Assessment of Language and Literacy in Children Who Are d/Deaf and Hard of Hearing

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Abstract: This article presents theoretical orientations and practical applications for the assessment of d/Deaf and hard of hearing (d/Dhh) children. It discusses current approaches to assessment and the factors affecting d/Dhh children's participation in assessments using those approaches. Gaps in the field around access to appropriate assessments are discussed. This review also shares information on the relationship between the purpose of the assessment and the approach selected. Basic considerations for both d/Deaf and hard of hearing multilingual learners (d/DMLs) and d/Dhh children with additional disabilities will be addressed. Finally, general recommendations are made for research and practice.

1. Introduction

Educational assessment is an important part of monitoring learning, creating educational programming, and identifying children for services. For d/Deaf and hard of hearing (d/Dhh) children, engaging in meaningful assessment is a complex and multifaceted process [1,2]. Well done assessments support learning and growth, while inaccurate assessment data may lead to potentially faulty decision-making and poorly designed educational plans for d/Dhh children in our schools. Inaccurate assessments can also lead to the misdiagnosis of additional disabilities, including either the diagnosis of an additional disability that is not present or the missed diagnosis of a key additional disability necessary to serving a child in the school and/or community [1,2]. Of particular importance is capturing the language and literacy development of d/Dhh children in our schools, as understanding these skills is essential to educational planning and decision-making.

There are many approaches that can be utilized during the assessment process, and no one test can provide all the information necessary for the d/Dhh children we educate. Therefore, this article will (1) address the challenging nature of assessing language proficiency for the d/Dhh population, (2) review the strengths and weaknesses of the major assessment approaches used with d/Dhh children, and (3) review the factors that influence the selection of assessment approaches and tools for d/Dhh children, including the assessment purpose and language being assessed.

2. Assessing Language and Literacy for d/Deaf and Hard of Hearing Children

Language and literacy development are essential to educational programming for d/Dhh children; however, assessing these skills remains a challenging task. d/Dhh children often use a wide variety of languages and/or communication systems in their home, school, and community, which makes

assessing language proficiency difficult [3]. For example, the language of instruction, language of socialization, and language of the home may all be different for a d/Dhh child. As such, a child may use spoken language, sign language, or some combination of both in their daily lives. A child may also use a manually coded form of a spoken language (e.g., Signed Exact English or Signed English) or a constructed sign system, which borrow features from an official sign language but is not one. Even when a child uses a conventional language, however, they may use it inconsistently across different contexts. This unpredictability in language use may leave gaps in a child's linguistic repertoire, making it hard to establish the primary language to be used during the assessment administration or even which languages should be included in the assessment.

Although there are challenges to appropriately assessing the language and literacy development of d/Dhh children, the conditions of the assessment will be improved if the child is assessed in what is believed to be the child's most proficient language based on background information about the child and her/his language history. The length of time a child has used a language should always be a factor in determining the language in which an assessment will occur. The assessment of all languages and communication systems used by the child is also necessary for a comprehensive portrait of a child's abilities [4,5]. When conducting the assessments of these various languages, the use of a qualified examiner who can communicate directly with the child contributes to the validity of the assessment [2,6]. Finally, the assessment should also include multiple sources of information from across various contexts (e.g., home, school, community) and informants (e.g., educators, family, etc.) in order to document across- and within-context skills [4,7].

3. Assessment Approaches for d/Deaf and Hard of Hearing Children

The various types of assessment approaches have been traditionally grouped into two categories: formal and informal assessment. Despite being controversial for some groups of learners (e.g., young children and culturally and linguistically diverse children), formal assessment is often preferred in schools, as each test is constructed to produce scores that are valid and reliable. Informal assessment, however, is the most widely used form of assessment in classrooms and educational settings, as it lends itself well to monitoring and documenting a child's learning on a regular basis. Each assessment approach within these categories has its own theoretical foundation, set of guiding principles, and implementation practices.

3.1. Informal Assessment Approaches for d/Deaf and Hard of Hearing Children

There are multiple informal assessment approaches that can capture language levels and growth over time. They commonly occur in the classroom setting, but can also happen in natural environments such as a child's home or community. These approaches are theoretically and practically distinct from each other. Each has its own set of strengths and limitations when working with d/Dhh children.

Naturalistic Assessment and Play-Based Assessment approaches are a type of assessment that focuses on observing children in their natural environments or authentic play scenarios. It is most commonly used in early childhood and early intervention settings. These approaches are praised for their authenticity and ability to see how a child independently uses various skills. For d/Dhh children, Naturalistic Assessment removes the barriers of participation in a contrived assessment setting with unfamiliar materials and content to see their functional language abilities in real-world settings. The use of Naturalistic Assessment with children who are signers, however, is limited to those who have the sign language proficiency to complete the observation. An interpreter may be used, but without formal training on observation techniques, an interpreter might inadvertently influence the data collected through the translation process. For example, a child who uses American Sign Language (ASL) may use a sign without the appropriate grammatical markers (e.g., use of movement), but the interpreter fills in the content as if the child included them.

Performance-Based Assessment, Curriculum-Based Assessment and Standards-Based Assessment are techniques that require children to perform a specified skill or task to demonstrate learning.

For Performance-Based Assessment, the skills are chosen based on a combination of age, grade, or questions about a child's learning. For Curriculum-Based Assessment, the skills are aligned specifically with the curriculum unit, chapter, or lesson. In Standards-Based Assessment, skills-based tasks are used to determine if a child has met the state or local standards for instructional content. These types of assessment are most commonly used in the classroom setting and administered by the classroom teacher. Benefits of these types of assessments are that they are typically given by someone familiar with the child and the characteristics child's language, which is an important part of understanding the full capabilities of a d/Dhh child. If the teacher does not share the child's language, however, they may need assistance in administering and interpreting the results by someone with the requisite language skills, which is challenging given that these assessments occur so frequently in a classroom.

Portfolio Assessment, as an approach, uses a targeted selection of children's work and relevant assessment data to document a child's learning. This approach is widely used in early childhood and is considered a good way to track a child's small increments of progress over time. For d/Dhh children, this approach can be especially useful to look at changes in expressive language development and writing skills over time. The accessibility of video technology in recent years has transformed the capacity of portfolios to capture visual language samples in a way that was previously hard to do [8]. By creating video portfolios, a child's authentic signed language can be documented more accurately. Given that Portfolio Assessment is typically generated by the classroom teacher, if the teacher does not know the nuances of language development for d/DHh children, they may not know the best artifacts to include in a portfolio to demonstrate development or growth, and so the portfolio may not accurately reflect true ability.

Dynamic assessment uses a test, teach, test again approach as a way of evaluating which instructional strategies may be effective for a specific child. This approach is valuable for distinguishing effective teaching strategies that work for a specific child versus those that do not impact the child's learning. It can also identify how quickly a child can learn new content in a one-on-one setting, rather than focusing only on what knowledge a child already possesses. The benefits of using Dynamic Assessment with d/Dhh children is the direct applicability to designing Individualized Education Programs (IEPs) including identifying teaching strategies, determining appropriate instructional pacing, and identifying necessary classroom accommodations. The drawbacks of Dynamic Assessment include the time necessary to engage in the test–teach–retest model on a regular basis.

While each of these approaches are unique in their data collection and process, they all share documentation strategies such as rubrics, checklists, rating scales, observational notes, student work samples, and portfolios [9]. The use of video is particularly important to monitoring sign language development over time. By combining various informal assessment and documentation approaches, it is possible to promote learning, impact instruction, and modify educational programming to meet the language and literacy needs of children in our d/Dhh programs and schools.

For a summary of the benefits and challenges of each type of assessment, see Table 1 below.

Table 1. Summary of informal assessment approaches.

Approach	Definition	Benefits	Challenges
Naturalistic Assessment	Assessment that focuses on observing children in their natural environments	• Authenticity of the observation • Ability to see how a child independently uses various skills • Eliminates the barriers of participation in a contrived assessment setting with unfamiliar materials and content to see their functional language abilities in real-world settings	• Observer must have the language proficiency to complete the observation in the child's languages • Use of interpreters may introduce bias, as they are not trained in reducing bias in observations and may inadvertently influence the observation through their choice of vocabulary or phrasing
Play-Based Assessment	Assessment that focuses on observing children in authentic play scenarios	• Authenticity of the observation • Ability to see how a child independently uses various skills • Eliminates the barriers of participation in a contrived assessment setting with unfamiliar materials and content to see their functional language abilities in real world settings	• Observer must have the language proficiency to complete the observation in the child's languages • Use of interpreters may introduce bias, as they are not trained on reducing bias in observations and may inadvertently influence the observation through their choice of vocabulary or phrasing
Performance-Based Assessment	Assessment techniques that require children to perform a specified skill based on a combination of age, grade, or questions about a child's learning to demonstrate learning	• Can be administered in the classroom by the teacher, who is familiar with the child's language characteristics • Tasks are more authentic to the types of activities that occur in classrooms	• If the examiner does not share the child's language, assistance from an interpreter or ancillary examiner may be needed • Finding someone who can assist in an administration as frequently as needed for this type of assessment may be challenging
Curriculum-Based Assessment	Assessment techniques that require children to perform a specified skill based on the unit, chapter, or lesson being taught to demonstrate learning	• Can be administered in the classroom by a teacher familiar with the child's language characteristics • Tasks are more authentic to the types of activities that occur in classrooms	• If the examiner does not share the child's language, assistance from an interpreter or ancillary examiner may be needed • Finding someone who can assist in an administration as frequently as needed for this type of assessment may be challenging
Standards-Based Assessment	Assessment techniques that require children to perform a specified skill based on the state or common core standard being taught to demonstrate learning	• Can be administered in the classroom by the teacher, who is familiar with the child's language characteristics • Tasks are more authentic to the types of activities that occur in classrooms	• If the examiner does not share the child's language, assistance from an interpreter or ancillary examiner may be needed • Finding someone who can assist in an administration as frequently as needed for this type of assessment may be challenging
Portfolio Assessment	Assessment that uses a targeted selection of children's work and relevant assessment data to document a child's learning	• Appropriate for assessment in early childhood • Considered a good way to track a child's small increments of progress over time, especially with regard to expressive and receptive language • Use of video is promising to capture authentic language samples of d/Dhh children	• If the teacher does not know the nuances of language development for d/DHh children, they may not know the best artifacts to include in a portfolio to demonstrate development or growth
Dynamic Assessment	Approach that uses a test, teach, test again approach as a way of evaluating which instructional strategies may be effective for a specific child	• Can distinguish effective teaching strategies that work for a specific child versus those that do not impact the child's learning • Can also identify how quickly a child can learn new content in a one-on-one setting • Has direct applicability to designing Individualized Education Programs (IEPs)	• Time consuming to administer on a regular basis

3.2. Formal Assessment Approaches for d/Deaf and Hard of Hearing Children

Formal assessment uses psychometrics to create a test with the power, validity, and reliability to isolate specific skills and compare a child's performance to that of other children [10]. In order to have confidence in the scores produced, the test must be administered the same way each time it is given [10]. When a test is administered outside of its intended population, however, there may be required deviations to the administration protocol that can impact the validity of the scores.

In the United States, most standardized assessments are intended to be used nationwide and are created based on a sample of children that often mimics the U.S. Census data. For d/Dhh children, these standardized tests can provide insight into how a d/Dhh child compares to other children at their age or grade using normative data. A handful of these assessments have also collected normative data specifically with d/Dhh children; however, the heterogeneity of the population, small sample size compared to their hearing counterparts, and sample bias all render the scores problematic at best [4,11,12].

There are very few tests designed for d/Dhh children, which creates challenges to the validity of the tests, as the items may be based on auditory concepts inaccessible to a d/Dhh child and it may be impossible for them to be translated into a signed language [4]. As a result, deviations to the administration protocol may be necessary for equity [13]. For d/Dhh children who use a sign language, sign translations of test content are frequently used, as the overwhelming majority of standardized tests are designed and administered in spoken English [14,15]. These translations can occur in three ways. First, if the examiner is proficient in the child's sign language, they can directly administer the test to the child in that language. Second, the examiner can collaborate with an ancillary examiner who is proficient in the language and understands how to administer tests appropriately. Finally, the examiner can use a sign language interpreter to translate the test during the testing session.

While these strategies can help to expand the available test materials for d/Dhh children, the interpretation process creates challenges of their own. Even when an examiner is able to administer a test in sign, without standardized test administration protocols or a sign language script, it is hard to administer the test in exactly the same way each time it is given. Access to an ancillary examiner who has both the knowledge of the assessment and the language skills necessary is not typical outside of schools for the d/Deaf. Even when there is a trained person to assist, they might be taken away from other important duties in order to assist in the test administration. Sign language interpreters may be available for the assessment even when ancillary examiners are not; however, without formal training on assessment, the interpreter may inadvertently affect the child's scores [16].

Each of these situations poses threats to the semantic equivalence for the test, an important aspect of test validity. Semantic equivalence is when a translation of the test keeps the item content and difficulty the same across both languages [14]. Crossing modalities from oral to sign language impacts the semantic equivalence of the assessment, as appropriately signing the test item may affect the content of that item through a concept called iconicity [17,18]. Iconicity is when a sign used to represent a concept or object may look visually like the referent [17]. When the iconicity is high, a sign may inadvertently give a child the cues to the correct answers [17,19–21]. For example, if the test item asked, "which shape is the circle?" and the answer choices were a square, circle, triangle, and a diamond, simply signing the question inadvertently gives clues to the answer, as the signs for these shapes mimic them closely.

When translation does not modify the content of an item, it still may change the level of difficulty of it [19–21]. For example, sign language phonology or morphology can affect the difficulty of an item by providing cues that can help elicit the correct answer [18–20,22]. These content changes have been well documented for ASL translations of math assessments, as they may provide number or mapping cues that can be used to solve the problem presented [19,20,22]. For example, an item might ask, "If Sally has 3 balls and Bobby has 2 balls, how many do they have altogether?". The sign for "altogether" also means "to add" in the context of math. The use of this sign thus signifies which mathematical operation to use.

Accommodations

Accommodations are assessment strategies which are intended to compensate for the barriers inherent in the testing situation and not improve the child's performance beyond their true abilities [23]. High-quality accommodations provide access to the tests and their content without altering the construction of the test. There are a wide variety of accommodations that may be used with formal

assessments; however, it is important to only use accommodations that are necessary to provide an equitable testing situation. While there are accommodations that have been deemed potentially useful with d/Dhh children, they should not be given arbitrarily to all children in these populations, but they should be looked at only when it is deemed that an individual student would benefit from them [18].

Often, children use a different language in school and/or at home than the one used on the assessment, and therefore accommodations are used to reduce the amount of bias and challenge the number of artificial barriers to the child's performance such as language diversity or disability [18]. The translation of test content is a common way to provide equity in an administration for d/Dhh children; however, this is not the only language strategy that has been shown to support access to test content.

For some d/Dhh students, preferential seating and use of their hearing assistive technology are the only accommodations that are needed, whereas others may need accommodations that not only provide access to test directions but also the content [18]. Additional accommodations often utilized for d/Dhh children include extended time, separate locations for testing, and computer administration [24,25]. Computer-based assessments pose a particular challenge for d/Dhh children, as they may rely on speech recognition or lack visual cues in item presentation. As a result, a live examiner may be required in order to ensure full access. Although accommodations have been useful for alleviating some of the linguistic bias of standardized assessments, care should be taken in using them. If accommodations are selected or used inappropriately, they may result in a threat to validity by altering the skills or constructs being assessed [24].

4. Purpose of the Assessment

An important factor to consider when selecting an assessment approach is the purpose of the assessment being conducted. Assessments are typically conducted with a specific focus in mind or to answer a particular question about a child's development and/or learning. In a foundational work, Shepard, Kagan, and Wurtz [26] identified four major purposes of assessment that remain relevant to assessment practices today: to promote the learning and development of individuals or groups of children; to identify children for health, educational, and social services; to assess academic achievement for accountability purposes at the local, state, national level; and to monitor trends and evaluate programs. Each of these purposes aligns itself with one or several of the approaches described above.

4.1. Promoting Learning and Development

The first purpose of assessment is to promote learning and development for children. For this purpose, informal assessment approaches are most often used [15]. These approaches lend themselves to this purpose as they are able to capture children's abilities in authentic settings, measure growth over short periods of time, and provide information that can inform instruction. These assessments can also be administered more frequently than formal measures. As there are many different informal assessment approaches, it is important to examine each particular approach in light of its strengths and limitations for capturing the language and literacy development of the d/Dhh population (see the section on informal assessment approaches above). In addition, most educators will use a combination of these approaches when assessing a child's skills over the course of the year.

4.2. Identification for Services

The second purpose of assessment relies on formal assessment for the identification of children for additional services. Two of the most prominent types of services include additional services required to meet the needs of children with another disability beyond hearing loss alone, and additional services to meet the needs of children who have diverse language backgrounds, such as d/Deaf and hard of hearing multilingual learners (d/DMLs). Although these are two common types of services provided,

there may be other services provided by a school or district (e.g., intervention services, Reading Recovery, etc.).

Assessment for additional services often examines a child's ability and achievement scores. Individualized standardized tests have been designed to measure multiple aspects of cognition, processing, achievement, language, and general child development. These tests have been recognized as useful in the identification for services, even for populations that are traditionally disserviced by these tests, such as for young children (e.g., NAEYC) [27]. In addition, they have been recognized as important for the evaluation of language proficiency and the need for additional English language services for English learners (ELs).

4.2.1. Assessment for Additional Disabilities

d/Dhh children with additional disabilities (DWD) constitute 30–40% of d/Dhh children overall [28]. While the scope of this chapter does not allow the time to discuss in detail the specific considerations for each additional disability category (see Bruce and Borders for a full review) [29], high-quality assessment practices are necessary to prevent the misidentification of d/Dhh children for additional disabilities they do not possess [30]. When a child is suspected of having an additional disability, it is important to consider the degree to which the suspected disability is impacted by language and/or literacy development. For example, certain disability categories include more of an emphasis on the nature of a child's language skills (e.g., autism) or literacy development (e.g., learning disability in reading) than others.

For children who are d/Dhh with additional disabilities, it may be necessary to go beyond conventional language abilities to examine the various functional communication skills a child may possess. These assessments may include the use of augmentative technology, including low-technology (e.g., picture boards) or high-technology (e.g., iPads) strategies in order to best understand a child's language and communication abilities. It is also important to examine these functional communication strategies in both the home and school contexts.

When determining the presence of an additional disability, it is important to have an examiner that understands the unique aspects of hearing loss versus other disability categories, as it may be easy to mistake one for the other with an untrained eye. Typically, school psychologists are the primary people who conduct psychoeducational evaluations to determine if a child meets the criteria set forth under educational law for services to address an additional disability. Clinical psychologists or psychiatrists are primarily responsible for the formal diagnosis of additional disabilities under the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) to meet the medical and health needs of children. The collaboration between school-based personnel and health/mental health personnel is essential to ensure that all diagnoses are accounted for educationally, as well as in home and community settings.

Although standardized assessment is the standard of care for the identification of additional services, data collected from the classroom may be essential to the identification of persistent challenges to learning that go above and beyond what can be accounted for by hearing loss alone. Specifically, dynamic assessment in a test–teach–retest model can be quite informative regarding the ability for a child to acquire new content with appropriate instructional supports, especially in the area of learning disabilities. When d/Dhh children struggle with learning despite appropriate instruction and/or interventions, a disability is more likely to be present (for example, Response to Intervention) [7].

4.2.2. Assessment for English Language Services

In the United States, children who come from diverse language backgrounds may be eligible to receive additional language services based on their language proficiency in English. d/Dhh children who use a combination of sign and/or spoken languages and come from a home where a language other than English is spoken have been referred to as d/Deaf and hard of hearing multilingual learners (d/DMLs) [5,7,8]. Hearing children who experience challenges in English that are associated with their native language or language environment are labeled "English learners" (ELs) [31]. Children who are

designated as ELs are typically eligible for English as a Second Language (ESL) services. d/DMLs are not necessarily served through ESL services, as each school and/or district may have different policies on how to identify and serve d/Dhh children with home language diversity. Currently, there is very little understanding about how d/DML children are identified or served in ESL programs [5,7].

Many of the assessments used to determine language proficiency for ESL services are standardized. Typically, an individualized standardized assessment is used for eligibility purposes, and then the child is monitored annually for progress. The progress monitoring approaches widely vary from state-to-state, but the ACCESS (Assessing Comprehension and Communication in English State-to-State) test is a popular standardized measure of language proficiency used across the country. Many of the standardized assessments are limited in their use with d/DML children, however, as two of the major assessment constructs focus on speaking and listening skills that may be inappropriate for children who have a hearing loss [5].

For a comprehensive language profile for children who are DMLs, it is necessary to go beyond the use of standardized tests. Informal assessments have been recognized for their ability to meet the developmental, cultural, and linguistic needs of children from diverse language backgrounds [14,15]. It is important that educators reflect on their own personal biases with regard to language and culture when conducting informal assessments of DMLs' language and literacy skills, as these biases may inadvertently influence the administration and interpretation of the assessments at hand [15]. Unfortunately, many professionals may be unaware of the hidden biases they may be expressing through the assessment referral, administration, and interpretation phases of the process. By consulting with various experts on language diversity within and outside of the d/Dhh field, the teacher, psychologist or other specialist may be able to seek support in reducing bias in their individual assessments of children [15].

4.3. Assessment for Accountability

Program accountability is important to the cycle of teaching and learning of children, as it gauges the extent to which programs are meeting their intended goal of student learning [15,24,32]. While assessments used for program accountability are standardized, they are different than the types of standardized assessments used to identify students for services. Assessment for accountability typically uses a large-scale summative standardized assessment that is centralized for scoring and reporting purposes. The goal of these assessments is to "have a uniform, efficient, and valid method of measuring schools' progress in developing student knowledge" [24] (pp. 462–463). Another important difference in standardized assessment for accountability is that assessments can "examine a more narrowly focused or limited set of indicators" rather than assessing the "full range and depth" of functioning necessary for other purposes of assessment [15] (p. 29). In the United States, these assessments are commonly administered at the state level, but are reported on using a standard procedure that determines whether the school or district has met predetermined benchmarks [24]. The three notable exceptions of accountability assessments used across states are the PARCC (Partnership for Assessment of Readiness for College and Careers) and SBAC (Smarter Balanced Assessment Consortium) tests of the common core state standards and the ACCESS (Assessing Comprehension and Communication in English State-to-State) testing for English learners (ELs) to monitor language proficiency.

The combination of these factors creates a high-stakes testing environment for children in U.S. schools [24]. Some states, such as Florida, are even using these accountability data to evaluate teachers' performance through value-added models, extending these high stakes to teachers as well [33–36]. Given the associated risks for teachers and children, it is imperative that states and districts employ best practices when conducting accountability assessment. High-quality assessment for accountability reflects the program goals, as "accountability depends on a clear assessment process—one with alignment between state policies and teacher practice" [24] (p. 484). Specifically, assessment for accountability should be aligned with the curriculum used for instruction. Without curriculum–test

alignment, "the strength of the relationship between schooling and test scores is diminished" [18] (p. 10).

Effective accountability measures should also ensure that special populations, including children who have disabilities or are linguistically diverse, are "meaningfully represented in the accountability frameworks" [24] (p. 476). Unfortunately, even special education law has recognized that "technical standards have not been established for the inclusion of special populations in academic assessment programs, which threatens the legitimacy of test-based accountability for all students" [18] (p. 2). Group characteristics of bilingual learners are also underrepresented in accountability frameworks, as "state standardized assessments were not designed to measure achievement in students without grade level English proficiency and academic preparation" [24] (p. 485).

For d/Dhh children who use ASL, there are an insufficient number of state tests that are available in their primary language because "systematically developed and standardized ASL presentations of state and district wide assessments remain unavailable from test developers and vendors" (p. 3) [18]. In fact, only South Carolina has undertaken the task of creating statewide assessments available in ASL [37]. This is problematic, as assessment in the instructional language is considered the standard of care for accountability purposes [32]. Therefore, children who are d/Dhh regularly participate in these accountability assessments; however, many need accommodations to access test content [24]. Although accommodations can help establish equity in the test session, the low-incidence nature of the d/Dhh population, the wide geographical differences in numbers of d/Dhh children, and the unique cultural and linguistic characteristics in d/Dhh programs make accountability assessment complex and ever evolving [24].

4.4. Monitor Trends and Evaluate Programs

The final purpose of assessment is for research and evaluation purposes. For basic and applied research to provide useful information, the assessments used in the investigations need to be high quality, specific to the purpose of the study, and targeted to the population being examined. The tests used for research and evaluation are typically a combination of standardized assessment, performance-based assessment, and researcher-designed tests.

As there are few testing companies creating tests specifically for d/Dhh children, researcher-designed tests are an opportunity for d/Dhh children to have tests created with their specific needs in mind. This is particularly important for tests of sign languages, as it provides the opportunity to consider the sign language features during test development and reduce the linguistic biases introduced through translation. Research with the aim of creating assessments and the sharing of assessments that are byproducts of larger research goals would both be beneficial to the greater academic community and understandings of d/Dhh children's language development and learning.

Program evaluation shares a common objective with assessment for accountability—to determine the extent to which program goals are being realized for children [15,32]. However, program evaluation can take many forms and does not solely rely on large-scale standardized assessments to achieve its aims. In fact, much of program evaluation is conducted "within the context of the broader academic research community," which allows for varied approaches to examining the effectiveness of programs [15] (p. 31). For d/Dhh children, program evaluation typically concerns the effectiveness of intervention programs. One key aspect of evaluating interventions is the focus on implementation science to ensure the program is being delivered as intended [38]. Therefore, strong intervention research needs to employ assessments of fidelity and quality with clear connections to child learning outcomes in language and literacy [38].

5. Factors in Assessing Sign, Spoken, and Written Languages

There is no one assessment that can provide a comprehensive portrait of a child's language and literacy abilities. A combination of assessment approaches is often used to determine the language and

literacy skills of individual or groups of d/Dhh children. These measures need to be selected with care to reduce inherent biases and establish validity.

Every language has its own distinct features and components. The assessment of various languages, therefore, requires the consideration of the unique assessment conditions related to each language being assessed. For the purposes of this next section, an overview of the factors involved in the assessment of sign, spoken, and written languages will be presented. For each language area, the availability of language assessments, aspects of language that need to be assessed for d/Dhh children, and individualized needs based on language modality will be addressed.

5.1. Sign Languages

There are a small number of formal assessments that can address language proficiency in sign languages (see Singleton, & Suppella [39] and Henner, Novogrodsky, Reis, & Hoffmeister [40] for more information about specific assessments available). In the United States, the number of available ASL assessments are limited due to challenges in creating tests that can adequately account for the linguistic features of ASL [41], the need for examiners to be highly trained and have strong language skills [42–44], and prohibitive costs associated with purchasing standardized tests and training examiners on those tests [40]. Although these assessments are not as widely available as necessary, it is important to attempt to use one of these formal assessments, as they are able to provide scores with higher levels of validity and reliability [40].

Assessments of sign language should be conducted by an examiner with the requisite language skills to adequately administer the test and interpret the scores [39]. Formal ASL assessments are beneficial in determining conventional language skills; however, they may have limitations in assessing the language skills of children who use constructed sign systems in their classrooms [40]. Therefore, the examiner should also be proficient in the regional and local sign systems used in the school context [4].

Given the small number of formal assessments that are available to examine sign languages and the need for the ongoing monitoring of sign language development, informal assessment can add a layer of understanding about a child's sign language proficiency. The Naturalistic Assessment of children's language and video portfolios are particularly useful to supplement standardized tests of sign language. In addition, one promising strategy to track the language learning of d/Dhh children who use ASL is to conduct Standards-Based Assessment using the Gallaudet K–12 ASL Content Standards [45]. These standards outline the types of ASL competencies that children should be learning across grade level bands. Educators are able to examine a child's ASL skill levels in relation to the types, functions, and structures of ASL that are considered age appropriate as a way to measure current levels and monitor learning.

While the assessment of conventional sign language development is necessary for our signing d/Dhh children, it is also important to capture the functional sign communication strategies children use as well. The documentation of home signs, or gestural communication systems used in the home, is necessary to understand the full communicative competency and repertoire of a d/Dhh child [46]. These sign systems may include some properties of conventional language but are not complete [47]. By examining the functional communication of the d/Dhh child in the home, a comprehensive portrait of their sign language understanding and use is possible.

5.2. Spoken Languages

The assessment of spoken language is necessary for all d/Dhh children who use spoken language. It is important to examine a child's audiogram and language background to inform the use of spoken language testing. The administration of spoken language assessments should always be conducted with caution, however, as the hearing loss may adversely affect their performance due to a lack of access to test content [13]. If a spoken language assessment is being attempted and the child is unable to participate, the examiner should terminate the testing session.

For children who will benefit from spoken language assessments, including those who exclusively use spoken language, there are conditions for conducting the assessment that strengthen the assessment, its findings, and conclusions. First, all children should be using all hearing technology when being assessed in a spoken language. Second, the testing environment should be acoustically vetted to ensure the background noise, reverberation, auditory or visual distractions, and general comfort levels can be maintained throughout the test session. Third, these assessments should be conducted by someone who is familiar with the child's personal speech characteristics when possible [4]. Fourth, collaboration with a speech and language specialist may assist in the appropriate assessment of spoken language skills. Finally, accommodations are especially helpful when conducting the formal assessment of spoken language skills for d/Dhh children.

For children who are d/DMLs, the assessment of home language abilities is also important, which is most often a spoken language. As with signed languages, there are limited spoken language assessments available in languages other than English and limited examiners with the requisite language skills to conduct these assessments. Although the issues pertaining to crossing modalities in translation (spoken to sign) do not apply for home languages, translation remains an issue, as semantic equivalence still needs to be established. For example, a common word in one language may translate into a more complicated word in the new language, or the reverse may be true.

5.3. Written Languages

The assessment of written languages includes both reading and writing skills. When assessing reading and writing skills, all test directions should be given in the child's most proficient language. Once again, if a translation of the test directions or content is needed, care must be taken to not modify or substitute the target skill being assessed. For example, a child who uses a sign language to dictate an essay will not be able to be assessed on her/his writing conventions, as she/he is engaging in aspects of writing (e.g., content and ideas), but not the conventions themselves. To provide a score for conventions in this scenario would be a significant modification of test content for this child.

For reading, it is important to examine d/Dhh children's test-based and knowledge-based skills. Text-based skills include letter and word recognition, decoding unfamiliar words, and automaticity in consuming print, while knowledge-based skills include meaning-making and comprehension [48]. While text-based skills are essential for a child to access the print in front of them, they are not sufficient for a child to understand what she/he is reading without the knowledge-based skills necessary to support comprehension [49]. Given the reciprocal relationship between language and literacy development, knowledge-based skills can be developed through the use of sign or spoken languages alongside, or even in the absence of, the print components of literacy.

The assessment of writing skills includes aspects of writing conventions (e.g., grammar) and conveying meaning (e.g., organization, content, etc.). For d/Dhh children, there are four major considerations for the assessment of writing. First, examiners should not let writing conventions overshadow the other aspects of writing, as they are typical areas of difficulty for d/Dhh children [50,51] and may unduly affect the overall score on a holistic writing assessment [52]. Second, writing assessments that require too much reading may also negatively affect a child's writing score. The selection of an assessment that does not create a burden due to the amount of reading it requires, or the use of accommodations when the amount of reading is excessive, may be necessary to capture a child's true writing abilities. Third, it is hard to establish interrater reliability for formal writing assessments, even when the criteria are detailed [52]. Finally, informal assessments are needed to provide detailed information about a child's present levels of writing skills, create writing goals, and to continually monitor writing improvement over time.

6. Conclusions and Recommendations

The diversity and variability of language exposure and use for d/Dhh children make assessing the language and literacy development of d/Dhh children challenging. These unique needs for language,

culture, and learning must be considered when planning, conducting, and interpreting assessment data for this population. As there are many approaches to assessment that may be used for a child who is d/Dhh, care must be taken in the test selection process to match the child's needs. While no two d/Dhh children will be exactly alike, some broad recommendations can assist examiners and educators in selecting assessment approaches that increase the validity and usefulness of assessment data, while reducing unnecessary biases inherent in the assessment conditions:

- The child's language background is important in determining the language of the assessment, including what language resources may be needed for a successful assessment (e.g., ancillary examiner or interpreter). The language match between the child and the examiner is especially important in reducing linguistic bias in the assessment.
- Multiple sources of assessment data are always needed for a comprehensive language and literacy assessment. The heterogeneous nature of the d/Dhh population will require multiple strategies, as more than one data point will increase the reliability of the assessment being conducted [33].
- The assessment approach needs to be vetted in terms of its strengths and weaknesses in assessing d/Dhh children but not decided based on those factors exclusively. There are many different formal and informal assessment approaches and tests that may be used with a child. There are factors that impact each approach to assessment related to hearing loss and language use for d/Dhh children. Although these factors can help to inform the selection process, the final approach should always be individualized to meet the specific child's needs at the time of the assessment.
- Assessment approaches should be viewed in light of the purpose of the assessment. Specific assessment approaches lend themselves to the various purposes of assessment better than others. It is important to consider the various purposes and how they are assessed for d/Dhh children when selecting approaches to be used in an assessment.
- The language being assessed matters for d/Dhh children. The availability of valid tests varies by the language being assessed. In addition, there are key aspects of language that pertain to sign, spoken, and written language that are important to consider when creating an assessment plan.

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