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Facing a Clinical Challenge: Limited Empirical Support for Toddler Speech Sound Production Intervention Approaches

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ABSTRACT

Purpose: Speech sound production intervention in early childhood is relatively rare despite empirical and theoretical support for providing this type of targeted therapy for toddlers. Challenges perpetuate the present clinical condition including those related to treatment decision making (e.g., intervention approach).
Method: Although there are numerous speech sound production treatment approaches appropriate for the pediatric population, a much smaller proportion are proposed to be appropriate for children under the age of 3 years. Of these, five approaches (i.e., core vocabulary, cycles, naturalist recast, stimulability, and psycholinguistic intervention) were selected for review because they can be used to treat functional speech sound disorders produced by toddlers and none required additional clinician training for implementation.
Results: We found the empirical evidence supporting the use of these approaches with children under the age of 3 years scant to nonexistent.
Conclusions: Due to the lack of empirical evidence, early intervention speech-language pathologists must primarily rely on internal factors (e.g., clinician experience and client/caregiver perspectives) to support evidence-based intervention decisions in the absence of external empirical support. Clinical action steps such as careful documentation of approaches used/discontinued and associated individual client outcomes are necessary for evidence-based decision making until more robust empirical evidence is established.

Although speech-language pathologists (SLPs) treat many communication disorders with children under the age of 3 years, rarely do we assess and treat speech sound productions as the primary concern for early intervention services (Broomfield & Dodd, 2004a; Sosa, 2011). In fact, Broomfield and Dodd (2004a) noted that for 3- to 4-year-old children, speech sound evaluation referrals (inclusive of phonological and articulatory-related referrals) represented 60% of all pediatric speech sound referrals, whereas speech referrals for children aged 2 years and younger constituted only 8.7%. They indicated that this distinction was likely due to limited speech sound use in the early stages of language development for most children within this young age group (Broomfield & Dodd, 2004a). Additionally, Sosa (2011) noted that some young children with limited expressive vocabularies may not be able or willing to name pictures associated with standardized testing or to imitate an adult model on command. Consequently, clinicians may question the appropriateness of a speech referral given these circumstances and the possible presence of an expressive language delay (Sosa, 2011).

Despite current clinical practices and the associated rationale regarding limited intervention for speech sound productions prior to the age of 3 years, there is empirical evidence to support specifically addressing speech sound production in early intervention. Parents and SLPs reported that unintelligible young children had difficulty participating in many everyday activities that involved

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having conversations, relating to others, focusing their attention, handling stress, and learning (McCormack et al., 2010a), which indicated a need for early therapeutic intervention targeting speech sound production. Additionally, early intervention has been associated with positive outcomes for toddler speech sound productions (Girolametto et al., 1997; Munro et al., 2021). The toddlers in the study of Girolametto et al. (1997) broadened their speech sound inventories for both initial and final position consonants following intervention. For Munro et al. (2021), the consonant and vowel inventories of three toddler participants also increased following intervention. Furthermore, the goal of early intervention service provision is to develop functional communication skills (Paul & Roth, 2011), which includes skills specific to phonological development (Broomfield & Dodd, 2004a, 2005; Sosa, 2011).

There is also theoretical support for early speech sound production intervention. The assumed underlying causes of speech sound production errors (e.g., motor skill limitations that constrain accurate articulation, misperception of sounds and sound classes, and sound representations that differ from adult standards) are present prior to speech production proficiency (see Claessen et al., 2017; Hoffman & Schuckers, 1984; Stoel-Gammon & Dunn, 1985) and, as such, could be addressed therapeutically at an early age despite limited speech sound use. Also, consistent patterns of disordered speech sound production in 2-year-old children have been identified and reported (see Claessen et al., 2017; McLeod & Bleile, 2003; McIntosh & Dodd, 2008b; Williams & Elbert, 2003). This type of normative data allows for reliable peer comparisons that facilitate assessment and intervention justification.

Combined, empirical evidence and theoretical factors offer support for the identification and treatment of suspected speech sound disorders (SSDs) prior to the age of 3 years, prompting researchers to recommend a reconsideration of the conventional referral age for speech sound production deficits (Dodd, 2014; McIntosh & Dodd, 2008b; Sosa, 2011). Claessen et al. (2017) noted that early "intervention targeting emerging phonology may be more cost-efficient than targeting a well-established system" (p. 92), and Broomfield and Dodd (2005) concluded that "the earlier intervention can be provided for phonological disorder, the better the outcome" (p. 227).

Nevertheless, even though early therapeutic consideration of speech sound production skills appears warranted, clinical challenges remain that affect both assessment and intervention practices. The assessment challenges, which include issues such as limited information about the reliability of informal measures and inconsistences in recommendations for connected speech sampling size, have been previously reviewed (see DeVeney, 2019). However, a review of the challenges involved with the provision of speech sound production therapy as a primary aspect of early intervention has not been recently addressed from a clinical perspective. One major clinical challenge, determining an appropriate and evidence-based approach for SSD intervention, has not been thoroughly addressed despite the early and critical nature of this type of treatment decision (Kamhi, 2006).

There are not many SSD treatment approaches proposed to be appropriate for children under the age of 3 years (see Williams et al., 2021). Of those that are, the lack of empirical evidence supporting their use with this young population is a substantial clinical problem. Given the dearth of available evidence, early intervention SLPs must rely on internal sources of evidence to support evidence-based practice (EBP) decisions (American Speech-Language-Hearing Association, n.d.) until more external evidence is available. To facilitate SLPs' informed decision making in the face of limited scientific evidence, we first present three case examples of toddlers who may benefit from speech sound production therapy so that the reader can envision and consider young children for whom a primary emphasis on speech sounds from an early age may be suitable. Then, we review five speech sound production therapy approaches generally deemed appropriate for implementation with 2-year-old children and summarize the empirical and theoretical support for the use of each with this young population, including their limitations for application. Finally, we offer recommendations for appropriate approaches an SLP could employ for the case examples to provide a guide for similar clinical practice decisions. In carefully considering these therapy approaches and their application to toddlers, we hope to provide clarity on this current practice challenge and offer suggestions for intervention decision making when little to no empirical support is available.

Case Examples

Case 1

Piper, a 2;3 (years;months) girl, was referred for a speech and language evaluation by the family pediatrician. Piper primarily produced consonant–vowel (CV) and consonant–vowel–consonant–vowel (CVCV) syllable combinations and reportedly omitted parts of words that made it difficult for her parents and older siblings to understand what she was saying.

The Preschool Language Scale–Fifth Edition (PLS-5; Zimmerman et al., 2011) was administered, and her auditory comprehension standard score of 100 was in the 50th percentile. Piper's expressive language skills were 1 *SD* below the mean with a standard score of 85. An oral peripheral exam was completed. Structure and function were unremarkable and adequate for speech sound production. An informal

language sample indicated decreased overall intelligibility due to limited consonant production. Her parents indicated an intelligibility level of less than 50% in known contexts with a familiar listener. The following phonological patterns were noted in regular use: backing (e.g., "gaw_" for "dog"; "buhk" for "bus"), final consonant deletions (e.g., "ka_" for "cat"), stopping of fricatives with stridency deletion present (e.g., "buhk" for "bus"), and reduplication of multisyllabic words (e.g., "baba" for "bottle"). Piper was stimulable for many consonant productions in isolation when provided moderate visual and verbal cues. The childcare provider reported that Piper frequently played alone, but she appeared to be a happy and kind child. However, both Piper's parents and the childcare provider noted that she often showed frustration and experienced frequent communication failures throughout a typical day.

Case 2

Frisco, a 26-month-old boy, was referred for a speech and language evaluation due to his limited use of verbal communication. Frisco had a history of otitis media and had pressure equalization tubes placed 2 months prior to his referral. Frisco used gestures, grunts, and whining to communicate and independently produced few words verbally without prompting (e.g., "mom," "dad," "no," "bye," and "up"). The Receptive–Expressive Emergent Language Test–Fourth Edition (Brown et al., 2020) was administered to determine his language development status. He obtained a language ability score in the below average range.

Frisco was administered the Goldman-Fristoe Test of Articulation–Third Edition (GFTA-3; Goldman & Fristoe, 2015) and obtained a standard score < 50 on the measure. He was observed to regularly omit initial and final consonants (e.g., "–/t," "–/k," "–/f") in single word productions. Frisco followed simple commands and was creative in communicating through alternative means like gestures and facial expression.

Case 3

Nash, a 2;6 boy with a history of ankyloglossia (tongue tie) that was remediated with surgery, was born at 27 weeks and had a bilingual background in which both Spanish and English were routinely spoken in the home. Nash demonstrated a total score of 0.63 on the Alberta Language and Development Questionnaire (Paradis et al., 2010), representing a score that is 1.5 *SD*s below the mean and indicating a profile consistent with children who have language impairment. Other testing and observations revealed that Nash demonstrated limited expressive language in both English and Spanish, but he had adequate receptive skills in both languages. Nash demonstrated the consistent use of final consonant deletion as a phonological pattern, but this use was considered language appropriate given the limited final consonants represented in Spanish words. No other phonological patterns were used consistently, and intelligibility with a known listener and an unknown topic was judged to be appropriate for his age.

Speech Sound Production Therapy Approaches for 2-Year-Old Children

Below, we characterize five approaches to speech sound production intervention purported to be appropriate for addressing speech sound production deficits with 2-year-old children, such as those presented in the case examples above. These five intervention approaches were selected for review because all are used for treating functional SSDs produced by toddlers (as well as older pediatric populations) and are readily available for clinical use without additional training requirements. Other approaches were considered that have also been reported to be appropriate for 2-year-olds. However, these approaches were not included because either they required additional clinician training (i.e., the Prompts for Restructuring Oral Muscular Phonetic Targets approach requires between 2 and 5 years of extensive clinician training for certification; see Hayden et al., 2021) or the approaches were specific to an organic etiology of SSDs such as childhood apraxia of speech (CAS; i.e., the Dynamic Temporal and Tactile Cueing approach; see Strand, 2021).

The characterization of each selected approach (i.e., core vocabulary, cycles, naturalist recast, stimulability, and psycholinguistic intervention) includes a general overview of its key components and theoretical foundations, a basic description of the procedures involved with implementation, a review of the empirical evidence base supporting its use with 2-year-olds, and potential limitations to its use with this target population. Each approach and its key components are summarized in Table 1 along with a brief review of the empirical evidence base inclusive of 2-year-old participants.

Core Vocabulary

Core vocabulary, an intervention approach designed for children who exhibit a functional SSD characterized by inconsistent productions that negatively influence intelligibility, utilizes a whole-word therapeutic focus to establish consistent word productions of a small set of targeted vocabulary (Crosbie et al., 2021; Dodd & Bradford, 2000; Dodd & Lacono, 1989). The theoretical foundation for this approach is grounded in the early-word learning hypotheses expressed by Ferguson and Farwell (1975) and Ingram (1976), who

Table 1. Overview of speech sound production approaches and the publicly available, peer-reviewed empirical evidence base for use with children under 3 years of age.

Approach	Key components	Empirical evidence to support use with 2-year-old children
Core vocabulary	• Focus on a small vocabulary set of individualized, high-frequency, functional words. • Goal is to produce words with a developmentally appropriate and consistent manner rather than target accuracy specifically.	Dodd et al. (1994): The use of core vocabular intervention was trialed with nine children with Down syndrome ranging in age from 2 to 6 years, including two children aged 2;2 and 2;11 (years;months).
Cycles approach	• "Cycle" through targeted phonological patterns such that each phoneme within a pattern is eventually addressed. • Phonemes that do not emerge in conversation are "recycled" and targeted again later. • New target phonemes are introduced before previously targeted phonemes have emerged in conversational use.	Almost & Rosenbaum (1998): Participant data were presented in aggregate by group but included at least two participants 33 months of age (age 2;9).
Naturalistic recasts	• Focus on the meaning of the child's message and adult's corrected repetition of the erred utterance with accurate speech production. • It uses conversational recast and expansion. • It is a flexibility-driven and naturalistic framework.	Camarata et al. (2006): It is possible but unlikely that this study included 2-year-old participants based on aggregated participant age information reported. Yoder et al. (2005): It is possible but unlikely that this study included 2-year-old participants based on aggregated participant age information reported.
Psycholinguistic intervention	• It is a holistic clinical framework emphasizing speech sound perception and processing, as well as speech output, phonological awareness, and literacy. • It is not a stand-alone intervention approach; it is used in conjunction with other treatment strategies.	Pascoe et al. (2016): This is a study with two 2-year-old children who were reportedly typically developing and acquiring the isiXhosa language. Stackhouse & Wells (1993): This is case study of one child with speech sound disorder from age 2;10–9;8, but majority focused on assessment and intervention tasks conducted beyond the age of 2 years.
Stimulability approach	• It is a short-term, transitional intervention for nonstimulable speech sounds. • Aim is to increase target sound stimulability.	No empirical evidence available for this age group.

noted the importance of broad, holistic whole-word learning in early phonological development that occurs prior to a reorganization of lexical units into more of a segment-based system as children get older. This shift to segmental rather than whole-word speech processing and storage seems to occur by age 2 years for most children; however, for children who continue to produce inconsistent speech errors in the absence of known etiological factors such as CAS, a focus on whole-word learning is deemed facilitative for increasing consistency of target word productions (Crosbie et al., 2021; Dodd & Bradford, 2000).

Key components of core vocabulary intervention include (a) a focus on a small vocabulary set of individualized, high-frequency, functional words and (b) a therapeutic goal of producing these words in a developmentally appropriate and consistent manner rather than targeting their accurate productions explicitly (Crosbie et al., 2005, 2021; Dodd & Bradford, 2000). Using these tenets, proponents of core vocabulary intervention maintain that this approach does not target surface error patterns or discrete phonetic features but instead addresses underlying phonological planning deficits (Crosbie et al., 2005). Such that, after consistency of whole-word productions is established and the child's phonological planning system is presumably stabilized, introduction to cognitive–linguistic approaches for speech sound remediation may be warranted for further speech sound production improvements (Dodd & Bradford, 2000).

To implement core vocabulary therapy, SLPs must first determine the nature of a child's speech sound deficit and indicate whether the deficit reflects an inconsistent phonological disorder (IPD; Dodd, 2014). This can be accomplished by following assessment procedures indicated by Crosbie et al. (2021) and/or those described by Hemsley and Holm (2017) for a child from a diverse cultural–linguistic background. Crosbie et al. (2021) recommended inclusion of a hearing assessment, oral–motor examination, stimulability probe, connected speech sample, and assessment of intelligibility and an examination of inconsistent productions using, for example, the inconsistency subtest of the Diagnostic Evaluation of Articulation and Phonology (DEAP; Dodd et al., 2002). If IPD is determined, clinicians may move forward with core vocabulary therapy by involving the child's family and teachers

in the generation of a 70-word corpus in which target words are selected based on their frequent and functional use by the child. The active involvement of caregivers and educators is salient to the core vocabulary approach (Crosbie et al., 2021). Following the collaborative generation of a target vocabulary list, Crosbie et al. (2021) recommended the clinician to initiate therapy sessions that typically occur twice a week for 30 min each. Up to 10 randomly selected words from the list are targeted at a time. During the first weekly session, the clinician would work with the child to elicit the child's best, although not necessarily accurate, production of each word by using a wide variety of intervention techniques (e.g., placement cues, syllable segmentation cues, imitation, and specific feedback on productions). Multiple productions are then elicited repeatedly and practiced during the remainder of the session through drill and drill–play type of activities. Caregivers and educators are encouraged to consistently target these best productions between sessions daily. In the next therapy session, the clinician would have the child produce each target word 3 times as well as a set of 10 untreated words for generalization monitoring every 2 weeks. Words that are produced the same during each of the three distinct trials are removed from the targeted list, and new, untreated words are added until 8 weeks of therapy (16 half-hour sessions) are completed (Crosbie et al., 2021).

The existence of IPD and the use of core vocabulary to treat it have been extensively studied in children 3 years of age and older (see Crosbie et al., 2005, 2006; Dodd & Bradford, 2000; Dodd & Lacono, 1989; Flanagan & Ttofari-Ecen, 2018; McIntosh & Dodd, 2008a). Additionally, researchers have explored IPD and core vocabulary use with children 3 years of age and older representing special populations such as children with hearing deficits (see Herman et al., 2015), children with Down syndrome (see Dodd et al., 1994), and children from culturally–linguistically diverse backgrounds (see Hemsley & Holm, 2017; Holm & Dodd, 1999). However, although proponents of the approach note its suitability for use with children 2 years of age and older (Crosbie et al., 2021), scant research is available regarding its successful implementation with 2-year-olds specifically.

Broomfield and Dodd (2004b) studied 1,100 children with the aim of describing subtypes of SSD for children with functional speech disorders in the absence of hearing deficits and learning and/or physical disabilities. In this study of SSD subtypes, children 0–2 years of age were represented by three participants, all of whom were indicated as demonstrating phonological delay. For 2- to 3-year-olds, represented by 25 participants, the children were reported to demonstrate phonological delay and/or consistent phonological disorders (Broomfield & Dodd, 2004b). It was not until the 3- to 4-year-old age range that children began to be identified as demonstrating IPD (Broomfield & Dodd, 2004b), the clinical SSD subtype for which the core vocabulary approach is recommended (Crosbie et al., 2021). Dodd et al. (1994) successfully trialed the use of core vocabulary intervention with nine children with Down syndrome ranging from 2 to 6 years of age. Although the study represented only a limited sample of children in the 2-year-old range (n = 2; aged 2;2 and 2;11), it does offer some narrow support for the use of core vocabulary with 2-year-old children.

A complicating factor for the use of core vocabulary with children as young as 2 years of age is the typical variability that is often exhibited by young children across multiple productions of the same word. This "intraword variability," defined as "multiple tokens of the same word produced differently at the same point in time (same chronological age, recording session, etc.)" (Sosa & Stoel-Gammon, 2006, p. 32), has been recognized by researchers in young children with typical development (Kim & Ha, 2016; Sosa, 2015; Sosa & Stoel-Gammon, 2006). Therefore, potentially, intraword variability could be misidentified as IPD for some children in determining their candidacy for the core vocabulary approach. Intraword variability has been noted as a limitation in assessing the speech sound productions of 2-year-olds (DeVeney, 2019). Sosa (2015) urged caution in using variable productions as an indication of SSD subtype even though typical intraword variability tends to gradually decrease with age from 2 to 3 years. Holm et al. (2007a) attempted to address the differentiation between typical intraword production variability and inconsistent productions by describing and quantifying word production consistency across children with typical development. However, the ages targeted in their study ranged from 3;0 to 6;11; therefore, the study did not resolve potential clinical confusion for assessing and treating speech production variability in 2-year-olds. Crosbie et al. (2021) recommended use of the DEAP (Dodd et al., 2002) for determination of inconsistent productions; however, this assessment tool is not normed for use with children 2 years old and younger. Crosbie et al. (2021) also recommended completion of a phoneme substitution matrix to visually depict the variability present in a child's speech sound substitutions, inclusive of target consonants and the child's productions when attempting to produce these consonants. The phoneme substitution matrix, as means to document inconsistent productions, could potentially be used with toddlers, but empirical evidence supporting its use with toddlers is absent.

Overall, the evidence base for core vocabulary therapy use is fairly robust with pediatric clinical populations 3 years of age and older, but the intervention should be implemented with caution when working with children younger than 3 years of age. For 2-year-olds, the empirical research evidence is scant. There is also the potential

for confusion between typical variability in word production and inconsistent productions that typify disordered speech for determining the presence of IPD and implementation of core vocabulary therapy.

Cycles Approach

The cycles approach (Hodson & Paden 1983, 1991) is designed for children with highly unintelligible speech (typically less than 20% intelligible) presenting with severe phonologically based deficits, but who are stimulable for deficient sound productions within phonological patterns (Prezas et al., 2021). The approach involves "cycling" through targeted phonological patterns such that each phoneme within a pattern is addressed for about 60 min per week. In this manner, different patterns are targeted, and two to four patterns can be addressed in a 10- to 15-week period (i.e., cycle; Prezas et al., 2021). Phonemes that do not emerge in regular use at the conversational level are then "recycled" and targeted again later in successive sessions (Prezas et al., 2021). A distinguishing feature of the approach is that new target phonemes are introduced before previously targeted phonemes have emerged in conversational use (Hassink & Wendt, 2010).

There are several theoretical notions that underly the cycles approach. One of these is Vygotsky's Zone of Proximal Development (ZPD; Vygotsky 1962, 1978, as cited in the study of Shabani et al., 2010). Shabani et al. (2010) discussed the educational implications of Vygotsky's ZPD for learning progression and the need for adult (or capable peer) facilitation so that a learner continues to the next attainable level of instruction with educational tasks slightly more difficult than what the learner could accomplish without assistance. In the cycles approach, targeting stimulable sounds within phonological patterns and providing continued auditory input to the child with the aim of facilitating the eventual production of nonstimulable sounds within the patterns are viewed as being within the child's ZPD (Prezas et al., 2021). Additionally, cycles approach proponents note its incorporation of the dynamic systems theory (see van Geert, 1991) because it incorporates complex structure emergence. Specifically, the cycles approach addresses the complex structure of speech sound production development and sound production mastery that occurs during phonological intervention (Prezas et al., 2021). Furthermore, proponents of the cycles approach note up to eight underlying tenets of speech sound development and intervention on which implementation of the approach is grounded (e.g., phonological development is gradual and speech perception is important for typically hearing children to acquire speech sounds through listening; for descriptions of each tenet, see Hodson, 1997, McLeod & Baker, 2017, or Prezas et al., 2021).

Before implementing, clinicians identify a child's use of phonological patterns and determine the stimulability of phonemes associated with pattern use during the assessment process. Prezas et al. (2021) recommended elicitation of single words through standardized assessments such as the Hodson Assessment of Phonological Patterns–Third Edition (Hodson, 2004), which was specifically designed for administration with children who exhibit highly unintelligible speech. Although normative data are only provided for ages 3–0 to 8–0 years, the assessment tool could be administered to children as young as 2 years of age and can be used to code and categorize phonological pattern usage, determine severity of impairment, and record stimulability of sound productions (Hodson, 2004). Patterns occurring at least 40% of the time are grouped and prioritized for intervention (Hodson & Paden, 1991). They are grouped as "primary" or "secondary" target patterns largely following a developmental approach and prioritized for inclusion in initial cycles according to general guidelines described by Hodson and Paden (1991). For instance, clinicians select patterns that involve the omission of word/syllable structures first, then those involving single-consonant omissions (e.g., initial-consonant deletion), followed by those involving posterior–anterior contrasts (e.g., velar fronting and backing), /s/ clusters, and liquids. For secondary patterns, to be addressed after all primary developing patterns have emerged, clinicians should consider patterns such as those involving voicing contrasts (e.g., prevocalic voicing), palatal productions (e.g., /ʃ/ and /tʃ/), and consonant clusters (e.g., /ɹ/−clusters, three-consonant clusters; Hodson, 2010; Hodson & Paden, 1991).

Following the determination of what to target and in what order, clinicians may begin cycles training, which involves speech perception training (with amplification) and an emphasis on speech productions within target patterns. Cycles should be implemented such that a child spends 2–6 hr (variable depending on the number of stimulable phonemes per pattern) on each primary pattern targeted (Hodson & Paden, 1991; Prezas et al., 2021). Overall, three to four cycles (30–40 hr of direct intervention) may be needed to achieve intelligibility (Prezas et al., 2021).

Proponents of the cycles approach note its appropriate use with children under the age of 3 years (e.g., Almost & Rosenbaum, 1998; Hodson, 2010; Hodson & Paden, 1991; Prezas et al., 2021). For children younger than 3 years of age, Hodson and Paden (1991) recommended an increased emphasis on "focused auditory input" (p. 107) in which there are no commands for the child to produce words or sounds; rather, target patterns are modeled and emphasized during parallel play, and other therapeutic activities and targeted primary patterns are cycled through as per usual (Hodson & Paden, 1991) with the exception that these session may be shortened to

30–45 min per week (Prezas et al., 2021). However, nearly all published studies available from peer-reviewed sources that were conducted to determine the efficacy of the cycles approach with and without modifications include only children 3 years of age and older (e.g., Churchill et al., 1988; Gillon, 2005; Gordon-Brannan et al., 1992; Hodson, 1983; Hodson et al., 1983, 1989; Montgomery & Bonderman, 1989; Rudolph & Wendt, 2014; Rvachew et al., 1999; Tyler et al., 1987; Tyler & Watterson, 1991). Additionally, various other studies have utilized the cycles approach or modified versions of it with a variety of pediatric participants, all of whom were 3 years of age or older (e.g., Conture et al., 1993; Harbers et al., 1999; MacLeod & Glaspey, 2014; Rvachew et al., 2004). An exception is the study conducted by Almost and Rosenbaum (1998) whose participant data were presented in aggregate by group but included at least two participants 33 months of age (age 2;9). Almost and Rosenbaum (1998) found measures of speech-language performance improved following the intervention. Hassink and Wendt (2010) classified the findings of Almost and Rosenbaum (1998) as "suggestive" of effectiveness for the cycles approach (p. 4). However, the study findings were presented as aggregated group data such that the individual performances of the 2-year-old participants are unknown. In addition to this study, there are expert opinions and narrative references that imply successful implementation of the cycles approach with 2-year-olds (see Hodson, 2010; Hodson & Paden, 1991; Prezas et al., 2021); however, detailed empirical data regarding 2-year-old participants publicly available in peer-reviewed sources are extremely limited.

Overall, evidence available regarding the use of the cycles approach, as well as modified versions of it, indicates that the approach is associated with speech intelligibility improvement (McLeod & Baker, 2017). In addition, the approach is widely used by clinicians working with preschool-age children (Brumbaugh & Smit, 2013). However, implementation with children younger than 3 years of age should be carefully considered given the lack of empirical evidence publicly available for this age group.

Naturalist Recast

The naturalistic recast approach is an SSD intervention designed for highly unintelligible children or children unable to attend or comprehend the language of instruction in traditional SSD intervention (Camarata, 2021). The approach focuses on the meaning of the child's message and an adult's corrected repetition of the erred utterance with accurate speech sound production. As such, the approach provides intervention at the lexicon or word level within a meaningful, functional context (Camarata, 1993, 2021). Naturalistic recast utilizes the SLP and/or caregivers' correct word pronunciation at the lexical level to target goals related to increasing intelligibility, comprehension, and sound production accuracy (Camarata, 2021).

To achieve these therapy goals, the naturalistic recast approach uses both conversational recast and expansion. Conversational recast involves restating a portion of the child's utterance and adding additional information, which includes semantic, phonological, and syntactical modeling (Cleave et al., 2015). In addition, conversational recast can change the purpose of the utterance from a statement to a question. An example of conversational recast is the child utterance "a tup" and the SLP or caregiver asking, "Is it a cup?" which provides the correctly modeled use of the /k/ pronunciation and other appropriate language-related information to the child. Conversely, expansion maintains the modality and semantic meaning of the child's original utterance (Cleave et al., 2015). For example, if the child stated, "I see a tat," the SLP or caregiver can restate, "I see a cat, too" with accurate speech sound production modeling (Cleave et al., 2015). The flexibility of the framework works well across linguistic and cultural differences and is optimal for individuals who may not benefit from direct imitation and drill approaches (Camarata, 2021).

The theoretical basis for the naturalistic recast approach is based on the timely comparison of correct and incorrect phoneme production in context (Camarata & Yoder, 2002). For example, if a child says "wain," their mother might nod and say "rain." The correct adult example provides timely and functional comparison of incorrect and correct productions. By providing the correct production, the child can cognitively compare the two productions (Cleave et al., 2015) at the whole-word level (Ingram & Ingram, 2001) and in real time. Thus, the "temporal proximity" and "semantic overlap of phonological knowledge" (Camarata, 2021, p. 341) are advantageous for unintelligible children to unconsciously contrast the phonological information between their utterance and the adult recast (Camarata & Yoder, 2002). The internal word knowledge or lexicon growth also creates expansion of the phonetic inventory (Stoel-Gammon, 1991). As a result, in the above example, the functional interaction coupled with the correct phonological production reinforces the internal lexicon and accuracy of the word "rain." In addition, the caregiver providing the target production supplied immediate feedback lessens the cognitive load and provides in-context models of correct productions (Camarata, 1993, 2021).

The "naturalistic" aspect of the approach encourages engagement and play. The approach can be utilized across cultures and languages because it resembles a natural caregiver–child relationship (Camarata, 1993, 2021). Conversely, nonconversational tasks that are decontextualized (i.e., imitation and drill tasks) can have an adverse

effect on a child's willingness to engage, communicate, and play and can also cause an increase in negative behaviors (Koegel et al., 1992). Therefore, explicit imitation and drill tasks are not included in this approach.

For implementation, assessment of speech sound production skills can be conducted with standardized instruments such as the GFTA-3 (Goldman & Fristoe, 2015) or the Woodcock-Camarata Articulation Battery (Woodcock et al., 2020) and spontaneous, conversational speech production sampling. For therapy, the approach can be utilized to target overall intelligibility and/or specific sound or sound class targets (Camarata, 2021). Structuring the therapy space with toys and books that contain targeted phonemes within the setting is helpful. Sessions should include data collection by SLPs or a trained listener when targeting specific phonemes; however, when implemented for intelligibility purposes, the approach can be implemented by parent/caregivers, teachers, and other adults who interact with the child (Camarata, 2021). Intentional yet functional and child-initiated conversation provides teachable moments to model target speech constructions within a context that facilitates and encourages conversation. The key elements are child initiation and adult recast of the correct production while focusing on the communication intent of the child, such that the child's communicative message is responded to appropriately within the adult recast provided. Biweekly assessments to check for progress are recommended as are progress updates from adults interacting with the child to monitor functional intelligibility gains (Camarata, 2021).

There is a solid foundation of evidence supporting the efficacy of the naturalistic recast approach for the pediatric population, particularly for children aged 3–7 years (see Bellon-Harn et al., 2004; Camarata, 1993; Camarata et al., 1994, 2006; Leonard et al., 2008; Smith & Camarata, 1999; Tyler et al., 2002; Yoder et al., 2005, 2016). However, the research foundation for children younger than 3 years of age is much more sparse, and specific inclusion of this age group is unclear. The few studies that may have included participants younger than 3 years of age, Yoder et al. (2005) and Camarata et al. (2006), did not target this population *per se* but may have included a small number of participants in this age range. However, because participant information for these studies was presented in group aggregates, it is difficult to determine if 2-year-olds were included in the studies. Although, their inclusion is unlikely given the group age means and standard deviations (e.g., participant mean ages by group were 44.3 and 43.2 months with standard deviations of 7.6 and 9.6 months in the study of Yoder et al., and the participant mean age was 5.7 years with a standard deviation of 1.3 years in the study of Camarata et al.). No other publicly available and peer-reviewed studies were found to focus on naturalistic recast and include 2-year-old participants.

Evidence supports the use of this approach with special pediatric populations such as children with Down syndrome (Yoder et al., 2016) and autism (Smith & Camarata, 1999), and the proponents of the approach hypothesized that toddlers would be appropriate candidates for its use as well given their developmental limitations in comprehension and metalinguistic competence that may limit the feasible implementation of more traditional speech sound production approaches (Camarata, 2021). Additionally, it seems logical that young children who are unable or unwilling to sit and attend for long periods of time and complete drill tasks (e.g., toddlers and children with developmental disorders) may benefit from a more play-based, flexible approach like naturalistic recasts (Camarata, 2021). However, for young children who may be minimally verbal and exhibiting SSD, this approach may have limited utility. Furthermore, the empirical evidence supporting the use of this approach with children under the age of 3 years is scant, at best, and likely, this approach has not been empirically tested for use with 2-year-old children.

Stimulability Approach

The stimulability approach (A. W. Miccio, 2005; A. W. Miccio & Ebert, 1996) was developed to facilitate the emergence of speech sounds absent in the phonetic inventories of children that cannot be produced even through imitation following instruction, cueing, and/or demonstration (i.e., nonstimulable sounds). This approach aims to be useful as a short-term, transitional intervention for nonstimulable speech sounds in children 2–4 years of age with limited phonetic inventories (M. W. Miccio & Williams, 2021). The purpose of the stimulability intervention approach is not for children to fully acquire or master absent sounds but for them to increase target sound stimulability, the "ability to immediately modify a speech production error when presented with an auditory or visual model" (A. W. Miccio, 2014, p. 177), so that sounds become easier to acquire in children with moderate to severe speech delays (M. W. Miccio & Williams, 2021). In essence, the aim of this approach is "'stimulating' stimulability" (Tyler & Macrae, 2010, p. 301). The limited repertoire of sounds for a young child results in highly unintelligible speech. Stimulability considers the accuracy demonstrated when complexity and other conditions of the sound production task are modified (Powell, 2003).

The clinical foundation for the stimulability approach to intervention dates to the 1950s when stimulability was used as an indicator for remediation outcomes (see Carter & Buck, 1958). Using stimulability probes for diagnostic purposes is common clinical practice (Paul, 2014), whether completed as part of a standardized test administration such as the stimulability task associated with the GFTA-3

(Goldman & Fristoe, 2015) or as an informal assessment task. Stimulability seems to provide evidence of the structural and functional integrity of the speech production mechanism under certain conditions (Powell & Miccio, 1996) leading to the notion that sounds that are more stimulable are more readily acquired and remediated with less time and frustration (Bleile, 2002).

According to McLeod and Baker (2017), the theoretical foundation of the stimulability approach is grounded in three main principles. First is the ability to perceive and produce speech are separate but related skills. Second is the complexity approach to target selection, which promotes targeting nonstimulable sounds rather than stimulable sounds, can be useful when working with young children to maximize treatment outcomes. Third is the use of multimodal cues (e.g., auditory, verbal, visual, and gestural) is beneficial for facilitating speech sound learning.

For implementation, the stimulability approach involves auditory and visual cueing to support the imitation of nonstimulable sounds (M. W. Miccio & Williams, 2021; Rvachew, 2005). In each session, all consonants in English are targeted except for /ʒ/, /ŋ/, and /ð/ such that 21 consonant phonemes are addressed per session (McLeod & Baker, 2017). Consequently, target selection is not a clinical consideration when using this approach because all consonant sounds (except for those noted above) are targeted (M. W. Miccio & Williams, 2021). Each consonant phoneme is associated with a character card that uses alliterative naming (e.g., "Putt-Putt Pig" for /p/) and gestural cues (e.g., skating gesture with hands) to elicit target phonemes (A. W. Miccio & Elbert, 1996; M. W. Miccio & Williams, 2021). After a stimulability probe is conducted with one third of the target sounds (i.e., seven of the 21 consonant phonemes addressed per session), the clinician reviews all the character cards, phonemes, and associated gestures with the child, incorporates them into play-based activities for much of the session (for description of play-based activities, see A. W. Miccio, 2005; A. W. Miccio & Elbert, 1996), and then concludes with a probe to assess generalization of targeted sounds to real words (M. W. Miccio & Williams, 2021, p. 297). In addition to phoneme elicitation aims, implementation of the stimulability approach also offers opportunities for pragmatic skill building (e.g., turn taking), preliteracy skill development (e.g., phoneme–grapheme exposure through character card use), early success, and encouragement (M. W. Miccio & Williams, 2021).

There is limited evidence for the use of the stimulability intervention approach overall (McLeod & Baker, 2017), and there is no empirical evidence for its use with 2-year-olds. The most noted studies are all individual case studies that involved a 3-year-old (A. W. Miccio & Elbert, 1996) and two 4-year-olds (A. W. Miccio, 2014, and Powell, 1996, respectively), and each case study indicated positive outcomes. For example, A. W. Miccio and Elbert (1996) and A. W. Miccio (2014) found that the intervention was successful in increasing the size of the phonetic inventory, as well as the number of sound productions for which the child was stimulable. Powell (1996) also noted increased complexity and range of syllable structures following stimulability intervention. Empirical research supporting the therapeutic use of targeting stimulable phonemes (Rvachew & Nowak, 2001) has been cited as supportive of the stimulability intervention approach (M. W. Miccio & Williams, 2021). Although the stimulability approach was designed for 2- to 4-year-olds according to M. W. Miccio and Williams (2021), there is a dearth in the available research literature regarding the direct use of this approach with 2-year-old children.

Psycholinguistic Intervention

The psycholinguistic intervention approach, devised by Stackhouse and Wells (1993, 2001), is essentially a way of holistically, comprehensively, and inclusively conceptualizing SSD treatment along with literacy development. The intervention is best utilized as a broad conceptual framework for approaching SSD therapy (Pascoe & Stackhouse, 2021) and is often described as a means to investigate, explain, and profile speech and literacy difficulties (Bowen, 2014). Proponents of the psycholinguistic intervention approach note that it can be used with any age including children as young as 2 years of age and implemented in individual or group therapy and delivered by SLPs, parents, or educational assistants (Pascoe & Stackhouse, 2021).

The model of Stackhouse and Well (1993) is based upon the notion that SSD is the result of failures in the processing of speech input, output, and/or internal lexical representations (i.e., storage; Pascoe & Stackhouse, 2021). Theoretical support for this therapeutic framework comes from the study of speech perception in which the prevailing principle is that speech perception (i.e., input) difficulties can result in speech production (i.e., output) difficulties (see Brosseau-Lapré & Schumaker, 2020; Stackhouse & Wells, 1997). The theory behind the speech processing system is based upon the interrelated neurological processing of semantic representation, the phonological components of words, motor speech planning, and grammatical and orthographic representations of a word (Pascoe & Stackhouse, 2021; Stackhouse & Wells, 1997). Together, these components elucidate the origins of speech sound production errors as being associated with input, storage, or output and link speech sound production to phonological awareness and literacy development (Pascoe & Stackhouse, 2021).

The first step in implementing the psycholinguistic approach is a comprehensive assessment. During the

assessment, the goal is to determine the area and level of breakdown in SSD including speech, lexical, and literacy skills. To do this, the assessment process must involve a variety of tasks (see Gardner, 2014, for a detailed description of potential assessment tasks) including those that can address aspects that are not always explicitly addressed in a typical SSD assessment process such as suprasegmental components including intonation and prosody (Stackhouse & Wells, 1993, 1997). The comprehensive assessment of sound production and processing along with lexical storage and retrieval provides a starting point for developing a psycholinguistic intervention plan (Stackhouse & Wells, 1997). Assessment of phonological awareness skills, auditory discrimination skills, and repetition of real and nonword are all recommended (Pascoe & Stackhouse, 2021) and may be completed comprehensively using an assessment tool such as the Compendium of Auditory and Speech Tasks (Stackhouse et al., 2007).

According to Pascoe and Stackhouse (2021), implementation of the psycholinguistic intervention is based upon the premise of working on the speech processing system holistically. Strengths and weaknesses related to speech processing skills are important to identify in the assessment process and utilize for intervention planning and goal setting. The use of minimal pair contrasts (Pascoe & Stackhouse, 2021) and/or auditory bombardment creates opportunities for the child to hear and comprehend contrasting sounds in meaningful contexts (Schaefer et al., 2016). It is important to plan treatment with phonological development in mind due to the interconnectedness of spoken language and phonological awareness (Schaefer et al., 2016). In addition, providing opportunities for the child to compare sounds, self-reflect on production errors and sound contrasts, practice auditory skills to become more familiar with contrasting sounds, experience new phonological patterns and nonsense words, make explicit links to literacy by emphasizing letter–sound correspondence, and promote generalization opportunities are included in the intervention framework (Pascoe & Stackhouse, 2021). However, not all of these techniques may be appropriate for implementation with a 2-year-old (e.g., self-reflection and letter–sound correspondence). Also of note, there are no special materials or equipment associated with the psycholinguistic approach. Rather, for young children, the therapy activities associated with this approach may be introduced through play-based interactions and are thought to be "in the head and hands" of the child, not associated with any new or specific materials (Pascoe & Stackhouse, 2021, p. 163).

There is empirical evidence, in general, to support the use of the psycholinguistic approach with pediatric populations (Pascoe et al., 2016; Stackhouse & Wells, 1993). However, most of the empirical support is evident for children aged 4–10 years (e.g. see Bryan & Howard, 1992; Ebbels, 2000; Hewlett et al., 1998; Pascoe et al., 2013; Spooner, 2002; Stackhouse et al., 2006; Stackhouse & Wells, 1993). Only a very limited indication of support for the effectiveness of the psycholinguistic approach with 2-year-olds is available. Pascoe et al. (2016) conducted a study with two 2-year-old children who were reportedly typically developing and acquiring the isiXhosa language. The use of repetition, naming tasks, and play-based activities were incorporated, and performance outcomes were measured in the study. This study was primarily exploratory in nature and did not represent children who presented with speech sound production issues or who were primary speakers of English (Pascoe et al., 2016), components most United States–based early intervention SLPs would be interested in for clinical application. Stackhouse and Wells (1993) conducted a descriptive study of a child with SSD and her speech and literacy development from the age of 2;10–9;8, the vast majority of which is focused on assessment and intervention tasks conducted after she was beyond the age of 2 years.

Application of the psycholinguistic framework to pediatric populations entails both drawbacks and strengths. A limitation to the psycholinguistic framework's use with young children is the assumption of a single lexical representation of speech. Instead, there are several representations that involve the way sounds are perceived (i.e., input), stored, and produced (i.e., output). The assumption of a single lexical representation does not necessarily separate the perception of phonological input from the revision of phonological productions (output) as a child acquires developmental phonemes (Hewlett et al., 1998). Hewlett et al. (1998) note that, rather, there may be two distinctive lexical representation systems: one for input representation and one for output. This dual-system representation would help explain a situation in which a child accurately perceives a word or sound auditorily and yet produces the word or sound inaccurately (e.g., perceive /kæt/ as "cat" in input and yet produce /tæ/ in output) or provide a rationale for why a child may produce a target sound more accurately in nonword (i.e., novel) stimuli repetitions than in repetitions of real words (Hewlett et al., 1998).

Another drawback to the psycholinguistic framework is that the nature of the approach is so broad, holistic, and abstract that it may be difficult for clinicians to adequately comprehend it for effective implement. It is primarily intended to encourage a different way of thinking about SSD treatment that emphasizes the interconnected features of speech input, storage, and output for application to speech and literacy intervention. However, strengths of psycholinguistic intervention are the malleability and ability to incorporate other treatment strategies in conjunction with the approach and application of the approach regardless of age or diagnosis (Pascoe & Stackhouse, 2021). Overall, much more information is needed regarding the application of the psycholinguistic

approach to children under 3 years of age who present with speech sound production deficits.

Implementation Recommendations for Speech Sound Intervention With 2-Year-Olds

Given the scarcity of empirical support available for children under the age of 3 years across all the intervention approaches reviewed, it is difficult to recommend an intervention approach for targeting speech sound productions with children in this young age group. Even though all were explicitly noted as being designed and/or applicable for use with this population, very few had been empirically investigated for use with toddlers such that the dissemination of results was noted in publicly available, peer-reviewed resources.

Several proponents of specific approaches have shared case studies as examples in the context of book chapters and narratives stating their expert opinions (e.g., Hodson, 2010; A. W. Miccio, 2014). Although expert opinion and case studies are often considered to be the lowest level of evidence-based hierarchies in most EBP descriptions (see Fey et al., 2014), they cannot substitute rigorous empirical testing (Fey et al., 2014) since they are prone to bias and should be viewed with skepticism until carefully evaluated through the research process (Dollaghan, 2004). SLPs are also encouraged to evaluate the level and quality of empirical evidence used for support, although all research study methodologies involving direct testing provide higher levels of EBP support for clinical utilization than expert opinion (Dollaghan, 2004; Fey et al., 2014).

At present, the lack of empirical evidence supporting the use of speech sound production intervention approaches with toddlers severely limits EBP decision making in this area for practicing clinicians. SLPs working in early intervention on speech production skills are encouraged to have a "healthy skepticism toward their own clinical practices" (Fey et al., 2014, p. 60) and acknowledge that successes they observe with young clients may not be due to clinical intervention, but rather to factors outside of clinician control such as inherent development due to maturation. As such, in terms of clinical action steps, SLPs are urged to maintain careful documentation of their clinical procedures, client progress, and goal outcomes and keep records of the intervention approaches they have utilized (Fey et al., 2014) and/or discontinued use of as a regular part of their clinical practice. Using these systematic methods, SLPs can refer to their own clinical experience as a means of providing rationale for why they are selecting a particular intervention approach.

Case Examples Revisited

We once again call attention to the case studies presented earlier. For each, we offer an intervention approach recommendation (see Table 2) along with supporting rationale for the decision based on theoretical perspectives and/or empirical evidence. As with many clinical practice issues in which empirical evidence as an EBP consideration is lacking, these recommendations are not the only possible approaches SLPs could consider and employ. Rather, they are suggested based solely on the review of the external empirical evidence currently available, not the internal factors that also lead to EBP.

Based on available yet scant empirical evidence, for Piper, we would recommend introducing the cycles approach to address her phonological pattern use and speech intelligibility improvement through focused attention on the emergence of consonant sound productions within sound production classes. Piper's functional communication is limited due to decreased intelligibility and number of errors making cycles an appropriate choice for functional communication. Theoretically, the incorporation of a child's individualized ZPD regarding the selection of phonological patterns targeted to facilitate the eventual production of nonstimulable sounds within these patterns would be relevant and of presumed benefit for Piper. This approach may be better suited for Piper rather than the core vocabulary approach given the nature of her SSD. It may be better suited for her rather than the stimulability approach because she was stimulable for many consonant productions when cued. For Frisco, as a suspected late talker, a psycholinguistic approach could be employed to address both his speech delay and language literacy development using a holistic and inclusive framework that emphasizes not only speech processing but also communicative importance through naturalistic means and flexible, play-based interactions. This approach may be a practical option in that it can be implemented by parents and is, therefore, amendable to the parent-coaching model often associated with early intervention service provision. From a theoretical standpoint, this approach could be appropriate for Frisco because it emphasizes the interconnectedness of speech sound production, phonological awareness, and literacy development, all of which need to be considered given Frisco's present language status. The psycholinguistic approach may be better suited for Frisco at this time than the naturalistic recast approach, for instance, as his limited verbal output could constrain opportunities to recast his utterances. In the case of Nash, the SLP would likely not focus on his speech sound productions as a primary intervention target at this time, but rather address language deficits primarily. This case was presented to illustrate the contrast between early intervention focuses. Once Nash begins using more expressive language in either or both ambient languages in his environment, speech sound productions may need to be addressed more directly. His case serves as a reminder that SLPs need to evaluate client profiles periodically to ensure the appropriate

Table 2. Potential SSD intervention approach for use with the presented case studies.

Case	Summary of profile	Relevant SSD considerations	Intervention rationale
Piper Age 2;3	• Omitted parts of words • Decreased overall intelligibility due to limited consonant production • Consistent use of multiple phonological patterns (e.g., backing) • Stimulable when given visual and verbal cues • Limited word combinations • Age-appropriate auditory comprehension skills, 1 *SD* below mean for expressive language skills	• Unintelligibility • Limited consonant productions • Use of multiple phonological patterns • Limited word combinations in verbal expression	• Cycles approach to address phonological pattern use and speech intelligibility improvement through focus on emergence of consonant sound productions
Frisco 26 months	• Limited use of unprompted verbal communication • Used a combination of single words, gestures, grunts, and whining to communicate • GFTA-3 standard score < 50 • Regularly omitted initial and final consonants • Follows simple commands	• Omission of initial and final consonants • Limited verbal communication • Low GFTA-3 standard score	• Psycholinguistic approach to holistically address speech sound development as well as language literacy acquisition
Nash Age 2;6	• Bilingual background (Spanish/English) • Total score of 0.63 on ALDeQ (1.5 *SD* below mean, indicating language impairment) • Limited expressive language in both English and Spanish but adequate receptive language skills in both languages • Consistent use of final consonant deletion	• Consistent use of final consonant deletion considered appropriate given his language background and age • Expressive language concerns	• Since the primary concern is language, recommend a language-based intervention approach rather than a focus on speech. Monitor speech skills.

Note. SSD = speech sound disorder; GFTA-3 = Goldman-Fristoe Test of Articulation–Third Edition; ALDeQ = Alberta Language Development Questionnaire.

intervention target(s) and approaches are used as client's communication skills and needs change.

Conclusions

In conclusion, speech sound production intervention research in early childhood is relatively rare despite empirical and theoretical support for providing this type of targeted therapy for toddlers. SLPs working with young pediatric populations are faced with many clinical challenges including those related to treatment decision making. Although there are numerous treatment approaches appropriate for SSD, a much smaller proportion are proposed to be appropriate for children under the age of 3 years. Of these, five approaches (core vocabulary, cycles, naturalist recast, stimulability, and psycholinguistic intervention) were selected for review because they can be used to treat functional SSDs produced by toddlers and none required additional clinician training for implementation. We found the empirical evidence supporting the use of these approaches with children under the age of 3 years scant to nonexistent. Much more research on SSD intervention is needed to inform clinical practice with this population. At present, early intervention SLPs must primarily rely on internal sources evidence to support EBP clinical decisions until more research support is available.

Author Contributions

Shari L. DeVeney: Conceptualization (Lead), Writing – original draft (Lead), Writing – review & editing (Lead). **Kristina Peterkin:** Conceptualization (Supporting), Writing – original draft (Supporting), Writing – review & editing (Supporting).

References

Almost, D., & Rosenbaum, P. (1998). Effectiveness of speech intervention for phonological disorders: A randomized-controlled

trial. *Developmental Medicine and Child Neurology, 40*(5), 319–325.

American Speech-Language-Hearing Association. (n.d.). *Evidence-based practice (EBP)*. Retrieved June 28, 2021, from https://www.asha.org/research/ebp/

Bellon-Harn, M. L., Hoffman, P. R., & Harn, W. E. (2004). Use of cloze and contrast word procedures in repeated storybook reading: Targeting multiple domains. *Journal of Communication Disorders, 37,* 53–75. https://doi.org/10.1016/j.jcomdis.2003.07.001

Bleile, K. (2002). Evaluating articulation and phonological disorders when the clock is running. *American Journal of Speech-Language Pathology, 11*(3), 243–249. https://doi.org/10.1044/1058-0360(2002/026)

Bowen, C. (2014). Intervention approaches. In C. Bowen (Ed.), *Children's speech sound disorders* (2nd ed., pp. 174–226). Wiley. https://doi.org/10.1002/9781119180418.ch4

Broomfield, J., & Dodd, B. (2004a). Children with speech and language disability: Caseload characteristics. *International Journal of Language & Communication Disorders, 39*(3), 303–324. https://doi.org/10.1080/13682820310001625589

Broomfield, J., & Dodd, B. (2004b). The nature of referred subtypes of primary speech disability. *Child Language Teaching and Therapy, 20*(2), 135–151. https://doi.org/10.1191/0265659004ct267oa

Broomfield, J., & Dodd, B. (2005). Clinical effectiveness. In B. Dodd (Ed.), *Differential diagnosis and treatment of children with speech disorder* (pp. 211–230). Wiley.

Brosseau-Lapré, F., & Schumaker, J. (2020). Perception of correctly and incorrectly produced words in children with and without phonological speech sound disorders. *Journal of Speech, Language, and Hearing Research, 63*(12), 3961–3973. https://doi.org/10.1044/2020_jslhr-20-00119

Brown, V. L., Bzoch, K. R., & League, R. (2020). *Receptive–Expressive Emergent Language Test* (4th ed.). Pro-Ed.

Brumbaugh, K. M., & Smit, A. B. (2013). Treating children ages 3–6 who have speech sound disorder: A survey. *Language, Speech, and Hearing Services in Schools, 44*(3), 306–319. https://doi.org/10.1044/0161-1461(2013/12-0029)

Bryan, A., & Howard, D. (1992). Frozen phonology thawed: The analysis and remediation of a developmental disorder of real word phonology. *European Journal of Disorders of Communication, 27*(4), 343–365. https://doi.org/10.3109/13682829209012045

Camarata, S. M. (1993). The application of naturalistic conversation training to speech production in children with speech disabilities. *Journal of Applied Behavior Analysis, 26,* 173–182. https://doi.org/10.1901/jaba.1993.26-173

Camarata, S. M. (2021). Naturalistic recast intervention. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 337–361). Brookes.

Camarata, S. M., Nelson, K. E., & Camarata, M. N. (1994). Comparison of conversational recasting and imitative procedures for training grammatical structures in children with specific language impairment. *Journal of Speech and Hearing Research, 37*(6), 1414–1423. https://doi.org/10.1044/jshr.3706.1414

Camarata, S. M., & Yoder, P. (2002). Language transactions during development and intervention: Theoretical implications for developmental neuroscience. *International Journal of Developmental Neuroscience, 20*(3–5), 459–465. https://doi.org/10.1016/s0736-5748(02)00044-8

Camarata, S. M., Yoder, P., & Camarata, M. (2006). Simultaneous treatment of grammatical and speech-comprehensibility deficits in children with Down syndrome. *Down Syndrome Research and Practice, 11*(1), 9–17. https://doi.org/10.3104/reports.314

Carter, E. T., & Buck, M. (1958). Prognostic testing for functional articulation disorders among children in the first grade. *Journal of Speech and Hearing Disorders, 23*(2), 124–133. https://doi.org/10.1044/jshd.2302.124

Churchill, J. D., Hodson, B. W., Jones, B. W., & Novak, R. E. (1988). Phonological systems of speech-disordered clients with positive/negative histories of otitis media. *Language, Speech, and Hearing Services in Schools, 19*(1), 100–107. https://doi.org/10.1044/0161-1461.1901.100

Claessen, M., Bettie, T., Roberts, R., Leitao, S., Whitworth, A., & Dodd, B. (2017). Is two too early? Assessing toddlers' phonology. *Speech, Language and Hearing, 20*(2), 91–101. https://doi.org/10.1080/2050571X.2016.1222723

Cleave, P. L., Becker, S. D., Curran, M. K., Van Horne, A. J., & Fey, M. E. (2015). The efficacy of recasts in language intervention: A systematic review and meta-analysis. *American Journal of Speech-Language Pathology, 24*(2), 237–255. https://doi.org/10.1044/2015_AJSLP-14-0105

Conture, E. G., Louko, L. J., & Edwards, M. L. (1993). Simultaneously treating stuttering and disordered phonology in children. *American Journal of Speech-Language Pathology, 2*(3), 72–81. https://doi.org/10.1044/1058-0360.0203.72

Crosbie, S., Holm, A., & Dodd, B. (2005). Intervention for children with severe speech disorder: A comparison of two approaches. *International Journal of Language & Communication Disorders, 40*(4), 467–491. https://doi.org/10.1080/13682820500126049

Crosbie, S., Holm, A., & Dodd, B. (2021). Core vocabulary intervention. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 225–249). Brookes.

Crosbie, S., Pine, C., Holm, A., & Dodd, B. (2006). Treating Jarrod: A core vocabulary approach. *Advances in Speech Language Pathology, 8*(3), 316–321. https://doi.org/10.1080/14417040600750172

DeVeney, S. (2019). Clinical challenges: Assessing toddler speech sound productions. *Seminars in Speech and Language, 40*(2), 81–93. https://doi.org/10.1055/s-0039-1677759

Dodd, B. (2014). Differential diagnosis of pediatric speech sound disorder. *Current Developmental Disorders Reports, 1,* 189–196. https://doi.org/10.1007/s40474-014-0017-3

Dodd, B., & Bradford, A. (2000). A comparison of three therapy methods for children with different types of developmental phonological disorder. *International Journal of Language & Communication Disorders, 35*(2), 189–209. https://doi.org/10.1080/136828200247142

Dodd, B., Crosbie, S., Zhu, H., Holm, A., & Ozanne, A. (2002). *Diagnostic Evaluation of Articulation and Phonology*. Psychology Corporation.

Dodd, B., & Lacono, T. (1989). Phonological disorders in children: Changes in phonological process use during treatment. *British Journal of Disorders of Communication, 24,* 333–352. https://doi.org/10.3109/13682828909019894

Dodd, B., McCormack, P., & Woodyatt, G. (1994). Evaluation of an intervention program: Relation between children's phonology and parents' communicative behavior. *American Journal of Mental Retardation, 98*(5), 632–645.

Dollaghan, C. (2004). Evidence-based practice in communication disorders: What do we know, and when do we know it? *Journal of Communication Disorders, 37*(5), 391–400. https://doi.org/10.1016/j.jcomdis.2004.04.002

Ebbels, S. (2000). Psycholinguistic profiling of a hearing-impaired child. *Child Language Teaching and Therapy, 16*(1), 3–22. https://doi.org/10.1177/026565900001600102

Ferguson, C. A., & Farwell, C. B. (1975). Words and sounds in early language acquisition. *Language, 51*(2), 419–439. https://doi.org/10.2307/412864

Fey, M., Justice, L. M., & Schmitt, M. B. (2014). Evidence-based decision making in communication intervention. In R. Paul (Ed.), *Introduction to clinical methods in communication disorders* (3rd ed., pp. 55–78). Brookes.

Flanagan, K. J., & Ttofari-Ecen, K. (2018). Core vocabulary therapy for the treatment of inconsistent phonological disorder: Variations in service delivery. *Child Language Teaching and Therapy, 34*(3), 209–219. https://doi.org/10.1177/0265659018784702

Gardner, H. (2014). Psycholinguistic profiling and intervention. In C. Bowen (Ed.), *Children's speech sound disorders* (2nd ed., pp. 206–210). Wiley. https://doi.org/10.1002/9781119180418.ch4

Gillon, G. T. (2005). Facilitating phoneme awareness development in 3- and 4-year-old children with speech impairment. *Language, Speech, and Hearing Services in Schools, 36*(4), 308–324. https://doi.org/10.1044/0161-1461(2005/031)

Girolametto, L., Pearce, P. S., & Weitzman, E. (1997). Effects of lexical intervention on the phonology of late talkers. *Journal of Speech, Language, and Hearing Research, 40*(2), 338–348. https://doi.org/10.1044/jslhr.4002.338

Goldman, R., & Fristoe, M. (2015). *Goldman-Fristoe Test of Articulation* (3rd ed.). PsychCorp.

Gordon-Brannan, M., Hodson, B. W., & Wynne, M. K. (1992). Remediating unintelligible utterances of a child with a mild hearing loss. *American Journal of Speech-Language Pathology, 1*(4), 28–38. https://doi.org/10.1044/1058-0360.0104.28

Harbers, H. M., Pade, E. P., & Halle, J. W. (1999). Phonological awareness and production: Changes during intervention. *Language, Speech, and Hearing Services in Schools, 30*(1), 50–60. https://doi.org/10.1044/0161-1461.3001.50

Hassink, J. M., & Wendt, O. (2010). Remediation of phonological disorders in preschool age children: Evidence for the cycles approach. *Evidence-based Practice Briefs, 5*(2), 1–7.

Hayden, D. A., Namasivayam, A. K., Ward, R., Clark, A., & Eigen, J. (2021). The PROMPT approach. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 477–504). Brookes.

Hemsley, G., & Holm, A. (2017). Intervention for a bilingual child with speech disorder. In B. Dodd & A. Morgan (Eds.), *Intervention case studies of child speech impairment* (pp. 319–335). J & R Press.

Herman, R., Ford, K., Thomas, J., Oyebade, N., Bennett, D., & Dodd, B. (2015). Evaluation of core vocabulary therapy for deaf children: Four treatment case studies. *Child Language Teaching and Therapy, 31*(2), 221–235. https://doi.org/10.1177/0265659014561875

Hewlett, N., Gibbon, F., & Cohen-McKenzie, W. (1998). When is a velar an alveolar? Evidence supporting a revised psycholinguistic model of speech production in children. *International Journal of Language & Communication Disorders, 33*(2), 161–176. https://doi.org/10.1080/136828298247811

Hodson, B. W. (1983). A facilitative approach for remediation of a child's profoundly unintelligible phonological system. *Topics in Language Disorders, 3*(2), 24–34. https://doi.org/10.1097/00011363-198303000-00006

Hodson, B. W. (1997). Disordered phonologies: What have we learned about assessment and treatment? In B. Hodson & M. Edwards (Eds.), *Perspectives in applied phonology* (pp. 197–224). Aspen Publishers.

Hodson, B. W. (2004). *Hodson Assessment of Phonological Patterns* (3rd ed.). Pro-Ed.

Hodson, B. W. (2010). *Evaluating and enhancing children's phonological systems: Research and theory to practice*. Thinking Publications.

Hodson, B. W., Chin, L., Redmond, B., & Simpson, R. (1983). Phonological evaluation and remediation of speech deviations of a child with a repaired cleft palate: A case study. *Journal of Speech and Hearing Disorders, 48*(1), 93–98. https://doi.org/10.1044/jshd.4801.93

Hodson, B. W., Nonomura, C. W., & Zappia, M. J. (1989). Phonological disorders: Impact on academic performance? *Seminars in Speech and Language, 10*(03), 252–259. https://doi.org/10.1055/s-2008-1064267

Hodson, B. W., & Paden, E. P. (1983). *Targeting intelligible speech: A phonological approach to remediation*. College-Hill Press.

Hodson, B. W., & Paden, E. P. (1991). *Targeting intelligible speech: A phonological approach to remediation* (2nd ed.). Pro-Ed.

Hoffman, P. R., & Schuckers, G. H. (1984). Articulation remediation treatment models. In R. G. Daniloff (Ed.), *Articulation assessment and treatment issues* (pp. 1–17). College-Hill Press.

Holm, A., Crosbie, S., & Dodd, B. (2007). Differentiating normal variability from inconsistency in children's speech: Normative data. *International Journal of Language & Communication Disorders, 42*(4), 467–486. https://doi.org/10.1080/13682820600988967

Holm, A., & Dodd, B. (1999). An intervention case study of a bilingual child with phonological disorder. *Child Language Teaching and Therapy, 15*(2), 139–158. https://doi.org/10.1177/026565909901500203

Ingram, D. (1976). *Phonological disability in children*. Wiley.

Ingram, D., & Ingram, K. D. (2001). A whole-word approach to phonological analysis and intervention. *Language, Speech, and Hearing Services in Schools, 32*(4), 271–283. https://doi.org/10.1044/0161-1461(2001/024)

Kamhi, A. G. (2006). Treatment decisions for children with speech-sound disorders. *Language, Speech, and Hearing Services in Schools, 37*(4), 271–279. https://doi.org/10.1044/0161-1461(2006/031)

Kim, H. Y., & Ha, S. (2016). Articulatory variability in 24- to 36-month-old typically developing children. *Communication Sciences & Disorders, 21*(2), 333–342. https://doi.org/10.12963/csd.16307

Koegel, R. L., Koegel, L. K., & Surratt, A. (1992). Language intervention and disruptive behavior in preschool children with autism. *Journal of Autism and Developmental Disorders, 22*(2), 141–153. https://doi.org/10.1007/bf01058147

Leonard, L. B., Camarata, S. M., Pawtowska, M., Brown, B., & Camarata, M. N. (2008). The acquisition of tense and agreement morphemes by children with specific language impairment during intervention: Phase 3. *Journal of Speech, Language, and Hearing Research, 51*(1), 120–125. https://doi.org/10.1044/1092-4388(2008/008)

MacLeod, A. N. N., & Glaspey, A. M. (2014). A multidimensional view of gradient change in velar acquisition in three-year-olds receiving phonological treatment. *Clinical Linguistics & Phonetics, 28*(9), 664–681. https://doi.org/10.3109/02699206.2013.878855

McCormack, J., McLeod, S., Harrison, L. J., & McAllister, L. (2010). The impact of speech impairment in early childhood: Investigating parents' and speech-language pathologists' perspectives using the ICF-CY. *Journal of Communication Disorders, 43*(5), 378–396. https://doi.org/10.1016/j.jcomdis.2010.04.009

McIntosh, B., & Dodd, B. J. (2008a). Evaluation of core vocabulary intervention for treatment of inconsistent phonological disorder: Three treatment case studies. *Child Language Teaching and Therapy, 24*(3), 307–327. https://doi.org/10.1177/0265659007096295

McIntosh, B., & Dodd, B. J. (2008b). Two-year-olds' phonological acquisition: Normative data. *International Journal of Speech-Language Pathology, 10*(6), 460–469. https://doi.org/10.1080/17549500802149683

McLeod, S., & Baker, E. (2017). *Children's speech: An evidence-based approach to assessment and intervention*. Pearson.

McLeod, S., & Bleile, K. (2003). Neurological and developmental foundations of speech acquisition, In *American Speech-Language-Hearing Association Convention* (pp. 1–12). ASHA.

Miccio, A. W. (2005). A treatment program for enhancing stimulability. In A. G. Kamhi & K. E. Pollock (Eds.), *Phonological disorders in children: Clinical decision making in assessment and intervention* (pp. 163–173). Brookes.

Miccio, A. W. (2014). First things first: Stimulability therapy for children with small phonetic repertoires. In C. Bowen (Ed.), *Children's speech sound disorders* (2nd ed., pp. 177–182). Wiley. https://doi.org/10.1002/9781119180418.ch4

Miccio, A. W., & Elbert, M. (1996). Enhancing stimulability: A treatment program. *Journal of Communication Disorders, 29*(4), 335–351. https://doi.org/10.1016/0021-9924(96)00016-0

Miccio, M. W., & Williams, A. L. (2021). Stimulability approach. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 279–304). Brookes.

Montgomery, J. K., & Bonderman, I. R. (1989). Serving preschool children with severe phonological disorders. *Language, Speech, and Hearing Services in Schools, 20*(1), 76–84. https://doi.org/10.1044/0161-1461.2001.76

Munro, N., Baker, E., Masso, S., Carson, L., Lee, T., Wong, A. M.-Y., & Stokes, S. F. (2021). Vocabulary acquisition and usage for late talkers treatment: Effect on expressive vocabulary and phonology. *Journal of Speech, Language, and Hearing Research, 64*(7), 2682–2697. https://doi.org/10.1044/2021_JSLHR-20-00680

Paradis, J., Emmerzael, K., & Sorenson, D. T. (2010). Assessment of English language learners: Using parent report on first language development. *Journal of Communication Disorders, 43*(6), 474–497. https://doi.org/10.1016/j.jcomdis.2010.01.002

Pascoe, M., Randall-Pieterse, C., & Geiger, M. (2013). Speech and literacy development in a child with a cochlear implant: Application of a psycholinguistic framework. *Child Language Teaching and Therapy, 29*(2), 185–200. https://doi.org/10.1177/0265659012467197

Pascoe, M., Rossouw, K., Fish, L., Jansen, C., Manley, N., Powell, M., & Rosen, L. (2016). Speech processing and production in two-year-old children acquiring isiXhosa: A tale of two children. *South African Journal of Communication Disorders, 63*(2), 1–15. https://doi.org/10.4102/sajcd.v63i2.134

Pascoe, M., & Stackhouse, J. (2021). Psycholinguistic intervention. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 141–170). Brookes.

Paul, R. (2014). *Introduction to clinical methods in communication disorders* (3rd ed.). Brookes.

Paul, R., & Roth, F. P. (2011). Characterizing and predicting outcomes of communication delays in infants and toddlers: Implications for clinical practice. *Language, Speech, and Hearing Services in Schools, 42*(3), 331–340. https://doi.org/10.1044/0161-1461(2010/09-0067)

Powell, T. W. (1996). Stimulability considerations in the phonological treatment of a child with a persistent disorder of speech - sound production. *Journal of Communication Disorders, 29*(4), 315–333. https://doi.org/10.1016/0021-9924(96)00015-9

Powell, T. W. (2003). Stimulability and treatment outcomes. *SIG 1 Perspectives on Language Learning and Education, 10*(1), 3–6. https://doi.org/10.1044/lle10.1.3

Powell, T. W., & Miccio, A. W. (1996). Stimulability: A useful clinical tool. *Journal of Communication Disorders, 29*(4), 237–253. https://doi.org/10.1016/0021-9924(96)00012-3

Prezas, R. F., Magnus, L. C., & Hodson, B. W. (2021). The cycles approach. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 251–278). Brookes.

Rudolph, J. M., & Wendt, O. (2014). The efficacy of the cycles approach: A multiple baseline design. *Journal of Communication Disorders, 47,* 1–16. https://doi.org/10.1016/j.jcomdis.2013.12.003

Rvachew, S. (2005). Stimulability and treatment success. *Topics in Language Disorders, 25*(3), 207–219. https://doi.org/10.1097/00011363-200507000-00004

Rvachew, S., & Nowak, M. (2001). The effect of target-selection strategy on phonological learning. *Journal of Speech, Language, and Hearing Research, 44*(3), 610–623. https://doi.org/10.1044/1092-4388(2001/050)

Rvachew, S., Nowak, M., & Cloutier, G. (2004). Effect of phonemic perception training on the speech production and phonological awareness skills of children with expressive phonological delay. *American Journal of Speech-Language Pathology, 13*(3), 250–263. https://doi.org/10.1044/1058-0360(2004/026)

Rvachew, S., Rafaat, S., & Martin, M. (1999). Stimulability, speech perception skills, and the treatment of phonological disorders. *American Journal of Speech-Language Pathology, 8*(1), 33–43. https://doi.org/10.1044/1058-0360.0801.33

Schaefer, B., Stackhouse, J., & Wells, B. (2016). Phonological awareness development in children with and without spoken language difficulties: A 12-month longitudinal study of German-speaking pre-school children. *International Journal of Speech-Language Pathology, 19*(5), 465–475. https://doi.org/10.1080/17549507.2016.1221449

Shabani, K., Khatib, M., & Ebadi, S. (2010). Vygotsky's Zone of Proximal Development: Instructional implications and teachers' professional development. *English Language Teaching, 3*(4), 237–248.

Sosa, A. V. (2011). *Too young to test? Assessing phonology in infants and toddlers* [Oral presentation]. Arizona Speech-Language-Hearing Association Annual Convention, Tempe, AZ.

Sosa, A. V. (2015). Intraword variability in typical speech development. *American Journal of Speech-Language Pathology, 24*(1), 24–35. https://doi.org/10.1044/2014_AJSLP-13-0148

Sosa, A. V., & Stoel-Gammon, C. (2006). Patterns of intra-word phonological variability during the second year of life. *Journal of Child Language, 33*(1), 31–50. https://doi.org/10.1017/S0305000905007166

Smith, A. E., & Camarata, S. (1999). Using teacher-implemented instruction to increase language intelligibility of children with autism. *Journal of Positive Behavior Interventions, 1*(3), 141–151. https://doi.org/10.1177/109830079900100302

Spooner, L. (2002). Addressing expressive language disorder in children who also have severe receptive language disorder: A psycholinguistic approach. *Child Language Teaching and Therapy, 18*(3), 289–313. https://doi.org/10.1191/0265659002ct239oa

Stackhouse, J., Pascoe, M., & Gardner, H. (2006). Intervention for a child with persisting speech and literacy

difficulties: A psycholinguistic approach. *Advances in Speech Language Pathology, 8*(3), 231–244. https://doi.org/10.1080/14417040600861029

Stackhouse, J., Vance, M., Pascoe, M., & Wells, B. (2007). *Compendium of auditory and speech tasks: Children's speech and literacy difficulties, Book 4*. Wiley.

Stackhouse, J., & Wells, B. (1993). Psycholinguistic assessment of developmental speech disorders. *European Journal of Disorders of Communication, 28*(4), 331–348. https://doi.org/10.3109/13682829309041469

Stackhouse, J., & Wells, B. (1997). *Children's speech and literacy difficulties: Book 1. A psycholinguistic framework*. Wiley.

Stackhouse, J., & Wells, B. (2001). *Children's speech and literacy difficulties 2: Identification and intervention*. Wiley.

Stoel-Gammon, C. (1991). Normal and disordered phonology in two-year-olds. *Topics in Language Disorders, 11*(4), 21–32. https://doi.org/10.1097/00011363-199111040-00005

Stoel-Gammon, C., & Dunn, C. (1985). *Normal and disordered phonology in children*. University Park.

Strand, E. A. (2021). Dynamic temporal and tactical cueing. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (2nd ed., pp. 537–571). Brookes.

Tyler, A. A., Edwards, M. L., & Saxman, J. H. (1987). Clinical application of two phonologically based treatment procedures. *Journal of Speech and Hearing Disorders, 52*(4), 393–409. https://doi.org/10.1044/jshd.5204.393

Tyler, A. A., Lewis, K. E., Haskill, A., & Tolbert, L. C. (2002). Efficacy and cross-domain effects of a morphosyntax and a phonology intervention. *Language, Speech, and Hearing Services in Schools, 33*(1), 52–66. https://doi.org/10.1044/0161-1461(2002/005)

Tyler, A. A., & Macrae, T. (2010). Stimulability: Relationships to other characteristics of children's phonological systems. *Clinical Linguistics & Phonetics, 24*(4–5), 300–310. https://doi.org/10.3109/02699200903532516

Tyler, A. A., & Watterson, K. H. (1991). Effects of phonological versus language intervention in preschoolers with both phonological and language impairment. *Child Language Teaching and Therapy, 7,* 141–160. https://doi.org/10.1177/026565909100700203

van Geert, P. (1991). A dynamic systems model of cognitive and language growth. *Psychological Review, 98*(1), 3–53. https://doi.org/10.1037/0033-295X.98.1.3

Williams, A. L., & Elbert, M. (2003). A prospective longitudinal study of phonological development in late talkers. *Language, Speech, and Hearing Services in Schools, 34*(2), 138–153. https://doi.org/10.1044/0161-1461(2003/012)

Williams, A. L., McLeod, S., & McCauley, R. J. (2021). *Interventions for speech sound disorders in children* (2nd ed.). Brookes.

Woodcock, R., Camarata, S., & Camarata, M. (2020). *Woodcock-Camarata Articulation Battery*. Schoolhouse.

Yoder, P., Camarata, S., & Gardner, E. (2005). Treatment effects on speech intelligibility and length of utterance in children with specific language and intelligibility impairments. *Journal of Early Intervention, 28*(1), 34–49. https://doi.org/10.1177/105381510502800105

Yoder, P., Camarata, S., & Woynaroski, T. (2016). Treating speech comprehensibility in students with down syndrome. *Journal of Speech, Language, and Hearing Research, 59*(3), 446–459. https://doi.org/10.1044/2015_JSLHR-S-15-0148

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (2011). *Preschool Language Scales* (5th ed.). Pearson.