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Introduction: special issue on age effects in child language acquisition

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While age of acquisition effects have been researched extensively in adult second language (L2) acquisition, there is less research focused on examining age of acquisition effects in child language learners. Importantly, for child learners, delays in exposure to language can occur not only for a second but also for a first language (L1). In regard to delays in exposure, it is a widespread assumption that these are detrimental to language outcomes, and that younger is always better for successful language learning. One of the aims of this special issue was to take a closer look at the evidence for this assumption with respect to language learning within the childhood years, both for delayed L1 and L2 exposure.

This collection of studies provides an overview of the state of the art in research on age effects and child language acquisition, showing, amongst many other things, that younger age of acquisition is not necessarily predictive of better language outcomes in all circumstances. This research makes it apparent that, especially during childhood, age is multi-faceted and indexical of maturational effects and plasticity, changing availabilities of cognitive and environmental resources, and growing connectivity as a function of environmental stimuli. As such, the internal mechanisms stemming from age interact with properties of the language environment during development, and thus age effects in child language acquisition might not be parallel to what is known for adult language acquisition. Each paper in this special issue addresses, more or less explicitly, the relationship between age and environmental factors in language learning.

Age effects concern, by definition, a delay in the onset of learning a language, which could be delayed L1 development, as in the case of deaf children born to hearing parents, or delayed dual language acquisition, as in the case of children who are sequential bilinguals / child L2 learners. This delay raises questions regarding the transferability of earlier experiences, differential effects across linguistic domains, and the nature of

the mechanisms for learning language in children after infancy. Studies in this issue suggest that how closely related the L1 and L2 are is a determinant of how persistent first language effects will be, even in young L2 learners. Studies also point to younger age of onset showing uneven effects across linguistic domains. Regarding mechanisms, in children, older age can mean more rather than fewer cognitive resources for learning language, and this contrasts with the role of age in many studies with older participants, including adolescents, adults, and the elderly. Furthermore, studies in this collection go beyond assessing simple relationships between language outcomes and age and explore relationships between age and other factors, e.g., speed of learning, majority–minority language status, and implicit versus explicit instruction. In sum, the research reported in this special issue underscores how “the younger the better” is too simplistic, and how more nuance is needed in understanding the intertwined influences of age of onset and environment in child language development.

Finally, we would like to highlight the range of research methodologies and designs covered by this special issue, from highly constrained experimental designs and relatively homogeneous samples to analyses of spontaneous speech and large, heterogeneous samples. While the former have the advantage of allowing us to be more confident about cause-and-effect relationships, the latter have greater ecological validity. Critically, three papers include longitudinal designs, which are highly informative of development. Together, these papers cover a range of linguistic domains, child populations, and study designs and this diversity also allows us to better understand how the multidimensional construct of age influences language learning during childhood.

Now we turn to specific populations and themes emerging across the papers in this special issue, starting with two contributions that are about children fitted with a cochlear implant in which age effects refer to age of implantation. In their paper, “Sensitive periods and language in cochlear implant users”, Moreno-Torres, Madrid-Cánovas, and Blanco-Montañez studied fourteen children fitted with a cochlear implant (CI) before the age of 2;0 with the aim of looking more closely into different sensitive periods for different aspects of language. Specifically, they hypothesized that there is an early sensitive period for lower-level speech perception and articulation skills which is too short for optimal development when language input is delayed, in contrast with higher-level language skills. This idea was supported by their finding that age at implantation correlated with the ratio of errors in place of articulation, but not with language skill measures. Environmental factors (parental education, family involvement) were correlated with both the both lower-level and higher-level language measures.

In Szagun and Schramm's contribution, "Sources of variability in language development of children with cochlear implants: age at implantation, parental language, and early features of children's language construction", the grammatical progress of children implanted with a CI was analyzed using longitudinal, spontaneous language sampling. The strong predictive value of mean length of utterance (MLU) at an early age for MLU outcomes 2½ years later points to stability in development. It turned out that parental expansions—expansions of incomplete or incorrect child utterances that provide the child with a correct grammatical model—were the second most important predictor. Age of implantation ranged between 0;6 and 3;10 in their sample, and emerged as the third factor of relevance, where more grammatical progress was found for those with an earlier age of implantation.

"The impact of input quality on early sign development in native and non-native language learners" (Lu, Jones, and Morgan) is the first study of its kind to compare the input to deaf children from hearing parents (non-native learners) with the input to deaf children of deaf parents (native learners). In this study, a picture-naming task was used and spontaneous signed conversation between parent and child were analyzed to evaluate the quality of the input. Children of deaf parents had more developed vocabulary and more phonological handshapes than children of hearing parents. Deaf parents used more sign tokens and more phonological types than hearing parents. This exploratory study demonstrates that the advantage of early linguistic exposure via sign for deaf children of hearing parents could be modulated by quality of the input.

The next five papers investigate age effects in early child L2 learners by studying morphosyntax, which is one domain where studies on adult L2 acquisition have found persistent effects of age. In each paper, the effects of age on morphosyntax are studied from a somewhat different angle. While some papers compare performance across different morphemes, other papers contrast linguistic domains and compare morphosyntax with vocabulary or syntax–semantics.

In their study, "Chinese L1 children's English L2 verb morphology over time: individual variation in long-term outcomes", Paradis, Tulpar, and Arppe looked more closely into the factors affecting the long-term outcomes with English verb morphology in eighteen Chinese L1 learners. On average, the children began to learn English at age 4;2, and were followed from four to six years of exposure to English. After five years, the children reached a plateau, but eleven out of the eighteen children did not reach native-speaker levels for one or more specific morphemes, showing that some early L2 learners may be at risk for not converging on monolingual norms. Internal factors, e.g., English vocabulary and verbal short-term memory, had the most predictive value for reaching a

native-like accuracy, followed by environmental factors (quantity and quality of English exposure at home). Whereas non-age factors contributed to explaining variation, a later age of onset did not appear to have a negative effect: children who did not reach native-speaker criterion scores started between ages 1;7 and 5;5, while children who met all criterion scores started between ages 3;8 and 5;8.

While Paradis and colleagues investigated sequential bilingual children whose L2 is markedly different from their L1, Blom and Bosma (“The sooner the better? An investigation into the role of age of onset and its relation with transfer and exposure in bilingual Frisian–Dutch children”) focused on bilingual children whose L2 (Dutch) is closely related to their L1 (Frisian). Age of onset of exposure to Dutch was treated as a continuous variable in this study ranging between birth and 4;0. Comparing the outcomes of a receptive vocabulary task and an expressive grammatical morphology task, this study demonstrates that if possibilities for transfer from L1 to L2 are abundant, a younger age of onset does not facilitate development. Moreover, input quantity might be of greater importance than age for those aspects of language that are highly language-specific, such as grammatical morphemes.

In the study by Unsworth, “Early child L2 acquisition: Age or input effects? Neither, or both”, age of onset effects are compared across three different linguistic domains. In addition to vocabulary and morphosyntax (verb morphology, verb placement), children’s performance on a construction at the syntax–semantics interface (direct object scrambling) was investigated. The children in this study were English L1 learners with an age of onset of exposure to L2 Dutch between 1;0 and 3;0 or between ages 4;0 and 7;0. Age effects were not found for any of the three linguistic domains, but the findings do point to (negative) transfer from English affecting verb placement patterns. The children scored high on the receptive vocabulary task, despite their low input, suggesting that children profited from cognate overlap between English and Dutch.

“Which mouse kissed the frog?’ Effects of age of onset, length of exposure, and knowledge of case marking on the comprehension of *wh*-questions in German-speaking simultaneous and early sequential bilingual children” (Roesch and Chondrogianni) compares monolingual children, French–German simultaneous bilingual children, and French–German sequential bilingual children on their ability to use morphosyntactic case marking as a cue to disambiguate the thematic roles of the different arguments in *wh*-questions in German. The simultaneous bilinguals showed greater accuracy than the sequential bilinguals, but no qualitative differences were found between the two groups. That is, the two groups showed the same error patterns and sensitivity to case

marking. Thus, age effects emerged in the rate but not in the patterns of development, which may point to similar underlying mechanisms.

Investigating the comprehension of (long) passives, Rothman, Long, Iverson, Judy, Lingwall, and Chakravarty (“Older age of onset in child L2 acquisition can be facilitative: evidence from the acquisition of English passives by Spanish natives”) observed that a later age of L2 onset predicted higher accuracy when L2 exposure time was held constant. The children in this study were enrolled in a 50/50 bilingual English–Spanish immersion school, in a monolingual Spanish context, hence exposure to English took place at school. After 3½ years, both the children who started at ages 3;0–4;0 and ages 6;0–7;0 comprehended active but not passive sentences. One year later, the older age-of-onset group had reached ceiling with passive sentences, in contrast with the younger age-of-onset group, despite similar general grammatical proficiency in English and length of exposure to English in school. After two years, the younger age-of-onset group caught up, showing that the advantage of the older age group was relatively short-lived and could be related to the availability of cognitive resources that increase with age.

While the above studies focus on effects of age of L2 onset on L2 acquisition, the study by Bedore, Peña, Griffin, and Hixon (“Effects of Age of English Exposure, Current Input/Output, and grade on bilingual language performance”) addresses the question whether L1 development is affected by age of L2 onset in a context where the L1 is a minority language (Spanish) and the L2 is the majority language (English). In this study, a large cross-sectional sample participated consisting of first- and third-graders who were bilingual speakers of Spanish and English with varying bilingual language experiences. Children were tested in both Spanish and English with tests of semantic and morphosyntactic knowledge. By comparing the linearity of effects, the authors observed continuity across grades 1 and 3 for English, indicating that age of onset had no influence apart from quantity of input. However, nonlinear effects were found for Spanish, showing that an earlier exposure to English was associated with a lower performance in the minority language.

The final study of this collection of papers is of a somewhat different nature than the other studies in terms of both population and method, as it is neither about delayed L1 nor about delayed L2 development, but is a controlled experiment in which different age groups learn a mini-language. In the literature on age effects, it has been hypothesized that children are primarily implicit language learners and make little or no use of explicit language learning mechanisms, in stark contrast with adults. This difference is thought to stem from maturational effects. In “Age and learning environment: Are children implicit language learners”, Lichtman investigates the Maturational Hypothesis, which predicts that only adults

make use of explicit instruction, as well as the Instructional Hypothesis, which predicts effects of explicit instruction, regardless of age. Using a mini-language learning paradigm with children and adults, Lichtman concludes that children benefit from explicit instruction, and perform better when their attention is drawn to structures in language. On the flip side, adults did not always rely on explicit learning.