SPANISH SIGN LANGUAGE ADAPTATION OF THE MACARTHUR COMMUNICATIVE DEVELOPMENT INVENTORY

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Vocabulary development is a fundamental skill for educational and literacy success in all children. Deaf children typically have slower vocabulary growth than their hearing peers, both in spoken and sign languages. In order to accurately assess children's language skills, it would be of interest to develop specific standard tests. The MacArthur Communicative Development Inventory (CDI) is a well-known instrument for the assessment of spoken language development. It has been adapted to many spoken and some sign languages. In Spain, although there is a CDI version for spoken language, professionals from bilingual schools for the deaf would benefit from the elaboration of an adaptation to the Spanish Sign Language (LSE). This is the final goal of our research. In this presentation, we will describe the process of developing a CDI version for deaf children aged 8-36 months. An adaptation of the checklist from existing CDIs (Spanish, British Sign Language, and American Sign Language) was carried out. After piloting the checklist with native signers, parents had to check off the signs that their children understood or produced every 4 months. We will present the early development of receptive and productive vocabulary data for native signers aged 8-36 months. Developing an LSE-CDI is of great

importance for educational specialists in order to assess deaf children's educational potential, given the crucial role of language in such processes.

Keywords: CDI, assessment, linguistic development, Spanish Sign Language

Introduction

The need for instruments to determine the degree of children's competence in sign language arises both in the educational context and in the setting of developmental and psycholinguistic research. Near the end of the 1990s, the first bilingual educational experiences of Sign Language-Oral language (SL-OL) were implemented in Spain. In contrast to oral language for which there are numerous assessment instruments from early ages, there was practically nothing to enable educational professionals to assess progress in sign language in deaf and hearing children who were being educated in this modality. On the other hand, there are few studies in the research setting dedicated to the development of Spanish Sign Language (LSE), being one of the reasons the lack of instruments to address its evolution. This difficulty increases when attempting to assess early development of sign language with normative criteria. The need for normative criteria concurs with interests in the educational and research settings, interests which were addressed by our research group, composed of professionals from both settings.

The MacArthur-Bates inventories, also called CDIs, are frequently used for the assessment of communicative-linguistic competence in oral speech at early ages. They were developed and published in the USA (Fenson et al., 1993, 1994), but they are currently adapted to more than 50 spoken languages. Such adaptations have allowed us to advance in the knowledge of oral communicative and linguistic development of hearing children between 8 and 30 months of age, and they have provided a considerable volume of normative data.

The inventories consist of checklists to be completed by the child's caregivers, on which the words the child understands or produces are checked. In our country, there is a Spanish adaptation of the inventories (8-15 and 16-30

months) (López-Ornat et al., 2005), as well as adaptations to Galician (Pérez-Pereira & García Soto, 2003), to Basque (García, Arratibel, Barreña, & Ezeizabarrena, 2008), and to Catalan (Serrat et al., 2005)

With regard to sign languages, there is a CDI version for American Sign Language (ASL) (Anderson and Reilly, 2002), and a version for British Sign Language (BSL) (Woolfe, Herman, Roy, & Woll, 2010). In both cases, the age interval tapped by the scales (8-36 months) is higher than that employed to assess development of spoken language (8-30 months). Both scales have provided normative data on deaf children born in deaf signing families, finding parallelism between the acquisition and development of oral language in hearing individuals and sign language in signing deaf individuals.

The CDI for BSL led to diverse studies. Woll (2013) describes differences in the vocabulary development of deaf and hearing children even when both of them are native signers with deaf parents. She finds significant differences between the scores on vocabulary comprehension of three groups of children: hearing monolingual children, hearing native signers, and deaf native signers, finding that the two groups of hearing children understand a greater number of words than the deaf children. With regard to production, she also finds some differences among the three groups of children, and the age interval between 20 and 26 months was significant**.** Also in other studies (Rinaldi, Caselli, Di Renzo, Gulli, & Volterra, 2014), when comparing the development of SL vocabulary of deaf signers and the OL of monolingual hearing children, a lower vocabulary production is found in deaf children. Rinaldi et al. allude to bilingualism in signing deaf children as a possible explanation of these results. Moreover, for Woll, these differences between hearing and deaf children could be explained by the different experiences in the learning of languages, because hearing children have the advantage of being able to see referent while listening to their parents label it, whereas deaf children must learn to switch their attention between the adult and the referent. This alternation in attention requires more time and could explain the slower rhythm of development observed in deaf children.

Currently, we are working on the adaptation to LSE of the CDI. We will present early development of receptive and productive vocabulary data, and we shall reflect on the heterogeneity presented by the sample of signing children.

Method

Participants

The sample recruited till now includes 43 native signers (24 boys and 19 girls) aged between 8 and 36 months. Of them, 12 are deaf and 31 are hearing children.

With regard to the linguistic characteristics, the criterion was that LSE was the family language, that is, that either both parents or one of them uses only LSE to talk to their child.

Of the 12 deaf children, seven are profoundly deaf, the rest present moderate to severe loss of hearing. Of the seven profoundly deaf, four have received a cochlear implant (IC) carried out between 11 and 15 months; of these, two have a bilateral implant. The remaining deaf children wear hearing aids from an early age.

Instrument

Two instruments were employed for data collection: a questionnaire to describe the sample and the CDI adapted to LSE.

The items of the early comprehension vocabulary and sentence list were generated from the inventories adapted to Spanish oral language (López-Ornat et al., 2005) and from those adapted to ASL and BSL (Anderson & Reilly, 2002; Woolfe et al., 2010). In the adaptation to LSE, we decided to use a single inventory and to expand the age range (8-36 months). A team of four native signing deaf people with extensive experience in early childhood education, jointly and exhaustively analyzed this first list and proceeded to make it culturally and linguistically appropriate to the communicative development of Spanish signing children. The result was an inventory of 532 signs, divided into 20 categories, and 21 sentences of early comprehension (Pérez, Valmaseda, De La Fuente, Montero, & Mostaert, 2013).

Subsequently, a pilot study was carried out with a sample of 12 native signing children. Parents were asked to add other signs their child used. Therefore, the initial questionnaire was expanded to include a total of 27 early comprehension sentences and 567 signs divided into 20 categories.

Procedure

After the families had agreed to participate in the study and authorized data collection in the children, a researcher of the team visited them and explained how to use the inventory and send the results of their observations.

Due to the difficulty of finding large samples of native signers aged between 8 and 36 months, we decided to collect various observations of the children's communicative development, a procedure similar to that applied by Anderson and Reilly (2002) in their adaptation of the CDI to ASL and by Woolfe et al. (2010) in their adaptation to BSL. Thus, each child was assessed every four months until the age of 36 months. Table 1 shows the number of recordings in each age interval evaluated, obtaining a total of 92 entries to date.

Table 1. Number of recordings by age interval

Age in months	8-11	12-15	16-19	20-23	24-27	28-31	32-36
Nr. of recordings	11	12	17	8	18	14	12

Preliminary results

What vocabulary development pattern is observed in the sample?

Between 8 and 11 months, the children produced between 0 and 5 signs and understood between 1 and 34 signs. As of this interval, there is a significant advance in the mean of signs understood and produced. As shown in Figure 1, the children understand more signs than they produce at all ages, and the

evolution of comprehensive vocabulary is quite similar to that of expressive vocabulary.

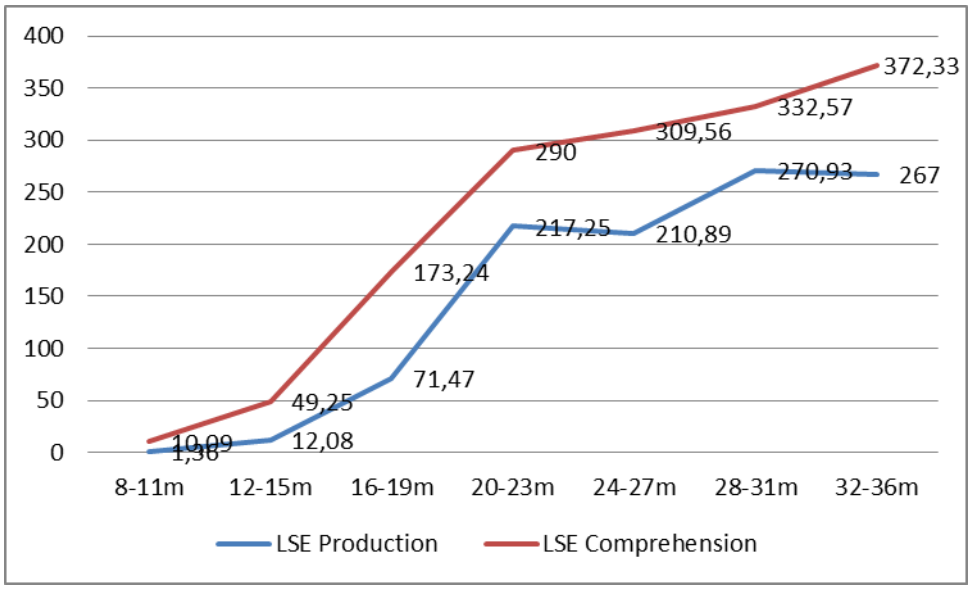

Figure 1. Mean number of signs understood and produced by 48 signers at each age interval.

Due to the fact that in former adaptations of the CDI to other sign languages, no sample of hearing signers was used, we consider some questions related to the possible different results that the two groups could provide**.**

Are there significant differences between the group of hearing children and the group of deaf children?

At this time, we have data from all the age intervals, and in each age interval, we have data both of deaf children and hearing children. Although the small size of the groups must be taken into account when reaching conclusions, in the statistical analyses carried out (using Mann-Whitney's U-test), no significant differences were found between hearing and deaf children at any of the age intervals. Table 2 presents the data of expressive and comprehensive vocabulary of the sample divided into the two groups of participants.

Table 2. Measures of comprehensive and expressive vocabulary in the two groups of signers.

Deaf children		**Total expressive vocabulary**				**Total comprehensive vocabulary**			
Age	N	M	SD	Min.	Max.	M	SD	Min.	Max.
8-11	3	2	2.65	0	5	7.67	7.37	2	16
12-15	3	7.33	9.45	0	18	30	6.56	24	37
16-19	6	78.83	58.77	8	187	169	111.12	17	303
20-23	4	214	102.79	92	336	293.50	146.45	114	416
24-27	5	167	95.32	14	269	226.80	147.22	35	324
28-31	5	209.60	126.53	23	329	255.20	153.43	48	401
32-36	4	258.75	166.01	68	409	318.75	199.72	127	536
Hearing children		**Total expressive vocabulary**				**Total comprehensive vocabulary**			
Age	N	M	SD	Min.	Max.	M	SD	Min.	Max.
8-11	8	1.13	1.64	0	4	11	12.25	1	34
12-15	9	13.67	10.56	3	30	55.67	43.81	16	156
16-19	11	67.45	30.70	12	107	175.55	74.01	73	328

20-23	4	220.50	130.14	69	332	286.50	142.37	110	423
24-27	13	227.77	145.77	4	496	341.38	147.22	102	534
28-31	9	305	170.05	53	526	375.56	164.22	135	566
32-36	8	271.13	165.31	105	527	399.13	117.65	233	565

Are there differences in the expressive vocabulary between deaf children and hearing signing children and hearing children who only use oral language?

As no significant differences in the two groups of signers were found, a relevant question is whether sign production in our sample is similar to the production of words obtained by monolingual hearing children in the normative data of the CDI of the Spanish language (López-Ornat et al., 2005). In Figure 2, the mean number of signs produced by hearing children of hearing parents using the CDI norms for the Spanish language is compared with the mean number of signs produced by the 31 hearing signers, the 12 deaf signers, and the total of 43 signers, deaf and hearing, using the LSE inventory.

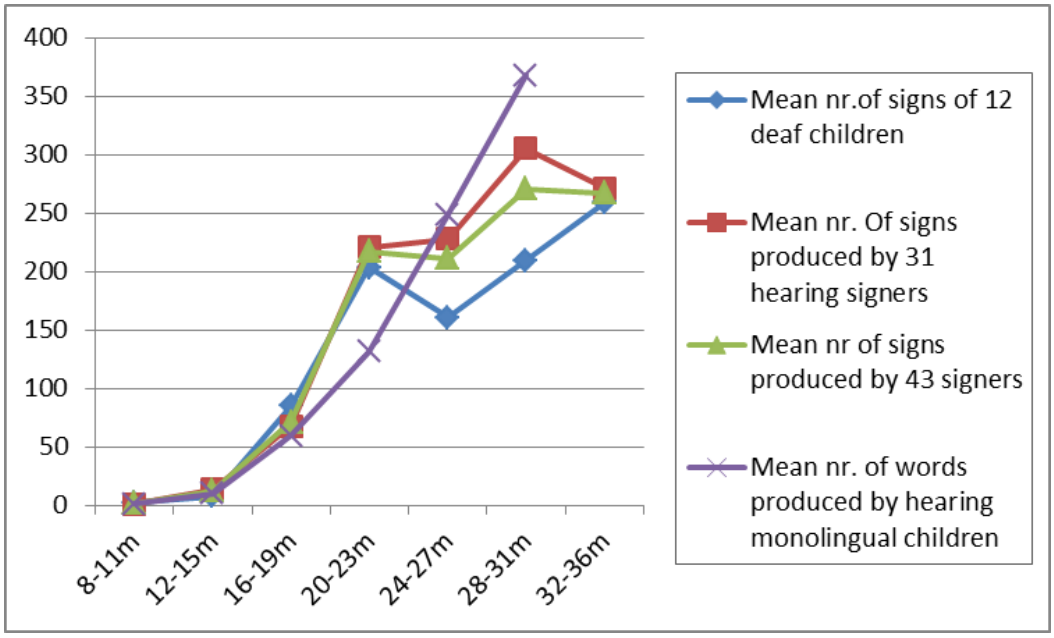

Figure 2. Scores of expressive vocabulary in LSE and in Spanish

A very parallel evolution of all the signers and non-signers is observed up to the 20-23-month interval. As of this period, some differences begin to emerge: one of them is that the number of signs produced by the signers is lower than the number of words produced by hearing monolingual children. On the other hand, we observed that the signer children follow a very similar evolution, but as of 23 months, the deaf children begin to distance themselves from the hearing signers in the number of signs produced.

Conclusions and implications

The growth curve of early vocabulary in LSE seems to show the same pattern as that found by Woolfe et al. (2010) and Anderson and Reilly (2002): comprehensive vocabulary is higher than productive vocabulary. In contrast to the findings of Woll (2013) for the BSL, we found no significant differences in sign comprehension among the deaf children and hearing signers. Nor were any differences found for expression, although a slight decline in the number of signs produced by deaf children was observed.

When comparing the mean number of signs produced by signers in each age group with the words produced in the CDI of the Spanish Language for monolingual hearing children, we observed a decrease in the number of signs produced in the 20-27-month interval for all the signers. A possible explanation is that the sample of participants is mostly made up of bilingual children. As various authors note (López-Ornat et al., 2005; Oller, 2005; Pearson, 1998), the linguistic skills of bilingual children may be distributed unequally over the languages. When they are assessed in each language separately, bilingual children seem to produce fewer words than monolingual children, whereas when a composite score is calculated of the words they produce in one or the other language, the production results are comparable to those of monolingual children (Marchman & Martinez-Sussmann, 2002; Pearson, 1998). This effect is also confirmed when bilingualism occurs between oral speech and sign language in deaf children with an early cochlear implant (Pérez, Valmaseda, & Morgan, 2014). It is obvious to consider hearing signing children as bilingual, but to a certain extent, some deaf children can also be considered bilingual. In our group of deaf children, four of them had received a cochlear implant, and five presented moderate deafness and used hearing aids. This could indicate that more than one half of the deaf children could also be developing in a bilingual situation of oral speech-sign language.

To acknowledge that currently most of the population of deaf children have the possibility of acquiring oral speech with better quality than ever before (Knoors & Marschark 2012) should lead us to realizing that deaf children in signing environments are exposed from an early age to a bimodal bilingualism, and this should have consequences with a view to the professionals who work with deaf children, the families, and the researchers.

Counselors, psychologists, and researchers should avoid evaluating each one of the languages as if the child were only exposed to one language and, therefore, they should analyze and interpret the data taking into account the processes undergone by children exposed to two languages. This would enable to elaborate a more accurate profile that is better adjusted to the child's evolution. Teachers and speech therapists should know and understand the processes undergone by children in the vocabulary evolution of both languages.

This would allow them to adapt their expectations and the linguistic plans. Lastly, the active role of the families in the elaboration of their child's profile by completing the Inventory is a meeting point with the professionals.

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