

# Sensitive periods in both L1 and L2: Some conceptual and methodological suggestions

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(Received: January 28, 2018; accepted: January 28, 2018; first published online 1 June 2018)

Keywords: critical period for language, sensitive periods, language acquisition, age of acquisition, bilingualism

The keynote article (Mayberry & Kluender, 2017) makes an important contribution to questions concerning the existence and characteristics of sensitive periods in language acquisition. Specifically, by comparing groups of non-native L1 and L2 signers, the authors have been able to ingeniously disentangle the effects of maturation from those of early language exposure. Based on L1 versus L2 contrasts, the paper convincingly argues that L2 learning is a “less clear test” of sensitive periods. Nevertheless, we believe Mayberry and Kluender underestimate the evidence for maturational factors in L2 learning, especially that coming from recent research.

## Two studies on AoA effects in L2

We will first review two sets of results from our lab in which we obtained strong, non-linear, age-of-acquisition (AoA) effects on aspects of L2 morphological processing. In a first study (Veríssimo, Heyer, Jacob & Clahsen, 2017), we employed masked morphological priming to compare priming produced by inflected (e.g., *geprüft* ‘checked’) versus derived words (e.g., *Prüfung* ‘(the) check’) on the recognition of their bases (signalling morphological decomposition), with a group of 93 Turkish–German bilinguals who had acquired German at different ages (0 to 38). AoA had a pronounced effect on inflectional priming (but not on derivational priming) and displayed a non-linearity indicative of a sensitive period: it was native-like if acquisition started before the ages of 5–6, but declined with increasing AoA. In a second study (Bosch, Veríssimo & Clahsen, 2018), we used cross-modal priming with 105 Russian–German bilinguals (L2 AoA: 0–22) to investigate a different phenomenon: priming from marked irregular stems (e.g., *wirf* ‘throw-2/3sg’) to base stems (e.g., *werf*-), signalling access to morphosyntactic features. The results revealed a striking AoA modulation of priming effects, which were gradually reduced until an AoA of

11, after which point there were no further AoA effects. From these results, we concluded that sensitive periods are indeed operative in the acquisition of L2 morphology, but that they are crucially dependent on the particular phenomenon that is being tested: there is a peak of native-like sensitivity during early childhood for the acquisition of regular inflection, as well as a gradual loss of sensitivity until the beginning of adolescence for the acquisition of stored irregulars and their morphosyntactic features.

## Conceptual and methodological suggestions

A number of characteristics of our two studies allow us to make specific suggestions regarding future research on sensitive periods in both L1 and L2. Firstly, AoA studies will benefit from taking seriously the notion that sensitive periods can display EXTREME SELECTIVITY. That is, given that the architecture of language consists of various systems and sub-systems, it is to be expected that multiple sensitive periods exist for different aspects of acquisition. In the domain of L2 morphological processing, such selectivity has been demonstrated in our own work (described above), in which clear AoA effects emerged for inflectional priming and for priming from marked stems, but they showed discontinuities at different points. Nevertheless, most of the ‘late L1’ studies reviewed in the keynote article (Mayberry & Kluender) were concerned with broad systems like phonology and morphology/syntax; we suggest that a complete account of sensitive periods in language acquisition will likely require looking at much narrower linguistic domains than those.

Secondly, if selective sensitive periods exist, they will ultimately manifest as AoA-dependent effects on psycholinguistic REPRESENTATIONS AND PROCESSES, not necessarily on language ability. Thus, in our view, the emphasis should be on the acquisition of particular kinds of knowledge and associated processing mechanisms

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(like processes of inflectional decomposition or of storage of morphosyntactic features), and less so on “proficiency” or “attainment” – constructs that are too general and carry little explanatory value.

Thirdly (and relatedly), one consequence of the traditional emphasis on proficiency and language ability is that research on sensitive periods has tended to employ TASKS AND MEASURES that are difficult to map to specific representations and processes. Thus, a good deal of the research reviewed in the keynote article has made use of global tasks, such as sentence recall, sentence-to-picture matching, and grammaticality judgements across many different types of constructions. Although such measures have served the field well, the results that they produce have typically been interpreted as a proxy for linguistic ability (or at best, syntactic ability) and thus may tell us little about the psycholinguistic mechanisms that are involved or about domain-specific sensitive periods.

Fourthly, as pointed out in the keynote article, the SHAPE OF THE FUNCTION relating AoA to linguistic measures is of particular theoretical significance. Specifically, non-linear shapes are indicative of the offset of a sensitive period and can provide strong support for the role of maturational factors in acquisition. The theoretical importance of distinguishing linear and non-linear effects, coupled with the fact that AoA is a continuous between-subject variable, indicates that sensitive period research may require the use of large samples (with wide-ranging and uniformly distributed AoA values), and crucially, of statistical methodologies that are appropriate to discover non-linearities. In our two studies on AoA effects, we have employed regression-with-breakpoints together with a discovery procedure that allowed finding the best location for a discontinuity in AoA effects (rather than arbitrarily defining particular cut-off points a priori; see Vanhove, 2013). Although research on L2 has often discussed the presence of non-linearities (and has occasionally employed appropriate statistical methods), research with non-native L1 signers has not (to our knowledge) specifically addressed this.

Finally, we concur with the keynote article that research on sensitive periods should move forward and tackle “the complex and intertwined processes of language acquisition” (Mayberry & Kluender), by uncovering the role of EXPERIENCE-MATURATION INTERACTIONS. Indeed, the major contributions made by Mayberry and Kluender’s research are that they have provided strong evidence for maturational factors in language acquisition, and, in addition, that they have persuasively shown that early exposure to linguistic input can have long-term consequences for L2 learning. It should now be possible to go beyond the issue of detecting sensitive periods and pinpointing their age boundaries, so that we begin to understand how experience and maturation govern plasticity in the different systems of language (Werker & Hensch, 2015; Newport, Bavelier & Neville, 2001).

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