Do late first-language learners of ASL rely on word order to comprehend simple sentences?

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Language deprivation is common among deaf individuals when they do not have early access to a sign language. When these deaf individuals acquire sign language as their first language (L1) at an older age, they often show deficits in their language performance. Simple sentence structures such as basic word order appear relatively unaffected, while complex morpho-syntactic structures, such as relative clauses, are unlikely to be acquired (Newport 1990; Boudreault & Mayberry 2006). Understanding the nature of these selective age of acquisition effects on sentence structure can illuminate the underlying mechanisms of the critical period effect and the early development of syntactic complexity among young children acquiring an L1.

Whether late L1 learners actually use basic word order when comprehending simple mono-clausal sentences remains unclear. Previous studies are insufficient to answer this question as they looked only at reversible sentences with probable meanings and animate subjects. One possibility is that late L1 learners use alternative strategies, such as agent first and probable event bias, to comprehend simple sentences. Three-year-old children show probable event bias when asked to act out improbable sentences, while four-year-olds rely more on word order (Strohner & Nelson 1974). Because late L1 learners show syntactic development similar to that of young native learners (Berk & Lillo-Martin, 2012; Cheng & Mayberry 2018; Ferjan Ramirez et al 2013), they may rely on similar alternative strategies when comprehending simple sentences rather than using word order to map syntactic positions and thematic roles. Given that mapping syntactic and thematic roles in simple sentences is a prerequisite for processing more complex syntactic structures, investigating this possibility is crucial to understanding the discontinuity in syntactic development among late L1 learners.

The present study used a sentence-picture matching experiment to explicitly investigate how deaf individuals with early language deprivation interpret simple, subject-verb-object (SVO) sentences in American Sign Language (ASL). During the test, the participants first watch a 3-second ASL sentence signed by a native signer. Next, they are presented with a picture that either matches or mismatches with the previous sentence. Responses to the picture (match vs. mismatch) as well as the response time are recorded for each item. We tested three groups of ASL signers: deaf native signers, deaf late L1 learners, and hearing L2 learners with ASL classroom experience. We included 4 sentence conditions contrasting in event probability and argument animacy (Figure 1). Each condition consisted of 12 stimuli with matched pictures and 12 stimuli with mismatched pictures that involved reversed thematic roles. There were also 96 control stimuli consisting of noun phrases and intransitive sentences, where the mismatch picture involved a change of one compositional component.

Figure 2 shows the d-prime scores from 22 participants collected so far. Native deaf signers and hearing L2 learners showed high signal sensitivity across all conditions. Deaf late L1 learners showed slightly lower but still positive d-prime scores for the filler condition and the probable conditions, but negative d-prime scores (i.e. more likely to falsely accept probable pictures) for both improbable conditions (main effect of event probability, $p < 0.001$), while subject animacy does not facilitate their performance ($p = 0.41$). These results suggest that late L1 learners do not fully rely on abstract syntactic structures such as basic word order when comprehending simple ASL sentences in real time. Instead, they tend to adopt the probable event strategy, just like three-year-olds, as reported in literature.

Our preliminary findings suggest that late L1 learners may show a discontinuity in syntactic development due to general difficulties in using abstract syntactic rules to map thematic roles, even in the simplest form of sentences. This difficulty prevents the subsequent acquisition of complex sentence structures.
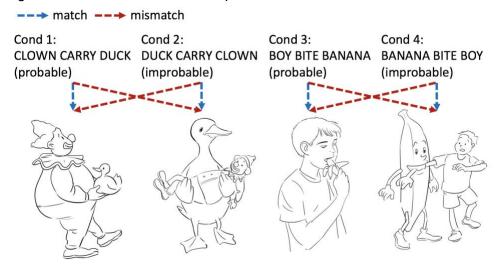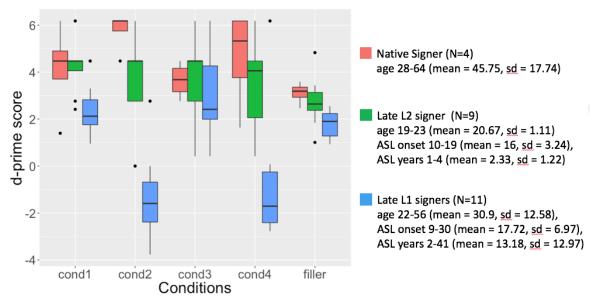
Figure1: test conditions and examples

Figure 2: preliminary results -- accuracy by condition and group

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