Diagnostic Evaluation of Children with Speech Sound Disorders

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Introduction

Diagnostic evaluation is a prime responsibility for speech-language pathologists (SLPs) in communication sciences and disorders. It is important to differentiate the diagnostic evaluation (the focus of this entry) from a screening procedure, which is conducted to provide preliminary information to determine if a more comprehensive examination is needed (Bernthal & Bankson, 2004; Hodson, 2007). In the assessment of a child with a primary Speech Sound Disorder (SSD), SLPs need to consider valid data from a thorough scientific investigation. Although an evaluation typically is the first step in diagnosing a child with SSD, it is important to keep in mind that "diagnosis is ongoing." Nonetheless, the initial assessment is an essential foundation. During this evaluation process, SLPs need to incorporate evidenced-based practices.

Major Considerations for Children with SSD

Children with SSD comprise the largest number of individuals on caseloads of school-based practitioners (ASHA, 2004). Generally these children fall into two major groups: (a) preschool children who have multiple errors and highly unintelligible speech, and (b) school-age children who have residual errors and minimal intelligibility concerns (e.g., Pascoe, Stackhouse, & Wells, 2006; Shriberg, 1994b; Shriberg, Tomblin, & McSweeny, 1999; Smit, 2004a; Smit, 2004b). Traditionally, children with SSD have been classified as having a disorder of articulation, apraxia, or phonology. The term, articulation, which refers to the process of producing speech sounds, often is used for children who experience difficulties with only a few speech sounds (e.g., /r/, lisp). Childhood apraxia, which refers to motor planning, is an extremely popular label and is used by some practitioners to refer to all children with intelligibility issues. The descriptor currently preferred by the American Speech-Language-Hearing Association (ASHA) is "suspected Childhood Apraxia of Speech" because there are no agreed upon definitive criteria for diagnosing apraxia at this time (Shriberg & Campbell, 2002). Phonology refers to the sound system of a language. Children with a phonological impairment demonstrate phonological deviations (e.g., cluster reduction) involving more than one sound in a phonological pattern (e.g., /s/ clusters). In most cases, the term articulation is used by SLPs to refer to mild/moderate SSD, whereas apraxic and phonological labels are generally reserved for children with a more severe/profound SSD. It is not uncommon, however, for a child to be labeled as "artic," or "phonological," or "apraxic," simply due to a preference of the SLP rather than because of specific criteria. ASHA

currently recommends using “Speech Sound Disorders” as the “umbrella” term to encompass all types.

Key Research Questions

1. What are the goals of a diagnostic evaluation?
2. What evidence-based practices are available for evaluation of children with SSD?
3. What are major SSD evaluation issues?
4. What are future research needs?

Diagnostic Evaluation Goals

The diagnostic evaluation for clients with a communication disorder involves a problem-solving process (Tomblin, 2000). The primary goal is to determine if there is, in fact, a communication disorder. Typically, formal and informal methods are combined to collect data that reflect the child’s current level of functioning. Results from these methods are considered when formulating hypotheses (Bleile, 1995; Stackhouse & Wells, 1997). In this decision-making procedure, it is important to consider the client’s age, linguistic community, and existing conditions (e.g., possible hearing acuity fluctuations). If assessment results reveal communication skills below expectations, determining the level of severity (e.g., moderate, severe) is the second essential goal (Hodson, 2007). Because certain conditions may predispose, precipitate, perpetuate, or even exacerbate existing conditions, the third goal is to identify possible etiological factors. In certain cases, a referral may be necessary for additional testing (e.g., to an audiologist) or for possible treatment (e.g., to an otolaryngologist). A fourth goal of a diagnostic evaluation pertains to prognosis (potential for improvement; expected outcome), which must be considered when working on the fifth goal, a direction for intervention.

Evaluation of Children with SSD

A variety of opinions on “best practices” for the assessment and diagnosis of children with SSD exists (e.g., Bleile, 2002; Hodson, Scherz, & Strattman, 2002). Although each approach varies, all diagnostic evaluations contain similar components. SLPs, for example, unanimously agree on the desirability of collecting case history information (including medical records) prior to the evaluation. This allows SLPs to identify possible etiological factors (e.g., hearing) that need to be evaluated more thoroughly. At the time of assessment, SLPs often conduct a parent interview in order to clarify questions related to the client history as well as to obtain additional information. Careful selection of formal tests and informal procedures that yield appropriate diagnostic information is crucial.

Assessment of speech sounds/patterns

The essential requirements for assessing SSD, which parallel general diagnostic evaluation goals, include obtaining the following information: (a) child’s phonological strengths and weaknesses (inventories as well as phonological deviations), (b) severity level, (c) stimulability information, (d) direction for intervention, and (e) measures that document changes/progress following intervention (Hodson, 2007). Most SSD tests

obtain single word samples elicited by naming pictures (e.g., *Goldman Fristoe Test of Articulation*, Goldman & Fristoe, 2000) or objects (*Hodson Assessment of Phonological Patterns*, HAPP-3, Hodson, 2004). The *Percentage of Consonants Correct* (PCC; Shriberg & Kwiatkowski, 1980) involves analyzing continuous speech samples. Lowe (1995) advocates using sentence imitation in phonological assessment. Several computer software programs also are available to assist in the evaluation process (e.g., *Computerized Articulation and Phonological Evaluation System*, Masterson, & Bernhardt, 2001; *Hodson Computerized Analysis of Phonological Patterns*, Hodson, 2003).

Additional considerations

Additional examination measures include: (a) language assessment (expressive and receptive), (b) evaluation of hearing, (c) oral mechanism screening, and (d) percentage of intelligible/understandable words. SLPs also are encouraged to incorporate metaphonological assessment because children with highly unintelligible speech often have accompanying difficulties in skills related to phonological awareness and literacy (Bird, Bishop & Freeman, 1995; Clarke-Klein & Hodson, 1995; Larrivee & Catts, 1999; Raitano, Pennington, Tunick, Boada, & Shriberg, 2004; Rvachew & Grawberg, 2006; Rvachew, Ohberg, Grawberg, & Heyding, 2003). According to the Critical Age Hypothesis (Bishop & Adams, 1990), literacy acquisition most likely will be compromised if children are not intelligible by age 5:6 (years:months).

Major SSD Evaluation Issues

Speech samples

Although the use of a continuous speech sample is advocated in research literature, some problems with this procedure are: (a) a continuous speech sample is usually more time consuming to collect and more difficult to transcribe, (b) unintelligible utterances cannot be analyzed, and (c) the range of phonemes attempted may be restricted (Stoel-Gammon & Dunn, 1985). Nonetheless, it is recommended that a continuous speech sample be obtained and recorded to use for comparison purposes later after the child's phonological system improves, even if the sample is too unintelligible to analyze during the initial assessment. Some issues also can occur with the use of sentence imitation. Imitation effects, for example, may be a problem. Moreover, some young children are unwilling to repeat sentences.

Scoring process

Most assessments (e.g., GFTA, PCC) do not differentiate types of deviations (omission, substitution, distortion) in the overall scoring process. Thus distortions (e.g., lisp) receive the same weight as omissions in the final scores (total correct/incorrect) even though omissions have a much more adverse effect on intelligibility. As a result, children with very different phonological systems often receive the same scores. Moreover, progress may not be noted in such scores during post-treatment testing for a child who has replaced omissions through the course of treatment with substitutions or distortions. Differentiation of deviation types in final scores, therefore, is especially critical in the diagnosis of children with highly unintelligible speech (e.g., HAPP-3, Hodson, 2004).

Severity of involvement

Severity refers to the degree (mild, moderate, severe, profound) to which communication ability is below expectations. SLPs frequently use SSD assessment measures to make judgments about severity. Interestingly, severity has been one of the most neglected aspects of clinical phonology (Flipsen, Hammer, & Yost, 2005; Gordon-Brannan & Hodson, 2000). Most research reports, for example, do not include valid information regarding pre-intervention severity levels. Although various methods for designating severity exist (e.g., listener ratings), the most common method reported in the literature is the PCC. Some clinicians, however, have documented limitations regarding the PCC (Velleman, 2005; Rvachew, Nowak, & Cloutier, 2004).

Stimulability considerations

Stimulability testing, which is an integral component of the diagnostic process for children with SSD, is used by SLPs to identify potential prognostic factors. Stimulability has been recognized, for example, to be a reliable predictor of phoneme acquisition in spontaneous speech (Miccio, Elbert, & Forrest, 1999). Determining stimulability involves the elicitation of sounds (e.g., /s/) or word structures (e.g., /s/ cluster) not currently produced spontaneously by a child. If it is determined that a child cannot produce these sounds at the time of the stimulability testing, such sounds are called “nonstimulable.” Some researchers advocate targeting nonstimulable, later-acquired sounds (e.g., /spr/ cluster) first in intervention (Gierut, Morrisette, Hughes, & Rowland, 1996; Morrisette, Farris, & Gierut, 2006), whereas others incorporate different tools (e.g., distance metric approach) for determining targets for treatment that do not include the consideration of stimulability (Williams, 2006). Rvachew and Nowak (2001) found, however, that children demonstrate greater gains when stimulable, rather than nonstimulable, sounds are targeted. Accordingly, most SLPs factor stimulability into the SSD diagnostic evaluation (e.g., Hodson, 2006; Ingram & Ingram 2002; Müller, Ball, & Rutter, 2006).

Speech perception

SLPs also have studied the benefits of speech perception analysis. Although many SLPs do not evaluate speech perception during assessment of SSD, Rvachew, Rafaat, and Martin (1999) reported that treatment success may be predicted by perception skills as well as stimulability. It is recommended, therefore, that a speech perception analysis be included in the SSD evaluation. In the assessment of speech perception (e.g., *Speech Assessment and Interactive Learning System*; AVAAZ Innovations, 1994), children are asked to identify correct and incorrect representations of target words (Rvachew, 1999). If a child demonstrates difficulty with speech perception, such tasks need to be included in treatment (Rvachew, 1994; Rvachew, Nowak, & Cloutier, 2004).

Subgroupings and markers

The differentiation of children into subgroups (Broomfield & Dodd, 2004; Shriberg, 1994a) and the identification of SSD markers (Shriberg, Lewis, Tomblin, McSweeny, Karlsson, & Scheer, 2005) are other areas that are being studied. Some researchers, for example, have explored the genetic susceptibility of SSD (Lewis, Shriberg, Freebairn, Hansen, Stein, Taylor, & Iyengar, 2006) and hypothesized that a number of genes contribute to SSD. Baker (2006) noted, however, that there is little agreement on subgroupings and markers at this time.

Major Needs for Future Research

A great deal more research is needed in the area of SSD diagnostic evaluations. Large-scale experimental studies are needed to investigate severity ratings and also treatment planning and outcomes based on assessment data. In addition, results of various measures need to be compared before and after intervention to obtain critical data for evidence-based diagnostic evaluation practices.

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