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Children Are Not the Main Agents of Language Change

Limor Raviv[1, 2], Damián Blasi[3], and Vera Kempe[4]

[1] Language Evolution and Adaptation in Diverse Situations Group, Max Planck Institute of Psycholinguistics, Nijmegen, The Netherlands

[2] Donders Centre for Cognition, Radboud University

[3] Catalan Institution for Research and Advanced Studies, Center for Brain and Cognition, Pompeu Fabra University

[4] Department of Sociological and Psychological Sciences, Abertay University

The long-standing claim that young children are the main agents of language change is often presented as an established fact, and has tacitly guided research in developmental science and evolutionary linguistics. It rests on the assumption that language change arises from language acquisition errors predominantly committed by children. Here, we review whether arguments in support of this idea stand up to logical and empirical scrutiny. We conclude that while children's imperfect learning indeed leads them to produce input-divergent linguistic variants, there is no convincing evidence that it is these child-generated innovations that eventually spread through the language community, nor that language change is mainly driven by constraints and biases operating uniquely in children. By exposing the conceptual and empirical shortcomings of overemphasizing children as the agents of language change, we hope to rebalance the field toward a more nuanced understanding of how individual- and population-level processes shape language change.

Keywords: child language acquisition, language change, cultural transmission, language evolution, children's innovation and regularization

The idea that young children are the main agents of language change is popular in research on language learning, use, and change, and is also very prominent in popular science, affecting laypeople's ideas about language. The view of children as the main innovators of language change has its roots in the early history of linguistics. At the end of the 19th century, it was already expressed by leading practitioners of the Neogrammarian school, responsible for setting up the comparative method in historical linguistics, who believed that "it is obvious that the process of language acquisition is of utmost importance in explaining change in language use; it is the most important cause for such changes" (Paul, 1880, p. 34). Imperfect acquisition was also invoked as the cause for language change by the philologist Henry Sweet, who pointed out that "if languages were learnt perfectly by the children of each generation, then languages would not change" (p. 75) and that the changes introduced by learning limitations, even if small, would be able to account for most violent changes, if we only allow time enough (Sweet, 1899/1964, p. 75). In the first half of the 20th century, this assumption was embraced by some of the most influential linguists of the era such as de Saussure and Millet (Baron, 1977), although some skeptical voices could also be found (Jespersen, 1922). The idea that children are the main agents of language change was then taken up again in the wake of the cognitive revolution of the second half of the 20th century by many prominent generativist linguists (Andersen, 1973; Bickerton, 1984; Kiparsky, 1965; Lightfoot, 2010; Yang, 2000).

The view of children as the main agents of language change can be summarized as follows: First, children learn and produce new variants of their native language that are slightly different from those produced by their parents due to inaccuracies in transmission and/or reinterpretation of existing linguistic forms. Second, for these innovations to bring about language change, they must then diffuse through the community and be a part of the linguistic input available to the next generation (see Figure 1).

There is no doubt that language change requires new linguistic variants to be transmitted to, and adopted by, the next generation of learners (Roberts & Labov, 1995). In this sense, children play an important role in language change as they must be the latest adopters of any new variant (Labov, 2007). Yet this in itself does not mean that children are necessarily the *creators* or *early adopters* of the kinds of innovations that end up spreading to the rest of the community, nor that they play a prominent role in the process of horizontal diffusion (Cooper, 1979; Rogers, 1962). Critically, the prevalent view of children as the main agents of language change, which we aim to address here, goes beyond this trivial role of children as participants in intergenerational transmission. Instead, it more strongly implies that the innovations generated by young children during the process of language acquisition are eventually the ones that then diffuse into the wider language community (Andersen, 1973; Cournane, 2019; Kroch, 2005; Lightfoot, 2010, 2019; Senghas, 2021; Turkel, 1997; Yang, 2000). In fairness, it is not the case that these views claim that children are the *only* agents

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Limor Raviv https://orcid.org/0000-0002-0716-3553

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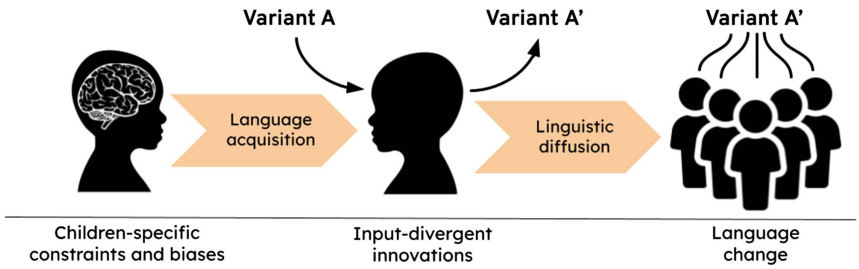
Correspondence concerning this article should be addressed to Limor Raviv, Language Evolution and Adaptation in Diverse Situations Group, Max Planck Institute of Psycholinguistics, Wundtlaan, 16525 XD, Nijmegen, The Netherlands. Email: limor.raviv@mail.huji.ac.il

Figure 1

Schematic Representation of the Idea That Children Are the Main Agents of Language Change



Note. See the online article for the color version of this figure.

of language change, but it is nonetheless being suggested that children play an important role as language innovators. It is this latter point that we are contesting (see also Diessel, 2011, 2012).

At present, the child-as-innovator approach is being advanced in three largely independent research areas: (a) theoretical work in generative linguistics on how children's biases affect the acquisition of morpho-syntax, (b) experimental research on language learning that studies how input-divergent forms arise as a result of children's cognitive constraints, and (c) observational research on the role of children in the emergence of new languages such as creoles and sign languages. In this review, we take a closer look at the evidence for the role of children's innovations in intergenerational transmission and horizontal diffusion and critically evaluate whether it indeed warrants the conclusion that children drive language change. We discuss the lack of consistency in the literature in terms of the mechanisms of change under scrutiny (e.g., innovation, selection, diffusion, incrementation), the state of the linguistic system that is affected by change (e.g., language emergence in its early stages vs. diachronic change in old and more established languages) and even the very definition of what constitutes a child (e.g., below or above 5 years of age).

In essence, based on our reading of the evidence, we argue that (a) innovations that precipitate language change do not uniquely originate from children, (b) innovations that are unique to children are not the ones that diffuse into the community, (c) there is no reason to assume that even if children were to play a role in language emergence, it necessarily generalizes to diachronic language change, and (d) claims about young children's role in language change tend to focus on morpho-syntax, while phonemic, phonological, and lexical change are often attributable to innovations introduced by older language users (adolescents and adults). Together, these conclusions do not support the idea that children are the main agents of language change. Finally, we suggest areas of exploration that may provide a more nuanced understanding of mechanisms that may drive language change over time.

Do Child Learner Innovations Lead to Language Change?

Proponents of the view that children drive language change attribute it to the input-divergent innovations that children produce over the course of language development. Depending on theoretical orientation, these input-divergent innovations have been attributed to language-specific biases or to domain-general cognitive constraints. We argue that this argument can be challenged on multiple grounds: (a) there is doubt about the existence of language-specific biases, (b) there is doubt that innovations that arise from domain-general constraints are unique to children, and (c) it is not clear that innovations that arise from the operation of cognitive constraints are the ones that are responsible for language change. Below, we tackle these arguments in turn.

Linguists working within the generativist framework typically invoke the existence of language-specific biases to motivate children's special role as language innovators compared with adults. In this framework, language change is seen as an iterative process that arises from the difference between externalized (E)-language and internalized (I)-language, that is between observed linguistic patterns and the internal representation of language (Chomsky, 1986; King, 1969). The logic of this approach is that since no two children have exactly the same linguistic input (E-language), different children in the same community might end up with slightly different internal grammars (I-language). Once a child has a different I-language, they may use language slightly differently than their peers, and as they grow up may end up producing novel utterances. As a result, these novel productions become available as linguistic input and could potentially be adopted by other children and propagate through the community, leading to changes in E-language (Lightfoot, 2010).

According to this view, children's input-divergent productions (or their different I-languages) are the result of innate linguistic biases, which are shaped by access to both the available input and to Universal Grammar (UG; Cournane, 2019). These biases were invoked to explain how human learners deal with the assumed "poverty of stimulus": that is the idea that the available linguistic input is too limited to allow children to induce grammatical rules from mere exposure, which means they must depend on other, hard-wired knowledge to master language (Pearl, 2022). It has been claimed that the acquisition of grammar is impossible without substantial innate biases guiding language learning, and children presumably tap into these biases by mapping the raw linguistic material they encounter onto internal representations of grammars guided by principles of UG. As a result, since children's interpretation of ambiguous input is guided by biases arising from innate UG principles (as opposed to the input alone), different inputs can lead to children ending up with different internal representations of grammar than their parents.

In the generative framework, children are assumed to cause language change by filtering their linguistic input through these

innate biases, and consequently, producing innovations that later become the new linguistic norm. This process was illustrated by Baker (2008), who conjectures about what might have driven the shift of Polynesian languages to an ergative system (Chung, 1978). His starting point was that UG endows individuals with the expectation for languages to be either head-final or head-initial (i.e., that the head of a phrase should either always precede or always follow its complements). As Polynesian children hear an abundance of passive sentences in a language that they are biased to interpret as head-final, they may "jump to the conclusion" that the best system that accounts for how grammatical relations are marked should be an ergative one (i.e., morpho-syntactic marking of intransitive subjects groups together with transitive objects, and is different from transitive subjects). As a result, children produce ergative-matching sentences, which, in turn, could precipitate a diachronic change toward an ergative system.

Most accounts of this type rely on the argument that children's errors are structured, and in fact consistent with other possible human grammars (Crain et al., 2006). For instance, between the ages 3–4 years, children acquiring English are reported to generate questions of the form "Why that boy is looking at us?" whereas adult speakers would produce the auxiliary verb "is" immediately after "why" ("Why is that boy looking at us?"). These productions, while ungrammatical in English, are nevertheless consistent with other Romance languages like Italian or Spanish. Consequently, researchers working within the Generativist framework have tentatively interpreted these errors as reflecting the guiding principles of UG. While intriguing, this hypothesis has not been empirically tested. Currently, it is unclear whether the provided hand-picked examples drawn from case studies are indeed representative of children's production errors more broadly, and whether or not they can be accounted for by other mechanisms (Diessel, 2012). If anything, computational models have demonstrated that many of children's errors (e.g., optional infinitive errors), which have been attributed to the operation of generativist principles, can in fact arise from a distributional analysis of the input under conditions of resource limitation (Freudenthal et al., 2006). Notably, empirical work on language acquisition phenomena that were previously postulated as being driven by UG shows that they can instead be accounted for by general cognitive mechanisms and usage factors (Lieven, 2016).

In contrast to approaches inspired by generative linguistics, cognitively oriented language development research has attributed children's input-divergent innovations to various domain-general cognitive constraints. For example, children's immature articulatory and phonological skills, which impact early phonetic and phonemic development, are responsible for word production errors (Dodd et al., 2003; Holm et al., 2023; Stoel-Gammon, 2011). There is also evidence that children rely to a much greater extent on implicit procedural learning, leading them in some instances to adopt implicit regularities more readily than adult learners (Smalle et al., 2018). Yet not every conceivable divergence from adult language produced by children is viewed as having the potential to affect language change. Rather, it is mainly errors that alter the structural aspects of language that have attracted claims about children as agents of language change. Specifically, errors that regularize inconsistent and unpredictable morpho-syntactic variation are considered to play an important role in creolization and, by extension, language change (Hudson Kam & Newport, 2005). By this account, children's special role in language change arises as a result of their increased tendency to regularize inconsistent variation and to introduce structure into the system. As Hudson Kam and Newport (2005, p. 185) put it, "child learners can surpass and reorganize inconsistent input, forming grammatical rules from input that did not contain such regularities," which serves to "stabilize the grammar of an emerging language" (p. 185).

Evidence for children's potentially greater propensity for regularization comes mainly from miniature artificial language learning experiments, which compare how children and adults learn morpho-syntactic forms when faced with inconsistent and unpredictable variation in their input. In a seminal study that is frequently cited in support of children's greater propensity to regularize, Hudson Kam and Newport (2005) showed that when determiners preceded nouns in the input only 60% of times, and when the use of determiners was not contingent on any lexical or semantic context, 5- to 7-year-old children regularized their productions significantly more by either consistently using or not using the determiner, in contrast to adults, who were more likely to probabilistically match their determiner productions to the distribution in the training input. This kind of regularization is assumed to be responsible for injecting structure into language.

However, the argument that regularization of unpredictable (i.e., random) variation is the type of innovation that constitutes language change is problematic for several reasons. First, children's greater propensity to regularize has been demonstrated predominantly with truly unpredictable variation, in which linguistic forms are used inconsistently in identical contexts (Hudson Kam & Newport, 2005; Samara et al., 2017). The use of unpredictable variation in artificial language learning experiments is intended to simulate the kind of variation assumed to be found in presumed precursors of emerging languages such as pidgins or home sign systems (Coppola & Newport, 2005; Goldin-Meadow, 2003; Goldin-Meadow et al., 1984; Goldin-Meadow & Mylander, 1984), where nonnative productions may display little consistency across identical contexts. Unpredictable variation has also been hypothesized to occur in situations of social instability and language contact, where there is no clear linguistic norm (Moyna & Sanz-Sánchez, 2023; Sanz-Sánchez & Moyna, 2023). But aside from these unique situations, unpredictable variation is rare in stable monolingual language use. One possible explanation for this is that unpredictable variation is weeded out over the course of language transmission, analogously to what happens in the iterated learning of artificial languages (Fehér et al., 2019; K. Smith & Wonnacott, 2010). Rather, the kind of variation available to children across languages is typically highly predictable: it may be conditioned on social features (e.g., pronouns can mark social distance to the addressee), semantic features (e.g., case markers can vary by noun animacy), morpho-syntactic features (e.g., adjectival suffixes can depend on head noun gender), lexical items (e.g., certain past-tense forms are used with certain verbs), context (e.g., certain morphological markers always indicate certain grammatical features), and/or use by the interlocutor (e.g., users with variable systems tend to accommodate users with deterministic systems, Fehér et al., 2019). Critically, for such conditioned variation, studies report no principled qualitative difference between adults and children: both age groups will regularize when the variation is too complex to learn, but will not regularize when they are able to grasp the underlying contingencies (Austin et al., 2020; Kam & Newport, 2009). The difference between children and adults then lies in the scope of regularization: since children have less cognitive capacity to identify and process the underlying contingencies that govern

variation in the input, they tend to regularize more than adults—but start matching the variation in the input once they are able to learn the contingencies (Chen, 2023; Culbertson & Newport, 2017; Hudson Kam & Chang, 2009; Perfors, 2016).

Second, there is no compelling evidence that domain-general cognitive constraints that operate in children are indeed causally linked to these regularization errors. The domain-general cognitive constraints that have been implicated are poorer working memory capacity (Newport, 1988, 1990), limited executive control (Chrysikou et al., 2011; Thompson-Schill et al., 2009), greater reliance on multiword chunks (Arnon, 2021; Arnon & Christiansen, 2017; Arnon et al., 2017), implicit procedural learning (Landsmann & Karmiloff-Smith, 1992; Ullman, 2001; Zwart et al., 2019), immature conflict resolution abilities that make it difficult to inhibit proponent responses (Ramscar & Yarlett, 2007), and/or asymmetric learning that weighs positive evidence higher than negative evidence (Rische & Komarova, 2016). However, attempts to induce regularization through experimental manipulations of some of these cognitive constraints have yielded mixed results. For example, increasing working memory load through concurrent tasks has shown no effects (Perfors, 2012b), or at best ambiguous effects, on regularization (Cochran et al., 1999). On the other hand, eliminating the cognitive effort associated with lexical retrieval during language production (e.g., by introducing forced-choice tasks or grammaticality judgments) has been shown to reduce regularization not only in children (Austin et al., 2020; Schwab et al., 2018) but also in adults (Hudson Kam & Chang, 2009). Indeed, in adults, regularization appears to be the natural outcome of tasks in which regularities are too difficult to detect (Chen, 2023; Perfors, 2012a; Saldana et al., 2022), casting doubt on the idea that a propensity to regularize is unique to children. These findings echo previous work on the production of English past tense, which shows that adults often produce the same types of regularization errors as children do under conditions of pressure and fatigue (Bybee & Slobin, 1982).

Finally, arguments in favor of children's unique propensity to regularize have been advanced predominantly for the domain of morpho-syntax. There is no evidence for increased regularization in other linguistic domains: even children under the age of 4 years tend to faithfully reproduce the frequencies of discourse-pragmatic, lexical, phonological, and phonetic variation in the input (J. Smith et al., 2007), and typically acquire the underlying contingencies, e.g., with respect to phonetic features (Roberts, 2005). For example, the documented glottal replacement of/*t*/in the Scots dialect spoken in Buckie in the North-East of Scotland shows a strong correlation between the rates of glottal replacement in the speech of 2- to 4-year-old children and their caregivers, that is, children effectively reproduce the frequency of phonetic variants that they encounter in the input (J. Smith & Holmes-Elliott, 2022). This finding aligns with the view that "probability matching is perhaps the most general form of transmission" (Labov, 2001, p. 419), and underscores children's capacity for it.

In sum, there is good reason to doubt the idea that (a) children's domain-general cognitive constraints are the dominant cause for regularization errors, that (b) only children regularize, and that (c) children's regularization is at all widespread across linguistic domains. Even if regularizations were a potential source of input-divergent innovations that ultimately precipitate language change, the evidence to date does not support the claim that children are the only or even the main source of such innovations.

Is There Diffusion of Children's Innovations?

One of the biggest hurdles for the view of children as the main agents of language change is that, whatever input-divergent behavior children may display early on during development, their innovations need to be adopted by others in order to effect language change. Yet children grow up acquiring the linguistic norms of their community: research on the trajectory of language acquisition shows that children's input-divergent variants are typically short-lived. In other words, normal language development entails "outgrowing" transient acquisition errors (Diessel, 2012; Kerswill, 1996). For instance, children's overgeneralizations—most prominently exemplified by a prolific line of research on the inverted u-shape trajectory of English past tense *-ed* errors—disappear around 6 years of age as children gradually encounter frequent irregular forms. This retreat from overgeneralization is inevitable due to gradual entrenchment of acceptable uses of a construction (e.g., encountering frequent uses of the past tense verb *went* gradually reduces the likelihood of incorrect use of the regularized past-tense form **goed*, Ambridge et al., 2015) based on prediction-based error-driven learning that operates on the available input (Ramscar et al., 2013). Similarly, optional infinitive errors (e.g., **He go home*), which emerge in various languages during the 2nd year of life, tend to disappear once children's utterances reach a syntactic complexity of about four morphemes per utterance (Freudenthal et al., 2006, 2006), which occurs around the 3rd or 4th year of life in typically developing children. A similar pattern is evident in other linguistic domains: even though young children's speech production is often riddled with mispronunciations that deviate from the adult norm, typically developing children tend to adopt adult pronunciations by early-to-middle childhood (Croft, 2000; Dodd et al., 2003).

Cournane (2019) argued that incomplete retreat from overgeneralization may serve to increment certain variants in the direction of diachronic change or that child peer-to-peer interaction can potentially spread children's input-divergent innovations. However, we are not aware of strong empirical evidence for such a protracted retreat from overgeneralization, and even if such evidence did exist, it would only explain why some variants may persist with slightly older children—but would still not provide a clear account for how they may diffuse into the wider linguistic community.

Some answers for how the spread of innovations contributes to language change may come from computational approaches that model rates of diffusion of innovations and time to fixation on the population level and compare them to observed rates of historical change. In fact, a recent computational simulation of how the rate at which individuals adopt linguistic innovations affects the spread of variants in a population has argued that the empirically observed time course of historical change is best approximated with usage-based models, in which language users in general adjust their use of new variants gradually in response to interactions in heterogeneous social networks (Blythe & Croft, 2021). This usage-based model was compared with an alternative model in which change originated from children, which implemented the assumption that during language acquisition, children adopt either one or the other variant. This model showed that the scenario by which children carry an innovation into adulthood and then transmit it to their offspring is not compatible with existing historical data on language change. Specifically, results showed that language change is more likely propagated through horizontal transmission in social

networks, with vertical transmission showing a poor fit to the historical data.

Furthermore, research on transmission of cultural traits in general does not provide much evidence that young children serve as models for older members of the community and that adults copy the innovations of young children. Rather, cultural transmission is generally governed by a suite of well-attested social learning biases, which make this highly unlikely (e.g., Henrich, 2001). One of the most prominent social learning biases is the prestige bias, that is the tendency to copy behaviors from individuals with the reputation of being skilled and proficient adopters of a cultural trait (Labov, 2001). In many domains, age serves as a proxy for prestige,[1] with younger children typically considered less prestigious models to copy from. Other social learning biases such as conformity bias (adopting the norm of the community) or similarity bias (learning from similar individuals) are also unlikely to favor young children as models from whom adults in the wider community might copy innovations. Interestingly, there is evidence from nonlinguistic domains that cultural innovations that carry some social or functional significance may be adopted by peer groups of children, and diffuse from there into the community (Lew-Levy & Amir, 2024). However, the same has not been shown for children's linguistic innovations, which are typically regarded as language acquisition errors. In other words, since children's regularizing and simplifying productions do not typically have any adaptive value (i.e., they do not provide functional advantages for communication), they are unlikely candidates for transmission.

Rather than providing direct evidence for the diffusion of children's innovation into the community, some researchers have tried to reconstruct the role of children in language change indirectly by pointing to parallels between historical linguistic changes and ontogenetic development (Brochhagen et al., 2023; Cournane, 2014, 2017). One example is the *going to-* construction, where *going to*$_{\text{MOTION}}$ ("I am going to San Nicolas to visit family") gave rise in middle English to *going to*$_{\text{FUTURE}}$ ("I am going to think about the offer") via grammaticalization. This trajectory is paralleled in English-speaking children, who produce *going to*$_{\text{MOTION}}$ constructions before *going to*$_{\text{FUTURE}}$ constructions (Schmidtke-Bode, 2009). Appeal to such similarities resembles an "ontogeny recapitulates phylogeny"-type of argument. However, its main fallacy lies in the conflation of correlation with causation: similarities between ontogenetic and historical change do not imply that the former causes the latter. Rather, both historical and developmental sequences might be partially explained by cognitive mechanisms that are shared by children and adults (Diessel, 2012). For instance, grammaticalization proceeds from the concrete to the abstract (moving to a physical place is a less abstract proposition than claiming that something will take place in the future), and children might also follow this cognitive bias when acquiring language (Diessel, 2011, 2012). Similarly, overextensions in children and colexification adopted by populations of language users both draw on shared semantic knowledge of conceptual similarity and relatedness (Brochhagen et al., 2023).

Moreover, despite some superficial similarities, the differences between historical change and ontogeny of both linguistic and nonlinguistic behaviors are substantial: First, children are already exposed to all variants, new and old ones (in this case, the two "going to"-constructions), so no direct evidence exists to show that they would introduce the diachronically more recent variant if they were just being exposed to the older one (Slobin, 2002). Second, parallels between historic and ontogenetic change are discussed selectively for just some linguistic features but not others. While it might be the case that historical and ontogenetic development of the semantics and/or pragmatics of constructions are similar in some instances, no evidence exists that children are displaying trajectories of morpho-syntactic or phonetic development similar to the sequences attested in language change. For example, while diachronic development of grammatical markers involves phonological reduction of more complex expressions such as *do not* and *going to*, language acquisition involves analyzing and expanding reduced expressions like *do not* and *gonna* (Diessel, 2011, 2012). Third, there are many instances where language acquisition proceeds differently or even in the opposite direction than the attested historical development of a given linguistic feature (e.g., consonant harmony or finite complement clauses in English, see Diessel, 2011, 2012), suggesting that many observed parallels between historical change and ontogenetic development are likely due to random coincidence, which is to be expected given the immense number of linguistic features, each with their own historical development. Finally, it is worth questioning whether the main motivation behind looking for parallels is logically sound: after all, the linguistic system that children encounter is very different from what it was in the past, so even if we expect children to come up with innovations, it is unlikely that they should recapitulate changes that have already taken place historically (Cournane, 2017). One approach for testing the relation between language change and children's innovators is to directly link the rates of language change to the assumed social and interactional structure of a linguistic community. While this approach has been computationally modeled in relation to the grammaticalization cycle of articles (Blythe & Croft, 2021), it currently does not support the premise that children are the source of this change.

In sum, there is no convincing evidence that children's input-divergent linguistic innovations diffuse into the linguistic community and are the source of permanent changes in language; rather, language development research provides overwhelming evidence for children's convergence to ambient linguistic norms. If parallels occur between historical and ontogenetic change, these are likely reflections of common conceptual processes operating across different time scales.

Language Change or Language Emergence?

Even though the claims discussed above are about the role of children in language *change*, they are in fact often presented in the context of language *emergence*, that is, situations where regular language transmission is disrupted or compromised due to lack of communication partners or normative language models, and new languages are formed in the absence of a full ambient linguistic system. The two most prominent cases of language emergence are the formation of creoles and of new sign languages, for which children have been proposed as the main agents of language emergence. Below, we review the available evidence for this claim and conclude that it is weak at best.

[1] In rapidly changing societies, where novel skills are more prized than traditional ones, the association between age and prestige might be somewhat weakened (Jiménez & Mesoudi, 2019). In such cases, we can see 'reverse socialization' (i.e., older individuals learning from younger individuals). While the best studied cases involve technology (Ekström, 2007) and innovations that were introduced and adopted by adolescents, more general conditions for reverse socialization to take place have been investigated through computational models.

Language emergence in the case of creoles involves new languages coming into existence in situations of multilingual contact in which individuals from different linguistic communities, who do not share a common language, need to interact regularly with each other (Bickerton, 1977; Hall, 1967). In those situations, most typically associated with circumstances of slavery and trade, interacting individuals first develop a simple communication system (referred to as a pidgin), which typically consists of a limited set of words and fixed expressions, minimal sentence structure, and little productivity (Hall, 1962; McMahon, 1994; Mühlhäusler, 1986). Pidgin languages have no native speakers (i.e., they are only used by adults who speak them as a second language) and are not considered to be full-fledged languages because of their limited expressive capacity (although not always, as expanded pidgins like Tok Pisin attest, Slobin, 2002). It has been conjectured that a pidgin might develop into a creole, which is a full-fledged language (Jourdan, 1991), in a process referred to as "nativization," that is, when the first generation of children acquires the pidgin as their native language (Bickerton, 1984). This hypothesis, known as the "Language Bioprogram Hypothesis", argues that when children acquire the pidgin, they "fill in the gaps" under the influence of their innate linguistic biases (Bickerton, 1984; but see Aitchison, 1991, for arguments against the role of children in creolization). Put simply, the idea is that the first children to acquire a pidgin as their mother tongue rely on these innate biases (proposed by the generative accounts of UG discussed above) to inevitably introduce some default grammatical structures that were missing from their input, transforming the pidgin into a creole (Adone, 2012). A similar logic has also been advanced with respect to the role of children's domain-general cognitive constraints, that is, by claiming that children's regularization errors can be viewed as part of creolization processes (Hudson Kam & Newport, 2005).

Since children's biases are assumed to be universal in all humans, this hypothesis thus predicts that much of the grammatical structure of creoles should be similar and not display any of the complexity that can emerge from purely historical processes. Indeed, while creoles borrow a large proportion of their vocabulary from other languages (typically, the colonial language in the case of slave plantations), it has been claimed that their grammar is not a straightforward replica of the grammars of the other languages it draws upon, but rather that different creoles tend to be surprisingly similar and that they display very little to no irregularity (Bakker et al., 2011; Daval-Markussen, 2013; McWhorter, 1998, 2001; Parkvall, 2008). This alleged similarity of creoles has been used to argue that the innate language-specific biases that operate during the process of child language acquisition must be the main drivers of creole formation.

However, the evidence for children's role as the creators of creole languages faces two major challenges. The first challenge relates to the fact that the extent to which creoles are actually truly innovated languages shaped by the biases of learners is in itself debatable. Specifically, the idea that creole grammars are the result of individuals creating structure from scratch on the basis of a structureless pidgin (rather than acquiring it from the available linguistic input in their environment) does not survive scrutiny. Multiple cross-linguistic comparisons have not supported the prediction that creole languages are similar in their grammatical structures (DeGraff, 2003; Mufwene, 2000), and across different linguistic domains, we encounter again and again that creoles do, in fact, mirror the grammatical structures of the languages that preceded them or coexisted with them (Blasi et al., 2017). A recent analysis of 48 creole languages showed that most creole grammars are inherited or replicated from their linguistic ancestry, rather than innovated (Blasi et al., 2017). The apparent structural similarities of creoles are simply an artifact of most of the literature analyzing West European and West African languages. While this does not rule out that children might play a role in the process of selecting structure in the early stages of creole emergence, it severely undermines the notion that creoles are infused with structure that is innovated by children.

The second challenge is that, due to the lack of detailed documentation of the process, it is often not clear who contributed to the very early stages of creole formation. Notably, children's postulated role in the process of creolization (i.e., "nativization") has been severely undermined by studies showing that creolization does not happen as soon as pidgins are acquired by child learners, but instead show that it is a slow and multigenerational process that can span hundreds of years (Arends, 1993; Carden & Stewart, 1988). Moreover, there is evidence that complex grammatical structures emerged long before the first children were acquiring creoles as their first language, as in the case of Hawaiian Creole and Tok Pisin (Arends, 1993; Arends & Bruyn, 1994; Roberts, 1995; Sankoff & Laberge, 1980). These findings indicate that the main innovators in the process of creolization are likely adult speakers, and suggest that children's contribution to the process, if any, lies not in innovation but in the regularization of variation (DeGraff, 2009; Hudson Kam & Newport, 2005). However, further evidence is needed to show if and how regularizations introduced by child learners diffuse into the emergent creoles, a question that to date has not received a satisfactory empirical answer.

The second language emergence scenario is the case of newly emerging sign languages, for which a prominent role of children has also been proposed. Sign languages can emerge when there is a relatively high proportion of individuals suffering from hereditary deafness in a community. Such scenarios have been shown to lead to the emergence of novel sign languages over generations, such as Al-Sayyid Bedouin Sign Language (Kisch, 2012; Meir et al., 2010), Kata-Kolok (De Vos, 2012), or Central Taurus Sign Language (Ergin et al., 2018). In contrast to creoles, where a new spoken language is formed based on the influence of other spoken languages (Blasi et al., 2017), these new sign languages are thought of as emerging *de novo* in the absence of prior linguistic input and are therefore seen as true instances of language creation. This is because the modality gap between deaf children and their hearing parents (who do not have prior knowledge of sign languages) is hard to overcome in cross-generational language transmission. One of the best known examples of an emerging sign language is the case of Nicaraguan Sign Language, where deaf children from all over the country (who were previously not exposed to any sign language and used family-based homesign) came together in 1977 with the establishment of a new school for deaf children in Managua. This event opened up the opportunity to trace the formation of a new conventionalized sign system in vivo, and has been taken to support the notion of "*children creating language*" (Senghas & Coppola, 2001; Senghas et al., 2004). For example, later-joining cohorts of Nicaraguan Sign Language learners introduced new gestures for marking grammatical relationships (e.g., spatial modulations of signs to indicate shared reference), and it has been suggested that it was specifically the younger children in the later cohort that produced these

innovations most frequently (Senghas & Coppola, 2001). Similarly, more recent cohorts of learners tended to dissect and linearize gestures into sequences of discrete consecutive elements (e.g., separate gestures for manner and path of an action like "rolling downhill"), in contrast to earlier cohorts who tended to produce gestures representing these elements simultaneously (Senghas et al., 2004). These findings are often interpreted as evidence that it is children who introduce design features of language such as discreteness, combinatoriality, and compositionality (Hockett, 1960) into newly emerging communication systems, courtesy of their special "*language-learning machinery*" (Senghas, 2021; Senghas et al., 2004, p. 1782). This machinery is thought to comprise a predisposition toward analytical and combinatorial learning, which may have emerged under the evolutionary pressure to accommodate languages containing hierarchical structuring of discrete elements (Hauser et al., 2002).

The problem with this line of research is that it cannot disentangle whether the emergence of structure is due to the fact that the new learners happen to be younger children, or whether any subsequent cohorts of learners exposed to unstructured or semistructured input, regardless of their age, would introduce similar innovations leading to more structured input over time. In other words: is it really innovations unique to children that introduce systematicity into the language, or are such innovations (and subsequently, the emergence of systematic combinatorial and compositional structure) an inevitable outcome of the process of cultural transmission? In support of the latter interpretation, a sizeable body of experimental and computational iterated language learning studies has demonstrated that linguistic structure reliably emerges from repeated cultural transmission of unstructured input over multiple generations of adults or artificial agents, due to general cognitive biases and constraints operating on *any* learner (Kirby et al., 2008, 2015; Motamedi et al., 2019; K. Smith, 2011). These studies show that grammatical structures can emerge over time regardless of learners' age (in fact, participants in these studies are often adults)—effectively shifting the explanatory burden from focusing specifically on child learners, to the process of cross-generational transmission in general—whether learners are children, adults, or computational agents. Such empirical work attributes the creation of structure over time to domain-general learning biases such as a bias toward simplicity (Chater & Vitányi, 2003; Kirby et al., 2015) or to the process of cultural evolution itself (Arnon & Kirby, 2024)—which leads to the emergence of structure over generations with *any* type of unstructured input, not just linguistic input—including, for example, abstract shapes (Carr et al., 2017), drumming (Ravignani et al., 2016), color sequences (Arnon & Kirby, 2024; Cornish et al., 2013), drawings (Tamariz & Kirby, 2015), dot patterns (Kempe et al., 2015), or binary auditory and visual sequences (Kempe et al., 2019, 2021).

Notably, in the field of emerging sign languages, there exists a confound between learners' age and generation number, as subsequent generations of language users also happen to be younger children—especially in the case of Nicaraguan Sign Language, which was acquired mainly by new cohorts of children joining the school for the deaf. This confound severely undermines the conclusions drawn from studies of emerging sign languages regarding children's unique role in the process of grammar formation. Instead, it suggests that the innovations characteristic for the early stages of those languages may not be exclusive to children and would have likely emerged with transmission by adults too, as long as they experience the same inconsistent or unstructured language input.

This critique, that is, that structured innovation is merely a consequence of general constraints operating on the transmission of Nicaraguan Sign Language, has recently been countered by the argument that the observed innovations must be child-specific because otherwise they would have been adopted by all users of the mixed-age and mixed-cohort community (Senghas, 2021). Thus, the alleged inability of older sign language users to adopt the innovations introduced by younger members of subsequent cohorts is taken as proof that these innovations are child-specific and hence beyond the grasp of older language users. However, given the extremely small sample sizes in research on Nicaraguan Sign Language, there is simply not enough evidence to conclude that older signers were unable to adopt these innovations: For example, Senghas and Coppola (2001) studied the adoption of spatial modulation of signs to indicate shared reference in two cohorts comprising 13 versus 11 individuals each, with varying age of first exposure. Their crucial finding is that while members of the second cohort first exposed to Nicaraguan Sign Language below 10 years of age created and adopted this innovation, those first exposed above 10 years of age did not. Yet the group of late-cohort nonadopters comprised only three or four individuals at most; a number we do not consider sufficient to draw far-reaching conclusions about the fundamental inability of older individuals to adopt innovations. Moreover, research in variationist sociolinguistics of spoken languages has found that the reasons for why older speakers may fail to take up the innovations introduced by younger speakers are not necessarily biological but often social in nature (Pichler et al., 2018; Sankoff, 2018), and that there are many documented cases of adoption of innovations and new variants by older speakers (Boberg, 2004; Sankoff & Blondeau, 2007). This means that even if nonadoption of innovation by older learners was an established fact for Nicaraguan Sign Language, there is no evidence that it constitutes a generalizable phenomenon precluding adults from contributing to language change. In fact, the claim that nonadoption of new variants reflects age-based constraints rests on the assumption of full interaction between all members of the community regardless of age. It is, however, plausible that older members of new cohorts of Nicaraguan Sign Language-learners were more likely to interact with older members of previous cohorts, thus potentially reducing their exposure to the innovations adopted by younger signers.

Finally, modeling work suggests that some of the structure formation seen in emerging sign languages (and potentially in creoles as well) might simply arise from the fact that the individuals serving as the initial models from which these languages were learned were also learners themselves: When Bayesian agents learn from other learners with partial knowledge (as opposed to proficient individuals), linguistic structure is more likely to emerge (Kirby & Tamariz, 2022). This will likely have been the case for Nicaraguan Sign Language at the point when structure emergence was tested: the older cohorts would have had no more than 6 years of experience with the language (Senghas & Coppola, 2001), so that the subsequent cohorts learned from individuals who were learners themselves, regardless of their biological age. Again, as mentioned above, the findings about structure emergence are based on very small sample sizes of around 10 individuals per cohort (Senghas & Coppola, 2001; Senghas et al., 2004)—a natural consequence of the small population size of initial signers—but a methodological

concern nonetheless that should invite caution when interpreting the data.

In sum, due to the aforementioned confounding factors and limitations, studies on language emergence in vivo are insufficient to establish the role of children as the main agents shaping the structure of the emergent languages during transmission. Moreover, language emergence is conceptually different from language change; the former is concerned with the formation of a structured linguistic system from an unstructured one or from no system at all, whereas the latter pertains to change of already established and structured languages. It is not a given that the same mechanisms and biases that operate in one process will also operate in the other (Hartmann, 2020; Mendívil Giró, 2019). Yet the leap from a putative role of children in language emergence to their role in language change relies on an implicit assumption of equivalence between the two. For example, stochastic drift plays an important role in explaining some grammatical changes, but may not operate in newly emerging languages as it depends on the coexistence of multiple competing variants (e.g., Newberry et al., 2017). This means that even if children were to play a role in language emergence, it does not necessarily follow that they also play a similar role in language change.

Conclusions and Future Directions

To summarize, we have provided three main lines of argument for why the claim that children are the main agents of language change does not stand up to scrutiny. We argued that a propensity to simplify language input credited with driving language change has only ever been documented for experimentally introduced unpredictable variation in the domain of morpho-syntax, which is not representative of the kinds and breaths of variation that language users experience in real life. Specifically, unpredictable variation is not a common feature of the multitude of structural contingencies that characterize mature linguistic systems, on which language change operates. Even in newly emerging communication systems like creoles or sign languages, the extent to which morpho-syntactic variation is truly unpredictable rather than contingent on the situation or properties of the speaker (i.e., their native language) is unclear. In addition, there is a scarcity of evidence for a causal effect of language-specific biases and domain-general constraints on innovations that can potentially drive language change. We also argued that even if we allow for the possibility that children's simplified input-divergent innovations may have some special utility in rendering the input more learnable, there is insufficient evidence that these short-lived innovations diffuse into the language community. Children recover from overgeneralizations and regularizations and typically end up adopting the forms and features of the ambient language before the age when diffusion of their transient innovations into the linguistic community is plausible and attested. There is no compelling evidence that children's errors are copied by other members of the community, or that they persist into adolescence or adulthood when they would have a chance to spread more widely.

To be clear, we do not claim that children can never introduce innovations. Although a detailed discussion is beyond the scope of this article, it is worth pointing to an emergent literature documenting children's innovative capacities in other, nonlinguistic domains. Anthropological research has attested that for subsistence activities like tool manufacturing or exploration of foraging ranges, children can contribute innovations as a result of individual learning processes (Lew-Levy et al., 2020), which are facilitated by peer group interaction (Lew-Levy & Amir, 2024), play (Boyette, 2016), and a drive toward exploration that is less constrained by prior knowledge than in adults (Gopnik et al., 2015). Crucially, these innovations can be seen as creative extensions to the space of possible solutions to a problem (as opposed to errors). Such nonlinguistic innovations introduced by children are likely to be within the bounds of what their communities may consider useful and socially acceptable, giving them a chance to be adopted more broadly, if appropriate. However, we know of no evidence showing that young children's input-divergent linguistic innovations, which in most studied cases are considered errors (e.g., overgeneralizations of regular patterns like the English past-tense inflection -ed as in "*goed*" or "*teached*"), are adopted by older members of the community. However, if meta-linguistic attitudes toward input-divergent productions were different in understudied societies or in the past, children might have had opportunities to introduce innovations—a possibility for which further evidence is required.

Finally, we pointed out that the arguments of children as agents of change often conflate language change and language emergence, and that even in situations of language emergence like creole formation and *de novo* creation of sign languages, the driving role of children is not well attested by the available evidence. Emergence of structure can be explained by general mechanisms of transmission that operate on any learner regardless of age. Note also that in situations of language emergence where conventionalized norms often do not exist, the innovations of new cohorts are typically not considered errors and empirical evidence as to their potential for spread to older cohorts is still outstanding.

We concede that part of the controversy around children's role in language change may arise from a lack of clarity about the specific age groups that are implicated in driving language change (i.e., which language users are considered to be "children"). For example, overgeneralization of irregular forms tends to occur between the ages of 2 to 6 years (Marcus et al., 1992), and experimental research typically attests children's regularization of inconsistent variation between the ages of 5 to 7 years (Hudson Kam & Newport, 2005, 2009). In the case of Nicaraguan Sign Language, the observed introduction of structural innovations appears to occur up to around 10 years of age. What we have contested here is the idea that young children (i.e., under 10 years of age) drive language change. However, it is highly plausible that older children and adolescents can be agents of language change. For example, J. Smith and Holmes-Elliott (2022) showed that while young children match the distribution of glottal stops in their input of Scots dialect, it was 11- to 13-year-old who demonstrated an overall increase of glottal replacement for/t/; this new phonetic variant eventually became dominant during vernacular reorganization in preadolescence. Similarly, the creation of novel pragmatic constructions in English, such as the quotative "*be like*", is often attributed to adolescents (Barbieri, 2009; Macaulay, 2001; Tagliamonte & D'Arcy, 2004, 2009). These observations align with findings documenting a so-called "adolescent peak"—a peak of innovative language use at around 17 years of age (Baxter & Croft, 2016; Cedergren, 1988; Tagliamonte, 2011). Moreover, experimental studies of novel communication systems have shown that young children's ability to introduce communicatively efficient innovations is inferior to that of adolescents and adults (e.g., Bohn et al., 2019; Garrod & Clark, 1993;

Kempe et al., 2019; Lister et al., 2021). Thus, the evidence of this kind suggests a role for adolescents, but not young children, with respect to introducing, and incrementally expanding, the use of linguistic innovations.

The disagreement about the ages at which language users produce the innovations that could drive language change highlights a further problem with the current evidence base: Most research in language development that appeals to children's linguistic biases or cognitive limitations as drivers of language change has focused on the domain of morpho-syntax (e.g., Cournane, 2014; Cournane & Pérez-Leroux, 2020; Hudson Kam & Newport, 2005). On the one hand, the few studies that looked at the adoption of new phonetic variants by young children do not invoke simplification or reanalysis as the underlying mechanisms, but instead attribute the change to children's exposure to dialect variation (Sneller et al., 2019) or to variation in child-directed speech (Roberts, 1999). On the other hand, sociolinguistic research that acknowledges the innovative role of adolescents tends to focus on phonetic, lexical, and pragmatic variation (e.g., Barbieri, 2009; Macaulay, 2001; J. Smith et al., 2007; Tagliamonte & D'Arcy, 2004). Thus, there is no consistency in the proposals and findings across linguistic domains, meaning that, at the very least, claims about the age of agents of language change should be qualified with respect to the specific linguistic domains under scrutiny (e.g., phonology, syntax). However, in the literature, qualifications of the scope of the claim that children are agents of language change are rarely made explicit. In this review, we scrutinized the claim primarily in relation to the linguistic domain most frequently invoked as evidence—morpho-syntax. We are not aware of similar claims that constraints operating in young children render them agents of phonetic, phonological, or semantic change. However, assuming differential roles for children across linguistic domains (i.e., assuming that children may be agents of morpho-syntactic change but not of change in other domains) would be an unparsimonious theoretical proposal in need of a strong evidence base that to date is not available. We therefore argue that casting doubt on children's role in morpho-syntactic change by extension casts doubt on their role as agents of language change in general.

More generally, these inconsistencies highlight a lack of systematic research in the field and call for future work aimed at disentangling the effect of age from the different affordances for diffusion and innovation associated with different linguistic domains. Filling this gap would provide a clearer understanding of contributions to language change across the human lifespan. For example, accepting the assertion that it is adolescents who either introduce novel variants or incrementally advance the use of existing yet infrequent variants' leaves open the question of what is it about adolescents' social interactions and social reach that facilitates such diffusion of novel variants. One possibility is that once adolescents become parents themselves, they transmit the innovative variants to the next generation (Kerswill, 1996; Roberts, 1999; Tagliamonte & D'Arcy, 2009). Another possibility is that teenagers in many modern Western societies are often in the process of "defining" and forming their identity, sometimes rebelling against normative pressures and cultural norms, which may lead them to favor nonstandard variants (Eckert, 2003; Labov, 2001). There certainly may be many other, hitherto less explored changes in social network structure across the lifespan that can provide complementary explanations for how linguistic innovations spread from adolescents into the wider population.

While this review has focused on children's role in language change in monolingual societies, a further research avenue that may shed more light on the role of different age cohorts in language change concerns the study of language contact. For example, do children, adolescents, or adults have different propensities to loan and borrow new variants from other languages in contact, like anglicisms, into monolingual language use? How do language mixing and translanguaging in situations of societal multilingualism affect language change, and are there age effects in the propensity to conventionalize blended language varieties like Spanglish? In this context, it is noteworthy that some theories of language change in contact situations such as the linguistic niche hypothesis (Lupyan & Dale, 2010, 2016) appeal to constraints on adult second language learning as the primary driver of language change when trying to explain cross-linguistic patterns of diversity (Reali et al., 2018; Wray & Grace, 2007). This hypothesis assumes that languages with larger proportions of adult second language learners exhibit simpler morpho-syntax, less redundancy of morphological marking, and greater reliance on optional lexical coding of grammatical distinctions because of the learning constraints that operate in adults (e.g., a preference for prefixation, difficulties with opaque inflection systems). However, direct empirical evidence for the simplifying effects of adult second language learning is mixed (Atkinson et al., 2018; Berdicevskis & Semenuks, 2022; Shcherbakova et al., 2023; K. Smith, 2024).[2] While outside the scope of this article, the question of whether or not the sociocognitive mechanisms that drive language change in situations of contact and multilingualism are similar in children versus adults is an important direction for future research.

Finally, arguments both against and in favor of the idea of children as the main agents of language change are limited by our relatively poor understanding of linguistic dynamics across a broader ecology of cultures and societies—a problem that permeates the study of humans in general (Blasi et al., 2022; Henrich et al., 2010, 2023). Given the current paucity of evidence that children are the main innovators of new linguistic norms, and given the existence of alternative research avenues (some of which we outlined in the two previous paragraphs), we suggest a further broadening of the research focus to include other potential agents of language change, such as multilingual and multidialectal adolescents and adults.

[2] An interesting example that provides indirect evidence for the role of adults in the adoption of novel variants comes from the study of language contact between English and French following the Norman Conquest. While there is controversy with respect to whether the influence of French on English arose mainly through borrowing or via societal bilingualism (Timofeeva & Ingham, 2018), modern corpus-linguistic research has shed light on the issue by demonstrating that English words of Germanic origin show earlier ages of acquisition than English words of Latinate origin (Hernandez et al., 2021). This suggests that French words were introduced by adults into more adult contextual domains, a conclusion that aligns with historical evidence that French spread from use by multilingual upper-class speakers in professional domains to monolingual language users (Ingham, 2012). This example illustrates how the combination of psycholinguistic research with historical research can provide fascinating insights into potential mechanisms and agents of language change. In this case, the agents of language change seemed to be multilingual adults using the French innovations in specific educational and professional contexts, while at the same time exerting a pressure on English to allow for morpho-syntactic accommodation of these loans and borrowings (Dalton-Puffer, 1996). Although the case of language contact between English and French is just one example, it further cements doubt in children as agents of language change.

Language change is undoubtedly a highly complex, nonlinear process where factors associated with individual language learning and use continuously interact with population-level diffusion mechanisms operating on diverse social networks, leading to changes across ontogenetic and historical time spans. This will hopefully offer a more nuanced understanding of when and how individuals become agents of language change.

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