

INVITED COMMENTARY

Individual differences differentially influence language domains and learning mechanisms

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Paradis' (2023) keynote article is a timely documentation of the ongoing shift in focus within childhood bilingualism research from investigating the factors that modulate majority or second language (ML/L2) attainment (Chondrogianni & Marinis, 2011) to understanding the sources of variation that lead to minority heritage language (HL) maintenance. This shift of focus into individual differences (IDs) in bilingual performance across both languages reflects converging research carried out in the past twenty years reporting that, when learning barriers are not at stake, bilingual children can reach ML outcomes. It also aligns with research findings suggesting that ML educational or linguistic outcomes are directly related to the successful attainment of HL educational and linguistic milestones, which, in turn, reinforce the need for the HL to be supported.

Paradis offers the conceptual tools to capture the differential contribution of child-internal and -external factors in the development of language domains in children with diverse language abilities. First, by adopting Bronfenbrenner's Bioecological Systems model (Bronfenbrenner & Morris, 2007), she expertly places bilingual children and their language development in the centre of a set of interconnected and dynamic systems that (in)directly influence language outcomes (see also Kay-Raining Bird, Trudeau, & Sutton, 2016 for children with developmental disorders). These systems range from the child's immediate family and peers (mesosystem or microsystem) to the child's school and wider community (exosystem), as well as social and educational cultural institutions (macro-system). These systems roughly map on to a range of proximal (e.g., HL/ML exposure/use) and distal (e.g., SES, HL/ML attitudes) child-external factors, which have been shown to differentially affect language outcomes. The division of child-external factors into distal and proximal factors not only allows us to capture how the sets of two factors may differentially modulate language outcomes, but also to investigate how distal factors may indirectly influence proximal factors to give rise to differential language outcomes. For example, in our study with Greek heritage children in North America, we showed that proximal factors such as HL input quantity not only differentially modulated HL performance on syntactic vs discourse phenomena, but that input quantity itself was reduced as a function of the children's immigration generation (second, mixed or third), a distal factor (Chondrogianni & Daskalaki, 2022). This means that a proximal factor changes as a function of a distal factor, which indirectly influences HL outcomes. At the same time, same levels of HL input gave rise to different levels of grammatical accuracy on

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the same structures across the three child generations. This suggests that children's generation in the context of HL acquisition is also a proxy for differences in HL input quality. This, in turn, gives rise to a non-linear relationship between input quantity and language outcomes across generations (Daskalaki, Blom, Chondrogianni, & Paradis, 2020).

Second, research on IDs allows us to investigate how language domains can be differentially affected by the same sources of variation, e.g., input. Although both vocabulary and structural properties of language are susceptible to variation in HL/ML input, the two language areas are not affected to the same extent. Even in studies where single word vocabulary production and/or comprehension are compared to the acquisition of complex grammatical structures (e.g., direct or embedded questions) in school-aged bilingual children, vocabulary tends to be more susceptible to input quantity than grammar (Chondrogianni & Daskalaki, 2022; Chondrogianni & Marinis, 2011). This speaks to the differential nature of the two language areas; one relying more on piecemeal learning of lexical items through exposure to the immediate environment; the other is more rule- or constraint-based, regardless of whether these constraints reflect innate representations or representations based on schemas.

The contribution of research on IDs to understanding language learning mechanisms, and especially UPTAKE, in neurotypical (TD) children and children with Developmental Language Disorder (DLD) is also key (Paradis, 2023). The notion of UPTAKE evokes Lila Gleitman's (1984) work on the biological predisposition to language learning in populations who are exposed to the same linguistic data but may have different learning devices. Given that heritage bilingual children are exposed to the minority HL from birth, the comparison between heritage bilingual children with and without DLD could highlight how child-external variables, such as quantitatively or qualitatively variable input, interact with an (un)impaired learning mechanism, when child-internal variables known to greatly contribute to individual variation in bilingual children, such as AoA, are held constant. This line of research can be further facilitated by the adoption of sophisticated experimental paradigms that can unravel the children's grammatical representations and their potential for learning. Along these lines, Hao (2022) showed that Mandarin-speaking heritage children (with English as ML) were more likely to repeat non-canonical structures when exposed to these structures through priming compared to their age-matched monolingual peers with DLD. If structural priming is taken as a proxy for accessing syntactic representations and implicit learning (Branigan & Pickering, 2017), this study offers first evidence that this ability differs in the two groups despite heritage children receiving less and potentially qualitative different input from their monolingual counterparts.

Finally, it would be impossible to not discuss a topic that has been the subject of much recent polarised debate, that of monolingual and bilingual comparisons. As Paradis observes, although group comparisons tend to highlight differences and provide evaluative appraisals between groups, THEY NEED NOT BE SO. They can be merely used to understand the performance of different groups of learners and the factors that influence this performance. This is particularly important when group comparisons help us not only address how IDs differentially modulate language outcomes in groups with different life experiences, but also tackle fundamental theoretical questions about language acquisition. When investigating language areas that are subject to variation and optionality (e.g., pronominal reference), or when addressing effects of crosslinguistic influence (CLI), to include in the design individuals with little or no exposure to other languages can highlight the added contribution of bilingual exposure to individual differences and

language outcomes. For example, in our studies with Greek-speaking heritage children in North America and monolingual children in Greece, monolingual speakers' performance on the syntactic and pragmatic conditions regulating subject placement displayed no variability; monolingual speakers opted for VS in both conditions, the default option in Greek (Daskalaki et al., 2020). This was in stark contrast to what was reported in the heritage group, where variable performance was observed especially in the pragmatic condition. The availability of the monolingual data allowed us to understand how stable the acquisition of this structural property is in Greek-speaking monolingual children from early on. It also revealed that what we observed in the heritage speakers' variability in production was crosslinguistic influence from the ML English, especially in the condition where there is overlap between the HL and the ML. Although one could counter-argue that these questions could be answered by including bilingualism as a continuous variable, this may not always be possible in the case of heritage groups where proximal and distal factors interact in complex ways. Analyses with continuous variables also presuppose large sample sizes, which, in turn, raise issues of equity across labs and research teams (Luk, 2022).

To conclude, monolingual and bilingual comparisons need to be theoretically motivated and meaningfully evoked to answer relevant research questions, which we would not otherwise be able to answer without this comparison. Understanding the sources of heterogeneity in different groups of learners must be in the heart of research without an a priori exclusion or evaluation of these groups. Rather than shying away from the complexity of IDs, we need to build stronger theoretical and analytical models to understand their contribution, and use experimental designs and analytical techniques that allow us to address more sophisticated questions about language outcomes and IDs (Kremin & Byers-Heinlein, 2021).

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