

Towards a bioecological model of bilingual development

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At its best, the field of bilingualism is a dynamic discipline informed by diverse perspectives. Carroll's critical review – situated within a linguistics framework – contends that current research on bilingual exposure and language development suffers from a lack of theoretical clarity, and makes little contribution to our understanding of bilingual acquisition. Carroll's push (Carroll) towards greater precision in our thinking about the relation between input and outcomes is an important and welcome challenge. However, it is also critical to keep in mind the social context that motivates much of the current research on bilingual development, and to leave room for studies whose main goal is to provide answers to societally important questions about bilingual children's health and development.

In many countries, policy discussions regarding bilingualism have focused on the potential for bilingual children to experience delays in language development relative to monolinguals (Hoff, 2013; Oller & Eilers, 2002). Research on language exposure and bilingual development has been essential in reframing these discussions, shifting the focus away from concerns about the 'risks' of bilingualism – which are unfounded – and focusing instead on the contexts that best support language development in multilingual children (McCabe, Tamis-LeMonda, Bornstein, Cates, Golinkoff, Guerra, Hirsh-Pasek, Hoff, Kuchirko, Melzi, Mendelsohn, Pérez & Song, 2013). In this context, understanding the social and experiential factors that enable children to become proficient users of more than one language has emerged as a priority.

Linguistic and psychological theories have played an important role in guiding research into the conditions that support bilingual development. Conceptualized within a bioecological model (Bronfenbrenner & Ceci, 1994), much of this work has centered on language exposure as a key aspect of children's 'proximal' experience, while also considering more 'distal' social and cultural factors that shape children's language-learning environments

(Pearson, 2007; Weisleder & Fernald, 2014). Critically, studies have shown that the amount of exposure to each language has a proportional relation to various aspects of bilingual children's development in that language, including vocabulary (Place & Hoff, 2011), speed of lexical processing (Hurtado, Grüter, Marchman, & Fernald, 2013), and some aspects of grammatical ability (Paradis, Tremblay & Crago, 2014; Thordardottir, 2015). Carroll highlights important limitations in the measures of language exposure used in these studies, which are based on parents' reports of the relative amount of time children hear each language. Fortunately, novel methods are now emerging that facilitate direct observation of children's language exposure through collection of daylong naturalistic recordings, thus enabling more in-depth investigation of the quantity and quality of speech that children hear during a typical day. Importantly, recent studies using these methods confirm that amount of language exposure is related to vocabulary size and speed of lexical processing in both monolingual and bilingual children (Marchman, Martínez, Hurtado, Grüter & Fernald, in press; Weisleder & Fernald, 2013).

Beyond these methodological concerns, Carroll questions whether broad measures of exposure tell us anything meaningful about the input children use. This is a good reminder of the importance of using multiple methods and levels of analysis to approach the same question. While these studies don't tell us HOW learners use the input to acquire specific linguistic phenomena, they show that amount of exposure is an ecologically meaningful construct with considerable explanatory power, and suggest the involvement of learning mechanisms that are sensitive to frequencies in the input. In future research, it will be important to examine how specific aspects of language experience relate to different language outcomes. This research can help identify properties of language exposure that relate to language learning in the context of children's real-life

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experiences, and thus suggest new targets for investigation in experimental studies.

From a practical standpoint, this literature has made meaningful progress on key questions important to parents, educators, clinicians and policymakers. It has reaffirmed the idea that bilingualism itself does not place children at risk for language delay, yet it also points to the language environment as a potential source of the differences observed between the language abilities of bilingual and monolingual children. Because many bilingual children in the United States come from low-income households and are at risk for poor academic outcomes, it is imperative to continue studying the many sources of variability driving individual differences in language development, and to inform policies that strengthen learning outcomes for all children. Carroll's keynote underscores the importance of research that connects theories of language acquisition to questions about how social environments can support bilingual development.

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