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Commentary

Exposure is the proximal influence on second language acquisition

Caldwell-Harris and MacWhinney (2023) offer a synthesis of the many factors that influence second language acquisition and propose an emergentist account of the effect of age. From their thorough description of what they categorize as "cognitive forces" and "motivational and social forces" for child and adult language acquisition one cross-cutting factor emerges: exposure to the target language. Exposure appears repeatedly as a determinant in their analysis, as a direct risk factor (section 1.3), or as a correlate of the motivational and social forces at play.

We argue that (lack of) exposure to the target language can explain most of the difficulties described by Caldwell-Harris and MacWhinney (2023) in their cognitive forces section. For instance, regarding entrenchment, adult learners have both produced more and been more exposed to specific features of their first language than younger learners. That, combined with a lack of exposure to the second language, can explain adults' difficulties in reversing entrenchment and acquiring the different configurations of specific features in the target language. Negative transfer can have a similar source: it is only by being exposed repeatedly to the target form that negative transfer can be corrected.

We thus propose a reorganization of the factors Caldwell-Harris and MacWhinney (2023) describe. We accept much of what they propose as important in second language acquisition, but organize the factors differently. Specifically, we propose a single *proximal* determinant of second language acquisition – exposure. Many *distal* factors either influence exposure or operate in tandem with exposure. The distal factors include internal influences like motivation, as well as external factors like time and age. Aptitude and cognitive resources indirectly affect how much exposure an individual seeks, but primarily affect the extent to which an individual benefits from exposure. Later we discuss systemic and societal factors that can impede exposure or make it difficult to profit from exposure because of cognitive overload.

Caldwell-Harris and MacWhinney (2023) thoroughly describe many distal factors and give examples of language properties that must be acquired. Exposure comes up frequently in different sections, and we think that is because all roads lead to exposure. We are skeptical but agnostic about whether Caldwell-Harris and MacWhinney supply a mechanism for second language acquisition. In our formulation, learners are hypothesis-testers, using the input as evidence for different hypotheses. Since we do not think the extant data allow a universally convincing preference for an emergentist vs nativist account, we concentrate here on the role of exposure.

1. Evidence from a study with parent-child recent immigrant dyads

Our recent work examining English acquisition by child and adult recent arrivals to the US from Spanish-speaking countries gives one example of exposure as a proximal factor and motivation, age, and so on as distal factors (Lambelet, 2021; Lambelet, 2023; Lambelet & Valian, 2020). Participants were 51 parent-child pairs of Spanish-speaking recent immigrants in New York City who participated in three sessions of data collection over a one-year period. During the first session, conducted as soon as possible after their arrival, participants' foreign language aptitude (LLAMA test battery) and working memory (digit span and Corsi Block) were assessed, along with three tests of language proficiency. Those three tests were tense comprehension, oral narrative, and a short verbal fluency task ("name as many animals as you can in 1 min"). They also answered a demographics questionnaire on exposure and anxiety. Six months and 12 months after the first session, participants' English proficiency was assessed a second and third time with a variation of the same tests. Participants also again filled out the demographic questionnaire.

We assessed the effects of age, cognitive (working memory, aptitude) factors, and contextual-affective (exposure, motivation, anxiety) factors on the development of lexical diversity (Lambelet, 2021) and verbal fluency (Lambelet, 2023). In this commentary, we will discuss the results of the tense comprehension task as well as the production of tense in the oral narrative task.

Tense *comprehension* was measured using a task developed and used by Valian (2006) to assess children's development of tense comprehension in first language acquisition. The task has also been used for investigating tense in adult second language learners (Martohardjono, Valian, & Klein, 2021). Participants saw a short videotaped scenario and were then asked to point to one of two alternatives representing main verb *is* or *was*, auxiliary *is* or *was*, and *did* and *will*. Difference scores for each dyad were averaged to create an average sensitivity to tense score.

Tense *production* was measured by computing participants' percentage of correctly produced English verbs (out of correct, incorrect, and Spanish verbs) in their oral narration of the book *Frog, where are you?* (Mayer, 1969)? at T1 and T3.

2. Children understand and produce tense better than their parents do

We find that children are superior to their parents in distinguishing between non-past and past copulas (*is/was*) and auxiliaries (*did/will*). Both children and parents improved in comprehension over the one-year

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period, but children had significantly better comprehension than their parents at each data collection point. Similar results appeared for production. Children progressed from producing 56% of their verbs correctly to producing 74% correctly. Parents, in contrast, progressed from 33% to 37% over the same one-year period. Age would thus appear to be a significant factor in second language acquisition, with children having the edge. As we discuss below, however, that appearance is misleading.

3. Exposure as the proximal determinant of acquisition in both children and adults

To investigate the factors predicting verbal tense comprehension and production development in children and adults, we fitted backward elimination linear mixed effects models. The random effect was family; the random slope was time; the fixed effects were age group, length of residence, aptitude, working memory, exposure to English, and anxiety when speaking in English.

In both comprehension and production, exposure to English was the most important predictor. Age (child vs parent) was *not* a significant predictor in either comprehension or production. For tense comprehension, length of residence, and the vocabulary learning subtest of aptitude (LLAMA_B) were additional significant predictors. For tense production, anxiety in speaking in English (less anxiety was related to better production) was an additional predictor.

Importantly, then, age was not itself a predictor, and exposure was the variable that accounted for the most variance. A closer look at the differences in exposure – see Fig. 1 – between and within groups shows that, as a group, adults are less exposed to English than their children. That holds from the first data collection session to the last. At the same time, some adults are more exposed to English than some children are.

When digging a little more deeply into the determinants of exposure, we find that the exposure differences between children and parents are most pronounced in the locations where they spend most of their day. At T1, for instance, adults use English on average during roughly 33% of their work day, while their children use English on average during roughly 75% of their school day. Similarly, at T3, adults use English in a little less than 50% of their work day while their children use English about 80% of their time at school or work. The only place where both adults and children use mostly Spanish is at church.

Adult immigrants to the New York area lead lives that are quite segregated, compared to their children. The fact that there is an active Spanish-speaking community both helps adults feel more at home and reduces their exposure to English. We queried participants about their exposure to English with friends, in the street and at the supermarket, on the internet, watching television and movies, listening to the radio and podcasts, and reading. In every environment except church, children are exposed to English and use English more than adults. As mentioned earlier, the difference is acute in the location where both children and adults spend most of their time – at work or at school. Children also mention having significantly more English-speaking friends than their parents, and tend to read in English, watch TV in English, and listen to more English music than their parents do. The difference is smallest where each group spends the least amount of time – at church.

To sum up, many factors, ranging from cognitive to motivational and social forces, can have an impact on language learning, as pointed out by Caldwell-Harris and MacWhinney (2023). But all these factors are important only insofar as they lead to more exposure. Only with exposure can learners learn.

We circle back to the beginning, suggesting that the factors that Caldwell-Harris and MacWhinney summarize can be divided into many distal factors and one proximal factor – exposure. The importance of exposure can explain the difficulties that adult immigrants experience in learning the language of their new country of residence, especially if they live and work in segregated neighborhoods and work environments, as is the case for Spanish-speaking immigrants in major American cities like New York. We recommend that immigrants' new countries act more productively to change the systemic factors that make it difficult for immigrants to acquire exposure to the new language and to benefit from that exposure.

4. A prospective look on research on age and second language acquisition

As we discuss elsewhere (Lambelet, 2023), work on the connection between age and second language acquisition would benefit from more research into not only lack of exposure, and the factors that Caldwell-Harris and MacWhinney (2023) list, but factors that they do not include. Recent immigrants may experience post-traumatic stress and rejection in their new country, and they may lack a sense of belonging. The

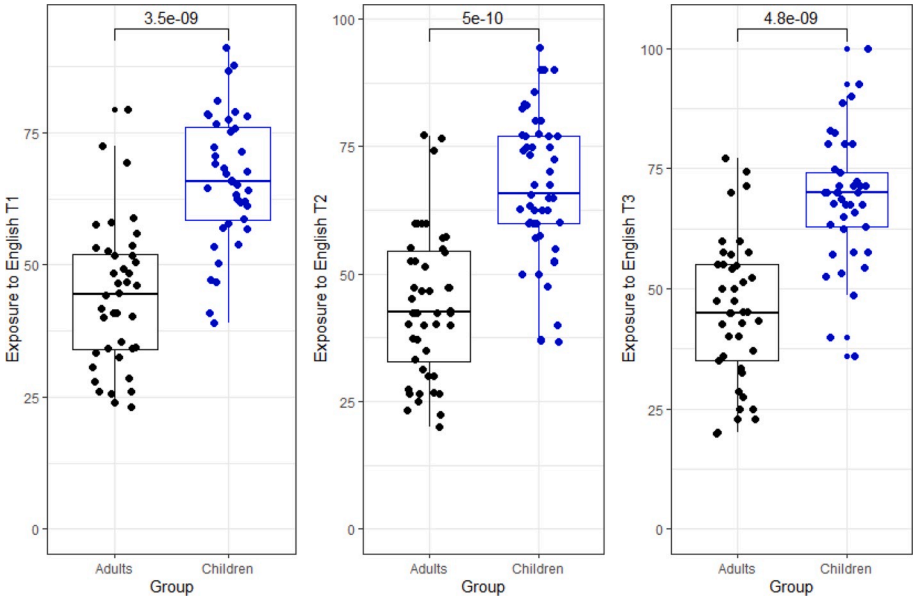

Fig. 1. Self-reported exposure to English at T1, T2, and T3 by adults (in black) and children (in blue).

contexts in which immigrants find themselves make exposure difficult and lead to cognitive overload. Work in social cognition highlights the roles of stereotype threat (Schmader, Johns, & Forbes, 2008; Spencer, Logel, & Davies, 2016) and lack of a sense of belonging (e.g., Gillen-O'Neel, 2021) in decreasing cognitive resources available for problem solving. We suggest that the status of an immigrant learning a second language is an extension of those phenomena. Motivation is itself affected by systemic societal factors. Adults will not seek out exposure unless their new country facilitates exposure.

Only by considering underserved populations, such as those with low socio-economic status and those who are recent immigrants, will we achieve a full understanding of second language learning and the proximal and distal factors that influence it. At *that* point, we might have enough evidence to confirm either an emergentist or nativist account of language acquisition.

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