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Review Article

Culture as a binder for bilingual acquisition

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ABSTRACT

Babies growing up bilingual attune to the speech sounds, rhythm, and intonation of each of their native languages; establish word meanings; and acquire syntax. Given that language acquisition occurs within a broader cultural context, we propose that culture may provide a *binder* for language acquisition, particularly for a bilingual learner. Bilingual infants may be able to use cultural information outside of language to help keep their two languages distinct, while simultaneously acquiring both of these languages successfully. We review the extant literature that supports this hypothesis, and suggest three mechanisms by which cultural binding may occur: acquired distinctiveness, structural isomorphy, and privileged relations.

Contents

1. Introduction

By the time infants understand and produce their first words, the acquisition of language is well underway. From the initial broad perceptual biases that orient them to language [41], and support discrimination of rhythmical, segmental, and intonational properties, infants rapidly become experts at perceiving their native language. Infants growing up in bilingual homes become attuned to the properties of both of their native languages. Bilingual infants equally prefer listening to both of their native languages at birth [5], attune to the vowel [3] and consonant [4,39] distinctions used in each of their languages, and acquire the phonotactic rules of each of these languages [37]. In some cases, bilingual infants become attuned to and use the properties of each of their languages within the same developmental time frame as monolingual infants [4,1,39,30]. In other cases, bilingual infants have been shown to exhibit success at a later age in these tasks compared to monolinguals [2,10,36,34,11]. However, increasingly, it is argued that the most useful approach may not be to ask whether bilinguals are faster or slower than monolinguals in acquiring language, but instead to describe and explain how all infants apply their universal language acquisition capabilities to successfully acquire their native language(s): two simultaneously in a bilingual environment and one in a monolingual environment.

One difference between monolingual and bilingual infants is that bilingual infants are more sensitive to perceptual detail in language, and are better able to track multiple cues simultaneously. For example, at 4 and 6 months, both monolingual and bilingual infants can discriminate French from English simply by watching silent talking faces [43]. By 8 months, however, only bilingual infants succeed. This continuing sensitivity to the visual cues that distinguish English from French is evident not just for infants being raised in a French–English environment, but also for infants being raised in a Spanish–Catalan environment who have never seen or heard English or French [38]. Similarly, neuroimaging evidence

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Box 1–Educational implications

The educational implications of understanding language acquisition in the context of cultural binding are far-reaching. First and foremost, the data and framework presented here speak to the concerns voiced by some families – and even some professionals – regarding raising infants and young children with two languages simultaneously. A considerable body of research has demonstrated that early bilinguals are not actually at risk for language delay [12] and that, in fact, there may be measurable cognitive advantages, particularly in executive function [25,26,35] resulting from bilingual acquisition (and see [29], for a review of bilingual cognitive advantages throughout the lifespan). Given these findings, researchers have begun to address the question of how bilingual infants so successfully acquire two languages at roughly the same rate as monolingual infants. The proposal put forth here suggests that successful bilingual acquisition is supported by the variation that exists between the two cultural contexts in which each language is acquired. Thus, rather than avoiding the exposure of children to the two cultures and languages that often co-exist within a single home, or between the home and the dominant society, this review would indicate that embracing the two cultures and languages could be beneficial to the child.

We can only offer conjecture at this time as to what the implications of this framework are for bilingual children once they begin daycare or more formal education. One important topic for research will be the extent to which employing teachers and aides who represent the cultures the children come from, and/or ensuring an environment that richly represents artifacts, music, and art from those cultures, helps support further successful bilingual acquisition. The literature from adult second language learners provides evidence that the presence of individuals from one's home culture increases the comfort levels and confidence of non-native speakers [28]. Yet, as reviewed in this paper [47], their presence may also selectively activate the home language, and thus decrease fluency in the non-dominant language. It will be important to determine if this is also the case for children who are bilingual from a young age, and to evaluate this impact *vis-à-vis* the goals of the classroom.

suggests that bilingual infants maintain sensitivity to non-native speech sound distinctions for longer than monolingual infants. While both 4-month-old bilingual and monolingual infants exhibit left inferior frontal cortex activation while hearing non-native phonetic contrasts, only bilingual infants maintain this activation at 12 months [34]. There is also evidence for bilingual infants' ability to simultaneously track multiple cues in the linguistic domain: while 7-month-old monolingual infants can use word frequency as a cue to word order [14], only bilingual infants can simultaneously attend to concurrent prosodic cues (duration and intonation) to segment according to the distinct word orders used in each of their two native languages [13].

As elaborated below, we suggest that this enhanced attention towards perceptual detail, and simultaneous tracking of multiple cues, may be important for supporting bilingual infants acquisition of two languages.

2. Culture as a "binder" for bilingual acquisition

While there is a growing literature exploring differences in language acquisition between monolingual and bilingual infants, little consideration has been given to the role that the culture(s) in which language is embedded might play in the acquisition of that language. Language acquisition occurs in interactions with other members of the linguistic community. The linguistic community, in turn, is situated within a broader cultural context. Speakers of different languages may be of different races, and may listen to different kinds of music, eat different foods, wear different clothes, etc. As such, cultural cues and linguistic cues often co-vary, leading to the possibility that the two could be mutually supportive. The co-occurrence of language with other manifestations of culture could be especially useful for the infant growing up bilingual. Indeed, it is possible that part of the advantage bilingual infants show for attending to detail and using multiple cues may stem from the simultaneous tracking of each language and the other manifestations of the corresponding culture.

The process of enculturation, similar to language acquisition, begins with an infant's first experiences at home and gradually extends to increased sensitivity towards community-based expressions of the native culture. At birth infants listen preferentially to their mother's voice [8,24], and to the songs [20] and stories [9] heard prenatally. Sensitivity to the ethnicities of faces, arguably one of the most salient manifestations of culture, shows a pattern of perceptual narrowing in the first year of life similar to that seen in language. For example, 3-month-old Chinese infants discriminate two different faces from an unfamiliar racial group as well as they discriminate two different faces from their own racial group. However, by 9 months, Chinese infants' discrimination of individual faces from a non-native racial group declines [22]. The same developmental trajectory of perceptual narrowing is also seen in music, another correlate of culture. At six months, infants detect violations in the rhythmic patterns of music from both their native and from a foreign culture [16]. However, by 12 months, infants' discrimination of foreign, non-isochronous rhythmic patterns declines, while their sensitivity to culturally typical isochronous patterns remains [17].

A key requirement for bilingual acquisition is to keep the two languages apart while simultaneously attending to the properties of each. Bilingual infants start this journey from the time of birth, with a preference for both native languages but a sustained sensitivity to the rhythmical cues that distinguish them [5]. This evidence suggests that the cultural context is not essential for distinguishing between languages. As acquisition proceeds, in some cases the two native languages might be embedded in largely overlapping cultural contexts, with only subtle cultural cues distinguishing one context from another. In other cases, the two languages might be embedded in very distinct cultural contexts even in a single home, such as when each parent primarily speaks a different language to the child, is from a different ethnicity, listens to different music, etc. Nonetheless, we suggest that, across this spectrum of variation, the co-occurrence of distinct cultural cues along with the distinct properties of each of the native languages (e.g., see [7]) might help the bilingual infant successfully track the properties of each native language separately in various contexts (Box 1).

Compelling evidence for cultural influences on bilingual language acquisition comes from studies investigating second language (L2) processing in adults. In one recent study, Chinese immigrants living in the United States exhibited increased dysfluency in English and increased lexical intrusion from Chinese when primed with an ethnically Chinese face or when exposed to Chinese cultural symbols [47]. Similarly, a recent neuroimaging study revealed the influence of facial ethnicity on Chinese–English bilingual language production in a picture-naming study [28]. Participants' naming of objects in one language was facilitated when simultaneously viewing a face ethnically associated with that language (e.g., naming in Chinese while viewing an Asian face), and impaired when viewing an incongruent face (e.g., naming in English while viewing an Asian face).

Remarkably, by 3 years of age, children also link the race of a speaker to the language spoken [18]. Moreover, there seem to be constraints on such linkages, as the same children fail to link speaker age with language. In fact, the process of tying language and faces appears to start early in infancy. At 5 months, infants look preferentially to a face that they have heard speaking their native language over a face speaking an unfamiliar language [23]. At the social category level, during the second half of the first year of life, infants begin to detect a relation between languages and ethnicity in the face. Specifically, at 6 months, and more reliably by 11 months, infants match faces of unfamiliar ethnicities to an unfamiliar language [31,40].

There is also evidence of mutual influences between the music and the language of a culture. Of most relevance here are the correlations between the rhythmical phrasal grouping properties of the language and the music of a culture [19,32], and the finding that adult perception is influenced by these properties. When presented with a tone sequence of alternating duration (e.g., … *long–short–long–short*…), native English speakers group these sequences as a series of short–long tones, reflecting the phrasal structure of English in which short function words precede longer content words. Japanese speakers, whose language has an opposite word order, show no such preference, and instead show a non-significant trend to group these sequences as a series of long–short tones [21]. Similar findings have been reported with infants. At 8 months of age, infants' grouping of non-linguistic tone sequences is shaped by the grouping rule of the native language: English-exposed infants, but not Japanese-exposed infants, show longer looking times when presented with a short–long grouping of tones, consistent with the phrasal structure present in English [46].

While, as noted above, it has been shown that bilingual infants can simultaneously track two sets of cues within language—both frequency and prosody [13]—what has not yet been studied is whether bilingual infants can simultaneously track cultural cues, such as faces or music, along with linguistic cues, such as prosody or phonetics, to keep separate and learn about each of their languages.

3. Mechanisms for an influence of culture on bilingual acquisition

If, as we suggest, the embedding of language in culture supports bilingual acquisition, how might it do so? Below, we posit three potential mechanisms (Fig. 1).

To the extent that language and other manifestations of the native culture co-occur, and that there are differences in the manifestations of the cultures in which different languages are embedded, bilingual learners may be able to use these co-occurrences to separately track and attune to the phonological and syntactic characteristics of each of their native languages. Hence, one learning mechanism that might be broadly available is *acquired distinctiveness* (AD). As first introduced in the animal literature, discrimination of two similar forms can be facilitated when these forms are consistently associated with two other cues that are more easily discriminable ([15; see 44,45] for the role of acquired distinctiveness in phonetic attunement). It has been previously suggested that the multiple co-occurring cues within each language might help bilingual infants pull the languages apart to learn the properties of each without interference [6]. Here we advance this framework further by suggesting that the co-occurrence of language in culture might provide another rich set of cues for the simultaneous acquisition and separation of two languages.

While many linguistic–cultural co-occurrences are arbitrary in nature (e.g., clothing, foods), some of the co-occurrences may bear

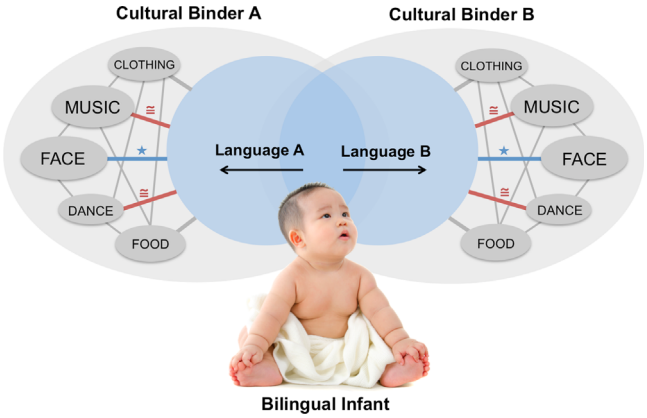

Fig. 1. An illustration of the mechanisms by which culture may serve as a "binder" for bilingual acquisition. The mechanism of *acquired distinctiveness*, such as that between an expression of culture and the language with which it co-occurs, is represented by a gray line. The mechanism of *structural isomorphy*, such as that between spoken language and music, is represented by a red line and the ≅ symbol. The mechanism of *privileged relations*, such as that between spoken language and human faces, is represented by a blue line and the ★ symbol. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

a more systematic, deeper relation. We suggest two additional mechanisms by which these deeper connections occur: structural isomorphy and privileged relations.

By *structural isomorphy*, we refer to the fact that some expressions of culture, in particular music (as reviewed above), share non-arbitrary properties with language. The availability of redundant structural cues between these domains may direct the simultaneous acquisition of the properties of each. The finding presented above that 8-month-old Japanese- and English-learning infants segment musical tone sequences in distinct ways [46] is our strongest evidence to date in support of this possibility. Whether such structural isomorphy is unique to the music and language of a culture, or is also seen in other rhythmic cultural manifestations such as dance and gait, is an arena for further study.

Finally, language and certain cultural correlations might be tightly integrated in part because of a privileged predisposition to acquire these mappings. A defining example of such a *privileged relation* involves the connection between faces and speech. By 2 months, infants can match heard speech sounds with corresponding articulations in the face ([33]; see also [27] with 4-month-olds). More recent work shows that by 5 months, infants learn to match human speech, but not human non-speech or non-human vocalizations, with a human face [42]. Vouloumanos et al. interpret these findings as evidence that infants appreciate the source from which speech emerges (i.e. that human language comes from human faces). We suggest the privileged mapping of faces to speech may direct infants to attend to those attributes of faces, such as ethnicity, that can signal different language communities. This hypothesis is supported by the work reviewed above showing that infants look differentially to familiar versus unfamiliar race when hearing familiar versus unfamiliar language [31,40]. We hypothesize that a similar privileged mechanism could facilitate simultaneous bilingual acquisition for infants growing up with two languages, each spoken by a member of a different ethnicity.

While each of the three mechanisms described above undoubtedly plays a role in monolingual acquisition, their importance may be greater in bilingual acquisition, supported by bilinguals' greater attention to detail and their ability to simultaneously track multiple cues. Thus, from a domain-general learning mechanism, through shared structural properties, and perhaps privileged

relations, culture may provide a *binder* for language acquisition, particularly for the bilingual learner. According to this view, then, the bilingual infant possesses two cultural binders corresponding to each of the native cultures. Each of these binders supports the cohesion of that culture with the corresponding language. This cohesion, in turn, may aid in the simultaneous acquisition of each of the native languages.

4. Summary

In conclusion, we have suggested that the embedding of language in culture may be an important factor in understanding simultaneous bilingual language acquisition. Starting with the data that bilingual infants attend more selectively to perceptual detail and better integrate multiple cues, we propose that bilingual infants may be able to use cultural information outside of language to help keep their two languages distinct, while simultaneously acquiring both of these languages. We review the extant literature that supports this hypothesis, and propose three mechanisms by which cultural binding may occur. In doing so, we hope to stimulate further research in bilingual acquisition, but in a new framework that probes how the embedding of language in culture may direct language separation and acquisition. Finally, an awareness of cultural influences on language acquisition may encourage bilingual families to value the language-learning environment they provide. Such knowledge may also guide the design of optimal educational environments to enable bilingual children to maintain and advance in each of their native languages.

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