



## OVERVIEW



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# Developmental sociolinguistics: Children's acquisition of language variation

Elizabeth K. Johnson<sup>1\*</sup> | Katherine S. White<sup>2\*</sup>

<sup>1</sup>Department of Psychology, University of Toronto, Toronto, Ontario, Canada

<sup>2</sup>Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada

### Correspondence

Elizabeth K. Johnson, Department of Psychology, University of Toronto, Toronto, ON, Canada.  
Email: elizabeth.johnson@utoronto.ca

Katherine S. White, Department of Psychology, University of Waterloo, Waterloo, ON, Canada.  
Email: white@uwaterloo.ca

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### Abstract

Developmental sociolinguistics is a rapidly evolving interdisciplinary framework that builds upon theoretical and methodological contributions from multiple disciplines (i.e., sociolinguistics, language acquisition, the speech sciences, developmental psychology, and psycholinguistics). A core assumption of this framework is that language is by its very nature variable, and that much of this variability is informative, as it is (probabilistically) governed by a variety of factors—including linguistic context, social or cultural context, the relationship between speaker and addressee, a language user's geographic origin, and a language user's gender identity. It is becoming increasingly clear that consideration of these factors is absolutely essential to developing realistic and ecologically valid models of language development. Given the central importance of language in our social world, a more complete understanding of early social development will also require a deeper understanding of when and how language variation influences children's social inferences and behavior. As the cross-pollination between formerly disparate fields continues, we anticipate a paradigm shift in the way many language researchers conceptualize the challenge of early acquisition.

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- Linguistics > Linguistic Theory
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## 1 | INTRODUCTION

What does it mean to learn a first language? How should we set out to study first language acquisition in children? The answers that spring to mind in response to these questions likely depend on one's training. Developmental psychologists might tackle when and how children acquire the sounds, words, and grammar of a language. Typically, their go-to strategy for understanding these processes would be to collect group data in a well-controlled laboratory setting. Their focus would be on how learning mechanisms, neural maturation, and innate biases might explain the observed patterns of results. Linguists with a background in phonology or syntax might analyze written transcripts of children's productions to describe children's mastery

\*These authors contributed equally to this work.

of deterministic rules and symbolic operations. Sociolinguists, in contrast to psychologists and other types of linguists, would never consider studying language acquisition divorced from its social context. Their likely methodology of choice would be to carry out in-depth interviews or to record children's interactions in their natural environments. These interviews and recordings would be analyzed to better understand the mastery of variable aspects of language production.

Which approach is most appropriate for understanding first language acquisition? Clearly, each approach has its strengths and weaknesses. Well-controlled laboratory experiments run with large numbers of children are important because they tell us about average tendencies and allow us to isolate specific learning phenomena. But they often cannot provide the nuanced understanding that intense scrutiny of one-on-one interactions between caregivers and parents provides. And, if care is not taken, both well-controlled experimental work and detailed observations can overlook the diversity in children's experiences across social contexts. Perhaps the best way to understand how these different discipline-specific approaches contribute to our overall understanding of first language acquisition is to invoke the analogy of a group of blind men who encounter an elephant for the first time. One blind man reaches out and grabs the tail, another the trunk, and another an ear. When the men compare their descriptions of the elephant, they find they are in complete disagreement over the nature of the animal. To some extent, the study of first language acquisition could be viewed through the same lens. Only by combining different disciplinary approaches will we uncover key over-arching principles missed by any single approach. In this review, we argue that one of these over-arching principles is the importance of meaningful variation—including socially conditioned variation—for all aspects of early language development.

## 2 | THE VARIABLE NATURE OF LANGUAGE

Language is inherently variable, but contrary to assumptions made by many contemporary approaches to the study of language acquisition, variability does not always equal noise. A key assertion in sociolinguistics is that variability is not simply a problem that language learners must overcome. Rather, it can encode important information about speakers and contexts. Despite this, 10 years ago, a psychology student could read a standard undergraduate textbook on language development and not come across a single discussion of how very young children acquire variable forms. One would find multiple studies exploring when infants tune in to the phoneme inventory of their language (Werker & Tees, 1984), and perhaps discussion of how variable pronunciations might impede this learning, consistent with the emphasis by speech scientists on the lack of invariance between phonemic categories and their acoustic realizations. But, in this classic textbook, there would likely be no discussion of how these variable pronunciations might be informative and linked to meaningful factors in the real world, like speakers' age, gender, or dialect. One would also find work on how infants extract words from fluent speech (e.g., Jusczyk & Aslin, 1995; Saffran, Aslin, & Newport, 1996), but little mention of how these tasks might be influenced by other knowledge about speakers. For example, the pronunciations of some speech sounds tend to subtly vary, depending on where they are positioned in a word (e.g., in the word "toot", the /t/ at the end is often pronounced differently than the /t/ at the beginning, with the /t/ at the end often unreleased, or lacking the burst sound that is typically heard in word-initial /t/). These differences in pronunciation (i.e., allophonic differences) can be used by infants to segment speech. But speakers differ in how often they use these variants (e.g., how often and/or how strongly they release word-final /t/). Do infants pursue the same strategy for all speakers, or can they adjust based on what they know about the speaker? Returning to the typical undergraduate textbook, it might also include extensive discussion of how word learning is facilitated by biases that encourage children to accept only a single label per word (e.g., Merriman & Bowman, 1989). But even within a single language, this ignores the situation faced by a child hearing multiple labels from individuals speaking different varieties of that language (e.g., in English, *nappy* and *diaper*; *stroller* and *pram*), or a single label that has multiple meanings depending on who produces it (e.g., in American English *tomato sauce* refers to pasta sauce, but in Australian English it refers to ketchup). Other developmental milestones discussed in introductory textbooks might include mastery of grammatical forms, such as the marking of grammatical gender (e.g., Van Heugten & Christophe, 2015; Van Heugten & Shi, 2009), number (e.g., Kouider, Halberda, Wood, & Carey, 2006; Paquette-Smith & Johnson, 2016), or verb tenses (e.g., Brown, 1973; Santelmann & Jusczyk, 1998; Shipley, Maddox, & Driver, 1991). But although these textbooks might discuss whether the presence of variable forms in the input complicates acquisition, it would be unusual to see serious consideration of how children actually learn these variable forms. For example, in casual speech the English verb ending *-ing* can be reduced to *-in* (e.g., "is reading" versus "is readin"), and the prevalence of reduction varies across different social groups (more on this later). When children are learning the relationship between the verb 'is' and the suffix *-ing*, do they collapse instances of *-ing* and *-in*, or do they initially treat them as separate suffixes? If they treat them as the same suffix, do they still track them separately and realize the different contexts in which they tend to be used (and the people who tend to use them)?

Although the classic textbook studies described above have taught us a great deal about early perceptual and learning capacities, they have not generally focused on the layers of complexity present in the real world, where speech is the basis of meaningful conversations between speakers, each of whom has a distinct identity and communicative goal. Experiments focused on child production have necessarily had to consider variation more than perception studies (because language production is by its very nature variable, especially in children), but still the end goal of these studies has almost always been to pull out the generalities in the acquisition process within and across children. And, until relatively recently, both perception and production experiments with children were almost entirely focused on middle to upper class (often Caucasian) children (see Nielsen, Haun, Kärtner, & Legare, 2017, for discussion). Children from other backgrounds were occasionally considered, but, even then, they were often approached with language varieties and communication styles that were largely alien to them (and then these populations were compared to “typical” populations on their ability to communicate in these alien styles; e.g., Labov, 1972). Indeed, experimental studies explicitly testing how children process different varieties of their native language did not even begin to emerge until about 10 years ago (e.g., Best, Tyler, Gooding, Orlando, & Quann, 2009; Schmale & Seidl, 2009; see Box 1). Clearly, researchers outside of the field of sociolinguistics have for too long assumed that there is one kind of input and one kind of learner.

To recap, as sociolinguists have been demonstrating for years, language is inherently variable (as are learners). The targets of acquisition are neither deterministic nor static. Language variation occurs at many levels (the sound, or phonological level, the word, or lexical level, and the morphosyntactic, or grammatical level), and is conditioned by many factors. Some of these factors are internal to the language system (such as the forms preferred in certain phonological contexts or by particular words). Others rest outside the language system proper, including social factors like identity (the speaker or audience) and situation (the formality of the context). Therefore, acquisition cannot be studied divorced from social context. In order to attain adult-like communicative competence, learners must not only track multiple forms within and across speakers, but also learn the factors that condition these forms—how often and in what contexts to use them. That is, children do not simply have to learn that English has a two-way voicing contrast in stop consonants (that is, that the difference between sounds like /p/ and /b/, which differ only in the onset of voicing, causes words to mean different things), they also need to learn that in more casual styles of speech, word-final stops can go unreleased, or alternate with glottal stops (particularly for some speakers). Similarly, as hinted at above, children not only have to learn the relationship between “*is*” and *-ing* in English, they also have to learn that the standard verbal *-ing* ending alternates with the *-in* form. And they have to learn that *-in* is not only more likely in less formal contexts or from certain speakers (external constraints governing the alternation), but also that it is more likely to occur following velar sounds (an internal constraint). These types of alternations are everywhere we look.

In addition to learning when to use various forms, children also have to learn about the probabilistic social information that much of this variation transmits, including information about social hierarchies and status, a talker's identity or gender, and

#### BOX 1 WHEN CHILDREN'S LANGUAGE INPUT INCLUDES DIFFERENT VARIETIES OF THE NATIVE LANGUAGE

Traditionally, developmental psychologists have paid little attention to which language variety (or varieties) a child was learning. Children are often tested on the locally dominant variety, regardless of their own language backgrounds, because of an implicit assumption that this variation does not matter. But children often find unfamiliar accents challenging. For example, 9-month-olds fail to recognize newly learned words across accents (Schmale, Cristia, Seidl, & Johnson, 2010). Fifteen- to twenty-month-olds struggle to recognize familiar words spoken in unfamiliar accents (e.g., Best et al., 2009; Van Heugten, Krieger, & Johnson, 2015). And, although 19-month-olds can sometimes adapt to unfamiliar accents (White & Aslin, 2011), school-aged children still struggle with them (e.g., Bent & Atagi, 2015; Creel, Rojo, & Paullado, 2016). If children are so challenged by unfamiliar varieties of their native language in the lab, how might daily exposure to multiple varieties affect language development in the real world? A handful of studies have addressed this question by testing listeners exposed to multiple varieties of their language in childhood (Buckler, Oczak-Arsic, Siddiqui, & Johnson, 2017; Chen, Rattanasone, Cox, & Demuth, 2017; Clopper & Pisoni, 2004; Durrant, Delle Luche, Cattani, & Floccia, 2015; Edwards et al., 2014; Fennell & Byers-Heinlein, 2014; Floccia et al., 2012; Van der Feest & Johnson, 2016; Van Heugten & Johnson, 2017). Taken together, this work demonstrates that early exposure to multiple varieties affects language processing; thus, we can no longer afford to ignore this issue when designing experiments or modeling early acquisition.

their geographic origin. For example, differences between males and females can be observed in the acoustic–phonetic realization of their fricatives (e.g., Strand, 1999), and talkers will lower their voice when they want to be perceived as powerful (e.g., Ko, Sadler, & Galinsky, 2015). Some variable aspects of language convey multiple layers of information. Glottal variants of /t/ and the reduced –in form are not only more likely in certain phonological contexts and in informal speech, they are also more common in certain dialects or socioeconomic groups (e.g., Trudgill, 1972, 1974; Wolfram, 1969). Remarkably, many people possess the ability to speak in multiple different varieties of their native language, enabling them to adjust their perceived identity like a chameleon to fit into different social contexts (e.g., Craig & Grogger, 2012). In fact, how much a talker adjusts the way they talk can itself reflect that talker's social attitudes toward a conversational partner (e.g., Babel, 2010, 2012).

When one stops to consider how much information is conveyed through predictable variation in language, it is remarkable that so many have largely ignored it for so long.

### 3 | WHEN DO CHILDREN ACQUIRE VARIATION?

At some point, children must acquire variable forms, as well as the social and linguistic contexts that condition their use; otherwise, children would never achieve adult-like language competency. But when are variable forms learned? Do children initially acquire only standard (or canonical) forms, and acquire other variants only after standard forms are fully mastered? One of the first people to recognize the importance of this question for language acquisition was William Labov. His pioneering work (1964) initially supported this type of Sequential View of variation acquisition. He observed that children appeared to be initially mono-stylistic—failing to produce variable features in their speech until adolescence. But more recent work (including his own) looking at a broader range of learners and types of variation suggests that a more nuanced view of children's acquisition of variation may be more accurate.

The Sequential View assumes that children first learn standard language targets, perhaps because language learners initially abstract away from the variation, or because alternatives to the standard form are either less frequent or simply nonexistent in the input. However, the notion that children are born with the ability to automatically extract underlying targets from variable input (and disregard surface variation) is somewhat at odds with demonstrations from the developmental literature that children are highly attentive to speech variation. In fact, some have argued that children are so sensitive to variation in speech that they struggle to extract even basic generalities from their input. For example, infants may have trouble recognizing different versions of the same word produced in different emotions (e.g., Singh, Morgan, & White, 2004), or by different speakers (e.g., Houston & Jusczyk, 2000). Further, the notion that infant-directed speech is a cleaned up version of adult-directed speech—and that children are only exposed to standard forms (or even predominantly standard forms)—is not consistently supported by corpus analyses (e.g., Buckler, Goy, & Johnson, 2018; Lahey & Ernestus, 2013; Shockley & Bond, 1980; Smith, Durham, & Fortune, 2007).

An alternative to the Sequential View is a Parallel View of variation acquisition, in which all forms—both standard and alternative—are essentially learned simultaneously. Much as we now know that children learn various aspects of their language (phonology, lexicon, and grammar) in parallel, rather than sequentially (e.g., Johnson, 2016), increasing evidence suggests that this is also true of the acquisition of at least some variable forms. Recent work seems to provide at least partial evidence for the Parallel View because children clearly produce multiple forms early on. In one large-scale study, Roberts (1994) found that, at the same age that children are acquiring past tense and progressive markers, they also begin to learn about the linguistic (phonological and grammatical) contexts conditioning /t/d deletion (the deletion of these sounds in word-final consonant clusters, e.g., when words like “left” are pronounced without the final /t/) and the alternation between word final –ing and the reduced version –in. For example, children are very sensitive to how a following vowel influences /t/d deletion even at 3 years of age (also, Roberts, 1997; Smith, Durham, & Fortune, 2009). By 4 years, Spanish-speaking children's production of variable word-final s-deletion is likewise influenced by these kinds of language-internal factors (Miller, 2013). And work on grammatical variation shows that, here too, children are sensitive to linguistic factors conditioning the alternation of different forms, in some cases as young as 2–3 years (Smith et al., 2007; Smith, Durham, & Richards, 2013). Thus, the existing production data on many language-internal constraints provide more support for a Parallel than Sequential account of variation acquisition because children clearly do not avoid multiple forms in their early productions.

Although language-internal constraints appear to be acquired early (in some cases, as early as 2–4 years of age), much of the variation in language is conditioned by social factors—such as the group identity of the person being spoken to or the formality of the situation—or a combination of social and language-internal factors. Examination of children's sensitivity to social factors suggests that, although children may use multiple forms early, they do not always use these forms in adult-like

ways. For example, Roberts (1994) and Smith et al. (2009) found no evidence that children under 4 years modulated their choice of *t/d* deletion and *-ing/-in* based on the formality of the context, unlike adults (see also Smith et al.'s (2007, 2013) work with 2–4-year-olds on grammatical variation). These are cases in which children produce multiple forms, but do not appear to have mastered/determined the social factors conditioning them. At the same time, however, other studies have found at least some sensitivity to social factors. For example, 3–4-year-old children have been found to alter their use of *-ing/-in* based on the age of the person they are talking to (Roberts, 1994) and, among speakers of a Scottish dialect, the pronunciation of the vowel in “*house*” based on the formality of the context (using the local pronunciation more often in play contexts; Smith et al., 2007). Miller (2013) similarly reported that Spanish-speaking children's *s*-deletion was affected by the formality of the context. Young children have also been shown to modulate the complexity of their speech more generally for listeners of different ages (e.g., 4-year-olds; Shatz & Gelman, 1973) and (in bilinguals) to modulate their choice of language based on their conversation partner (e.g., 2–3-year-olds; Comeau, Genesee, & Mendelson, 2007). In summary, although sensitivity to language-internal factors governing variation is consistently observed very early in development, the evidence about children's sensitivity to social factors governing variation is more mixed. This suggests that children's learning about social factors occurs along a more protracted time course (although there is clearly some overlap in the acquisition of variation conditioned by these two types of factors).

A complete answer to the Parallel versus Sequential question will require more work on the acquisition of variation in children under the age of 3 years. Currently, there is a scarcity of data in the literature for this age group. Unsurprisingly, what little work exists mostly focuses on children's receptive abilities, rather than their own productions. And of course, the relationship between perception and production is a complex one (see Box 2). Particularly early in development, children's perception of variation may outstrip their ability to produce it themselves. A full understanding of the acquisition of variation must, therefore, consider both types of knowledge. Most relevant to the current discussion on the perception side is the handful of studies asking whether children who are exposed to more than one dialect learn features of both and, if so, whether they link them to the appropriate dialect. In one study, toddlers did appear to have encoded the properties of both dialects, applying different word recognition criteria based on the speaker's dialect (Dutch toddlers exposed to dialects with and without stop voicing contrasts; Van der Feest & Johnson, 2016). However, in another study, toddlers exposed to two dialects were found to recognize words in only one (British toddlers exposed to rhotic [with /r/] and nonrhotic word variants from the community and their parents, respectively; Floccia, Delle Luche, Durrant, Butler, & Goslin, 2012). Therefore, the jury is still out on when infants begin to learn multiple forms and link those forms to particular speakers or social groups. However, there is evidence that even 10–12-month-old infants can learn a novel vowel alternation between two speakers (Weatherhead & White, 2016) and that by 16 months, infants make the general assumption that speech variation is linked to social group information (specifically, race; Weatherhead & White, 2018).

## BOX 2 HOW THE PERCEPTION AND PRODUCTION OF VARIATION ARE RELATED

How are the production and perception of language variation related, and how does this relationship develop? Logically, it would seem that a distinction must be learned perceptually before it can be produced, and that the forms used in one's own speech must be perceptually privileged over others. But in actuality, this may be an oversimplification (Evans & Iverson, 2007; Fridland & Kendall, 2012; Kendall & Fridland, 2017). For example, Sumner and Samuel (2009) found that, although an individual adult's experience with nonstandard variants was evident in a short-term priming task, there was a long-term memory advantage for standard variants, even for listeners who did not produce those variants themselves. And, bi-dialectal Dutch-learning toddlers, who do not yet possess adult-like mastery of their native language phonology—and are presumably learning to speak in only one variety of Dutch—nonetheless use different word recognition strategies for the two varieties of Dutch heard in their environment (Van der Feest & Johnson, 2016). In other contexts, however, children's productions precede aspects of their perception. For example, children produce some variants before they are able to socially evaluate them (Barbu et al., 2013; Chevrot et al., 2011; Nardy et al., 2013). And some have claimed that children's productions directly influence their speech perception by serving as a perceptual filter (DePaolis, Vihman, & Keren-Portnoy, 2011; Foulkes & Docherty, 2006; Masapollo, Polka, & Menard, 2016). Clearly, a thorough understanding of the relationship between the perception and the production of variation—in both adults and children—remains elusive.

Although the field of developmental sociolinguistics is relatively young, the available data do suggest that children learn at least some patterns of variation extremely early in development, with others following a more protracted trajectory. In other words, as Smith et al. (2013) demonstrated in their comparison of six different types of variation, the acquisition of variation is itself variable (see below for more on the factors that may influence learning). It is clear, then, that a purely Sequential view does not adequately capture the data we currently have on the acquisition of variation—children do not typically learn only a single form early on; instead, they tend to use multiple forms even at the earliest stages (even though use of those multiple forms may not initially fully reflect the subtle nuances of adults' usage). It also seems to be the case that young children track both internal (linguistic) and external (social) factors governing variation, though in many cases they show earlier sensitivity to the former. A full understanding of this process will require not only extending these investigations to even younger ages, but more systematic exploration of the factors that modulate when different forms of variation are acquired.

## 4 | HOW IS THIS VARIATION ACQUIRED?

Children cannot learn variation that they are not exposed to. And it seems only logical that the more frequent a variant, the easier it would be to learn. Thus, properties of the input should play a significant role in determining when different types of variation will be acquired. So what does the input look like? A general tendency observed in studies of sociolinguistic variation is that women—who have traditionally spent the most time with young children—use more standard variants than men (at least for patterns of variation that are stable in the community; Labov, 1990). And for at least some sociolinguistic features, the input female caregivers provide to children is even more likely to contain standard variants. But, as mentioned earlier, there are many ways in which infant- or child-directed speech does not constitute a “cleaned up” version of adult-directed speech, and in some cases, non-standard forms may be much more common in children's input than the standard form (Smith et al., 2007).

Roberts (1994) and Foulkes, Docherty, and Watt (2005) demonstrated how the prevalence of some sociolinguistic features differs in child-directed and adult-directed speech. In Foulkes et al.'s study of a British dialect, usage of glottal variants of /t/ was high in the community, but there was a drastically lower rate of glottal production in speech to children (particularly in speech to young girls). The authors suggest that mothers are consciously aware of the social markedness of the glottal variants and attempt to model desirable behavior (especially for girls) by providing more standard input. This is consistent with the results of Smith et al. (2007), where Scottish parents increased the use of standard forms in their speech to children for certain features (the vowel in “*house*” discussed earlier), but not others (plural vs. singular “to be”, as in “*trousers is*”). For the former feature, parents also showed some modulation by context. An intermediate situation was observed by Miller (2013), who found that although parents' use of *s*-deletion did not differ in child-directed and adult-directed speech, there was considerably less deletion in certain contexts with children (in particular, intimate and teaching contexts). Smith et al. (2007) argue that parents reduce their use of nonstandard variants only when they are aware of the social value of such variants. When the social status of variants is less accessible to awareness, local forms are used in child-directed speech at rates commensurate with adult-directed speech. This leads to earlier acquisition of the local or informal forms.

In some cases (e.g., the pronunciation of “*house*” or *s*-deletion), there are strong correlations between the rates of standard versus nonstandard forms in input to children and the rates at which children produce these forms, the contexts (formal vs. informal) in which these forms are used, and the particular lexical items that each form appears with (Miller, 2013; Smith et al., 2007). The effects of race and social class on children's productions, which emerge early and get stronger with age, also show that children are sensitive to the frequency of forms in their input. For example, French children from high SES backgrounds were more likely to produce optional liaisons by the age of 2–3 years (and to judge them to be correct by the age of 4–5 years) than children from low SES backgrounds (Barbu, Nardy, Chevrot, & Juhel, 2013; Chevrot, Nardy, & Barbu, 2011). Children's input mirrored this difference (high SES children were exposed to more realized optional liaisons). Similarly, socioeconomic status affects the rate at which marked dialect forms are used by 5–6-year-old learners of African American English (with low SES children, particularly males, using more dialect-specific forms; Washington & Craig, 1998). The authors argue that this is because children in middle SES environments are more likely to be exposed to speakers of the standard dialect. Children's productions also change as the source of their input changes, with more influence of the parental dialect in young childhood and strong community influences later (Kerswill & Williams, 2000).

So children's acquisition of variants is clearly affected by the frequency with which they occur in the input. As Shin (2016) notes, variation is more obvious when it occurs more frequently, and those conditioning contexts that are more frequent should also be tracked earlier. However, pure frequency of variants cannot be all that matters. Although there are sometimes correlations between the input parents provide (i.e., the rate at which parents produce different forms) and the forms their children produce, this is not true across the board. For example, Smith et al. (2009, 2013) reported that in some cases, even when

parents used non-standard or local forms, young children still produced more of the standard variants; in these studies the correlation between the use of *t/d* deletion in individual child-parent dyads was low. One possible explanation for this dissociation is that parents' productions of standard forms were more emphatic (louder, longer) than their productions of the local variants (Smith et al., 2013), perhaps privileging them for learning (see discussion in Sumner, 2015; Sumner, Kim, King, & McGowan, 2014). Parents may also produce more standard forms in salient teaching contexts (in Spanish: Miller, 2013). Work on infant-directed speech more generally has demonstrated that parents tend to place novel, to-be-learned information in utterance-final position (e.g., Aslin, Woodward, LaMendola, & Bever, 1996), and experimental studies have shown that infants as young as 6 months are more sensitive to information aligned with utterance edges than information placed utterance medially (Johnson, Seidl, & Tyler, 2014). It remains to be seen whether parents' use of more standard forms is more likely in utterance-final positions. If so, this distributional property likely interacts with the child's own perceptual biases to influence their uptake of these forms, as certain phrasal positions (final) are more salient to children (Slobin, 1973). And, of course, it is also likely that parental input is not the only input that matters (more on this below).

Learners must also be able to track and correctly characterize the conditioning contexts that govern the occurrence of different variants. Disentangling these conditioning contexts may be a huge challenge, complicated by the fact that children may initially only have regular exposure to a limited number of speakers. For example, different talkers may consistently appear in different types of social contexts (e.g., a child's preschool teacher may speak a different dialect than their parents, and may also tend to speak in a more formal style of speech than the child's parents), so it may initially be difficult for the child to work out whether a pattern is conditioned by the formality of a context, the dialect of a speaker, by talker-specific preferences, or a combination of all of these parameters.

One sign that children are indeed trying to work out the factors governing the patterns they hear, rather than strictly reproducing their input, is that they sometimes get things wrong. For example, Roberts (1994) reports that, with respect to one grammatical constraint on *t/d* deletion, children deviated quite significantly from the adult pattern, having apparently acquired the wrong grammatical constraint. It is likely that the more complex the constraint (e.g., in terms of the number of conditioning contexts), the more difficult it will be to acquire (Shin, 2016; Smith et al., 2013). And, in some cases, constraints may involve factors that young children are not yet aware of (e.g., adults tie dialect variation to regional background or SES, but young children may not yet be sensitive to these socially defined groups (Foulkes & Docherty, 2006)).

One way to directly test the types of variation that children can learn is to conduct artificial language studies, in which the input can be precisely controlled (Docherty, Langstrof, & Foulkes, 2013; Hudson Kam, 2015; Samara, Smith, & Brown, 2017). As Samara et al. argue, when children do not produce variant forms in naturalistic situations, it is not always clear whether this is because they cannot learn the variation or because they were not exposed to it. Artificial language studies can help distinguish between these possibilities. When faced with novel patterns of variation in such studies, adults tend to learn the patterns veridically, matching the probability of their input (except when the patterns are very complex). This is true both when the variation is unconstrained and when it is systematically conditioned by either grammatical or social factors (Docherty et al., 2013; Hudson Kam & Newport, 2005, 2009). In contrast, children appear to over-regularize when variation is not systematically conditioned (Hudson Kam & Newport, 2005, 2009). For example, if a particular determiner form occurs only 60% of the time, they may produce it 100% of the time. This may enable children to discover underlying patterns from noisy or impoverished input (Singleton & Newport, 2004).

However, sociolinguistic variation is not random, and almost none of this artificial language research has explored children's learning of variation that is conditioned by linguistic or social factors. In one such study, 5–7-year-old children were unable to learn a grammatically conditioned constraint on determiner variation (Hudson Kam, 2015). However, 5–6-year-old children showed some learning of noun particles conditioned on speaker gender in a similar paradigm, even when they were not verbally able to identify the relationship (Samara et al., 2017). And even 12-month-old infants use talker voice to track the relationship between word types in an artificial grammar (Gonzalez, Gerken, & Gomez, 2018). Given that children clearly do learn variation in the real world, artificial language approaches are promising for exploring the conditions (e.g., the types of conditioning contexts, the amount of data, relative frequency of the variants, the number of speakers producing the same kind of variation) under which it is or is not learned. However, for this approach to be truly fruitful, an effort must be made to ensure that these languages mirror children's natural input. If this is not done, the outcomes may not be reflective of real-world learning. For example, if children are more attentive to information at the ends of utterances, as argued above, then artificial language situations that include variation only utterance-medially may underestimate children's ability to detect these patterns.

## 5 | A LITTLE BIT ABOUT MODELS

Psycholinguistic models of early speech development (e.g., PRIMIR, WRAPSA) often consider variation, but tend to treat it as noise—an obstacle that children need to abstract over to learn about invariant patterns (Curtin, Byers-Heinlein, & Werker, 2011; Houston & Jusczyk, 2000; Jusczyk, 1997; Werker & Curtin, 2005). At the same time, others have suggested that input variation is a feature that results in more robust learning (Apfelbaum & McMurray, 2011; Rost & McMurray, 2010). But children's acquisition and use of the type of structured variation discussed in this review are not typically considered in these approaches. Moving forward, any attempt to explain children's acquisition of variation needs to not only account for how children store multiple variants, but also for how they determine the contexts in which each form should be used (in other words, how they link variants to conditioning factors), and whether this is affected by the similarity of the variants. For example, is it easier to learn the relationship between the plural markers *-s* and *-z* than it is to learn the relationship between *-s* and *-es*, because the forms in the latter pair are more distant, involving a different number of sounds in addition to the voicing change? Similarly, is it easier to learn that *running* and *runnin'* are related than it is to learn that *pram* and *stroller* are related because, once again, the latter pair sound much less alike? And finally, a model that takes the acquisition of structured variation seriously will also need to account for the fact that learning is dependent on the structure of the input—it will take longer to build up categories that are less frequent or more distributed across multiple contexts.

There are multiple possible accounts of how sociolinguistic variation is learned and represented (Nardy, Chevrot, & Barbu, 2013), although most of the discussion has centered around adults: for example, variation may be represented as variable rules weighted by the contexts they operate over or as generalizations over stored utterance/context events. However, a common approach for capturing this type of variation is based on exemplar accounts of word representation. Exemplar accounts propose that individual experiences with words are stored. These exemplars are acoustically detailed, including not only linguistic information, but also information related to the specific instantiation of speech sounds and the speaker's voice (Goldinger, 1996). It is important to note that these stored exemplars likely do not reflect the raw statistics of the input (Goldinger, 2007), as they are filtered through the listener's attention and prior knowledge. The stored exemplars cluster in the representational space according to their similarity along multiple dimensions. Therefore, clusters will form along dimensions that are linked to variation (e.g., particular types of speakers, like males and females).

A related, but somewhat different, account is the dual coding model proposed by Sumner (Sumner, 2015; Sumner et al., 2014). On this account, a single word form gets simultaneously linked to a linguistic representation (the word) and to a social representation (e.g., type of person). When a variant is presented in a more socially salient context, it will receive greater weight, functionally increasing the importance of that variant beyond its frequency of use. This model accounts for the fact that canonical forms may be better remembered, even though they may be encountered less frequently than other forms. Miller's (2013) observation that parents engage in less Spanish *s*-deletion in teaching contexts (which are likely more salient) is consistent with this type of account. However, future work will need to determine what other features of a context make it socially salient and to test this prediction more systematically.

In applying these models to children's acquisition of variation, it is important to keep in mind that they may not find the same contexts salient that adults do, and that their knowledge differs from that of adults. This may result in differences in the exemplars that are stored or highlighted, with consequences for the patterns that are extracted. Moreover, children's understanding of the factors that condition variation may change over development. For example, the prestige and stigma of certain variants appear to affect adults' processing (Sumner & Samuel, 2009), but children may not make such social evaluations until later in development (Nardy et al., 2013). It is clear that children do not ignore social factors in their analysis of linguistic variation (since their productions are in some cases modulated by formality or listener age). However, the absence of many social effects until later in development could be at least in part due to children's different conceptions of the social world (Foulkes & Docherty, 2006). In other words, children's acquisition of variation may be affected not only by structural properties of the input (such as the frequency and complexity of different forms and conditioning factors), but also by their social understanding of the world. Indeed, there is a tight connection between children's social skills and other areas of language development, like lexical acquisition (e.g., Brooks & Meltzoff, 2008). Given the complexity of the relationships between social groups and linguistic features, it would be surprising if the same were not true for the acquisition of sociolinguistic variation.

## 6 | THE EFFECT OF LANGUAGE VARIATION ON SOCIAL INFERENCES AND BEHAVIOR

As the previous sections make clear, language external factors—such as the situational context and social factors—strongly influence language behavior. For example, we have discussed how speakers switch registers to suit the audience at hand, and how this switching is related to the use of different variants. But of course, the influence of social and contextual factors on language is not a one-way street. The perception and production of socially conditioned variable forms in language also influence social behavior. For example, adults often activate strong stereotypes when they encounter speakers from different linguistic backgrounds (Kozlowski, 2015); these stereotypes influence our attitudes and actions toward others, as well as our processing of the speech signal (e.g., Hay, Nolan, & Drager, 2006; Niedzielski, 1999; Van Berkum, van den Brink, Tesink, Kos, & Hagoort, 2008). Prestige varieties of a language are often perceived as more educated or attractive, whereas less prestigious varieties can sometimes be associated with negative stereotypes. And adults tend to judge people who speak their L1 with the same native accent as more socially desirable and intelligent than L2 speakers who speak in a nonnative accent (Fuentes, Gottdiener, Martin, Gilbert, & Giles, 2012). The stereotypes associated with different speaking styles are also thought to have observable consequences on spoken interactions—for example, it has been observed that conversational partners tend to converge in their pronunciations and gestures. The degree to which this type of imitative behavior occurs is influenced by a speaker's social biases (Babel, 2010). Even the act of imitating itself (regardless of one's initial attitude) has been argued to increase liking (Adank, Stewart, Connell, & Wood, 2013). On the more serious side, there are real social consequences of these biases—the variety of language an applicant speaks can affect how readily they will be rented an apartment (e.g., Bosch, Carnero, & Farre, 2010) or offered a job (e.g., Giles, Wilson, & Conway, 1981).

But when in development does this bidirectional relationship between social processing and language variation emerge? Most work examining how listeners react socially to different language varieties has been done with adults. Recently, however, there is a growing body of work examining how children react to different languages or language varieties. Work in this area has revealed that language has a surprisingly early influence on children's behavior. At birth, infants already attend closely to language differences (e.g., Byers-Heinlein, Burns, & Werker, 2010). By 5 months, infants can not only already tell their own native accent apart from other accents (e.g., American English-learning infants can distinguish American English from British English; Nazzi, Jusczyk, & Johnson, 2000), but they also show a looking time preference for people who speak a familiar language or language variety (i.e., they look longer to the face of a person who previously spoke in a familiar language variety than to the face of a person who previously spoke in an unfamiliar language variety; Kinzler, Dupoux, & Spelke, 2007). Work with preschool-aged children shows that they become increasingly good at discriminating and categorizing accents, with some distinctions easier than others. Although few studies have directly addressed this question, it seems likely that these patterns of preference and discrimination are conditioned by a wide variety of factors, including how readily children can perceive the difference between their own local language or language variety and the other language or variety, and how much exposure they have had to the other language or variety (e.g., Creel, 2018; Floccia, Butler, Girard, & Goslin, 2009; Kitamura, Panneton, & Best, 2013).

But how do different languages and language varieties affect children's social behavior? By the age of 10 months, children choose to play with toys presented by a speaker of a familiar language over toys presented by a speaker of an unfamiliar language (Kinzler et al., 2007). By 3 years of age, children preferentially acquire new words from talkers who speak a native variety of their language over a talker who speaks a nonnative variety, even if the latter is more reliable in labelling known words (Corriveau, Kinzler, & Harris, 2013). However, by 4 years of age, children in this same study weighted talker reliability more than talker accent. By 5–6 years of age, children choose to be friends with children who speak a native variety of their language over a non-native variety (e.g., Creel, 2018; Kinzler et al., 2007). At this point, accent-based friendship preferences are so strong that they outweigh race preferences (Kinzler, Shutts, DeJesus, & Spelke, 2009; see Rakic, Steffens, & Mummendey, 2011, for related findings with adults). Young children's preference for friends who "talk like me" also holds for bilingual children (even when the non-native accent is familiar; DeJesus, Hwang, Dautel, & Kinzler, 2017), as well as when children have to choose between a speaker of their own regional variety and another regional variety of the same native language, such as Canadian and British English (Paquette-Smith, Buckler, White, Choi, & Johnson, 2019). From early on, children seem to weight a speaker's proficiency in the native language phonology over their semantic or syntactic proficiency when forming language-based social preferences (Hwang & Markson, 2018).

At about this same age, children possess a developing understanding of the relationship between the language variety spoken by somebody and their likely geographic origins and cultural preferences (Kinzler & DeJesus, 2013; Wagner, Clopper, & Pate, 2014; Weatherhead, Friedman, & White, 2018; Weatherhead, White, & Friedman, 2016). Although children have an

early general understanding that language is linked to geography and culture, more specific knowledge about these links takes time (and exposure) to develop (Jones, Yan, Wagner, & Clopper, 2017; Kinzler & DeJesus, 2013). For example, children may prefer to be friends with a speaker of their own regional variety by the age of 5 years, but do not demonstrate explicit negative stereotypes about speakers from other regions until 9 or 10.

All of the studies summarized in this section so far have focused on how children react when they hear different languages or language varieties. What can we say about the production side of the equation? Who do children learn from? Children clearly move from speaking like their parents to speaking like the broader community (Kerswill & Williams, 2000; Tagliamonte & Molfenter, 2007). A young child being raised in North America with one British parent and one North American parent may learn both British and American labels for objects (e.g., *stroller* and *pram*), but they would not be expected to pick up the pronunciation characteristics of the British English-speaking parent. Rather, they would be expected to speak with the same North American accent used by their peers in school and the broader community. Likewise, if this same child has some family members who speak their native language with a native accent and some who speak with nonnative accents, they would again be expected to selectively acquire the native variety. Moreover, if a young school-aged child relocates to a new town where their peers speak a different variety of English than their parents, then the child will pick up the accent of their peers—and they will likely do so faster than adults. Why is this the case? Why are children so good at adopting the pronunciation patterns of new varieties? And why do they selectively acquire the language variety spoken by certain talkers in their environment?

With respect to the first question—why children are so much better than adults at learning new pronunciation patterns—the developmental trajectory of speech perception provides some clues. Young infants are much more sensitive to nonnative speech contrasts than adults, who have had years of experience attending to speech sounds in a particular way (e.g., Werker & Tees, 1984). In fact, young children's heightened sensitivity to subtle pronunciation differences may be one reason why they have such difficulty at first in understanding novel accents (e.g., Nathan, Wells, & Donlan, 1998). Children may also be more motivated to imitate novel pronunciations than adults are (Subiaul, Winters, Krumpak, & Core, 2016).

But, given that children are highly attuned to pronunciation variation and motivated to imitate, what determines which patterns they imitate? Why do children go from speaking like their parents to speaking like the broader community? There are many possible answers to this question, but very little experimental work to help us distinguish between the possibilities. One possibility is that children simply imitate the most frequent language variety they hear. If this were the case, then one would expect that prior to starting school, children who were home with a mother who spoke a language variety other than the locally dominant variety might sound more like their mother than the community. Then, once they begin full time daycare or school and their input shifts, so too would their productions. Another possibility is that children take a weighted frequency of their input, taking into account how many different speakers they hear producing a variety (rather than just how often they hear it collapsed across speakers). This might predict that in the previously mentioned scenario, how much the child sounded like their mother would depend on how many other talkers they have heard who do not speak the same language variety as their mother. Additionally, children may pay attention to how consistent any particular speaker in their environment is. For example, L2 learners are sometimes less consistent in their pronunciations than L1 speakers, and children may take this consistency into account when deciding who to imitate. Yet another possibility is that the input is weighted by social salience (Sumner, 2015) or that children are somehow evolutionarily programmed to attend to and imitate the socially dominant or desirable language variety spoken in their environment. Indeed, anecdotal evidence and case studies suggest that perhaps all of these factors play at least some role in determining which language model(s) in a child's environment they will imitate.

Finally, an interesting possibility given little attention in the literature is that individual differences may play a role in determining how a child will speak—that is, that not all children may be influenced in exactly the same ways. Those individual differences could be internal to the child (e.g., phonological skill, personality, or other factors thought to influence things like skill at acquiring a second language), as well as external to the child (e.g., strength of social biases in the child's environment). Indeed, some individual differences could be driven by a combination of internal and external factors, such as the fact that one must be able to distinguish two language varieties to develop a bias for one, and individual differences in the ability to distinguish language varieties could be affected by inborn perceptual skill as well as experience-based perceptual learning.

To summarize, acquiring the ability to appropriately use and interpret variable forms is an integral part of becoming a competent language user. In previous sections, we have discussed at length when and how children begin producing variable forms, and how they cope with variability in their input. Interestingly, it appears that children can produce variable forms before they have fully mastered the complex contexts (both social and linguistic) that condition their use. In this section, we have gone one step further—discussing how sensitivity to variable forms and language varieties informs listeners' social behavior and inferences. A growing body of evidence suggests that this influence begins early in life and becomes more

refined with experience and maturation. Thus, from the very early stages of child development, language variation is tightly linked to how humans carve up their social world and make decisions about conversational partners in their environment.

## 7 | CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

What must children learn to achieve adult-like competency in their native language? Until recently, many studying early language development assumed that there was a one-size-fits-all answer to this question: a single set of language targets—common for all learners of a particular language—and a single type of learner. But, as this review demonstrates, it is becoming increasingly clear that this approach will not allow us to fully understand what children must learn when acquiring a new language, or how they learn it. In several fields—including psychology, linguistics, and the speech sciences—the insights provided by decades of research by sociolinguists are taking hold. There is an increasing recognition of the diversity of learners and learning contexts that must be considered when studying early language development. Moreover, there is a growing body of evidence demonstrating that children appreciate the link between social and linguistic variation at a very young age.

So where do we go from here? As researchers from many fields are becoming more aware of how language variation and language-based social inferences complicate (and in some sense define) the acquisition problem, the developmental sociolinguistics framework is emerging as a powerful and rapidly evolving approach to study early language acquisition. Training students in interdisciplinary approaches to studying language development will ensure that we can continue to make progress on big questions like what factors condition the acquisition of variation, and how the developmental time course of variation acquisition might differ for children growing up in different environments.

Going forward, interdisciplinary cross-talk and methodological innovations will be crucial to maintaining the momentum in this area. An increasingly interdisciplinary approach may help sociolinguists to extend their work further to younger children, and to inform experimentalists about the variable patterns that they uncover in real word language input to these young language learners. More longitudinal work can help us to answer questions about how changing environments and sources of input affect the learning process. For example, how do children move from talking like their parents to talking like their peers? Thanks to technological advances in computing power and audiovisual recording equipment, traditional sources of sociolinguistic data can now be supplemented with dense recordings of infants' and young children's input and their own productions, and new tools will facilitate the sharing of such corpora across labs. Experimentalists better informed about real-world variation by sociolinguists can design more creative tests to explore very young children's perceptual acquisition of this variation and the mechanisms that support learning—for example, by testing the conditions under which patterns of variation can and cannot be learned by children of different ages. And developmental psychologists studying social development can provide both groups with a better understanding of how young children carve up their social worlds in ways that are relevant for language variation and how populations of learners with different social profiles (e.g., autism spectrum disorder) may provide new insights into how social processing constrains language learning. Given the growing sophistication of data analysis and data visualization techniques, researchers of all backgrounds will be able to venture into new territories and address core issues in more nuanced ways. As the developmental sociolinguistics framework continues to evolve, we anticipate an exciting paradigm shift in the way we conceptualize how children learn language. This shift will undoubtedly contribute to the development of more accurate models of early language acquisition.

### CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

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### ORCID

Elizabeth K. Johnson  <https://orcid.org/0000-0002-9941-9949>

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