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Language aquisition and assessment in sign language

Aquisição e avaliação da linguagem na língua de sinais

Adquisición y evaluación del lenguaje en lengua de señas

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Abstract

Deaf signing children commonly begin acquiring Brazilian Sign Language as their first language late. Consequently, many deaf children experience delays in language, both comprehensively and expressively, due to not having the opportunity to interact with children, adolescents, and adults who use Brazilian Sign Language from birth or in the early years of life. Additionally, there are deaf children who, in addition to delays in the language acquisition process due to lack of exposure and interaction in Brazilian Sign Language (linguistic deprivation), show deviations in the acquisition process due to intrinsic factors. The main objective of this article is to briefly present how the language acquisition process begins for deaf signing children and some tests for language assessment in Brazilian Sign Language. Moreover, it aims to promote reflections on the importance of professionals working with deaf babies and deaf children, such as speech-language pathologists/therapists and health professionals in general, to observe and/or follow the language acquisition process in this population. Considering that it is possible to prevent and treat delays and/or deviations in the language acquisition process of deaf babies and signing deaf children, it is hoped that more professionals will prevent language delays, carry out intervention in Brazilian Sign Language, and/or guide parents/caregivers on the importance of Brazilian Sign Language, so that the deaf child can achieve the best linguistic development according to their potential.

Keywords: Language acquisition; Assessment; Child; Deafness; Sign language.

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Resumo

As crianças surdas sinalizantes, comumente, iniciam a aquisição da Língua Brasileira de Sinais, como primeira língua, tardiamente. Consequentemente, muitas crianças surdas apresentam um atraso na área da linguagem, em níveis compreensivo e expressivo, por não terem a oportunidade de interagir com crianças, adolescentes e adultos usuários de Língua Brasileira de Sinais desde o nascimento ou nos primeiros anos de vida. Além disso, há crianças surdas que além do atraso no processo de aquisição da linguagem, pela falta de exposição e interação em Língua Brasileira de Sinais (privação linguística), apresentam desvios no processo de aquisição em decorrência de fatores intrínsecos. O objetivo principal deste artigo é apresentar, brevemente, como ocorre o início do processo de aquisição da linguagem por crianças surdas sinalizantes e alguns testes para avaliação da linguagem na Língua Brasileira de Sinais. Além disso, visa promover reflexões sobre a importância de profissionais que atuam com bebês surdos e crianças surdas, como fonoaudiólogas(os) e profissionais da saúde em geral, observarem e/ou acompanharem o processo de aquisição da linguagem nesta população. Considerando que é possível prevenir e tratar o atraso e/ou desvios no processo de aquisição da linguagem de bebês surdos e de crianças surdas sinalizantes, espera-se que mais profissionais previnam o atraso em linguagem, realizem intervenção em Língua Brasileira de Sinais e/ou orientem os pais/cuidadores quanto à importância da Língua Brasileira de Sinais para que a criança surda alcance o melhor desenvolvimento linguístico conforme suas potencialidades.

Palavras-chave: Aquisição da linguagem; Avaliação; Criança; Surdez; Língua de sinais.

Resumen

Los niños sordos que señalan comúnmente comienzan a adquirir la Lengua de Señas Brasileña como primer idioma tardíamente. Como consecuencia, muchos niños sordos presentan un retraso en el área del lenguaje, en niveles comprensivo y expresivo, por no tener la oportunidad de interactuar con niños, adolescentes y adultos usuarios de Lengua de Señas Brasileña desde el nacimiento o en los primeros años de vida. Además, hay niños sordos que, además del retraso en el proceso de adquisición del lenguaje por la falta de exposición e interacción en Lengua de Señas Brasileña (privación lingüística), presentan desviaciones en el proceso de adquisición debido a factores intrínsecos. El objetivo principal de este artículo es presentar, brevemente, cómo ocurre el inicio del proceso de adquisición del lenguaje por niños sordos que señalan y algunas pruebas para la evaluación del lenguaje en Lengua de Señas Brasileña. Además, busca promover reflexiones sobre la importancia de que los profesionales que trabajan con bebés sordos y niños sordos, como logopedas y profesionales de la salud en general, observen y/o acompañen el proceso de adquisición del lenguaje en esta población. Considerando que es posible prevenir y tratar el retraso y/o desviaciones en el proceso de adquisición del lenguaje de bebés sordos y de niños sordos que señalan, se espera que más profesionales prevengan el retraso en el lenguaje, realicen intervención en Libras y/o orienten a los padres/cuidadores sobre la importancia de Lengua de Señas Brasileña para que el niño sordo alcance el mejor desarrollo lingüístico según sus potencialidades.

Palabras clave: Adquisición del lenguaje; Evaluación; Niños; Sordera; Lengua de señas.

Introduction

The language acquisition of babies and deaf children who acquire a sign language from birth, such as Brazilian Sign Language (Libras), is very similar when compared to that of monolingual hearing babies and children who acquire a spoken language, like Brazilian Portuguese (PB). Language acquisition is independent of the modality of the language (visual-spatial or oral-auditory), and the process of language acquisition in children learning a sign language and/or an oral language – whether in a typical (expected or normal) atypical (delayed or deviant) – deserves equal attention.

Currently, most deaf children do not begin their language acquisition process through a fully accessible visual language like Libras. Among the factors contributing to this issue are: the lack of awareness among hearing parents and healthcare professionals regarding Libras and the importance of early acquisition of Libras by deaf babies and their families; the recommendation of auditory devices (individual sound amplification devices and cochlear implants) and the exclusive focus on oral language acquisition (auditory) for deaf babies and children, despite scientific evidence that acquiring a sign language benefits a child's overall development, including learning an oral language; and the lack of locations and proficient professionals in Libras who can provide services to deaf babies and/or children and their families in a way that facilitates the acquisition of Libras, even if the child uses or is recommended to use auditory devices. Consequently, most deaf children commonly experience delays in language acquisition due to insufficient exposure and interaction in a fully accessible language, such as a sign language. The delay in language acquisition (both comprehension and production) in these children does not stem from impairments in the language area, but rather from linguistic deprivation in a language that enables access to linguistic information processing, thereby impacting expected language acquisition.

However, there are deaf children who experience delays in the language acquisition process due to a lack of exposure and interaction in a sign language, while concurrently facing language-related difficulties stemming from intrinsic factors such as neurological disorders, intellectual disabilities, autism, cerebral palsy, etc. In these cases, deviations in language development can be exacerbated by the lack of exposure and interaction in sign language, resulting from a context that does not support the full linguistic potential of the child.

Considering that delays in language acquisition among deaf babies and children due to insufficient exposure and interaction in an accessible language modality can be prevented, and that babies and children with delays and/or deviations in the language acquisition process can and should receive appropriate support as early as possible, it is essential to develop and implement tools (protocols and/or tests) to assess language at comprehensive and/or expressive levels across various linguistic domains (phonetic-phonological, morphological, semantic, syntactic, and pragmatic).

The development and application of assessment tools (protocols and/or tests) for deaf signing babies and children are still relatively recent compared to the use of protocols and tests in spoken languages. These tools facilitate a deeper understanding of the acquisition and processing of language in visually spatial modalities, as well as the expected and unexpected linguistic behavior for the respective age group. Furthermore, they enable professionals working with deaf babies and children, such as speech-language pathologists/therapists, to provide preventive or therapeutic interventions tailored to each child's needs.

An effective intervention (preventive or therapeutic treatment) depends on an assessment process that verifies the linguistic knowledge acquired by the baby or child and determines whether intervention is necessary. It is important to emphasize that delays and/or deviations in language, when not identified and addressed, can hinder overall development, as language provides support for cognitive, social, and emotional growth.

The primary objective of this article is to briefly present the process of language acquisition in signing Deaf children and to discuss some tests in Libras that can be applied in educational and clinical contexts, as well as in research on Libras acquisition by signing Deaf children and bimodal bilingual children (both hearing and Deaf).

Although the tests presented here are a sample of the available linguistic assessment tools in Libras, it is hoped that this article will encourage reflections on the importance of the Libras acquisition process for Deaf babies and signing Deaf children in Brazil. Furthermore, it aims to contribute to ensuring that more professionals provide Deaf

children with opportunities to develop their full linguistic potential as early as possible through Libras.

Libras is a natural language that is fully accessible to Deaf children, facilitating the language acquisition process (both comprehension and production) and contributing to new learning, which includes the acquisition of one or more sign languages (signed and/or written) or oral languages (spoken and/or written). Therefore, it is essential for Libras to be integrated into the lives of Deaf children and the professionals who work with them.

Acquisition of Sign Language from Birth by Deaf and Hearing Children

The process of language acquisition for deaf and hearing babies, who are children of signing Deaf parents/caregivers, begins at birth, as parents/caregivers interact with the baby using sign language that allows full and complete access to information. Thus, the acquisition of the sign language used by the Deaf community to which the parents/caregivers and the baby belong occurs naturally in daily life.

In Brazil, Libras is commonly acquired by deaf babies born to Deaf parents. However, Brazil is a multilingual country, and there are babies and children who acquire other Brazilian sign languages used in villages or isolated communities.

Deaf babies with signing Deaf parents often become bilingual, acquiring sign language as well as the written language of their environment, or both sign language and spoken language. Given that access to and processing of spoken sounds, with or without hearing devices, varies considerably within this population, the spoken language is typically learned with the help of hearing devices and speech and language therapy support.

Deaf babies who are children of signing Deaf parents typically acquire spoken language simultaneously with sign language. These children, known as KODAs or CODAs (Kids/Children of Deaf Adults), are considered bilingual and bicultural because they share their Deaf parents' culture and sign language while also inevitably being part of the hearing community, acquiring the spoken (oral and written) language of their environment.

Early studies on the acquisition of sign language among Deaf children with signing Deaf parents, in contexts that facilitate interaction in sign language, have shown that this process occurs similarly to that observed in hearing children with hearing, oral-speaking parents. Comparing the language acquisition processes of Deaf children with access to sign language and hearing children with access to oral language revealed that language acquisition is independent of the language modality: visual-spatial (sign language) or oral-auditory (spoken language). Studies have found that Deaf and hearing children go through very similar stages of linguistic development within the same timeframe and age range, and that language acquisition can proceed in a typical (normal) manner across both language modalities.[3,1].

Exposure to and interaction in sign language, or "immersion" in sign language, for Deaf babies (children of Deaf and/or hearing parents/caregivers) and for CODA babies (hearing children of Deaf parents/caregivers) is essential, as it fosters the development of their true linguistic potential. The importance of this "immersion" is similar for hearing children born into homes where oral language is used by their parents/caregivers. However, exposure to and interaction in a fully accessible language modality may not be sufficient for either Deaf or hearing babies and children to undergo typical language acquisition, meaning linguistic behavior that aligns with their chronological age.

There are intrinsic factors that contribute to the language acquisition process. Just as with hearing children, signing Deaf children may experience expected or unexpected language acquisition (delays and/or deviations). If there are suspicions of delays and/or deviations in these children's language acquisition process, it is vital to investigate the possible causes, conduct a language assessment, and monitor their language development.

Health professionals commonly ask parents/caregivers about language development and observe and/or assess the language of hearing children during routine check-ups. Likewise, it is important to adopt these procedures for Deaf or hearing parents/caregivers of signing babies and children (whether Deaf or hearing) and, when necessary, to conduct a comprehensive language assessment.

The process of evaluating language at comprehensive and/or expressive levels through observations and/or instruments (protocols and tests) in a sign language, such as Libras, will enable professionals to provide guidance to parents/caregivers and/or to offer treatment (preventive or

therapeutic) according to the linguistic needs of each baby or child.

Late Acquisition of Sign Language as a First Language (L1) by Deaf Children

Most Deaf babies and children often do not initiate the language acquisition process through a sign language from birth or even in the early years of life. It is estimated that only 5% to 10% of Deaf babies are born into homes where their parents/caregivers are signing Deaf individuals, ensuring exposure to and interaction in sign language.[4].

In the sociolinguistic study conducted by Quadros and collaborators[5], with signing Deaf individuals, it was found that only 20% of participants began acquiring sign language before the age of 4. Over 40% of participants reported that they acquired sign language in school between the ages of 7 and 12, while the remaining participants had contact with sign language after the age of 12. The data collected by the authors reveal that most of these Deaf individuals experienced late acquisition of sign language.

It is still common for many Deaf babies and children to lack exposure to oral and/or sign language input for some period of their lives (months or years) because they are born into homes where sign language has not been acquired by their hearing parents, they do not have a diagnosis of hearing loss, and/or they have not received auditory devices.

However, even when Deaf babies and/or children receive auditory devices, there are often limitations in access to sounds in terms of both quantity and quality, as well as some impairments in adequate processing and accurate discrimination of sounds. Thus, the use of auditory devices may not ensure that sounds are received in quantities and qualities similar to those of individuals with normal hearing thresholds. Consequently, exposure only to an oral language reduces the opportunities for them to develop their true linguistic potential.

The lack of input in a language (oral and/or sign) through natural interactions in a visual language (fully accessible) that allows the baby to access and process information will at the very least lead to delays in language development. Therefore, linguistic input in a language modality that provides complete access and processing of conveyed information is crucial for promoting the acquisition process at both comprehensive and expressive levels.

The late onset of sign language acquisition as a first language (L1) by Deaf individuals occurs at different periods in life (from childhood to adulthood) and in various contexts, such as: at home, in clinical settings (with speech-language pathologists who work under a signed and/or bimodal bilingual approach), in schools with Deaf and/or hearing professionals, at Deaf clubs, in churches, and other spaces with Deaf individuals[5,6]. Access to sign language can vary considerably, occurring on just one or several days of the week, for a few or many hours, with Deaf individuals and/or hearing individuals (who may be highly proficient or not so proficient in sign language), with interpreters, and with parents/caregivers who are learners of sign language[6].

Studies on the onset (age) of sign language acquisition by Deaf individuals include participants with significant age differences and investigate the effects related to the timing of acquisition in the early years of life, whether late or very late, as well as the duration of linguistic exposure according to the age at which acquisition begins. Generally, these studies reveal that children exposed to sign language in their early years have linguistic advantages over those who are exposed late or very late, even after a long period of linguistic exposure.[6,7,8,9]. These cases result from the late onset of the first language, rather than from specific impairments in the language domain, and the challenges in comprehension and/or expression may become permanent, especially if there is no appropriate intervention as early as possible.

In 2019, the Joint Committee on Infant Hearing (JCHI) presented the "Principles and Guidelines for Early Detection and Intervention Programs'[10] emphasizing the utmost importance of ensuring the development of comprehensive and expressive language in babies and children. Whether the language is spoken, signed, or both (bilingual acquisition) is less important than guaranteeing access to the language and the resulting linguistic competence. In addition to linguistic access, the JCHI highlights the importance of early intervention, providing families with complete information about various approaches to communicative and linguistic development, and the necessity of language acquisition as early as possible, immediately following the

detection of hearing loss. Moreover, the Brazilian Academy of Audiology (ABA) encourages speech-language pathologists and physicians involved in Universal Newborn Hearing Screening, Pediatric Audiological Diagnosis, and Speech-Language Intervention to read the 'Principles and Guidelines for Early Detection and Intervention Programs'[11].

In Brazil, Law 12.303/2010[12] it mandates the free execution of the test known as Evoked Oto-acoustic Emissions, commonly referred to as the "Ear Test", in all hospitals and maternity wards for children born in their facilities. Furthermore, Decree No. 5,626, dated December 22, 2005, in Chapter VII, provides for the 'Guarantee of the right to health for Deaf individuals or those with hearing disabilities'[13].

Despite the legal advances that encompass early diagnosis and intervention, as well as the right of families to be informed about Libras, many Deaf babies and children who could have expected acquisition in Libras and/or bimodal bilingual acquisition (the acquisition of a sign language and a spoken language) receive only recommendations from healthcare professionals to use hearing devices and to exclusively learn the spoken language (Brazilian Portuguese). Deaf babies or children may experience delays in the language acquisition process due to a lack of interaction in a fully accessible language, such as Libras, especially if they do not have complete and adequate access to sounds and appropriate speech-language therapy support.

Therefore, Deaf babies and children who have not had the opportunity to acquire sign language from birth and who begin to acquire language through sign language in the early years of life or later on must be assessed in the area of language using protocols and tests in a sign language, such as Libras, and when necessary, receive appropriate intervention through Libras.

Delays in the language acquisition process for Deaf children can and should be avoided, provided that healthcare professionals, after evaluating Deaf babies and children, recommend as early as possible the acquisition of Libras through entry into a language stimulation program for babies, their parents/caregivers, and family members, in bilingual schools for the Deaf, and/or through support from bilingual speech-language pathologists, or in other settings that facilitate interaction in Libras according to the available support options in their community.

Deviant Acquisition of Sign Language by Deaf Children

In the previous sections, we presented the language acquisition process for Deaf children through sign language, discussing both expected (normal) and unexpected (deviant) paths resulting from a lack of exposure to and interaction in a sign language. In this section, we will focus on the process of deviant language acquisition among Deaf children, emphasizing that alterations in the language domain can occur even when there is exposure to and interaction in a fully accessible language modality from birth. Therefore, Deaf children born to hearing parents or signing Deaf parents may experience language difficulties.

Language alterations or deviations arise from various etiologies, such as pre- and post-natal trauma, genetic syndromes, metabolic disorders, diseases, and environmental deprivation. Additionally, there is a group of children who exhibit language deviations without the aforementioned etiologies, which are referred to in the literature as children with Specific Language Impairment (SLI)[14] or, according to terminology currently used by various researchers, Language Development Disorder (LDD)[15].

Research conducted on signing Deaf children with Specific Language Impairment (SLI)[16] and autism[17] is very important as it contributes to a greater understanding of the nature of language and enables the development of language assessment tools and techniques for the specialized support of Deaf babies and children who exhibit language deviations at different linguistic levels and degrees.

Thus, deviant language acquisition can occur in Deaf babies and children born to signing parents and/or caregivers, even when they are "immersed" in sign language from birth. This is because language deviations may be associated with various etiologies, such as autism, intellectual disabilities, cerebral palsy, neurological disorders, and/or specific language impairments (SLI/LDD).

Deaf babies and children who begin acquiring language through sign language, such as Libras, in childhood or very late may also experience language alterations due to the same etiologies mentioned earlier. In these cases, changes in language resulting from a specific cause associated with linguistic delays can exacerbate language

disorders if early assessment and intervention are not provided.

Deaf children with deviant acquisition in sign language who begin acquiring the language from birth, during childhood, or very late need to be evaluated by professionals from different specialties. This ensures they receive an accurate diagnosis and are monitored by one or more professionals according to their development in various areas, receiving appropriate treatment, including in language.

Language Assessment in Libras

The assessment of language in sign languages and spoken languages can be informal, conducted through direct observation, and/or formal, using standardized tests and protocols[6].

In informal assessments, observing the interaction of Deaf babies or children with different interlocutors and contexts can provide valuable insights into their communicative behavior and acquisition process. This approach allows for the collection of information regarding the child's comprehension and expression while using language that closely resembles everyday usage. However, during observation, not all aspects that need to be assessed may be evident. Therefore, a formal assessment using standardized protocols or tests is necessary.

In formal assessments, it is possible to identify the level of language development (comprehension and expression) based on the period of linguistic exposure and/or age range, as well as to analyze specific language aspects such as phonology, morphology, vocabulary, syntax, and/or language use in different situations and contexts. Most assessment instruments (tests and protocols) provide developmental data according to age range, facilitating comparisons between the child's responses and the expected linguistic behavior for their chronological age, thereby allowing for the identification of deviations in the acquisition process.

Both forms of assessment (formal and informal) are essential as they complement each other and can either confirm or challenge the data collected in each type of evaluation.

The assessment of language skills by healthcare professionals, often speech-language pathologists proficient in Libras, allows for the identification of delays and deviations, monitoring the language acquisition process, and providing insights for appropriate intervention for these Deaf children if language alterations are present.

Secora and colleagues[18] conducted a study with 30 specialists regarding the qualifications and skills that speech-language pathologists need to work effectively with signing Deaf children. The participants, more than half of whom were Deaf, were professionals in the fields of Speech-Language Pathology, Deaf Education, and other related areas. They were asked to evaluate their agreement with statements provided in a survey. The results showed that, in addition to proficiency in American Sign Language (ASL) at least at an intermediate level, it is crucial for professionals to have knowledge of Deaf culture, audism, bilingual service provision, and interprofessional collaboration with interpreters, as well as active participation in the Deaf community, while maintaining the same standard of care offered to hearing children.

It is important to note that language assessment through sign language is not limited to Deaf babies and children; it may also be necessary for other populations, such as signing Deaf adults and hearing children who exhibit characteristic development and acquire sign language under special conditions.

Signing Deaf adults, like hearing individuals who use a spoken language, may experience language alterations due to circumstances such as traumatic brain injury, stroke, or certain neurodegenerative diseases. Therefore, when there are changes in language (comprehension and/or expression), language assessment is essential to ensure they receive appropriate therapeutic intervention tailored to their linguistic needs. Additionally, there are hearing children with autism or developmental disorders who acquire a sign language. Studies involving children with Down syndrome, Cri du Chat syndrome (cat's cry syndrome)[19], cerebral palsy, and Landau-Kleffner syndrome[20] suggest that teaching sign language to these children can enhance oral communication, prevent communication difficulties, and alleviate frustration.

Regarding research that utilizes tests and protocols in sign language to assess language in Deaf and signing hearing children (whether monolingual, bilingual, bimodal bilingual, or multilingual), this contributes significantly to scientific advancement in clinical practice. Such research increases our understanding of typical (normal), delayed (disordered), or deviant language acquisi-

tion in populations that acquire their L1 at different stages of life and under various conditions. The findings from these studies support the creation of linguistic policies that ensure Deaf children to have the opportunity to acquire a fully accessible L1, while also providing valuable resources for professionals working with this population in the area of language.

Instruments (Tests and Protocols) for Evaluating Language in Libras

The development of tests for assessing language in sign languages has advanced across various sign languages, including Libras. To illustrate this progress, we present five assessment instruments in Libras: three tests for evaluating the language of children, adolescents, and/or signing adults, and two tests from the "Bimodal Bilingual Development Project," for which the team developed and adapted tests and protocols in Libras to conduct investigations on the language of bimodal bilingual children (hearing and Deaf children who use cochlear implants).

The first three tests are typically administered by bimodal bilingual professionals working with the child, such as speech-language pathologists and educators, in clinical or educational contexts. The primary goal is generally to evaluate language (both comprehension and expression) broadly or across different levels, with the aim of identifying the need for stimulation from educators and/or therapeutic support from speech-language pathologists.

The next two tests were utilized in the research of the "Bimodal Bilingual Development Project." The main objective here was to investigate the language acquisition process of children learning both a sign language and a spoken language, contributing to an increased understanding of bimodal bilingual acquisition. However, these tests, along with others developed by the project team, can also provide valuable support for stimulation and interventions in the area of language. The five tests will be presented below.

The "Assessment of Sign Language in Deaf Children at School" is a test proposed by French[21], adapted by Quadros[22], in which a professional proficient in Libras, working with Deaf babies or signing children, answers key questions about language development at both the comprehension and expression levels. To address these questions, observations of the baby or child are conducted during interactions with familiar individuals and/or the professional. The test consists of key questions distributed across 8 levels, ranging from zero (up to one year) to 7 (ages 11 to 13), with response options of "yes" or "no." Each level corresponds to a specific age range, reflecting the expected performance in relation to comprehension and expression.

This test can be administered to babies and children who begin acquiring Libras from birth or at different stages in life, allowing for the identification of their potential language development level (expected/typical or delayed) and/or serving as a means of monitoring language development. The complete text regarding this protocol and the protocol itself can be accessed online[22].

The "Sign Language Assessment Instrument (IALS)," developed by Quadros and Cruz[6], evaluates language at both the comprehension and expression levels through Libras in signing children aged 4 and older.

Comprehension assessment is conducted in two stages: demonstration tasks and evaluation tasks. Both types of tasks are divided into three phases with varying levels of complexity: Phase I consists of simple sentences (one subject), Phase II includes longer and more syntactically complex sentences than Phase I (two or more subjects), and Phase III involves a narrative with extensive and complex sentences. The execution of demonstration tasks prior to evaluation tasks ensures that instructions are understood, allowing for the observation of the child's performance in each phase of the test. Before starting each evaluation task, the child receives instructions from a professional proficient in Libras who is not the one providing direct support to the child.

In the first two phases, the child views a signed message on a computer and, after viewing each message, is presented with three images. The child is asked to select the image that represents the message they just watched. In the third phase, the child watches a signed story, and after viewing the story, is given eight cards. The child is then asked to select the corresponding images from the story (five images) and arrange them in sequence according to the narrative they viewed.

For the expressive language assessment, the child receives instructions and watches a clip from a cartoon (Tom & Jerry) lasting 1 minute and 10 seconds, shown twice. The child then narrates the

story to an adult proficient in Libras (who is not the professional working with the child) and who has not seen the cartoon. The signed narrative is recorded via video for subsequent transcription and analysis. In this test, the production is evaluated based on phonology, morphology, syntax, vocabulary, use of classifiers (signs used to specify the movement and position of objects or to describe their size or shape), as well as the sequence and quantity of events.

In the IALS, the child's performance can be compared to the expected performance according to age ranges presented in tables developed by the authors. Nine-year-old children with expected development achieve a 100% success rate on the comprehension assessment test and demonstrate clear production without deviations in the evaluated linguistic levels and aspects. Given that many Deaf children begin acquiring Libras late and exhibit delays and/or deviations in language, the IALS can also be administered to signing Deaf or hearing children aged over 9 years. In these cases, the relationship between the period of exposure to Libras and performance on the tasks can be considered when assessing the level of comprehension.

The work "Sign Language and Cognition - LiSCo: Studies in Speech-Language Assessment Based on Brazilian Sign Language," organized by Barbosa and Neves[23], presents evaluation instruments for language and cognition in Libras, along with research conducted using each of the instruments. We have selected the "Screening of Linguistic Skills in Brazilian Sign Language" to be presented in this section.

The "Screening of Linguistic Skills in Brazilian Sign Language" was developed by Barbosa[24] for application by clinical or educational professionals working with Deaf individuals who have language complaints. This screening provides information about linguistic levels, aiming to promote appropriate intervention in the area of language. The instrument consists of four parts, each corresponding to a specific linguistic level: Pragmatic, Discourse, Syntactic, and Phonetic-Phonological, with analysis focused on Libras and its structure.

In the Pragmatic Level, interaction is the main aspect evaluated through observation of linguistic performance in a semi-structured situation. The examiner assesses the interaction as a whole and answers 7 questions about open communicative interactions, such as: "Does the subject exhibit communicative intent?" Responses are recorded in a table, with one point assigned when the skill is executed adequately and zero when it is not.

In the Discourse Level, the examiner asks the participant to tell a story based on a presented image. Seven characteristics of the signed narrative are observed, including: the reporting of characters and events present in the image, clarity in signing, complete syntactic structure, use of descriptive verbs, spatial syntactic organization, and correct time markers in Libras. Responses are recorded in a table, with one point awarded for adequate execution of the skill and zero for inadequate execution.

In the Syntactic Level, comprehension of Libras is evaluated through 7 sentences produced using the spatial syntax of Libras. The materials used are three objects: a pencil, paper, and a cup. Before the assessment, the examiner asks for the sign of each object and requests the participant to pick them up. One of the sentences produced by the examiner is: "Place the paper between the cup and the pencil." Responses are documented in a table, with one point given when the command is executed correctly and zero when it is not.

In the Phonetic-Phonological Level, the production of 20 signs in Libras is assessed across 4 categories: (1) unmarked handshape + simple movement, (2) marked handshape + simple movement, (3) unmarked handshape + internal hand movement, and (4) marked handshape + internal hand movement. The participant is asked to produce the sign corresponding to each of the 20 images. Production is evaluated based on the following sublexical units or parameters that form the signs: handshape, movement, location, hand orientation, non-manual expressions, and the number of hands used. This is not a vocabulary assessment; therefore, if the participant is unfamiliar with the sign corresponding to the image, the examiner may name the image and ask the participant to repeat the sign. Responses are recorded in a table, with one point assigned when the sign is executed correctly (adult standard) and zero for inadequate execution.

After summing the scores from the four assessed levels (subtotals 1-4), we check the reference table to determine whether the score achieved in each level meets the expected criteria or not. This means evaluating whether the child (up to 15 years old) or the adult (over 15 years old) "passes" or "fails." In the overall result of the screening, a "pass" is assigned when all analysis levels are

within the expected range, while a "fail" is given when one or more analysis levels fall short of expectations.

The "Bimodal Bilingual Development" project investigated bimodal bilingual acquisition in signing children from the United States and Brazil, aged 1 to 8 years, who acquire both a sign language and a spoken language simultaneously, namely ASL-English or Libras-PB. The participants included CODA children (hearing children of Deaf parents) and Deaf children who use cochlear implants (children of Deaf and hearing parents). The investigations were conducted through longitudinal and experimental studies, with children aged 1 to 3 years and 4 months participating in the longitudinal study, while children aged 4 to 8 years took part in the experimental study. In the following sections, we will briefly address the experimental study, as it involves the application of tests in Libras.

The experimental study utilized tests and protocols in ASL, Libras, English, and Portuguese, alongside an Intelligence Quotient (IQ) test. For each linguistic aspect assessed, validated tests in each language were selected and subsequently compared to ensure that the format and quantity of items were similar for future data cross-referencing. Tests with identical or very similar formats formed a subset of tests in the two language pairs: Libras-PB and ASL-English. However, when identical or similar tests were not found in both language pairs, the project team translated, adapted, and/or developed tests to evaluate linguistic aspects. The assessment battery for Libras and PB consisted of tests and protocols that assessed language at both the comprehension and expression levels concerning phonology, syntax, morphology, phonological memory, vocabulary, and phonemic discrimination. Additionally, productions in Libras were collected during interactions between parents/caregivers and children, as well as in narratives[25]. We will now present the Phonemic Discrimination Test[25,26] and the Phonological Assessment[25], which evaluate phonemic discrimination (perception) and Libras phonology (production), respectively.

The Phonemic Discrimination Test for Libras (TFDF-Libras) was developed by the team behind the "Bimodal Bilingual Development" project, recognizing that the ability to discriminate phonemes in the sublexical units of a sign language or spoken language is crucial for typical language acquisition. The TFDF-Libras follows the structure of the Phonemic Discrimination Figure Test (TFDF) proposed by Carvalho[27], which evaluates the phonemic discrimination abilities of Libras sublexical units (handshape, place of articulation/location, movement, and palm orientation). The test consists of 28 presentations, with the first being a demonstration item, followed by 20 minimal pairs and 7 pairs of identical signs. Some items differ only in terms of handshape, movement, point of articulation/location, or palm orientation.

To take the test, the child watches instructions signed by a native Deaf signer (Nelson Pimenta) on a computer, followed by the demonstration and evaluation items. On the computer screen, the child first views the production of two signs (either identical or different) and then sees a column with images representing the pair of signs produced.

In Libras, the signs for CAVALO (horse) and COELHO (rabbit) form a minimal pair that differs only by the orientation of the palm, as illustrated in the following figure (with the signs for CAVALO and COELHO written in the SignWriting system) and/or in the videos from the 'Libras SignBank' (freely accessible software) available at the following links:

https://videos.nals.cce.ufsc.br/SignBank/V%C3%ADdeos/CAVALO.mp4#t=0.001

https://videos.nals.cce.ufsc.br/SignBank/V%C3%ADdeos/COELHO.mp4#t=0.001

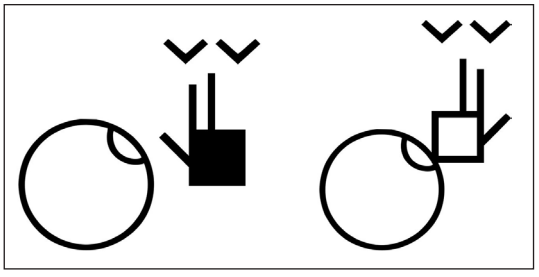

Figure 1. Signs CAVALO (horse) and COELHO (rabbit) in Libras, written in the SignWriting system.

The display shown on the computer includes columns for the child to select based on the two signed signs, as follows:

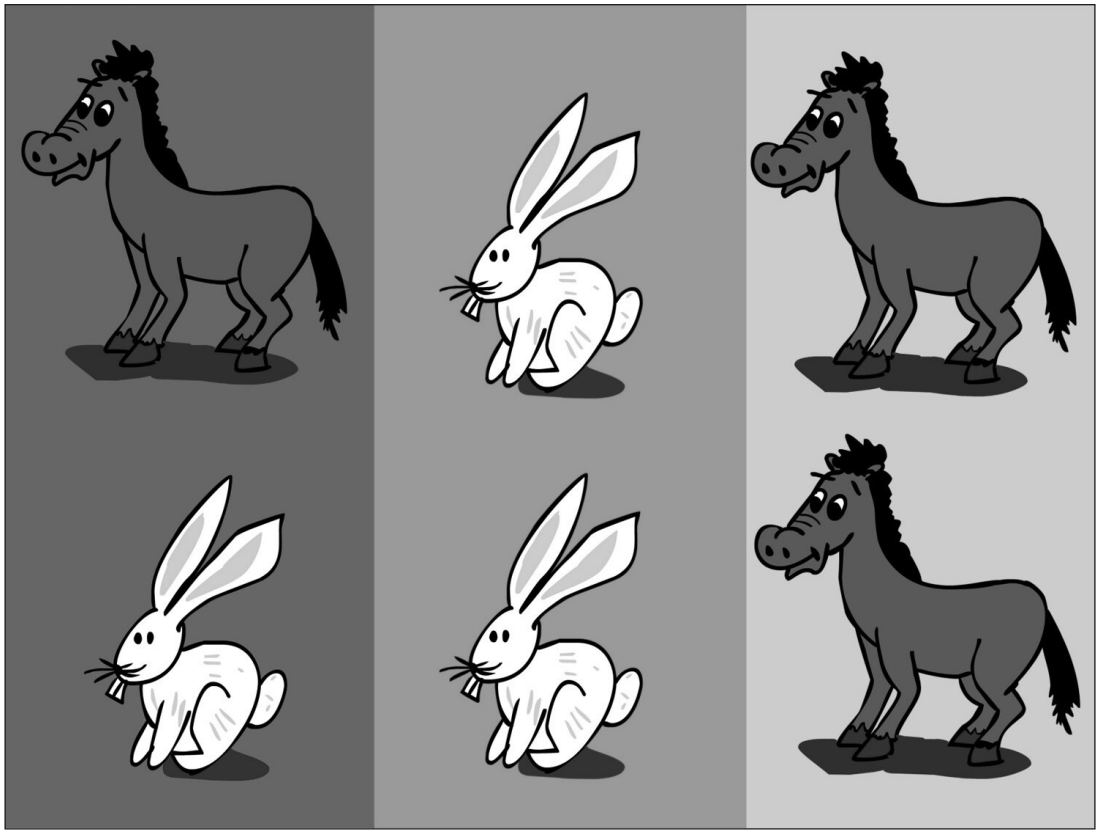

Figure 2. TFDF-Libras

For the Phonological Assessment in Libras within the "Bimodal Bilingual Development" project, items from Cruz's study[28] were utilized – Part 1. This evaluation observes the production of the sublexical items that form each of the assessed signs, including handshape, location, movement, palm orientation, and facial expression, all of which are compared to adult standards. The child produces the signs through spontaneous naming after viewing each of the 48 colored images, which represent: food, toys, means of transportation, colors, numbers, animals, clothing, and household appliances. The 48 signs depicted in the images have different formations, namely: one hand with one handshape (1H1HS), two hands with one handshape (2H1HS), two hands with two handshapes (2H2HS), and one hand with two handshapes (1H2HS).

In this Phonological Assessment proposal, the application followed the same guidelines as the Child Language Test in the areas of phonology, vocabulary, fluency, and pragmatics (ABFW)[29] in the field of Phonology. To conduct the assessment, the examiner asks the child to name (produce the sign for) each of the 48 images. If the child is unfamiliar with the sign corresponding to an image or produces an unexpected sign (different from the intended concept), the examiner shows the sign to the child. After presenting five new images, the examiner again requests the naming of the previously unnamed image, or the one named with an unexpected sign. In this assessment, the production of the sublexical items that form the signs is compared to the adult standard, observing each sublexical item (handshape, point of articulation/location, movement, palm orientation, and facial expression) to determine if there are any difficulties in producing signs with specific formations, considering the age range. The responses are recorded on video for later documentation and analysis.

The tests used in this project facilitated the development of various studies on bimodal bilingual acquisition by hearing children of Deaf parents and by cochlear implant users who are children of Deaf and hearing parents. The investigations conducted

with tests assessing phonology[30] and phonemic discrimination[26] revealed that bimodal bilingualism does not hinder the acquisition of Brazilian Portuguese (PB) or Libras for either hearing children or Deaf children who use cochlear implants. In fact, the early acquisition of a sign language by Deaf children who use cochlear implants may have been one of the factors that benefited the acquisition of both Portuguese and English among the participating children.

Conclusions

Communicative interaction through a fully accessible language from birth is essential for fostering the development of a baby's true potential for language acquisition, regardless of their hearing thresholds, as it contributes to their overall development (linguistic, cognitive, emotional, and social).

This article addressed the process of language acquisition through a sign language and presented tests in Libras that can be applied to identify the level of linguistic development, diagnose language deviations, monitor the language acquisition process, and conduct investigations into acquisition (whether typical or deviant) by signing children.

Delays and/or deviations in language may be associated with various factors, with a common issue in the Deaf population being a lack of exposure to and interaction in a sign language (linguistic deprivation). Considering that many Deaf children today often experience delays due to insufficient exposure and interaction with sign language from birth or in their early years, the importance of providing Deaf babies, Deaf children, and their families with access to Libras is emphasized. When necessary, language assessment through Libras should also be conducted.

Assessing language through Libras allows for the identification of delays or deviations, accurate diagnosis, and timely intervention when needed. Moreover, language assessment in sign language remains crucial during the intervention period (whether preventive or therapeutic), as evaluations are necessary for monitoring the child's developmental progress.

The development of tests in sign languages for research purposes, such as those created in the "Bimodal Bilingual Development" project, contributes to an increased understanding of the language acquisition process, specifically for bimodal bilingual children.

Although the tests from this project were designed for research purposes, the findings contribute to professionals working with Deaf babies and children in clinical or educational contexts.

The observation that acquiring languages of different modalities from birth or during the early years does not hinder the language acquisition process for children (hearing children of signing Deaf parents, Deaf children using cochlear implants who are children of signing and hearing parents learning Libras) but may actually benefit the acquisition of a new language represents a significant advancement in addressing the "common" delays in language acquisition among Deaf children.

Tests and protocols for assessing Libras are gradually being developed and recognized by professionals who work with signing children. There is increasing acknowledgment of the importance of using these instruments to diagnose deviations, monitor progress, support the development of therapeutic plans, and select intervention strategies in both educational and clinical settings.

The significant contribution of studies that propose, validate, and apply tests in Libras should be emphasized, as these tests and their results often facilitate advancements in knowledge about language acquisition through Libras and assist in providing appropriate interventions for signing children with expected, delayed, or deviant language acquisition.

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