consistent pairings between speakers and languages could support learning (Ronjat, 1913), but it remains unclear whether the frequency of language mixing has a positive or negative impact on bilingual children's learning (e.g., Byers-Heinlein, Morin-Lessard, & Lew-Williams, 2017; Byers-Heinlein, 2013; Place & Hoff, 2016). In fact, some evidence suggests that infants have difficulty forming associations between individual speakers and the languages they use (Schott, Tamayo, & Byers-Heinlein, 2023). However, at the same time, bilingual toddlers appear to be sensitive to the knowledge of their language partners, as they adjust the way they speak in the presence of monolingual vs. bilingual adults (Comeau, Genesee, & Lapaquette, 2003; Genesee, Boivin, & Nicoladis, 1996). From a young age, children raised in bilingual or multilingual environments are able to adapt to the fact that different people use different languages and to learn from a variety of people around them.

2.4 Summary

Research to date has provided compelling evidence that infants are closely attuned to their social partners, and many studies have made significant progress toward understanding how infants' language learning is linked to their interactions with key people in their environments. It is widely agreed that infants benefit from caregivers who produce rich, varied, developmentally appropriate language input and that there is important variability in how effectively individual people are able to provide learning opportunities. However, existing research may overemphasize the input that comes from just one or two caregivers (mostly commonly mothers) and overlook other people that may be critical to the infants' daily experience. People and families do not operate in isolation, and the field's tendency to narrowly

focus on dyadic interactions may limit our ability to understand children's broader social environments. Going forward, we suggest that while there is no question that infants' relationships with their primary caregivers are essential to their experience with language, it is also important to try to understand the larger social structures in which they live.

3. Places

A hallmark of successful learning is the ability to generalize information from one context to another, yet at the same time, the location where information is encountered can be central to its meaning and use. While some research has tested the role of the physical environment in early word learning, location tends to be less emphasized than person-focused questions in studies of language development. However, children spend time in different environments, and influential theories of language development emphasize that infants' learning is embedded in a rich perceptual environment and highlight the need to consider how infants can successfully extract the key information in their surroundings (e.g., Smith, Jayaraman, Clerkin, & Yu, 2018; Stevens, Gleitman, Trueswell, & Yang, 2017). As infants navigate their physical spaces, they have the opportunity to take advantage of a variety visual of cues, including statistical regularities and social signals, that can be used to build their understanding of language (e.g., Çetinçelik, Rowland, & Snijders, 2021; Smith & Yu, 2008).

Crucially, infants' environments are not static. In particular, as infants themselves move, their perspective on the environment changes (Clearfield, 2004; Kretch, Franchak, & Adolph, 2014; Smith et al., 2018). The ability to self-locomote has been linked to development in a variety of domains, including working memory, attention, and understanding of other people (see Anderson et al., 2013; Campos et al., 2000 for reviews). Infants who explore their environments more at young ages have higher academic achievement in adolescence (Bornstein, Hahn, & Suwalsky, 2013), emphasizing the value of being able to interact at an early age with the physical environment. As infants begin to walk, their motor skills tend to be correlated with their vocabulary knowledge, and walking infants tend to have more advanced language skills (Libertus & Violi, 2016; Walle & Campos, 2014). This correlation could reflect general neurological and cognitive development, yet it could also reflect changes in social experience. People tend to talk differently to babies that are able to move by

themselves (Karasik, Tamis-LeMonda, & Adolph, 2014; West, Saleh, Adolph, & Tamis-LeMonda, 2023), providing infants with new and often richer learning opportunities. At the same time, as children are able to move on their own, they may spend less time in the immediate vicinity of their caregivers (Chen, Schneider, West, & Iverson, 2023). While relatively little research has explored children's physical proximity to caregivers, there is evidence that children who spend more time near adults tend to hear more speech (Salo et al., 2021). Future research will be needed to better understand how children's learning is affected by their ability to approach and engage with different people and objects in their environments.

3.1 Location as a cue in learning

Children, like adults, readily encode information about the context where they learned new information and can use that context as cue to support learning and memory. Adults are faster to name objects that occur in their expected locations (Boyce & Pollatsek, 1992; Oliva & Torralba, 2007), and in lab tasks, toddlers are more likely to learn new labels for objects that appear in a predictable location (Benitez & Saffran, 2018; Benitez & Smith, 2012; Samuelson, Smith, Perry, & Spencer, 2011). They are also more likely to learn a set of new words in a single context compared to learning the same words across different contexts (Gershkoff-Stowe & Hahn, 2007), providing additional support for the view that consistency during learning may support later learning and memory. Likewise, changes in context may introduce challenges. Young children often struggle to recognize newly learned words when they appear in novel visual contexts (Goldenberg & Sandhofer, 2013; Vlach & Sandhofer, 2011; Werchan & Gómez, 2014). While toddlers are able to generalize their learning across new contexts (Wojcik, 2017), it has been suggested spatial predictability can help to organize attention and therefore can promote learning of new words (Smith, Colunga, & Yoshida, 2010).

Importantly, contextual consistency can influence learning in naturalistic settings as well as in controlled lab experiments. For example, some words that are commonly used at home may rarely be used in a school setting and vice versa (Marvin, Beukelman, & Bilyeu, 1994). Moreover, some words may be even more narrowly constrained to a particular space. Children are highly likely to hear food-related words in the kitchen, and they often hear body parts named in the bathroom, and locations may also coincide with routines such as mealtime or bath time (Custode & Tamis-LeMonda, 2020; Tamis-LeMonda, Custode, Kuchirko, Escobar, & Lo, 2019). In contrast, activities such as book-reading that

can occur in a variety of contexts and spaces are less likely to involve specific items (Hoff, 2010). Infants are more likely to produce words that have previously been used in consistent contexts (Perry, Samuelson, & Burdinie, 2014; Roy, Frank, DeCamp, Miller, & Roy, 2015), providing additional evidence that spatial stability can facilitate word learning and that children are sensitive to the locations where words tend to occur.

3.2 Places as source of variability in language experience

The context in which children learn language can be described at a variety of levels, and children's language skills are shaped by the language they hear in different locations. Often, research has highlighted the importance of home language environment, as children typically hear more speech from adults at home than in other settings such as school (Larson, Barrett, & McConnell, 2020). Studies that examine input in individual children's homes have found that the amount of speech that children hear at home can predict their vocabulary knowledge and processing efficiency (Rowe, 2012; Weisleder & Fernald & 2013), showing that home is a crucial place for language exposure. But crucially, many children spend significant time outside of their homes, and their learning is also related to experience in other places that they spend significant amounts of time, such as daycare centers and schools (e.g., McCartney, 1984; Tizard, Cooperman, Joseph, & Tizard,1972). The language interactions that children experience in preschool settings, for instance, can predict children's vocabulary and language growth in both their first and second languages (Aukrust, 2007; Duncan et al., 2020; Justice, Jiang, & Strasser, 2018). Thus, while the home may be one important setting for learning, children also take advantage of experience with language in other settings.

For some children, different settings may introduce the opportunity to hear and practice different languages or other styles of speaking. In multilingual communities, families may use one language at home and another in public (Ballinger et al., 2022; Mak et al., 2023). For example, in the US, English is typically the primary language in a school setting, but children may hear and speak and different languages in their homes (Hoff, Tulloch, & Core, 2021). Families vary in the emphasis that they place on building children's skills in different languages (see Fibla, Kosie, Kircher, Lew-Williams, & Byers-Heinlein, 2022 for review), but current studies suggest that use of a different language at home does not impede children's learning of the dominant language in the community (Chen, Zhou, & Uchikoshi, 2021; Pham & Tipton, 2018), further supporting the view that children can

adapt their learning to their everyday environments and that they recognize that language may be used differently in different locations.

Even when children seemingly live in a community with just one language, there may be significant differences in the dialect or accent that they hear at home compared to what they encounter in formal or educational settings. While children vary in their explicit awareness of the differences between a mainstream and local dialect (Charity, Scarborough, & Griffin, 2004), it has been shown that school-based standardized measures may not appropriately reflect children's language knowledge when they speak a different dialect at home, such as using African American English (Charity, 2007; Roberts, Burchinal, & Durham, 1999). Many children are sensitive to dialect differences and are able to adapt their language use for different contexts with remarkable skill (Craig & Washington, 2006; Washington, Craig, & Kushmaul, 1998). However, as children enter school, they may encounter challenges when learning a written code based on a mainstream dialect that differs from their home or community dialect (Caesar & Kerins, 2020; Washington & Seidenberg, 2021), making it crucial that educators are aware of the diversity of language use in the home in multicultural, as well as multilingual, communities.

3.3 Summary

Children's physical environments represent not only the backdrop for learning language, but also are often a reliable cue to support their emerging knowledge. As infants grow, they are likely to encounter new spaces and also to engage with their surroundings in different ways (see De Barbaro & Fausey, 2022). By encountering the same or different words across different contexts, children are able to refine their understanding of language and appropriately adapt their own use. For some children, this may mean that they communicate differently across different settings, including potentially speaking entirely different languages or switching between dialects across different locations. While some research has incorporated the role of contextual cues in learning, the majority of studies that examine children's "language environment" focus on the speech that they hear in the home, even though many young children spend significant amounts of their day in other places, such as daycare (e.g., Phillips & Lowenstein, 2011). Understanding the different ways that children encounter language across different places and how they integrate their knowledge across different contexts will be crucial in developing more comprehensive theories of learning, as well as being able to provide research-based advice to educators, clinicians, and policy makers seeking to create supportive pathways to learning for young children.

4. Things

In a common framework, the process of learning words (or even language) has been conceptualized as a challenge of linking words to their referents in the physical world (e.g., Bloom, 2002; Smith & Yu, 2008; Stevens et al., 2017; see Wojcik, Zettersten, & Benitez, 2022). Many of the first words that infants say are concrete nouns that appear frequently in their visual input (Clerkin, Hart, Rehg, Yu, & Smith, 2017), suggesting that infants may be tracking the objects that they encounter and linking them with words they hear. Infants also tend to learn the words for objects that their parents label often at earlier ages (Bergelson & Aslin, 2017; Goodman, Dale, & Li, 2008), providing additional evidence that they attend to the both the presence of different items and the frequency with which their parents mention them.

Visual cues are not the only information available to infants, and as infants' motor skills develop, the ability to handle objects directly provides multimodal sensory experience that supports learning (James, Jones, Swain, Pereira, & Smith, 2014; Yu & Smith, 2012). For instance, as infants gain the postural control to sit up (and therefore hold toys while looking at them), they show a better understanding of the three-dimensional nature of objects (Soska, Adolph, & Johnson, 2010), demonstrating how infants build their knowledge by interacting with the things around them. Moreover, infants' attention to objects in multiple modalities (i.e., what they are touching, as well as viewing) predicts the words that they are likely to learn (Schroer & Yu, 2023). In a striking example, infants who have been outfitted with "sticky mittens" that enable them to pick up toys before their fine motor skills allow them to grasp objects tend to show greater interest in objects in both immediate and long-term tests (Libertus, Joh, & Needham, 2016; Needham, Barrett, & Peterman, 2002). Thus, early experiences with objects are thought to have lasting effects on infants' attention and behavior. While the specific objects with which children interact varies, children across different cultures tend to spend more time engaging with objects as they get older (Casey et al., 2022). During play, infants spend large proportions of their time interacting with toys (Herzberg, Fletcher, Schatz, Adolph, & Tamis-LeMonda, 2022), and parents tend to provide labels when infants are holding objects (West & Iverson, 2017). In fact, studies have shown that mothers' use of labels and infants' manipulation of objects are dynamically coordinated over time (Chang et al., 2018; Tamis-LeMonda, Kuchirko, & Tafuro, 2013), suggesting that multimodal interactions provide a rich environment for learning.

Although it is true that concrete objects are a frequent and important component of infants' early environments, object names are not the only important words for infants to learn. The narrow construal of word learning as the process of linking a concrete referent with a label may underestimate what children know and could lead to a misunderstanding of cultural differences in how children build their vocabularies (Wojcik et al., 2022). Words other than nouns appear in children's very early vocabulary (Frank, Braginsky, Yurovsky, & Marchman, 2021), and knowledge is not limited to simple associations between labels and objects. For example, infants commonly understand and say words associated with social routines such as *hi*, *uh-oh*, and *more*, even when those words do not have an obvious visual referent (Casey, Potter, Lew-Williams, & Wojcik, 2023). They can also reliably show understanding of other types of words, including verbs (Golinkoff & Hirsh-Pasek, 2008; Valleau, Konishi, Golinkoff, Hirsh-Pasek, & Arunachalam, 2018) and adjectives (e.g., Ebeling & Gelman, 1994; Fernald, Thorpe, & Marchman, 2010; Waxman & Markow, 1998), providing additional evidence that their knowledge of language includes more abstract concepts, as well as tangible items.

4.1 Using objects to learn language

In addition to being a target for word learning, the objects present in children's daily environment also influence how and what they can learn. One clear illustration of this idea comes from observations of how children's language experiences vary during interactions with toys. For example, play involving vehicles has been found to elicit less language than play that involves dolls (O'Brien & Naigle, 1987), suggesting that different types of toys can create more or fewer opportunities to engage in dialogue. More recently, it has been shown that parents tend to talk more in the presence of traditional toys, such as blocks, compared to electronic toys that make sounds (Miller, Lossia, Suarez-Rivera, & Gros-Louis, 2017). Likewise, both typically-developing and autistic children tend to speak less when they are playing with electronic toys (Venker & Johnson, 2022), further demonstrating that objects can influence both children's language input and their production.

For families looking to enrich their children's language experience, another popular item to introduce is children's books. The language used in children's books is different from the typical content of spoken language, and text tends to have more diverse vocabulary and more complex sentence structure (Cameron-Faulkner & Noble, 2013; Montag, Jones, & Smith, 2015;

Montag, 2019). Children can learn new words from reading interactions, and they can also learn other information such as facts, narratives, and moral lessons (e.g., Breitfeld, Potter, & Lew-Williams, 2021; Flack, Field, & Horst, 2018), and engaging in shared reading has been shown to promote language development (Bus, Van Ijzendoorn, & Pellegrini, 1995; Duursma et al., 2007; Fitton, McIlraith, & Wood, 2018; Sénéchal, Pagan, Lever, & Ouellette, 2008). While some of the learning opportunities may stem directly from the book text, children have also been shown to benefit from the talk that surrounds book-reading (Whitehurst et al., 1988; see Read, Rabinowitz, & Harrison, 2022 for review). Thus, children's books can promote dialogue in addition to directly providing language input and seem to be a particularly useful tool for supporting language skills.

A newer, but highly prevalent, source of information in children's environments is digital media, and the impact of screentime is a hotly debated topic for both researchers and parents. As digital devices became more popular, and as new programs and products were developed for infants, researchers began to explore correlations between 'screentime' and children's language development. Many early studies suggested that very young children who spent more time watching television and videos tended to have weaker language skills (Barr, Lauricella, Zack, & Calvert, 2010; Kirkorian, Wartella, & Anderson, 2008; Zimmerman, Christakis, & Meltzoff, 2007). Lab-based studies supported this position, showing that infants tend to learn less from screen-based exposure than from live interactions (Deloache et al., 2010; Krcmar, Grela, & Lin, 2007) and that infants may have difficulty applying what they learned on screens to the real world (Barr, 2010; Zack, Barr, Gerhardstein, Dickerson, & Meltzoff, 2009). Moreover, the background noise introduced by TV reduces conversation between adults and children, which could also contribute to the negative effects on language learning (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009; Zimmerman et al., 2009). Combined, this research suggests that screentime does not provide high quality language experience and could even impede learning.

However, more recent studies have not necessarily replicated early findings that tended to rely on US samples. For example, a study in the UK found no significant association between the amount of time children spent watching media on screens and their vocabularies (Taylor, Monaghan, & Westermann, 2018), and a study in Argentina found positive correlations between children's vocabulary and their computer use (Tabullo & Gago-Galvagno, 2022), suggesting that media could

support learning or at least does not necessarily impede language development. It has also been found that toddlers are able to learn words similarly from print and digital books (Strouse & Ganea, 2017), indicating that they can extract information from screen-based experiences. One possible explanation for these apparent inconsistencies is that many studies do not consider the quality and type of program that children watch, and some types of media may be more supportive of language skills than others (e.g., Hudon, Fennell, & Hoftyzer, 2013). Another possibility is that children's learning varies with age and experience. While very young children may not learn much from media (especially in comparison with natural play), children's ability to learn from screen-based experiences may change over the second and third year of life, with preschool-age children being more likely than infants to benefit from educational programming (Kirkorian, Wartella, & Anderson, 2008; Krcmar, Grela, & Lin, 2007; Rice, Huston, Truglio, & Wright, 1990). Relatedly, children with stronger language skills seem to learn more from watching TV than peers with weaker skills (Neuman, Wong, Flynn, & Kaefer, 2019), suggesting that over time, children may take greater advantage of input provided by media. As new, interactive technologies become available, research will be needed to continue to evaluate the circumstances that are most likely to promote or hinder learning, and as with other tools, it is likely that individual children's learning depends on the content of the media, their own learning-related abilities, and their caregivers' scaffolding of the media content.

4.2 Things as a source of variability in language learning

In some homes within some communities in the world, families actively look to provide child-centered objects, such as books and toys, that can be used promote language learning (Arnold, Graesch, Ochs, & Ragazzini, 2012). However, even in cultural contexts where these items are common, individual children's experiences vary (de Barbaro & Fausey, 2022), and in particular, differences in wealth and family resources can influence how often children engage with different types of objects. Notably, children from homes of higher socioeconomic status tend to have more access to books, and in fact, the number of books in a home is sometimes used as an index of socioeconomic status in large-scale studies (e.g., Blömeke, Olsen, & Suhl, 2016; Eriksson, Lindvall, Helenius, & Ryve, 2021). A general finding is that children who have greater access to books in their homes and who regularly participate in reading and literacy activities tend to have

stronger language and academic skills, independent of their families' income (Eriksson et al., 2021; Evans, Kelley, Sikora, & Treiman, 2010; Mendive, Mascareño Lara, Aldoney, Pérez, & Pezoa, 2020).

In addition to having fewer opportunities to interact with books, children growing up in under-resourced environments are typically reported to spend more time watching television and using screens (Anand & Krosnick, 2005; Hutton et al., 2018; Mendelsohn et al., 2008). This increased use of screens may not be directly related to income and possessions, and instead could reflect differences such as parents' availability to engage in other activities, the need to entertain the child with fewer alternatives, or the safety of the neighborhood for outdoor play (e.g., Hartshorne et al., 2021; Hutton et al., 2018; Lee, Bartolic, & Vandewater, 2009). In fact, it has been suggested that screen time could be a mechanism contributing to socioeconomic disparities in children's health and behavioral outcomes (McArthur, Browne, Racine, Tough, & Madigan, 2022). However, the effects of screen use may not be the same for children across different communities. For example, in one study examining language development in young children in Iran, television exposure negatively predicted vocabulary skills for children from higher socioeconomic backgrounds but was positively associated with vocabulary for children from lower socioeconomic backgrounds (Farangi & Mehrpour, 2022). Thus, children seem to adapt to take advantage of the resources available to them, but importantly, there are likely to be individual and cultural differences in the tools and routines that are most useful in support language learning.

4.3 Summary

Interacting with different objects allows children to learn about their properties (Bonawitz et al., 2011; Stahl & Feigenson, 2015) and to engage in rich social exchanges (Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, & Klahr, 2016). Research has tended to highlight how the visual environment provides support for children to learn labels for concrete nouns, but there is clear evidence that children's knowledge extends beyond object names and that they make use of multimodal cues in learning. It is also important to recognize that individual children have access to different objects, influencing their learning opportunities and later language skills. A large and prominent body of research has documented differences in language input in homes with more and fewer resources (e.g., Gilkerson et al., 2017; Hart & Risley, 1995; Hoff-Ginsberg, 1998; Rowe, 2008, 2012; Weisleder & Marchman, 2018; see

Schwab & Lew-Williams, 2016a), but it remains unclear if these differences are robust or meaningful, or why they may emerge. The relations between family income and language experience are complex, and more research is needed to develop a more nuanced understanding of how children's language experiences depend on the resources in both their immediate and broader environments.

5. Structures and systems

Thus far, we have described children's environments through the lens of local, immediate influences: the people, places, and things that they directly encounter. Children's experiences are complex and variable, and with the arrival of new technology that enables collection of large, dense samples of children's experience, researchers have been able to begin separating the shared and unshared experiences that can help explain why some children learn language more easily than others. For example, there is robust evidence that children's learning is shaped by their interactions with the key people in their lives: when adults provide rich input, children have a better chance to learn. Thus, a very reasonable response to these findings has been to examine individual differences in parents' knowledge and behavior that might lead them to talk more or less, such as their educational background, sensitivity to their children, and their understanding of child development (e.g., Hoff, 2006; Rowe, 2008) and to develop interventions that are intended to promote behaviors and activities that appear to be associated with children's learning (e.g., Ridge et al., 2015; Suskind et al., 2016). However, drawing inspiration from Bronfenbrenner's bioecological model of development (Bronfenbrenner & Ceci, 1994), we suggest that it might be more fruitful to consider how behaviors emerge within a larger system, and to consider distal as well as proximal influences on children's language environment. That is, parents' behaviors, like children's, vary across different contexts, and emphasizing individual factors could neglect larger forces that change children's experiences with language (see Rowe & Weisleder, 2020; Zengilowski et al., 2023). In the next section, we revisit the impact of the people, places, and things in children's environments, considering how structural and systemic influences, as well interactions between these different factors, may contribute to children's lives and learning opportunities.

5.1 Systemic influences on people: sociocultural factors

Decades of research in social psychology have demonstrated that human behavior is shaped by social context, such as interpersonal relationships, group attitudes, and the perceived norms of a community. As result, children's interactions with people depend on the both the immediate social context and the larger culture in which they are embedded. Here, we illustrate how broader circumstances can affect the ways in which people communicate with young children. Crucially, we do not claim to offer an exhaustive list of how sociocultural contexts shape children's experience, but rather to present evidence that individual differences may be better understood from this perspective.

As one example, it has been shown that mothers experiencing depression or anxiety tend to speak less, engage in fewer interactions, and even to spend less time in close proximity with their children (Bettes, 1988; Breznitz & Sherman, 1987; Clifford, Stockdale, Coyne, Rainey, & Benitez, 2022; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Rowe, Pan, & Ayoub, 2005; Væver, Krogh, Smith-Nielsen, Harder, & Køppe, 2013). While unfortunate, it is perhaps unsurprising that parental mental health is correlated with children's language experience and outcomes (Paulson, Keefe, & Leiferman, 2009; Stein et al., 2008). However, while these associations could be framed as individual differences, it is important to recognize that depression is influenced by factors such as economic hardship and discrimination (Belle & Doucet, 2003; Miech & Shanahan, 2000; Zimmerman & Katon, 2005). These patterns suggest that parents' behaviors cannot be understood in isolation, and children's language environments can be shaped via external influences on their parents' cognition, mental health, and resources.

An emphasis on individual people may also provide an overly narrow understanding of infants' interactions with caregivers. While studies of children's daily language environments tend to prioritize input from a primary caregiver (most often the mother), many children have complex caregiving networks, and the composition of these networks tends to vary along dimensions such as ethnicity and socioeconomic status (see Okocha et al., in press). Adults from different cultural and socioeconomic backgrounds follow different customs when interacting with young children, and cultural communities differ in the importance they place on language or school-related skills vs. practical tasks and work-related activities (Fouts, Roopnarine, Lamb, & Evans, 2012; Morelli, Rogoff, & Angelillo, 2003).

Moreover, when children interact with a greater number of caregivers, they usually receive different types of experience from each one. Therefore, closely examining the influence of a single caregiver cannot capture the totality of children's experience, and this may be especially true for children raised outside of the nuclear family structure that is most common in middle class European American communities.

As individuals and groups, parents and educators have different goals for children's language development, and their goals often reflect cultural practices and priorities, not just their personal ideas. For instance, it has been suggested that parents from less affluent backgrounds may express greater concern about their children's learning of the culturally-dominant language (Lambert & Thomas, 1996), perhaps because of the economic opportunities associated with particular languages. However, it has also been shown that parents' attitudes toward bilingualism and their decisions to enroll their children in multilingual activities are influenced by their environment, their family background, and their perceptions of the utility of two languages (Ballinger et al., 2022; Surrain & Luk, 2023). In addition, the perceived status of a language in the community affects what children choose to speak (Giles & Watson, 2013), and when there are significant imbalances in status, children's skills in the majority language have been shown to negatively predict their knowledge of a minority language (Hoff, Quinn, & Giguere, 2018). Children tend to learn majority languages more easily and may require additional experience to achieve similar proficiency in a home or heritage language (Gathercole & Thomas, 2009; Hoff et al., 2021). But notably, when there is institutional support for a heritage language, such as opportunity for formal instruction at school, children's language skills in both languages can benefit (Wright, Taylor, & Macarthur, 2000). Thus, the way that the people, institutions, and communities around them value and use different languages appears to be transmitted to children in both direct and indirect ways, and other social factors (e.g., neighborhood demographics, geopolitical climate, educational opportunities) likely exert similar influences on children's experience with language.

5.2 Systemic influences on places: geographic factors

As researchers have begun to move beyond describing convenience samples, it has become more and more apparent that children's language environments can vary considerably across different cultural communities and geographic settings. Thus far, the bulk of the research we have reviewed refers to findings from North American and/or English-speaking environments,

where children hear the largest quantity of input from adult female speakers who frequently address their speech to children directly (Bergelson et al., 2019). In other communities, these interactions may be less common. For example, in a study of a Tsimane community, it was reported that adult caregivers do not often speak directly to their infants (Cristià et al., 2019). Similarly, adults in Papuan and Tseltal Mayan communities tend to provide less infant-directed speech, compared to North American parents, yet their children are able to learn their language from other sources, like overheard speech or speech from other children (Casillas et al., 2020, 2021). When children grow up in different cultural environments, they are exposed to different patterns of speech, as well as other conventions, that allow them to learn the language and customs of their own environments. Therefore, it is critical to examine different types of learning environments that provide different cues and experiences rather than assuming children always learn language in the same way.

Even within one cultural context, children's physical environments can be vastly different across different communities or neighborhoods (Minh, Muhajarine, Janus, Brownell, & Guhn, 2017). Children raised in rural vs. urban settings, for example, have access to different resources and are surrounded by different systems of social support, which can influence their language and academic opportunities (e.g., Lloyd & Hertzman, 2010). Children's language skills have been shown to be stronger when their neighborhoods and homes are safer, quieter, and include community organizations such as churches, community centers, or libraries (Abufhele & Laurito, 2023; Cohen, Glass, & Singer, 1973; De Marco & Vernon-Feagans, 2013; Ha et al., 2019; Werner & Smith, 2019). Community resources such as playgrounds and music programs have been shown to enrich parent-child interactions (Bustamante, Hassinger-Das, Hirsh-Pasek, & Golinkoff, 2019; Smith et al., 2024), further illustrating how children's language experience can be influenced both their local and broader environments (see Rowe & Weisleder, 2020).

5.3 Systemic influences on things: economic factors

As discussed above, children differ in their access to material resources, including not only the objects in their homes but also more fundamental items such as food, stable housing, clean water, and medical care, as well as crucial services including reliable childcare and transportation. A variety of studies have shown that children from more vs. less privileged homes, on average, have different experiences with linguistic, social, and

object-oriented interactions (e.g., Clearfield, Bailey, Jenne, Stanger, & Tacke, 2014; Fouts et al., 2012; Rowe, 2008), but the reported associations between socioeconomic status and experience do not necessarily separate different components of that construct (wealth, education, and/or social standing), which may not exert identical influences. For example, it also recently been suggested that financial concerns can lead parents to talk less (Ellwood-Lowe, Foushee, & Srinivasan, 2022; Roby & Scott, 2022), demonstrating one way that economic hardship could affect children's everyday experience with language. Other effects may be less apparent, but equally consequential. For example, when COVID-19 introduced disruptions in childcare arrangements, workers from higher-status jobs tended to have more options for working from home (Parker, Horowitz, & Minkin, 2022), allowing them to more easily make alternative caregiving arrangements and maintain their income. This type of stability is likely to be beneficial for children's health and wellbeing, as well as their language and cognitive development, while families with fewer resources face increased vulnerability for mental health challenges and family conflict (Feinberg et al., 2022; Nievar, Moske, Johnson, & Chen, 2014), illustrating another pathway through which economic disadvantages may affect children's daily experiences. Further supporting this idea, new research suggests that offering regular cash support to parents living in poverty has measurable effects on children's early brain activity (Troller-Renfree et al., 2022), providing additional evidence that economic factors have direct influences on development.

Importantly, children can take advantage of resources outside the home, and the availability of goods and services in the outside community may be especially important for children whose families have fewer opportunities to provide them. In communities of lower socioeconomic status, family support networks tend to be stronger (Campbell, Marsden, & Hurlbert, 1986; Carey & Markus, 2017), increasing the sources of support for both the child and the family. In addition, high-quality childcare and preschool programs tend to have greater positive impacts on children from lower-income homes (Crosnoe et al., 2010), showing how community and institutional support have the potential to reduce the impact of poverty on children's development. Similarly, school enrollment is especially important for supporting academic skills for children from underprivileged backgrounds (Ramey & Ramey, 2004). Thus, the broader systems in a child's environment can both compound and ameliorate the economic disparities in their experience.

6. Conclusion

In this chapter, we have described what we see as the building blocks of children's communicative environments—the people who provide input, the places input is produced, and the things that elicit input—while also suggesting that studying any of these components in isolation presents an incomplete view of children's experience. In particular, the focus on individual actors, or even group differences, neglects the broader circumstances that shape children's environments, where both adults' and children's behaviors reflect sociocultural, geographic, and economic influences, not to mention their interactions. We use the term "systemic influences" to encompass tangible elements of the environment, such as physical resources and locations, but also more hidden factors, such as stress, health, and discrimination, in a broad attempt to acknowledge the range of variables that cannot be attributed to a single person, place, or thing (Zengilowski et al., 2023). Although we have attempted to apply a bioecological systems framework (Bronfenbrenner & Ceci, 1994), our perspective is still incomplete, and challenging to implement, and we acknowledge that we have not addressed all types of experience, such as that of children with developmental disabilities or children learning other types of communicative systems such as signed languages. In reality, we have only begun to consider the dynamic nature of children's environments, which can change rapidly through their own growth and development, or because of outside influences and even world events. Going forward, we suggest that to accurately describe and analyze "natural environments," it will be necessary to continue considering larger systems and understanding the meaningful differences found across different environments.

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