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SCREENING FOR EMERGING LITERACY IN PRESCHOOL AND ELEMENTARY SCHOOL (RaLEPEEB – SURDEZ): PRELIMINARY DATA

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Abstract:
A significant body of evidence underscores the importance of preschool education, indicating that skills in oral language, phonological awareness, and letter knowledge predict how well children will learn to read when exposed to formal instruction in elementary school. However, acquiring and developing these skills is challenging for children with hearing loss due to technological advances in early identification and intervention processes. These processes, in conjunction with other factors, account for the heterogeneity of this population. An assessment of literacy skills that considers all languages and communication systems used by a child with a hearing impairment across various contexts is necessary to identify potential risk areas and enable educators to adapt their methods, strategies, content, and materials to each student's learning needs. The objective of this study is to present the tool Emerging Literacy Screening for Preschool and Elementary Education (RaLEPEEB-Surdez), which was developed to address the lack of a reliable instrument for identifying areas associated with emerging literacy that are potentially at risk in Portuguese children with hearing loss. The screening evaluates five areas related to the development of emergent literacy. Based on an instrument validated for identifying these areas in hearing children (RaLEPE; Sapage & Cruz-Santos, 2023), the RaLEPEEB-Surdez tool recognizes the bilingualism and biculturalism of students with hearing loss as integral to their acquisition and development of communication skills. This instrument assesses language comprehension (20 items), language production (32 items), metalinguistic awareness (27 items), literacy (23 items), and interaction with books (11 items) in the two languages that guide these students' access to the school curriculum and shape their relationship with the predominantly hearing society in which they live: spoken language and sign language. Some preliminary data from the pilot study will be presented regarding the heterogeneity of the population

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with hearing loss and the internal consistency of responses to the items in the five areas of emergent literacy.

Keywords: deafness, bilingualism, emerging literacy, screening

1. Introduction

Reading is a fundamental skill acquired during childhood that must be cultivated as an indispensable prerequisite for acquiring and developing knowledge across a wide range of fields (Kutner, 2007; Newman, 2009). Competent reading—the ability to interpret what is read effectively—stems from a process that begins before formal instruction. During this period, skills related to phonological processing emerge, along with the awareness that speech sounds result from the interaction between a robust and functional biological system and a supportive family and educational environment (Scarborough *et al.*, 2009; Whitehurst & Lonigan, 1998; 2001).

However, children with deafness may develop an incomplete representation of the linguistic system due to imprecise sound recognition caused by partial, inconsistent, or absent hearing. This places them at a disadvantage when learning language rules, vocabulary, grammar, phonemic awareness, and phoneme-grapheme correspondence. Studies on the emerging literacy of children with hearing loss have shown that, provided they have a stimulating educational environment, qualified interaction between adults and children, experiences gained through child-centered approaches, and an assessment process that allows for recording, documenting, and interpreting their development, their development follows processes similar to those of their hearing peers, albeit at a slower pace (Atlar, 2018; Easterbrooks *et al.*, 2008; Johnston & Rogers, 2001). In education, policies that recognize the linguistic and methodological differences of deaf students have facilitated their inclusion in mainstream schools. These policies have also sparked discussions about establishing an educational framework that incorporates sign language as the primary language of the deaf community and as a means of accessing the curriculum (Lacerda, 1998). In Portugal, Article 23 of Decree-Law No. 3/2008 aims to improve educational quality by providing a model for educating deaf children in bilingual settings that promote proficiency in Portuguese Sign Language (PSL) and Portuguese as a second language (L2) from preschool through secondary school. This model incorporates curricular adaptations that introduce specific subjects, such as Portuguese Sign Language (L1) and Portuguese as a second language (L2).

However, linguistic and cultural heterogeneity pose significant challenges in assessing skills, especially for individuals from diverse socioeconomic, educational, cultural, and linguistic backgrounds (Shipley & McAfee, 2023). For deaf children, the challenges posed by linguistic diversity and its effect on learning to read and write underscore the importance of early identification of skills related to emerging literacy (Akmese *et al.*, 2024; Werfel, 2017). Consequently, screening has become the most widely adopted methodology for rapid and efficient identification. This preventive approach

facilitates proactive measures aimed at mitigating the impact of such difficulties on these children's educational journeys (Fricke *et al.*, 2016).

Assessing bilingual deaf individuals who use sign and spoken/written languages requires methods and instruments that consider the linguistic structures of both languages, their developmental trajectories, and how they interact with one another. These methods must also consider the cognitive demands associated with using both languages in different contexts.

A timely linguistic assessment of emerging literacy skills allows for the adoption of data-driven pedagogical practices, the identification of potential language delays, and the implementation of appropriate educational interventions (Henner *et al.*, 2017). Decisions about which skills to assess have prompted reflection on the importance of receptive and expressive vocabulary, phonological awareness, grapheme-phoneme correspondence, and retelling stories for normal literacy development (Albritton *et al.*, 2022; Verhoeven *et al.*, 2020).

In the context of European Portuguese, the lack of instruments that assess these skills from a multidimensional perspective in hearing children at an early age (three to six years old) led to the creation of the Screening Tool for Emerging Literacy in Preschoolers (RaLEPE; Sapage & Cruz-Santos, 2023). This tool addresses the need for systematic monitoring and follow-up, ensuring a quality education accessible to all children, including those with specific needs. However, unlike monolingual children, bilingual children in the same age group—including deaf children—have difficulty accessing an assessment geared toward identifying potential language development delays in both languages (Lugo-Neris *et al.*, 2015; Yamasaki & Luk, 2018).

The objectives of this study are twofold: (1) to describe the process of adapting and developing a screening instrument for emerging literacy skills in spoken and signed languages, as they pertain to the learning and interaction contexts of deaf children aged 3 to 10 enrolled in a bilingual education program in Portugal; and (2) to present preliminary results from administering the pilot version of the RaLEPEEB- Surdez instrument to deaf children with and without comorbidities.

2. Methods

2.1 Participants

This study's sample consists of three children, aged five to nine, who are enrolled in bilingual education schools for deaf students. One child is in preschool, one is in first grade, and one is in fourth grade. All three children have sensorineural hearing loss and no family history of hearing loss. One child's hearing loss is attributed to genetic factors, while intrauterine infections are suspected to be the cause of the other child's hearing loss.

2.2 Materials

The RaLEPE tool consists of 62 items that assess five dimensions associated with the emerging literacy of Portuguese children aged 3 to 6 years, according to the literature reviewed that served as the basis for its development. Its structure is presented in Table 1.

Table 1: Distribution of RaLEPE items (Sapage & Cruz-Santos, 2023) across the five dimensions of emerging literacy

Comprehension	Production	Metalinguistics	Literacy	Books
1. Identifies images of objects by their function	11. Names familiar objects	27. Distinguishes between pairs of words	45. Identifies the sounds of letters	57. Retells a story
2. Recognizes categories	12. Names images of actions	28. Auditory-distinguishes minimal pairs	46. Recognizes and names at least 5 letters of the alphabet	58. Tells the story depicted on the book cover
3. Identifies categories of images	13. Identifies an object by its function	29. Distinguishes between pairs of pseudowords	47. Recognizes and names at least 10 letters of the alphabet	59. Holds and looks at books Correctly
4. Identifies the location of an object	14. Names categories	30. Identifies words with the same initial syllable	48. Matches a letter with the initial sound of a word	60. Follows the direction of writing
5. Identifies colors	15. Names items within categories	31. Identifies words that rhyme	49. Recognizes letters in their name	61. Makes simple predictions and comments about the story being read
6. Identifies opposites	16. Names colors	32. Identifies words that begin with the same phoneme	50. Copies geometric shapes	62. Shows a growing interest in reading and books
7. Understands semantic object-location relationships	17. Names the days of the week	33. Identifies words that end with the same sound	51. Begins to write the letters of their name	
8. Understands action-location semantic relationships	18. Counts from 1 to 20	34. Claps once for each word in a sentence	52. Recognizes their name in writing	
9. Understands object-attribute semantic relationships	19. Uses locative prepositions	35. Claps once for each syllable in a word	53. Recognizes familiar written words	
10. Understands complex sentences	20. Uses opposites		54. Begins to draw as a way	
	21. Uses regular plurals			
	22. Uses irregular plurals			
	23. Uses simple sentences			
	24. Use complex compound sentences			

	25. Uses complex subordinate clauses 26. Define words	36. Combines syllables to form words 37. Break words down into their constituent phonemes 38. Combines phonemes to form words 39. Recalls words that begin with a phoneme 40. Add sounds to words 41. Omit sounds from words 42. Makes up words that rhyme 43. Recognizes ungrammatical sentences 44. Corrects ungrammatical sentences	to express ideas and stories 55. Match uppercase letters with lowercase letters 56. Begins to associate each sound with a letter in a simple word	

Before administering the instrument, sociodemographic data about the child must be collected, including age, native language, health status, support services, and family information. The person completing the instrument must have prior knowledge of their own competencies. The instrument can be used by various professionals in education and health, as well as by children's parents or caregivers. A total of 128 individuals completed the pilot version, and good internal consistency was observed for the screening tool overall (α = 0.97), as well as for its subdomains (α values ranging from 0.84 to 0.94). For each item on the screening tool, the child receives a score of 0 (zero) if the competency in question has not been acquired or a score of 1 (one) if it has been acquired. Each item is accompanied by a scenario that illustrates the skill being assessed. However, the evaluator is not required to replicate the scenario. Instead, they may use analogous situations that have occurred previously and allow for a reliable assessment of whether the skill has been acquired.

2.2 Procedure

2.2.1 Screening for Emerging Literacy in Preschool and Elementary School- RaLEPEEB-Surdez (Exploratory Version)

To evaluate its suitability for bilingual children with hearing loss, the RaLEPE was administered to nine children with various diagnoses of hearing loss and related conditions who were enrolled in a kindergarten at a reference school (Osório & Cruz-Santos, 2024). Since the RaLEPE has not been validated for this population, the study involved various stages and processes. These included direct observation of the children in the diverse contexts that characterize their daily school life. This allowed the researchers to better understand the children's specific needs, as well as the instruments, materials, and work dynamics used by the professionals on the bilingual intervention team. The researchers took a flexible approach to the skills assessed by the items, considering various ways these skills could be acquired, such as through oral expression, sign language, writing, or drawings.

Throughout the RaLEPE process, the applicability of certain items in their original format was discussed between the bilingual intervention and research teams. This resulted in a selection of items to be retained, eliminated, adapted, or replaced. In addition to changes in the sociodemographic data characterizing each child's and their family's profile, as well as the observations, comments, and suggestions made throughout the process, it was concluded that the wording of some items needed to change to allow for positive evaluation of a child's demonstration of a specific skill through PSL expression, either instead of or alongside spoken language.

This process resulted in the retention of 12 items, the adaptation of 19 items, and the creation of 34 new items. These items were defined based on an analysis of the guidelines describing the process of acquiring language skills in the children's first language, Portuguese Sign Language (PSL).

2.2.2 Screening for Emerging Literacy in Preschool and Elementary School- RaLEPEEB-Surdez (Pilot Version)

For deaf children, respecting the linguistic path of acquisition and development of the mother tongue necessarily involves immersion in a context of exposure to and interaction with sign language users. This enables them to achieve higher levels of cognitive development, just like their hearing peers. Proficiency in written Portuguese is a powerful tool for accessing knowledge, participation, and personal and social success. It also serves as an interface for communication between deaf children and the hearing population (Almeida *et al.*, 2009, p. 8). However, deaf students cannot learn to read and write based on knowledge of the oral modality of written language. Therefore, the roles of Portuguese and Portuguese Sign Language for deaf students are unquestionable.

Since the bilingual education provided to deaf students in Portugal does not focus solely on one language, the research team responsible for this study concluded that both languages should be assessed concurrently. This is based on the assumption that progressive mastery of Portuguese, whether in its written or oral forms according to

individual abilities, must occur alongside the acquisition of Portuguese Sign Language, their first language. Accordingly, the 62 RaLEPE items assessing emerging literacy associated with spoken language underwent a pairing process. This resulted in the incorporation of 62 new items into the new instrument designed to assess competencies associated with sign language.

This new version of the RaLEPEEB-Surdez was submitted to invited experts for review. These experts have recognized experience providing technical and pedagogical support to deaf students. The reviewers included two speech-language pathologists (RV and CB), a Portuguese Sign Language instructor (CF), and a Portuguese Sign Language interpreter (TM). The reviewers evaluated the relevance and appropriateness of the wording of the questions in the child and family profile form. This form precedes the screening and is an integral part of it. The reviewers also evaluated the feasibility of the proposed pairing. This evaluation considered the structural differences between spoken and sign languages. To ensure the independence of the assessments, we used the Delphi method (Borg & Gall, 1984), an iterative questioning method ranging from two to five rounds that is often conducted online, though a hybrid approach may also be adopted. We chose this method to ensure anonymity among the experts throughout the entire process and minimize the "bandwagon effect," which is when individuals adopt different behaviors, opinions, beliefs, or preferences based on unfounded perceptions of status (Martorella, 1991).

The instrument was emailed to five experts with a request to analyze it and provide comments on each item. They were asked to critique the wording and assess whether a comparative evaluation of linguistic competencies in spoken and sign languages could be established in the context of bilingual/bimodal education. The comments submitted by each expert were incorporated into a second version of the instrument, which led to the reformulation or removal of some items. The instrument was then resubmitted for a new round of analysis. One question (No. 16) was added to the original child and family profile form, and the initial 124 items in the screening tool were reduced to 113 in the final version (Table 3). Of these, 20 assess comprehension in spoken and sign languages, 32 assess oral and sign language production, 27 assess metalinguistic skills in oral and sign languages, 23 assess knowledge of the letters of the oral and sign alphabets, and 11 assess the child's relationship with books in oral and sign languages.

Table 3: Distribution of the pilot version of the RaLEPEEB-Surdez across the different assessed domains

Comprehension	1. Orally identifies images of objects by their function	**Production**	21. Names familiar objects
	2. Identifies images of objects by their function using sign language		**22. Names familiar objects in PSL**
	3. Recognizes categories		23. Names images of actions
	4. Recognizes categories based on their representation in PSL		**24. Names images representing actions in PSL**

	5. Identifies image categories		25. Identifies an object by its function
	6. Identifies image categories based on an instruction given in PSL		**26. Identifies an object by its function in PSL**
			27. Names categories
	7. Identifies the location of an object		**28. Names categories in PSL**
	8. Identifies the location of an object based on an instruction given in PSL		29. Names elements of categories
			30. Names elements of categories in PSL
	9. Identifies colors		31. Names colors
	10. Identifies colors based on their representation in PSL		**32. Names colors in PSL**
	11. Identifies opposites		33. Names the days of the week
	12. Identifies opposites based on their representation in PSL		**34. Names the days of the week in PSL**
	13. Understands semantic object-location relationships		35. Names and orders the numbers from 1 to 10
	14. Understands object-location semantic relationships based on an instruction given in PSL		**36. Orders and names, in PSL, the numbers up to 5**
			37. Orders and names, in PSL, the numbers up to 10
	15. Understands action-location semantic relationships		38. Uses locatives
	16. Understands action-location semantics based on an instruction given in PSL		**39. Uses locatives when expressing themselves in PSL**
			40. Uses opposites
	17. Understands object-attribute semantic relationships		**41. Uses opposites when expressing themselves in PSL**
	18. Understands object-attribute semantic relationships based on an instruction given in PSL		42. Uses regular plurals
			43. Uses plurals when expressing themselves in PSL
	19. Understands complex sentences.		44. Uses irregular plurals
	20. Understands complex sentences in PSL		45. Uses simple sentences
	46. Uses simple sentences when communicating in PSL		**64. Identifies gestures that end with the same querema**
	47. Uses complex coordinated sentences		65. Claps once for each word in a sentence
	48. Use complex coordinated sentences when communicating in PSL		66. Claps once for each syllable in a word
	49. Uses complex subordinate clauses		**67. Makes one movement for each syllable**
	50. Uses complex subordinate clauses when communicating in PSL		68. Combines syllables to form words
	51. Defines words		69. Breaks words down into their constituent phonemes
	52. Defines words in PSL		**70. Breaks words down into the letters of the sign language alphabet that make them up**
Metaling	53. Distinguishes between pairs of words		71. Combine phonemes to form words
	54. Distinguishes pairs of gestures		**72. Combines sign elements to form signs**
	55. Audibly distinguishes minimal pairs		73. Recalls words that begin with the same phoneme

	56. Distinguishes pairs of pseudowords		**74. Identifies gestures that begin with the same kerema**
	57. Identifies words with the same initial syllable		75. Adds sounds to words
	58. Identifies gestures that share the same initial letter, based on the phonetic representation of both		76. Omit sounds from words
	59. Identifies words that rhyme		77. Recalls words that rhyme
	60. Identifies signs whose written representations rhyme		78. Recognizes ungrammatical sentences
	61. Identify words that begin with the same phoneme when spoken		79. Corrects ungrammatical sentences
	62. Identify signs that begin with the same kerema[ii]	**Knowledge of letters**	80. Identifies the sounds of letters
	63. Identifies words that end with the same sound when spoken		**81. Matches letters of the spoken alphabet with letters of the sign language alphabet**
	86. Recognizes and names the 26 letters of the (spoken) alphabet		82. Recognizes and names at least 5 letters of the (spoken) alphabet
	87. Recognizes and names the 26 letters of the sign language alphabet		**83. Recognizes and names at least 5 letters of the sign language alphabet**
	88. Matches a letter with the initial sound of a word		84. Recognizes and names at least 10 letters of the written alphabet
	89. Associates a letter with the hand shape		**85. Recognizes and names at least 10 letters of the sign language alphabet**
	90. Recognizes letters in their own name		99. Matches uppercase letters with lowercase letters
	91. Recognizes the PSL letters that make up their name		**100. Matches uppercase letters, lowercase letters, and PSL letters**
	92. Copy geometric shapes based on verbal instructions		101. Begins to associate each sound with a letter in a simple word
	93. Begins to write the letters of their name		**102. Begins to associate each sign language alphabet letter with a letter of the written alphabet**
	94. Recognizes their name in writing		103. Retells a story that was read to them
	95. Recognizes their name in sign language	**Relationship with books**	**104. Retells a story that was told in sign language**
	96. Recognizes familiar written words (logos or signs)		105. Tell the story based on the book cover
	97. Recognizes gestures associated with trademarks		**106. Tells the story in PSL based on the book cover**
	98. Begins to draw as a way to express ideas and stories		107. Holds and looks at books correctly
			108. Follows the direction of writing (from left to right)

[ii] In Portuguese Sign Language, the smallest unit of articulation corresponds to the concept of a phoneme in spoken languages. The simultaneous combination of these units forms all signs. The four essential queremes of Portuguese Sign Language are hand shape, point of articulation, movement, and orientation.

		109. Makes simple predictions and comments about the story being read
		110. Makes simple predictions and comments, in PSL, about the story being read
		111. Shows a growing interest in reading and books
		112. Narrates the story, based on the book's cover, in PSL
		113. Retells a story told in PSL

A perfect match was achieved in the subdomains of comprehension and production of spoken and sign languages. Nearly perfect results were achieved in the subdomains of literacy and relationship with books. Regarding the metalinguistics subdomain, the number of items assessing spoken language was twice that assessing sign language, a difference justified by the two languages' distinct grammatical structures.

2.2.3 Descriptive analysis

Due to the preliminary nature of the study and the small size of the pilot sample (n = 3), data analysis followed a descriptive and exploratory approach. The application of inferential statistics would be methodologically inappropriate at this stage. The analysis aimed to illustrate emerging literacy profiles and demonstrate the applicability of the instrument in real educational contexts.

Initially, the analysis focused on the sociodemographic and audiological characteristics of the children and their families. This allowed us to identify profiles that the literature identifies as the main predictors of literacy success in deaf populations. These predictors include age, degree of deafness, type of hearing aid, and family communication context. Regarding the RaLEPEEB-Surdez, scores were calculated for each domain (Comprehension, Production, Metalinguistics, Letter Knowledge, and Relationship with Books) on a binary scale (0 for unacquired competence; 1 for acquired). This allowed for a comparison of linguistic profiles across both oral and sign language modalities.

3. Results

Table 4 presents the results of the RaLEPEEB-Surdez assessment administered to three children, reflecting the heterogeneity of the school-age deaf population. Table 4 highlights characteristics of these children, including their grade level, gender, comorbidities, age at Universal Neonatal Hearing Screening (UNHS), degree of hearing loss, type of hearing aid, age at which they began using the hearing aid, and age at which they began attending a referral school.

Table 4: Characteristics of the sample evaluated by RaLEPEEB - Surdez.

Schooling	Gender	Age	Associated condition	RANU (days)	Degree of hearing loss		Hearing aid	Age at which hearing aid was first used	Age at EREBAS (months)	ESE[1]	Parents' educational qualifications		Home communication environment
					Left	Right					Mother	Father	
Preschool	F	5	No associated condition	36	P	P	Cochlear implant	12 months	36	C	Secondary Education	High School	Oral
1st year	F	7	DNA Deletion	23	M	M	Hearing aid	1 month	48	A	High School	High School	Oral
4th grade	F	9	Selective mutism + Trisomy 21	42	M	M	Not used	N/A	38	A	2nd CEB	2nd CEB	Bimodal (Oral + PSL)

Notes: P-Severe, M-Moderate, SES-Socioeconomic Status. 1 Regarding SES, students in the Portuguese public school system are categorized according to their families' income, as reported on their income tax returns. Students in category A receive free meals and textbooks and are given top priority for other forms of support. Students in category B pay half price for meals and receive subsidies for activity fees and field trips. Students in category C pay the maximum amount stipulated for school meals, but they may be eligible for other support defined by the Ministry of Education or local authorities.

In addition to deafness, one child has a DNA deletion, and another has selective mutism and trisomy 21. Only one child underwent the recommended RANU examination within 30 days (Monteiro & Serrano, 2018), while the other two were tested within 12 days after the 30-day period ended. All three were diagnosed with sensorineural hearing loss. Two children had moderate bilateral hearing loss, with hearing thresholds ranging from 41 to 70 decibels (dB), while the other child had profound bilateral hearing loss, with a hearing threshold ranging from 91 to 119 dB (Martins & Monteiro, 2018).

Each child's situation regarding hearing aid use and age of onset is unique: one does not use any device, one has used a hearing aid since birth, and one received a cochlear implant at 12 months. Finally, regarding the age at which they first had contact with bilingual education, we observed that all three children enrolled in a reference school between 36 and 48 months of age.

As shown in Table 5, there is a substantial difference in the language skills of children with hearing aids and those without in the different domains that make up the RaLEPEEB-Surdez assessment. Notably, the child without a hearing aid was assessed as not having acquired competencies in metalinguistics, letter knowledge, or interaction with books in either spoken or signed language. In contrast, the two children who use hearing aids demonstrated different strengths. The child with a cochlear implant had better oral comprehension and knowledge of the letters of the written alphabet, while the

child with a hearing aid had better oral production, metalinguistic skills, and interaction with books in spoken language.

Table 5: Sample Performance and the Role of Hearing Aid Type and Use

	Does not use	Hearing aid	Cochlear implant
Speech Comprehension	4	8	10
Sign Language Comprehension	0	7	2
Total Comprehension	4	15	12
Oral Production	1	9	8
Gestural Production	2	10	7
Total Production	3	19	15
Oral Metalinguistics	0	5	4
Gestural Metalinguistics	0	3	0
Total Metalinguistic	0	8	4
Oral Literature	0	5	7
Gestural Letters	0	6	5
Total Letters	0	11	12
Oral Books	0	3	2
Gestural Books	0	0	1
Total Books	0	3	3
Total RaLPEEB- Surdez-Oral	5	30	31
Total RaLPEEB-Surdez- Gestural	2	26	15
Total RaLEPEEB-Surdez	7	56	46

4. Discussion

Instead of designing a new instrument, we adopted an adaptation approach based on the RaLEPE, which was validated for hearing children. This methodological choice reflects a pragmatic, theoretically grounded strategy balancing efficiency and cultural sensitivity. There are several considerations that justify the decision to adapt an existing instrument. First, the RaLEPE's five-domain structure—language comprehension, language production, metalinguistics, letter knowledge, and book interaction—aligns with theoretical frameworks identifying these competencies as critical predictors of reading success in hearing and deaf populations (Cupples *et al.*, 2014; Majorano *et al.*, 2025; Nittrouer *et al.*, 2012). Second, this multidimensional approach is consistent with contemporary theoretical frameworks emphasizing that emergent literacy comprises multiple interrelated skills that develop along distinct yet interconnected trajectories (Majorano *et al.*, 2025; Werfel, 2017).

The inclusion of metalinguistic awareness as a distinct domain is noteworthy because its presence in spoken and signed languages has been identified as a critical predictor of reading success in both populations (Gilliver *et al.*, 2016; Miller *et al.*, 2013; Werfel *et al.*, 2016). Though sometimes overlooked in emergent literacy evaluations, assessing book-interaction behaviors reflects the understanding that motivation to read and familiarity with book conventions independently contribute to reading development beyond code-related skills.

The adaptation process involved three distinct phases: an exploratory application with nine deaf children; a systematic analysis of the items, resulting in the retention of 12 original items, the adaptation of 19 items, and the creation of 34 new items designed specifically for Portuguese Sign Language (PSL) skills. This three-part categorization distinguishes between items that transfer directly across language modalities, those that require modification to accommodate sign language characteristics, and those that require new development to capture PSL-specific skills. The final instrument consisted of 113 items, compared to the original RaLEPE, and included bilingual pairings to assess skills in both spoken Portuguese and PSL across the five domains.

This strategy has strong parallels in the international literature. The British Sign Language Development: Receptive Skills Test for American Sign Language, for example, adopted a similar process involving item-by-item analysis, cultural adaptation, and pilot testing (Enns & Herman, 2011). Similarly, the adaptation of the German Sign Language Receptive Skills Test involved systematically modifying items to account for linguistic differences while maintaining the validity of the underlying construct (Haug, 2011). Similarly, the adaptation of the Early Learning Outcomes Measure (ELOM) to South African Sign Language (Young *et al.*, 2025) relied on expert consensus, mirroring the validation approach adopted in the present study. These converging practices across multiple linguistic and cultural contexts suggest that, when conducted systematically with input from experts, adaptation represents a methodologically sound approach to developing instruments for populations that use sign languages.

Using a panel of five experts with diverse specializations—two speech-language pathologists, a Portuguese Sign Language teacher, and a Portuguese Sign Language interpreter, all of whom have extensive experience supporting deaf students—was a significant methodological aspect of the RaLEPEEB- Surdez development process. Conducting iterative rounds of anonymous expert review focused on the relevance and appropriateness of the items, the feasibility of pairing spoken Portuguese with PSL, and accommodating structural linguistic differences between the two languages enabled the systematic refinement of the items based on expert feedback. Anonymity reduced potential biases arising from hierarchical or interpersonal dynamics among panel members.

Young and his colleagues employed a similar online approach to reach a consensus on the items in their adaptation of the ELOM for South African Sign Language (Young *et al.*, 2025). Varghese *et al.* (2023) employed a survey methodology to develop items for the Childhood Stuttering Screening Test, demonstrating the method's applicability across various communication disorder contexts. Converging expert opinions across multiple rounds provides content validity, which is valuable in the early stages of instrument development before large-scale empirical validation is feasible.

The bilingual design of the RaLEPEEB-Surdez is a theoretically sophisticated and culturally sensitive methodological choice. It assesses emerging literacy skills in spoken Portuguese and Portuguese Sign Language (PSL), reflecting the bilingual and bicultural reality of deaf children in Portuguese reference schools. This design acknowledges that

literacy development among deaf children occurs across multiple linguistic modalities, and a comprehensive assessment must capture competencies in both languages to identify areas of risk and guide educational planning. The bilingual pairing of all 113 items, with parallel assessments in spoken and sign language modalities, allows for comparison of linguistic strengths and needs across modalities within each child. This is a crucial feature for individualized educational intervention.

The theoretical rationale for this bilingual approach is firmly grounded in contemporary understandings of Deaf bilingualism. Consistent research demonstrates that literacy development in deaf children is supported by strong competencies in sign language and the majority culture's spoken/written language (Easterbrooks *et al.*, 2008; Lederberg *et al.*, 2014; Most *et al.*, 2006). Proficiency in sign language establishes a linguistic basis for metalinguistic awareness, narrative comprehension, and conceptual development. Meanwhile, skills in spoken and written language provide access to print literacy and academic content. RaLEPEEB-Surdez assessment of both modalities aligns with theoretical models that emphasize the complementary roles of sign language and spoken/written languages in literacy development among deaf individuals.

The item development process demonstrates methodological sophistication by addressing the structural and functional differences between spoken Portuguese and Portuguese Sign Language (PSL). Creating 34 new items specifically designed to assess PSL skills reflects the recognition that sign languages have unique linguistic features, such as spatial grammar, non-manual markers, and classifier constructions, that cannot be adequately assessed by simply translating items from spoken languages. This approach contrasts with previous assessment instruments that treated sign languages as mere translations of spoken languages, failing to capture their unique linguistic competencies. Adapting 19 items and retaining 12 original items suggests a nuanced analysis of which emerging literacy constructs are transferable across language modalities and which require specific operationalization for each modality.

A comparative analysis of the international literature reveals both convergent practices and unique innovations. Some studies have developed bilingual or bimodal assessment instruments for deaf populations in recognition of the need for such approaches in deaf education. In Brazil, tests assessing phonemic discrimination in both Portuguese and Libras were developed for bilingual, bimodal children, as well as deaf children with cochlear implants. These tests used parallel structures across modalities (Cruz *et al.*, 2015). Quadros *et al.* (2012) assessed phonological memory in bilingual bimodal children and children with cochlear implants in both spoken Portuguese and Libras. The challenges of assessing multilingual deaf populations were also observed in the convergent validity of vocabulary assessments in written German and German Sign Language for deaf students (Marx & Mann, 2025).

The pilot testing phase of RaLEPEEB-Surdez involved administering the instrument to three deaf children, aged five to nine years, with diverse audiological profiles and sensorineural hearing loss: one child without hearing aids, one with hearing aids, and one with a cochlear implant. Although this pilot sample was extremely small,

it was intentionally selected to represent the heterogeneity characteristic of the contemporary school-age deaf population. This heterogeneity includes socioeconomic status, parents' educational level, the family's linguistic environment, the age at which hearing loss was identified, the age at which intervention began, and linguistic exposure within the family context. Since these factors are well-established predictors of literacy outcomes in deaf children (Cupples *et al.*, 2014; Lund & Werfel, 2022; Werfel, 2017), the objective of the pilot test was to generate preliminary data on the administration procedures of the instrument and its ability to capture various literacy profiles within the deaf population.

A comparative analysis of international instrument development studies reveals that the pilot sample for the RaLEPEEB-Surdez is substantially smaller than the typical pilot phase sample size. The validation of the Latvian Sign Language Comprehension Test included 34 deaf and hard-of-hearing children, enabling the assessment of internal consistency, inter-rater reliability, item difficulty and discrimination indices, and construct validity. The validation of a Brazilian Portuguese oral language screening instrument for preschool-aged children conducted by Puglisi *et al.* involved 128 children in the pilot phase, enabling a comprehensive psychometric analysis (17). Even studies explicitly defined as pilot or preliminary investigations generally employ larger samples. The pilot study by Sapage *et al.* of the original RaLEPE (for hearing children) involved 128 participants, resulting in robust reliability estimates. Thus, the sample size of three children in the RaLEPEEB–Surdez pilot phase is exceptionally small, even considering the challenges of recruiting specific populations.

5. Limitations

This pilot study is exploratory and descriptive in nature. The main purpose of the study is to demonstrate the applicability of the instrument in real educational contexts and illustrate the types of literacy profiles it can capture. However, this rationale does not exempt the study from having certain limitations. For example, the extremely small sample size and the scope of the instrument in educational settings may present feasibility challenges for routine screening. This is because the 113 items could require a considerable amount of time to administer.

Regarding the sample, the three children selected to represent different uses of hearing technology (no device, hearing aid, and cochlear implant) may not adequately represent the broader population of Portuguese deaf children in bilingual education. The sample includes a child with significant comorbidities (selective mutism and trisomy 21), which may influence literacy development independently of deafness. While population heterogeneity is a reality in contemporary deaf education, including a child with multiple developmental conditions in a pilot sample of three may distort the results and limit their generalizability to the deaf population as a whole.

6. Conclusion

RaLEPEEB-Surdez is a significant methodological advancement in the evaluation of bilingual education for deaf individuals. It addresses the critical need for culturally and linguistically appropriate screening tools to assess emerging literacy skills among deaf Portuguese children. The instrument's development demonstrates several advantages, such as the systematic adaptation of a validated instrument, rigorous expert validation, a comprehensive bilingual design that assesses skills in spoken Portuguese and Portuguese Sign Language (PSL), and flexible administration protocols that accommodate deaf children's multimodal communication. These advantages reflect a sophisticated understanding of deaf bilingualism, sign language linguistics, and emerging literacy development.

The instrument incorporates a theoretical perspective that recognizes deaf children's bilingualism as an asset and values spoken and sign languages as legitimate linguistic systems that support literacy development. It also acknowledges deaf children's multimodal communication. This perspective challenges deficit-based frameworks that have historically dominated the education and assessment of deaf individuals by offering an approach grounded in deaf children's linguistic and cultural resources. Thus, RaLEPEEB-Surdez is a practical assessment tool and a methodological model for culturally responsive research in deaf education and other fields.

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Conflict of Interest Statement
The authors declare no conflicts of interest.

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