

Chapter 16: Assessing ASL Vocabulary Development

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Abstract

Accurate assessment of vocabulary is challenging in both spoken and signed languages. Vocabulary is affected by a child's specific background and linguistic experience, which vary across children, even within the same community. Culture also affects vocabulary, increasing the variance between children who speak the same language. Thus, focusing on the number of words children know, limits our understanding of the child's lexical capacity and is vulnerable to an inaccurate representation of her knowledge of the language. The current chapter presents three vocabulary subtests of the American Sign Language Assessment Instrument (ASLAI) battery: Antonym, Synonym and Analogical Reasoning. These receptive vocabulary subtests examine the child's knowledge of signs and of the relations between signs; representing the developmental language trajectory of ASL. Moreover, the structure of the ASLAI allows exploring errors when children choose an incorrect response, as well as dissociation patterns within and between the subtests. These three subtests are discussed in terms of three factors: vocabulary development across school age, similarities between signed and spoken language and the significance of early sign language exposure.

Acquisition of vocabulary is a **natural** process when children are exposed to language input and the language mechanism is intact. For children with typical language and no impairment, as children age, they acquire **more words**. A child's specific vocabulary depends on his/her experience and interests.¹ One core question in language assessment is how to measure vocabulary. Vocabulary tests must be linguistically and culturally fair, to avoid a bias that will over diagnose children only because they are exposed to variety of language input that does not include the tested items. Further, to avoid under diagnosis, meaning not to identify children with language difficulties because the test is too easy and cannot pinpoint real deficit in language acquisition. The question of how to measure vocabulary is relevant for professionals (educators and clinicians such as teachers, speech and language therapists, psychologists) and for researchers.

The current chapter presents evidence from the American Sign Language Assessment Instrument (ASLAI), highlighting its ability to represent an extensive view of a child's vocabulary.

Vocabulary development in sign language

While sign language is the mother tongue of signing communities, 90–95% of deaf children are born to hearing families (Mitchell & Karchmer, 2004) and are not naturally exposed to sign language from birth. Ideally, children are exposed to sign language during 0-3 early intervention programs, but this is not always the case. Later, when they attend a school or a program for the deaf, sign language will be part of the intervention (in the USA, usually at age 4-6 years). The delay in exposure to sign language affects its acquisition in all linguistic domains (for an example of the effect

¹Some children learned all the Pokémon's names (hundreds of names with their specific features), other children know hundreds of sport players' names.

on the acquisition of ASL syntax, see Novogrodsky, et al., 2017). The lack of exposure to sign language is crucial for language development, because it leaves many deaf children with no access to language in their critical period for language acquisition. For numerous deaf children, access to spoken language is limited due to the hearing loss (Novogrodsky, Meir, & Michael, 2018), resulting in language deprivation. Specifically, it is not the limitation of the deafness but rather lack of accessible linguistic input. (Henner, et al., 2018b). Thus, assessment of sign language is important as it estimates the child's knowledge and ability to acquire language naturally, in his intact modality. To test the child's vocabulary, there are various direct assessment measures (these are measures based on testing the child directly by an examiner, e.g., naming an object or a picture) and indirect assessment measures (these measures are based on indirect information from caregivers of the child e.g., parental questionnaires).

For example, the MacArthur-Bates Communicative Developmental Inventory parental questionnaire (Frank, Braginsky, Yurovsky, & Marchman, 2017) is a common vocabulary assessment tool at preschool age. It has been adopted to different sign languages: American Sign Language (ASL) (Anderson & Reilly, 2002; Caselli & Pyers, 2017), British Sign Language (Thompson, Vinson, Woll & Vigliocco, 2013), Israeli sign language (Novogrodsky & Meir, under review), Spanish Sign language (Rodríguez-Ortiz, et al. 2019) and Turkish Sign Language (Sümer et al., 2017). Parents know their children best and at preschool age they experience more hours with them than any external examiner does. The studies cited above showed that as children grew, their scores on the tests improved, indicating larger sign language vocabularies. This was shown across different sign languages, similar to children who acquire spoken languages (Frank et al., 2017). The Communicative Developmental Inventory is an indirect valid measure based on an adult's reporting. It displays vocabulary size of a

child, its growth over time (when using the test at different time periods) and the characteristics of early lexicon use. For example, studies showed that iconicity (e.g., Novogrodsky & Meir, under review) and frequency (e.g., Caselli & Pyers, 2017) of signs supports the process of early vocabulary acquisition. However, in the case of hearing parents who learn the sign language in parallel with their children, their reports might be less precise.

While indirect measures are valid for preschoolers, by school age, direct testing is required. According to Hoffmeister (1994), knowing a sign for a concept comprises three levels: its direct definition, its use in context and a metalinguistic knowledge of its relations to other signs/words. One challenge at school age is the diverse experiences and cultural backgrounds children have, which will affect their performance on any vocabulary test.

The ASLAI tests include various subtests that explore ASL vocabulary breadth and depth. Here we present three of these tests: Synonym (Novogrodsky, Fish, & Hoffmeister, 2014), Antonym (Novogrodsky, et al., 2014a) and Analogical Reasoning (Henner, et al., 2016; Henner, et al., 2018a). The three subtests are video-based, receptive, multiple-choice tasks. The items represent frequent and infrequent signs from different lexical categories. For example, the Antonym subtest (Novogrodsky, et al., 2014a) includes pairs of adjective antonyms and pairs of verb antonyms. The items also represent various semantic fields. For example, in the Analogical Reasoning subtest (Henner, et al., 2016) the Whole-Part and Part-Whole items test participants' abilities to examine proportional relationships from different semantic areas (e.g., NOSE is to FACE, like TIRE is to [CAR], which is the correct response). Each item in the tests consist of a prompt, a target, and three false options (for an overview of the ASLAI test, see Chapter 18).

At the breadth level, the Synonym (Novogrodsky, et al., 2014b), Antonym (Novogrodsky, et al., 2014a) and Analogical Reasoning (Henner, et al., 2018a) subtests measure quantity. However, and this is critical, these subtests allow exploring the child's depth vocabulary knowledge beyond quantity. Depth knowledge infers the number of meanings of a sign a child knows, different usages of a sign, and the relationships between signs (for more discussion of breadth and depth of vocabulary knowledge, see, Novogrodsky, et al., 2014a). For example, does the child understand that different signs have the same meaning (e.g., WORK and DO-WORK²)? Is the child aware of opposite semantic relations between signs (e.g., VAGUE and CLEAR) and how many analogical relations between signs does she know (e.g., causal relations, RAIN - WET: SUN - DRY).

Our research showed that native signers scored higher on these three subtests compared with nonnative signers (Novogrodsky, et al., 2014b; Novogrodsky, et al., 2014a; Henner, et al., 2018a), supporting the importance of sign language input at an early age. However, when exploring the effects of age, Antonym knowledge and language status (being a native signer versus a nonnative signer) on English reading comprehension, the only variable that explained reading comprehension was the Antonym score (Novogrodsky, et al., 2014a). Nonnative signers who scored high on the Antonym subtest, scored high on the Stanford Achievement test - Reading Comprehension test (Traxler, 2000). This finding suggests that it is not the language status that counts (whether the child is a native or a nonnative signer), but rather knowledge of the language. Children who knew more antonyms, representing depth vocabulary knowledge, scored higher in a reading task. It supports the need for a

² Following convention, all English glosses of ASL signs are written in capital letters.

language and the importance of a signing environment with linguistic input for children who are native, and even more so for nonnative signers.

The studies also showed that native signers reached a ceiling at middle school in both Synonym and Antonym subtests. This finding does not mean that children do not learn more synonyms and antonyms after this age, but rather that the test is sensitive to evaluate development in elementary and middle school. For nonnative signers who scored lower than native signers, both subtests were sensitive throughout school age, including high school, suggesting that children use their knowledge of relationships between signs to learn more signs when the language is accessible to them, even during high school.

Notably, the analysis of the Analogical Reasoning subtest showed how different linguistic knowledge is required for various analogical relationships. For example, while syntactic abilities were linked to analogical reasoning items of noun-verb and causal relations, vocabulary (and syntax) were linked to whole-part reasoning items (Henner, et al., 2018a). This dissociation emphasizes how understanding a child's profile in different parts of the subtest discovers his/her deep linguistic knowledge. Clinically, scoring low on one of the Analogical Reasoning parts of the test and not on others can indicate possible language difficulties beyond the score of the test itself. For example, low scores on noun-verb and causal relations subtests and high scores on the other analogical reasoning subtests might support difficulties in syntax beyond analogical reasoning.

Finally, the ASLAI can be used to assess language disorders in deaf children. In a retrospective study (Novogrodsky, et al., 2014c), two native signers were tested three times along different years on the Synonym and Antonym subtests. Their reading comprehension scores and academic profile scores, as rated by teachers, were compared

with the language measures. Both children demonstrated progress in their performance over the years, but it was constantly lower than that of their mean age group. In addition, their low performance on the ASLAI subtests was in line with their low reading comprehension scores and low academic profile scores. These findings add to the growing literature regarding language disorders among people/children who use sign languages (Mason, et al., 2010) and specifically in ASL (Quinto-Pozos, Forber-Pratt, & Singleton, 2011).

The subtests of the ASLAI are useful assessment tools beyond a simple score per age. Some children come from diverse ASL backgrounds and might not match the norms (Henner, et al., 2018b). For example, they use another sign language at home and ASL at school, or they use ASL variation (Woodward, 1973) that is not similar to the ASL of the test. In these cases, exploring the child's performance qualitatively might be useful (Hou & Kusters, 2019)³. For example, a child might not match his age score even if he understands the concept of antonyms and most of the errors are semantic (see the next section for more information regarding error analysis). This means that the child does not know the exact signs for the Antonym subtest, but has the linguistic capacity of antonyms. Following the child's progress after a period of time might substantiate this assumption.

Similarities between signed and spoken languages

In addition to evaluating ASL vocabulary, the ASLAI research allowed comparison of acquisition patterns between sign language and spoken language measures from standardized spoken tests. As discussed in the first section, similarly to spoken

³ The effect of bilingualism on children's lexical scores and the need to consider it in language assessment of a bilingual child is shown also in spoken languages (e.g., Degani, Kreiser, & Novogrodsky, 2019).

languages, signing children's scores on vocabulary measures improved with age (e.g. on Analogical Reasoning, Henner, et al., 2016). The current section discusses additional similarities between signed and spoken modalities.

We explored error types on the Synonym subtest in two studies and showed that children's errors shifted from being primarily phonological to primarily semantic in the same way as children using spoken languages (for signs, Novogrodsky, et al., 2014b; Novogrodsky, Fish, & Hoffmeister, 2013, for words, Felzen & Anisfeld, 1970). At the beginning of elementary school, when hearing children erred in receptive vocabulary tasks, they tended to choose words that rhymed with the prompt items. In middle school, they chose words that were semantically related to the prompt items, when they did not know the answer (Felzen & Anisfeld, 1970). Error patterns on the Synonym subtest (Novogrodsky et al., 2013) revealed that with increasing age, native signers tended to prefer semantic false options over phonological false options when choosing the incorrect answer.⁴ Additionally, when children had two phonological false options in a question, they preferred the phonologically close one over a distant phonological false option, suggesting that they prefer neighbor signs over signs that do not belong to the neighboring phonological category; in line with findings of hearing children (Garlock, Walley, & Metsala, 2001). In another study that explored errors, the analysis revealed similar findings. Both native and nonnative signing children demonstrated a decrease in phonological false choices with increasing age (Novogrodsky, et al., 2014b).

Another similarity between signed and spoken languages is the age when synonyms emerge. Global scores on the synonym subtest showed chance performance at age 4-5 years. However, item analysis revealed that at this age, similarly to children

⁴ For example, for the prompt sign STUMPED, the semantic false options was DIFFICULT and the phonological false options was NAB, differing in only one phonological parameter from the prompt sign (Novogrodsky, et al., 2014b).

acquiring spoken languages (Doherty & Perner, 1998), native signers performed above chance on three items of the subtest. This finding suggests that children who acquire ASL are expected to understand the semantic concept of synonym signs by age five.

Finally, the comparison between scores on the Synonym and Antonym subtests showed that at young ages, children performed higher on the latter, representing ease of acquisition of signs with opposite meanings, as compared to signs with similar meanings (Novogrodsky, et al., 2014a). The gap between the two tasks supports the theoretical idea of the principle of lexical contrast in acquisition (Clark, 1978). The idea behind this principle is that at early ages of language acquisition, it is easier for children to learn new words/signs with meanings that are different from known words/signs. As they age, children learn that there are also words/ signs with another synonym word that is related to them. Clinically, it suggests that a young child is expected to score higher on the Antonym task than on the Synonym Task.

The examples presented in this section support the assumption that ASL vocabulary development of native signers follows the typical developmental path of children acquiring spoken vocabulary. This has important clinical implications, when testing a specific child's ASL knowledge. A child is expected to show typical age score at any tested age for the different subtests of the ASLAI, each subtest has its own age reference norm. If a child does not meet the test criteria, intervention is suggested, similarly to children who communicate in spoken languages. Further, the child is expected to show increased scores with age, which is an option if one uses the ASLAI, as it has age reference scores along school age. Qualitative analysis of the performance, allows understanding the child's deep vocabulary knowledge. Characteristics of the errors (e.g., phonological versus semantic), items known by the child at an early age and the gaps between subtests might shed light on ASL progress and on typical versus

atypical acquisition. While the score on a subtest can give us an estimation of a child's vocabulary, a broader language capacity is hidden behind this number.

The importance of early exposure to sign language

The research presented here supports the importance of early sign language exposure. Likewise, the findings support that both quantity and quality input of sign language show positive effects on children's performance (e.g., Henner, et al., 2016). The gap between native and nonnative signers persisted throughout the school age years and was not easily closed even after years of ASL exposure (e.g., Novogrodsky, et al., 2014a). This is strong evidence for the benefits of early sign language input representing quantity effect of input. Furthermore, age of entry to school for the deaf also had a significant effect (Henner, et al., 2016). This variable relates to systematic exposure to ASL specifically for nonnative signers, supporting the unique benefit of the qualitative sign language input children receive at school. The findings showed that age of entry into an academic signing environment after 6 years of age (regardless whether native or nonnative signer) was associated with poorer performance on the Analogical Reasoning subtest at later ages (Henner, et al., 2016). However, this qualitative effect does not mean that nonnative signers cannot develop proficient ASL, our findings indicate the contrary. For example, both native and nonnative signers with high ASL scores showed strong academic achievements based on their reading comprehension scores (2014a) and teacher ratings (Novogrodsky, et al., 2017). Furthermore, children who entered schools for the deaf at younger ages and had more years of ASL experience, had higher scores on the Analogical Reasoning subtest. Importantly, half of the nonnative signers scored as well as the native signers did on the

Analogical Reasoning subtest (Henner, et al., 2016), showing ongoing effects of ASL learning.

The findings from the studies of ASLAI vocabulary subtests suggest that early sign language is necessary; but is not sufficient. Ongoing linguistic input is the only way to develop a proficient vocabulary.

To conclude, the current chapter presented three ASLAI subtests illustrating how they can be used in assessing ASL skills beyond simple comparisons to the norms. This was demonstrated through different qualitative analyses of the subtests, by comparisons among the subtests and by discussing the similarities between ASL and spoken languages. Finally, the importance of early ASL and qualitative input during the school years is suggested as keys to enable children to become proficient signers.

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