

Clinical Forum

Treatment Decisions for Children With Speech–Sound Disorders

Alan G. Kamhi

University of North Carolina–Greensboro

I have a vivid memory of a brief conversation I had several years ago with one of the elders of the profession in a hallway at a conference about the latest buzzword that was beginning to infiltrate the profession. This individual scoffed at what he viewed as the latest attempt to get our profession to use research to justify and support treatment practices. He had been in the profession for more than 40 years and had seen repeated attempts to make clinical practice more research

based and was not optimistic that this latest attempt would be any more successful than previous ones. What was once a buzzword was the theme of our 2005 national convention in San Diego. The buzzword is, of course, evidence-based practice. The term is so familiar these days that most simply refer to it as EBP. Like my older colleague, I was initially skeptical about what EBP had to offer our profession, but once I began reading the literature on EBP, I came to see that EBP was much more than simply using research to guide clinical practice.

As discussed in the first article of this forum (Bernstein Ratner, this issue) and in many other places (see Dollaghan's 2004 article in *The ASHA Leader*), there are several myths that have become associated with EBP. EBP is not simply using an intervention approach that has research support. EBP is the integration of the best research with clinical expertise and client values (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). In other words, clinical expertise, such as the use of effective relationship skills, and client values, defined as each client's unique characteristics and circumstances, are just as important for EBP as research. Some EBP scholars go so far as to say that client preferences rather than clinician preferences should be considered first whenever it is possible to do so (Haynes, Deveraux, & Guyatt, 2002).

Another myth about EBP concerns the nature of the evidence required to support a treatment approach. Although EBP does emphasize the use of the highest quality scientific evidence, Vandiver (2002) stated that EBP is more appropriately viewed as a process of using a variety of databases, including systematic case studies, to guide interventions. Taking this point one step further, Ylvisaker (2004), at a recent conference on EBP sponsored by the Bamford-Lahey Foundation, argued that the strongest evidence for a clinical decision is experimental validation with the particular client. This evidence could come in the form of trial therapy, diagnostic teaching, or dynamic assessment.

ABSTRACT: Purpose: In this article, I consider how research, clinical expertise, client values, a clinician's theoretical perspective, and service delivery considerations affect the decisions that clinicians make to treat children with speech–sound disorders (SSD).

Method: After reviewing the research on phonological treatment, I discuss how a clinician's theoretical perspective influences goal selection. Five perspectives are considered: (a) normative; (b) bottom-up, discrete skill; (c) language-based; (d) broad-based; and (e) complexity-based. The literature on treatment efficiency is then considered, followed by a discussion of service delivery factors, client values, and clinician factors.

Implications: I believe like M. Ylvisaker (2004) that treatment decisions are influenced the most by the changes that occur in client behaviors. These changes must, however, be experimentally validated, which is not always easy to do. M. Ylvisaker suggests that validation could take the form of trial therapy, diagnostic teaching, or dynamic assessment, but it may also be important to show that the treatment provided, not some other variable, was primarily responsible for the behavioral change (A. Tyler, personal communication, January 11, 2006).

KEY WORDS: speech disorders, treatment

Making treatment decisions is, therefore, not particularly easy. There is no simple prescription for choosing an intervention approach because clinical expertise and client values will vary. The existence of high-quality research can certainly help inform clinical decisions, but research is just one of several factors that influence clinical decisions. These factors include the other two components of EBP—clinical expertise and client values—as well as a clinician’s theoretical perspective and service delivery considerations. In the remainder of this article, I will consider how these factors can be used to make clinical decisions involving children with speech–sound disorders (SSD).

REVIEWING THE RESEARCH

Shriberg (1997), in summarizing his previous studies on speech normalization, reported that approximately 75% of children with speech delay normalize their speech errors by age 6. Of the remaining 25%, most normalize by age 9. A small proportion of children continue to exhibit residual speech errors, most typically distortions of /s/, /r/, and /l/. Shriberg uses these data on speech normalization to address important questions about the etiology, classification, and prognosis of SSD. These data also can be used to tell us something about treatment efficacy. Assuming that the 75% of children who normalize speech by age 6 do not receive the same type of treatment, or perhaps receive no treatment at all, the type of treatment that children receive must not have much of an influence on speech normalization. Conclusions such as these are often troubling to clinicians and researchers who want there to be a “gold standard” treatment approach that works for all children with SSD.

The problem, however, is that there seem to be too many ways to improve children’s speech, and these approaches are often theoretically incompatible with one another. This often leads to heated debates and confusion about which approach is the best one to use: the traditional hierarchical approach (Van Riper & Emerick, 1984); the cycles approach (Hodson & Paden, 1991); a conventional minimal pair approach; a language-based approach (Norris & Hoffman, 2005); the metaphon approach (Howell & Dean, 1994); or an eclectic approach that includes oral motor activities, cycles, perceptual training, minimal/maximal contrasts, multiple oppositions, story retells, and phonological awareness activities. Despite differences in procedures, goal attack strategies, and emphases (e.g., perception, production, metalinguistic skills), there is evidence from numerous reviews (e.g., Bauman-Waengler, 2004; Bernthal & Bankson, 2004; Gierut, 1998; Weston & Bain, 2003) that these approaches are all effective in modifying children’s phonological systems. How then do clinicians decide which treatment approach to use?

One determining factor might be the efficiency of the approach in inducing change. Whereas treatment effectiveness refers to whether a given treatment works, *treatment efficiency* refers to whether one treatment is better than another (i.e., leads to similar outcomes in a shorter period of time)(Olswang, 1990). Gierut (1998, 2005) reviewed the limited research that investigated treatment efficiency. Van Riper’s traditional approach has been compared to the conventional minimal pair (Ward & Bankson, 1989, cited in Gierut, 2005) and a modified metaphon approach (Powell, Elbert, Miccio, Strike-Roussos, & Brasseur, 1998). The conventional minimal pair approach has been compared to a modified cycles approach

(Tyler, Edwards, & Saxman, 1987) and a language-based approach (Hoffman, Norris, & Monjure, 1990). Gierut (2005) acknowledges that these are landmark studies but believes that all of the methodological comparisons have not been made and systematic replications are lacking. These limitations notwithstanding, Gierut finds a common theme emerging from these comparisons: The different treatment approaches are not distinguishable in affecting change in a child’s sound system. In other words, one treatment approach has not proven to be better than another.

This conclusion led Gierut to question the importance of a particular treatment approach for promoting change. If our teaching method is of secondary importance, then what is important? Those familiar with Gierut’s work know her answer to this question: The primary trigger of change is the sounds and phonological structures that clinicians target in therapy. In other words, *what* is treated is more important than *how* it is taught (Gierut, 2005).

A recent meta-analysis of phonological treatment studies by Weston and Bain (2003) confirms how little guidance the existing research literature provides clinicians. These authors found 41 peer-reviewed intervention studies from 1960 to 2003 involving children with a primary diagnosis of phonological disorder with or without an accompanying language disorder. The studies included descriptive and experimental designs but not case reports. The majority of studies (19) addressed issues in generalization, reflecting the prolific work of Gierut and her colleagues. Eight of the studies examined treatment approaches; five considered cross-domain effects; three questioned whether treatment worked; and the remaining studies examined relationships between perception, knowledge, and production. The majority of the studies (22) focused on young school-age children (5–7 ½), 14 considered preschoolers (3–5), and 5 examined children 8 years and older. The findings from the meta-analysis of these studies are listed below.

- The quality of intervention research was not at the more rigorous levels established in EBP hierarchies.
- There was only one randomized clinical trial study.
- Few studies investigated the rate of phonological change.
- Limited research exists about treatment outcomes.
- Of the 36 studies that provided information about targeted linguistic level, the highest level targeted for 23 of the studies (64%) was syllable or word productions. The remaining 13 studies (36%) began with isolated sounds productions and worked up to connected speech.

On the basis of these findings, Weston and Bain (2003) concluded that “it would be difficult to establish ‘best clinical practice’ guidelines based on the existing research.” So, what is a clinician to do? As reflected in the title and theme of this forum, clinical decisions are based not just on existing research, but also on clinical reasoning that considers clinical expertise and client values, as well as a clinician’s theoretical perspective, service delivery considerations, and experimental validation with individual clients. After discussing these factors, I will present some general principles for selecting treatment goals for children with SSD. I have talked about some of these factors before in American Speech-Language-Hearing Association (ASHA) presentations (Kamhi, 2003, 2004) and have written about them in the concluding chapter of a book that Karen Pollock and I edited on clinical decision making in phonology (Kamhi, 2005). The information in the following sections expands on the information from that chapter.

THEORETICAL PERSPECTIVES

If treatment goals are more important than the approach used, as Gierut (2005) suggested, then one of the most important treatment decisions a clinician has to make is deciding which goals to target. Possible treatment targets include oral motor proficiency, phonetic perception, phoneme identification, phonological contrasts, sound/syllable/word productions, intelligibility, phonological awareness, language abilities, and communicative effectiveness. The theoretical perspective that one has about phonological development and treatment has a significant influence on the treatment goals selected and, in some cases, the approach used to target these goals.

A perusal of the phonological treatment literature (e.g., Kamhi & Pollock, 2005) finds that there are five fairly well-defined theoretical perspectives: (a) normative; (b) bottom-up, discrete skill; (c) language-based; (d) broad-based; and (e) complexity-based. These perspectives are each associated with a particular view of goal selection but not necessarily a particular treatment approach. For example, the normative perspective is used primarily to justify the selection and sequence of treatment goals and is agnostic with respect to the approach used to target these goals. Bottom-up, language-based, and broad-based approaches typically use the normative perspective to determine the sequence of treatment goals. The same treatment approach may also be used to target goals associated with different perspectives. Traditional motor approaches, for example, may be used to target goals associated with the bottom-up, broad-based, and complexity-based perspectives. In the sections below, I briefly discuss and evaluate each of these five perspectives. In light of the evidence suggesting that treatment goals are more important than treatment approaches (Gierut, 2005; Weston & Bain, 2003), the focus will be on the goals associated with each perspective rather than on how these goals may be targeted.

The Normative Perspective

The normative perspective refers to how speech develops in typically developing children. There is now compelling evidence that the entry level for speech and language development is words, not sounds, morphemes, or other sublexical units (Velleman & Vihman, 2002). Individual speech sounds do not exist as neatly packaged and sequenced units in either perception (Nittrouer, 2002) or production (e.g., Oller, 1978). Initial lexical representations are holistic in nature and only gradually become more fine grained and segmental in early through middle childhood (e.g., Metsala & Walley, 1998). Vocabulary growth is now believed to be the principal driving force for the lexical restructuring that leads to more segmental (phoneme-based) representations (Walley, Metsala, & Garlock, 2003). On the production side, infants and young children do not produce individual speech sounds. The smallest unit of speech production is the syllable. At around 6–7 months of age, infants begin to produce CV (consonant-vowel) or VC (vowel-consonant) syllables (canonical babble).

If one uses these facts about normal speech development to guide treatment decisions, clinicians would not target any unit smaller than the syllable, and the primary focus of treatment would be on acquiring words. Words with simple syllable structure (CV, VC, CVCV) would obviously be targeted before more complex ones. A phonological assessment would provide information about the specific word contrasts that a child is able to make, and based on this

assessment, clinicians would attempt to systematically expand existing word contrasts (e.g., Ingram & Ingram, 2001; Williams, 2005). Because vocabulary is thought to be primarily responsible for the development of phoneme-based representations, therapy activities that focus attention on identifying speech segments may have little benefit.

Although individual sounds may not exist in neatly packaged units, there has been considerable interest in the age at which children are able to produce each of the phonemes correctly in their language. Vihman (2004) summarized the major cross-sectional studies of speech–sound production in her chapter on later phonological development. Despite the variations in age of acquisition and mastery across these studies, there is consistency in the general sequence of sound acquisition: nasals, stops, and glides are acquired early; fricatives, affricates, and consonants clusters are acquired later (Vihman, 2004). The normal sequence of sound acquisition is used by many clinicians to determine the order in which sounds should be targeted. The age appropriateness of phonological processes/patterns is also often used by clinicians to determine which processes/patterns to target in treatment.

Another aspect of normal development that can have an impact on treatment decisions is the developmental relationship between speech perception and speech production. It is generally believed that speech perception and production develop independently of one another early in development (e.g., Locke, 1995). Anatomical and physiological characteristics of the vocal mechanisms determine the speech sounds that young infants produce, and the sounds and syllable structures that young infants produce are not tied to their perceptual abilities or what they hear in the ambient language (Locke, 1995). Even when the two systems begin to converge in the second year of life, the motoric information necessary to produce words is different than the information necessary to recognize words (Locke, 1995). There is thus no convincing developmental data that would suggest that targeting phonetic perception or discrimination will have a direct impact on speech production. Any improvements in speech production as a result of improving phonetic discrimination will be artificial—the result, for example, of increased attention to speech.

Evaluation of the normative perspective. There are a number of problems with the normative perspective. The most obvious one is that children with speech delays are not developing normally, so it may not always be appropriate to base clinical decisions on how typically developing children learn to talk. For example, even though there is no normative stage of speech development in which isolated sounds are produced, children who are having difficulty producing individual speech sounds often seem to benefit from producing sounds in isolation. With respect to goal selection, most clinical phonologists agree that the normal sequence of sound acquisition is just one of several factors that need to be considered (cf. Kamhi & Pollock, 2005). Other factors that should be considered are the pervasiveness and consistency of the speech error, the effect the sound has on speech intelligibility, the effect the sound has on morphosyntax, stimulability, and the sound's complexity. There is considerable debate among clinical phonologists about the relative importance of each of these factors in determining which sounds to target (Kamhi & Pollock, 2005).

The normative perspective on phoneme awareness is also problematic. Although the normative data indicate that the majority of preschool children have limited explicit knowledge of phonemes (e.g., Morais, Bertelson, Cary, & Alegria, 1986), this does not mean that cognitively intact children with speech delays cannot benefit from activities that target explicit sound awareness. Such

activities might actually lead to more fine-grained lexical representations that may in turn lead to improved speech productions (Howell & Dean, 1994). In fact, there are recent studies that show the benefits of phoneme awareness training for 3- and 4-year-old children with moderate-severe speech delays (Gillon, 2005).

Another problem with the normative perspective concerns the autonomy of the speech production and perceptual systems. Even though the two systems develop independently of one another, improving one system might have direct or indirect effects on the other. For example, on the perceptual side, more fine-grained lexical representations might lead to increased awareness of the specific sounds that are misarticulated. In addition, improved attention and listening abilities might translate to enhanced attention to the speech production process. On the production side, the ability to produce a word accurately might lead to a more accurate lexical representation.

The final problem with the normative perspective is that there is more than one view of normal development. I have presented a view of normal speech development that is supported not only by research, but also by first-hand observations of typical and atypical children's speech development. What I view as an unequivocal fact, however, may be viewed by someone else as an unproven speculation or just plain wrong.

Bottom-Up, Discrete Skill Approaches

There are two bottom-up, discrete skill treatment approaches—one that starts with oral motor movements and another that begins with isolated sound productions (i.e., the traditional Van Riper approach).

The oral motor approach. Clinicians who use oral motor exercises as part of their treatment protocol believe that practicing nonspeech oral movements will increase coordination and strengthen the musculature involved in speech production. The use of oral motor exercises is based on the assumption that poor oral motor control and/or strength contributes to poor articulation and that the complex motor coordination required for speech can be facilitated by breaking down this complex behavior into smaller units (Forrest, 2002). Common oral motor activities include brushing the tip and sides of the tongue to increase tactile awareness, having the child hold a tongue depressor between the teeth while speaking to help stabilize the jaw, and having the child say phrases like “giddy-up” to increase awareness of lateral tongue muscles (e.g., Marshalla, 1996).

Evaluation of the oral motor approach. Despite the widespread use of oral motor activities to remediate speech delays (e.g., Lof & Watson, 2005), concerns have been raised about the assumptions that underlie these activities and the lack of evidence supporting their use (e.g., Clark, 2003; Forrest, 2002; Tyler, 2005). Although differentiated movement of the oral structures (e.g., tongue, lip, jaw) is necessary for normal speech production, tongue strength, speed, and awareness of motor movements have little impact on early speech production (e.g., Green, Moore, Higashikawa, & Steeve, 2000). There is also no evidence that nonspeech movements have any relationship with speech. Researchers have shown that the coordinative lip and jaw movements involved even in early speech are distinct from nonspeech behaviors such as chewing (e.g., Ruark & Moore, 1997).

The greatest concern with the use of oral motor exercises, however, is the lack of data showing that they are effective in improving speech production skills (e.g., Clark, 2003; Forrest, 2002). Although there are numerous anecdotal reports attesting to the benefits of oral motor exercises, there are no well-controlled studies. Moreover, many of

the anecdotal reports have methodological confounds because oral motor exercises are often used with some other type of treatment, thus making it impossible to determine the source of the gains (Tyler, 2005). The few studies that have examined the benefits of oral motor exercises (e.g., Roehrig, Suiter, & Pierce, 2004) found that adding them to traditional articulation therapy does not result in better treatment outcomes.

The traditional motor approach. The traditional motor approach advocates targeting speech sounds individually, one after another, in a series of phases. The phases in what is often called the traditional motor approach (Van Riper & Emerick, 1984) begin with discrimination training followed by production of the sound in isolation, nonsense syllables, words, structured phrases, sentences, and spontaneous speech. This approach uses a vertical goal attack strategy in which high criterion levels (e.g., 85% correct production) must be reached before moving to the next phase.

Evaluation of the traditional motor approach. In their evaluation of the traditional motor approach, Bernthal and Bankson (2004) noted that it “has stood the test of time because it has ‘worked’ for many clinicians, with many clients” (p. 307). As noted previously, however, few studies have compared the efficiency of this approach to other approaches (Gierut, 1998, 2005). Questions have also been raised about including discrimination training as part of the treatment process and the appropriateness of the approach for children with multiple speech errors (Bernthal & Bankson, 2004). The use of a vertical goal attack strategy makes the approach a poor choice for children who have concomitant language and communication deficiencies because these deficiencies will not be targeted until the child is able to accurately discriminate and produce individual error sounds. I vividly recall the frustration I had working on discrimination training with a client for an entire semester in the mid-1970s. I wanted to work directly on speech and language but could not because the client never reached the criterion level on the discrimination tasks. Despite problems such as these, the traditional approach is still used by many clinicians for a wide variety of clients, including those with multiple errors and moderate-severe speech delays.

Language-Based Approaches

The use of a language-based approach requires a theoretical perspective that emphasizes the interactive, interdependent nature of speech and language. This is the perspective embraced by Norris and Hoffman (2005). In this perspective, phonology is viewed as an integral and inseparable part of the language constellation, which makes targeting phonological form without meaning and function “a useless shell” according to Norris and Hoffman. In their view, phonology is only useful when it is integrated with language. Consistent with this theoretical perspective, Norris and Hoffman use illustrated story books as their principal therapy context. Stories provide an unchanging context that can be talked about from different perspectives and different levels of language. The focus in therapy could change from attention to sound discrimination to sound production, prosody, phonological awareness, vocabulary, syntax, or story plot. Norris and Hoffman provide more frequent production cues for children with motor speech disorders such as developmental apraxia, but retelling stories is still the major focus of treatment.

In the strong version of this approach (Camarata, 1993), language and communication goals are the sole targets of intervention; speech

is not targeted directly. In a small study involving 2 preschool children, Camarata found that recasting speech errors was sufficient for speech to normalize.

Evaluation of language-based approaches. The use of language-based approaches, particularly Camarata's (1993), requires a lot of faith that children's speech will improve without any direct instruction or speech practice. It is difficult to envision this approach being effective with severely delayed children or school-age children who have distortion or residual errors (e.g., /s/, /l/, /r/). In support of this point, several studies (e.g., Fey et al., 1994; Tyler & Sandoval, 1994) have found that direct treatment of speech errors is necessary for children with more severe speech delays. The evidence in support of language-based approaches is not compelling, even for children with mild errors. The studies often cited to support the use of a language-based approach involved a set of twins (Hoffman et al., 1990) and 2 preschool children (Camarata, 1993). The one study that has shown some cross-domain generalization between language and phonology focused on finite morphemes (Tyler, Lewis, Haskill, & Tolbert, 2002). The lack of evidence in support of language-based approaches suggests that they are probably best used in conjunction with an approach that targets speech production directly.

Broad-Based Approaches: Cycles Training

Many clinicians are not wedded to a particular theoretical orientation, or they indicate that they are eclectic and use whatever works. These clinicians are likely to embrace a broad-based approach to improve speech. A broad-based approach would target everything from oral motor movements to conversational discourse and would involve different goal attack strategies depending on the child's developing phonological system. Clinicians who use a variety of techniques, strategies, and approaches are likely to embrace the principles of EBP because they adapt their treatment approach to the needs of individual clients and will change their approach if it is not working.

Hodson and Paden's (1991) cycles training is probably the best-known broad-based approach. Cycles training combines elements of traditional speech therapy (motor placement) with a perceptual component, an efficient goal attack strategy (cycling), and phonological assessment. Target selection is based on the normative perspective. The underlying premise of using cycles is that phonological acquisition is gradual. In direct contrast to the traditional approach, there is no predetermined criterion for phoneme mastery or phonological process production within each cycle. Cycles training is designed for children with severe speech delays who are highly unintelligible. More recent versions of the approach (e.g., Hodson, 1997) include metaphonological activities because of the close link between phonological disorders and later literacy problems (e.g., Larivee & Catts, 1999).

Evaluation of the cycles approach. The cycles approach is one of the most widely known treatment approaches for children with speech delays (Lof & Watson, 2005). Although many clinicians can attest to its effectiveness, the studies in support of its effectiveness are largely case reports (e.g., Hodson, 1997). As with other treatment approaches, there is no evidence showing that the cycles approach is more efficient than other approaches (Gierut, 2005; Weston & Bain, 2003). As noted above, the appeal of the cycles approach is that it is broad-based, combining an efficient goal attack strategy with

traditional speech therapy and metaphonological activities. Even if it is proven not to be as efficient as other treatment approaches, it appears to be an effective approach for children with moderate-severe speech delays.

The Complexity Approach

The basic principle of this approach is that more complex linguistic input promotes the greatest change in a child's overall sound system (Gierut, 2001, 2005). The effects of a complex treatment target have been shown to have a positive impact not only on the treated sound in untreated contexts, but also on untreated sounds. Changes in untreated sounds include within-class generalization (e.g., treat a fricative, learn other fricatives) as well as across-class generalization (e.g., treat a liquid, learn untreated nasals). Gierut and her colleagues have provided considerable research support for the complexity-based perspective. For reviews of this research, see Gierut (1998, 2001, 2005). Indeed, there have been more research studies investigating this perspective than almost all of the other approaches combined (Weston & Bain, 2003). Despite the research support in favor of complexity-based goal selection, however, practicing clinicians rarely select goals based on complexity principles (Weston, 2004). The evaluation of this approach is presented in the next section on treatment efficiency.

TREATMENT EFFICIENCY

Treatment that has efficiency as a guiding principle promises the quickest path to speech normalization. The most efficient treatments are those that get something for free. Gierut's complexity approach is efficient because targeting difficult sounds (e.g., /v/) leads to better generalization of untreated sounds than does targeting easier sounds such as /f/ (cf. Miccio & Ingrisano, 2000). Focusing on conversation or narratives (Camarata, 1993; Hoffman & Norris, 2002) and getting accurate speech production for free would be the most efficient approach.

As with the other theoretical perspectives, one based on efficiency is not without some concerns. One of the problems often raised about efficiency is that quicker may not always be better. For example, one can imagine that the traditional motor approach might work well in getting children to produce sounds accurately in isolation, in syllables, or even in words, but this approach usually will not be very efficient in improving overall intelligibility and general communicative effectiveness. Language and communication-based approaches have the potential to be very efficient if children are able to increase the accuracy of their sound and word productions in conversational and narrative language contexts. The multiple opposition approach advocated by Williams (2005) also has the potential to be highly efficient with its emphasis on phonetic as well as phonemic learning in meaningful communicative contexts.

The approach that is arguably the most motivated by efficiency is Gierut's complexity approach. There would be no reason to consider targeting more complex sounds before simpler ones if efficiency was not the primary goal. The underlying motivation of Gierut's research program has been to determine the linguistic targets that will promote the greatest change in a child's overall sound system. Gierut's interest in systemwide changes means that she is not as concerned with how long it takes to acquire a particular sound; of

more importance is whether a treated sound will generalize to untreated contexts and untreated sounds. In some cases, the actual sounds targeted (e.g., /v/) might have little immediate impact on language or communication. Words that contain /v/ are not particularly prevalent in English (e.g., *vat, van, vacuum, vet*). Overall, however, the majority of complex targets do not have this problem. In a series of studies, Gierut showed that targeting affricates improves fricatives, targeting clusters improves singletons, targeting fricatives improves stops, targeting nonstimulable sounds improves stimulable sounds, and targeting voiced stops improves voiceless stops (see Table 17.1 in Gierut, 2005, for the complete list). Targeting more complex linguistic targets thus does appear to promote significant changes in a child's overall sound system. The trade-off, however, is that frequently used sounds (e.g., /f/ vs. /v/, stops vs. fricatives) may take longer to acquire than if they were targeted directly. It is also not clear how readily systemwide changes at the word level generalize to conversational and other communicative contexts.

It should be apparent that target outcomes are a critical factor in comparing the efficiency of different treatment approaches. If the goal is to produce individual sounds accurately, then traditional motor approaches would probably be the most efficient. If the goal is intelligible word productions, then a maximal pair approach (Gierut, 2005) or Williams' (2005) multiple opposition approach would probably be the most efficient. If effective communication is the goal, then approaches that target larger discourse units like conversation or stories might be more efficient for some children. Hopefully, future research will fill in the large gaps that exist in comparative studies of treatment efficiency.

SERVICE DELIVERY FACTORS

The nature of the treatment approach and the goals targeted are not the only factors that affect treatment efficiency. A case can be made that service delivery factors may play a more important role in how quickly a child normalizes speech than the approach used and the targets selected. Service delivery factors include the setting in which treatment is provided (i.e., clinic, classroom, home), the participants (i.e., individual, group, family-based), and the schedule of treatment. The level of family support and involvement can also play an important role in treatment progress. Data from the National Outcomes Measurement System (NOMS) has shown that the proportion of children making significant gains in speech is more than doubled when the children participate in a structured home program (ASHA, 2002). In fact, just having the parent present in the therapy room might affect treatment outcome. A recent client in our summer speech clinic would not participate in any therapy activities until his mother and younger brother joined the session. Unfortunately, the clinicians spent the first 6 weeks of the summer trying to get the child to respond to therapy activities.

Schedule of treatment is a factor that historically has received little attention. NOMS data have shown that more treatment time, especially in individual sessions, resulted in more functional gains. It is common, however, in many clinics for preschool children with speech delays to be scheduled for weekly 30–60-min sessions. One hour of speech therapy with a 3- or 4-year-old will challenge the most experienced clinician. Tyler (2005) recommends scheduling individual sessions twice a week for 45 min to 1 hr. After 6–8 months, if marked changes are made in the child's system, Tyler suggests

decreasing the frequency to once a week, especially if there is an accompanying home program. Another possibility is to provide children with intensive therapy blocks. There is evidence with language and literacy training that intensive therapy 5 days a week for 2–4 weeks may be the most efficient model of treatment (e.g., National Reading Panel, 2000). Although it is difficult to provide intensive treatment blocks during the school year, summers provide an excellent opportunity for intensive treatment programs.

CLIENT VALUES

As indicated at the beginning of this article, EBP is influenced not just by research, but also by client values and clinical expertise. Client values encompass the client's unique characteristics and circumstances. This includes the various causal correlates that can impact speech, such as family history, hearing, speech production, language, cognitive abilities, and psychosocial traits (e.g., Shriberg & Kwiatkowski, 1994), as well as the (a) nature and severity of the speech delay; (b) age of child; (c) success of previous therapy; and (d) child's motivation, attention, and effort. Kwiatkowski and Shriberg's (1998) capability-focus framework provides a way to use some of these factors to make treatment decisions. *Capability* refers to the child's current phonological abilities and risk factors (mechanism, cognitive-linguistic, and psychosocial). *Focus* refers to the amount of motivational support a child needs to persist at a difficult task. In retrospective and prospective studies, Kwiatkowski and Shriberg (1993, 1998) found that pretreatment capability is the best predictor of normalization rate, but lack of focus is associated with minimal progress even in children with high capability scores. These findings suggest that clinicians may need to think of innovative or unconventional ways to motivate children with low focus.

Another aspect of client values to consider is the attitudes and beliefs about treatment that parents and families may have. Consider, for example, the 2-year-old child with a moderate speech delay without concomitant language problems. The level of concern a parent has about the speech delay will play an important role in whether or not the child receives services. Unconcerned parents will probably not even take their child to be evaluated. In contrast, a concerned parent will not only have the child evaluated, but may insist that the child receive services even if the clinician recommends against treatment at this time. The important point here is that it may not be the nature or extent of the speech delay that determines whether services are provided, but rather the level of parent concern and persistence in finding a professional to provide services.

CLINICIAN FACTORS

Clinician experience and expertise is the third factor that impacts EBP. Clinical experience is, of course, not always a good measure of clinical expertise because clinical expertise is based on knowledge as well as experience. Clinical expertise also is often influenced by attitudinal factors such as enthusiasm and belief in the effectiveness of a treatment approach (e.g., Kamhi, 1994). In the deaf education literature, for example, Gee (1992) found that any method, no matter how unintelligent it was, worked if the teachers believed in it and the parents supported it at home. On the basis of these findings,

Gees concluded that enthusiasm, belief, advocacy, and parent support were more important than specific teaching methods.

Another example is Chall's almost 40-year-old study of the effectiveness of different reading programs (Chall, 1967). The success of a program, Chall found, was due less to its nature than to its newness in schools. Innovators tended to be believers. They involved parents, confronted difficulties, and did so regardless of the particular philosophy of the program. The atmosphere of the classroom—excitement or boredom—and student interest were not related to the content of the stories or the emphasis on phonics rules. Instead, student involvement depended on the momentum, support, and expectations that were created by the classroom teacher. A key variable was the teacher's ability to stay tuned to the delicate interval between ease and difficulty and to stay within this interval for different students. Chall referred to this variable as *pace*. Good teachers were able to stay within this interval; poor teachers were not.

Clinical expertise does not seem to be associated with a particular theoretical perspective. Stanovich (2000) found that most teachers do not embrace a particular theoretical orientation; instead, they are "committed pragmatists who single-mindedly pursue what works" (p. 416). Like teachers, clinicians also tend to use an approach because it works (Kamhi, 1994). This finding troubled me initially because I naively thought that clinicians would say that they used an approach because there was empirical support for it or it was consistent with their theoretical view of language development or learning (Kamhi, 1999). There is a body of literature, however, that supports the "what works" teaching epistemology. The most important determinant of teacher attitudes toward change is not prior attitudes or beliefs as was commonly thought, but whether new practices led to demonstrable gains in student achievement (Gersten & Brengelman, 1996). Attitudes changed dramatically when teachers saw changes in their students' learning abilities. This finding makes a lot of sense: Teachers and clinicians should be most influenced by the changes that occur in their student and client behaviors. This is why teachers and clinicians are not averse to using different instructional approaches. They are more concerned with changes in children's learning than in the theoretical nature of the instructional approach.

MAKING CLINICAL DECISIONS

A central tenet of EBP is that rigorous scientific studies should have much more influence on clinical practices than the beliefs and opinions of authorities (Dollaghan, 2004). But, as Dollaghan goes on to say, if there is no strong empirical evidence on a clinical question, the opinions of experts are among the sources of information to be integrated with our clinical expertise, values, and clients' preferences to make a clinical decision. Unfortunately, according to Weston and Bain (2003), of the 41 phonological treatment studies that were conducted between 1960 and 2003, only one would qualify as rigorous. Our treatment decisions thus will be influenced by the opinions of experts, clinical expertise, values, and client preferences, as noted by Dollaghan. These decisions also will be influenced, however, by the "what works" teaching epistemology that most clinicians embrace.

As discussed in the previous section, behavioral change is a central component of the "what works" teaching epistemology. Not coincidentally, the use of behavioral change to validate clinical decisions is also consistent with a central tenet of EBP: The strongest evidence for a clinical decision is experimental validation with an individual client

(Ylvisaker, 2004). The key question is how behavioral change is experimentally validated. Ylvisaker, as noted at the beginning of this article, suggested that experimental validation could come in the form of trial therapy, diagnostic teaching, or dynamic assessment. Ann Tyler (personal communication, January 11, 2006) suggested that it would be important to show that the treatment provided, not some other variable, was primarily responsible for the behavioral change. A particular benefit of experimental validation is that it allows for differences in the goals targeted and the approach used to target these goals. With these points in mind, I offer some thoughts on goal selection.

PRINCIPLES OF GOAL SELECTION

Like most of us, I think it is useful to distinguish between short- and long-term goals. The long-term goals for children with SSD are speech normalization and effective communication. I would not imagine there would be much debate about these goals, yet they will rarely appear in clinical reports, probably because they seem too obvious. It is easy, however, to lose sight of these long-term goals as one targets the various short-term goals that need immediate attention. A central principle of goal selection for me is thus: "Keep the long-term goal in mind." One way to do this is to make the long-term goal a short-term goal as well.

Consider the case of a preschool child with a severe phonological disorder. Such a child needs to be taught ways to communicate intentions and meanings with his or her limited phonological abilities. A short-term goal would be to develop a core lexicon that could be used in short phrases. The core lexicon could then be incorporated into stories and thematic activities. Clinicians may have to write their own stories in order to use the core lexicon. Children's books can also be used, but the vocabulary may need to be modified. In conjunction with these short-term goals, clinicians should also work toward the long-term goal of speech normalization by targeting error patterns and specific sounds that have a major impact on intelligibility and communication. Specific sounds and phonotactic structures should be targeted at different levels of language and in varying communicative contexts. Literacy activities that facilitate print and sound awareness should also be integrated with these communication and speech normalization goals. These goals can be achieved by using one of the systematic approaches to goal selection such as cycles training (Hodson & Paden, 1991), the multiple opposition approach (Williams, 2005), the complexity approach (Gierut, 2001, 2005), or combinations of these and other approaches. The particular approach used will necessarily vary according to clinical experience, client values, service delivery factors, and experimental validation with individual clients.

CONCLUSION

Making good clinical decisions is not easy. The existence of high-quality research can certainly help inform clinical decisions, but research is just one of several factors that influence clinical decisions. Additional factors are the two other components of EBP—client values and clinical expertise—as well as a clinician's theoretical perspective, service delivery considerations, the opinion of experts, and experimental validation with individual clients. In this article,

I considered how each of these factors impacts the decisions that clinicians make to treat children with SSD. The underlying theme of the article has been that treatment decisions should be influenced the most by the changes that occur in client behaviors and that these changes should be empirically validated by demonstrating that the treatment provided, not some other variable, was responsible for the behavioral change.

REFERENCES

- American Speech-Language-Hearing Association.** (2002). *National outcome measurement system*. Retrieved September, 2002, from http://professional.asha.org/resources/NOMS/treatment_outcomes.cfm
- Bauman-Waengler, J.** (2004). *Articulatory and phonological impairments: A clinical focus* (2nd ed.). Boston: Allyn & Bacon.
- Berthal, J., & Bankson, N.** (2004). *Articulation and phonological disorders* (5th ed.). Boston: Allyn & Bacon.
- Camarata, S.** (1993). The application of naturalistic conversation training to speech production in children with specific disabilities. *Journal of Applied Behavioral Analysis, 26*, 173–182.
- Chall, J.** (1967). *Learning to read: The great debate*. New York: McGraw-Hill.
- Clark, H.** (2003). Neuromuscular treatments for speech and swallowing: A tutorial. *American Journal of Speech-Language Pathology, 12*, 400–415.
- Dollaghan, C.** (2004, April 13). Evidence-based practice myths and realities. *The ASHA Leader*, p. 12.
- Fey, M., Cleave, P., Ravida, A., Long, S., Dejmaj, A., & Easton, E.** (1994). Effects of grammar facilitation on phonological performance of children with speech and language impairments. *Journal of Speech and Hearing Research, 37*, 594–607.
- Forrest, K.** (2002). Are oral motor exercises useful in the treatment of phonological/articulatory disorders? *Seminars in Speech and Language, 23*, 15–25.
- Gee, J.** (1992). *The social mind: Language, ideology, and social practice*. New York: Bergin & Garvey.
- Gersten, R., & Brengelman, S.** (1996). The quest to translate research into classroom practice. *Remedial and Special Education, 17*, 67–74.
- Gierut, J.** (1998). The conditions and course of clinically induced phonological change. *Journal of Speech and Hearing Research, 35*, 1049–1063.
- Gierut, J.** (2001). Complexity in phonological treatment: Clinical factors. *Language, Speech, and Hearing Services in Schools, 32*, 229–241.
- Gierut, J.** (2005). Phonological intervention: The how or the what? In A. Kamhi & K. Pollock (Eds.), *Phonological disorders in children: Clinical decision making in assessment and intervention* (pp. 201–210). Baltimore: Brookes.
- Gillon, G.** (2005). Facilitating phoneme awareness development in 3- and 4-year-old children with speech impairment. *Language, Speech, and Hearing Services in Schools, 36*, 308–324.
- Green, J., Moore, M., Higashikawa, M., & Steeve, R.** (2000). The physiologic development of speech motor control: Lip and jaw coordination. *Journal of Speech, Language, and Hearing Research, 43*, 239–256.
- Haynes, R., Deveraux, P., & Guyatt, G.** (2002). Clinical expertise in the era of evidence-based medicine and patient choice. *ACP Journal Club, 136*, 1–7.
- Hodson, B.** (1997). Disordered phonologies: What have we learned about assessment and treatment? In B. Hodson & M. L. Edwards (Eds.), *Perspectives in applied phonology* (pp. 197–224). Gaithersburg, MD: Aspen.
- Hodson, B., & Paden, E.** (1991). *Targeting intelligible speech: A phonological approach to remediation* (2nd ed.). Austin, TX: Pro-Ed.
- Hoffman, P., & Norris, J.** (2002). Phonological assessment as an integral part of language assessment. *American Journal of Speech-Language Pathology, 11*, 230–246.
- Hoffman, P., Norris, J., & Monjure, J.** (1990). Comparison of process targeting and whole language treatments for phonologically delayed preschool children. *Language, Speech, and Hearing Services in Schools, 21*, 102–109.
- Howell, J., & Dean, E.** (1994). *Treating phonological disorders in children. Metaphon: Theory to practice* (2nd ed.). London: Whurr.
- Ingram, D., & Ingram, K.** (2001). A whole-word approach to phonological analysis and intervention. *Language, Speech, and Hearing Services in Schools, 32*, 271–283.
- Kamhi, A.** (1994). Toward a theory of clinical expertise in speech-language pathology. *Language, Speech, and Hearing Services in Schools, 25*, 115–119.
- Kamhi, A.** (1999). To use or not to use: Factors that influence the selection of new treatment approaches. *Language, Speech, and Hearing Services in Schools, 30*, 92–98.
- Kamhi, A.** (2003, November). *How to decide which speech treatment approach to use*. Mini-seminar presented at the Annual Convention of the American Speech-Language-Hearing Association, Chicago.
- Kamhi, A.** (2004). A meme's eye view of speech-language pathology. *Language, Speech, and Hearing Services in Schools, 35*, 105–111.
- Kamhi, A.** (2005). Summary, reflections, and future directions. In A. Kamhi & K. Pollock (Eds.), *Phonological disorders in children: Clinical decision making in assessment and intervention* (pp. 211–228). Baltimore: Brookes.
- Kamhi, A., & Pollock, K.** (Eds.). (2005). *Phonological disorders in children: Clinical decision making in assessment and intervention*. Baltimore: Brookes.
- Kwiatkowski, J., & Shriberg, L.** (1993). Speech normalization in developmental phonological disorders: A retrospective study of capability-focus theory. *Language, Speech, and Hearing Services in Schools, 24*, 10–18.
- Kwiatkowski, J., & Shriberg, L.** (1998). The capability-focus treatment framework for child speech disorders. *American Journal of Speech-Language Pathology, 7*, 27–38.
- Larivee, L., & Catts, H.** (1999). Early reading achievement in children with expressive phonological disorders. *American Journal of Speech-Language Pathology, 8*, 118–128.
- Locke, J.** (1995). *The child's path to spoken language*. Cambridge, MA: Harvard University Press.
- Lof, G., & Watson, M.** (2005). *Survey of universities' teaching: Oral motor exercises and other procedures*. Poster presented at the Annual Convention of the American Speech-Language-Hearing Association, San Diego, CA.
- Marshall, P.** (1996). *Oral motor techniques in articulation therapy*. Temecula, CA: Speech Dynamics.
- Metsala, J., & Walley, A.** (1998). Spoken vocabulary growth and the segmental restructuring of lexical representation: Precursors to phonemic awareness and early reading ability. In J. Metsala & L. Ehri (Eds.), *Word recognition in beginning literacy* (pp. 89–122). Mahwah, NJ: Erlbaum.
- Miccio, A. W., & Ingrisano, D.** (2000). The acquisition of fricatives and affricates: Evidence from a disordered phonological system. *American Journal of Speech-Language Pathology, 9*, 214–229.
- Morais, J., Bertelson, P., Cary, L., & Alegria, J.** (1986). Literacy training and speech segmentation. *Cognition, 23*, 45–64.
- National Reading Panel.** (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and*

- its implications for reading instruction. Washington, DC: National Institute of Child Health and Human Development.
- Nittrouer, S.** (2002). From ear to cortex: A perspective on what clinicians need to understand about speech perception and language processing. *Language, Speech and Hearing Services in Schools, 33*, 237–253.
- Norris, J. A., & Hoffman, P. R.** (2005). Goals and targets: Facilitating the self-organizing nature of a neuro-network. In A. Kamhi & K. Pollock (Eds.), *Phonological disorders in children: Clinical decision making in assessment and intervention* (pp. 77–87). Baltimore: Brookes.
- Oller, K.** (1978). Infant vocalization and the development of speech. *Allied Health and Behavior Sciences, 1*, 523–549.
- Olswang, L.** (1990). Treatment efficacy. The breadth of research. In L. Olswang, C. Thompson, S. Warren, & N. Minghetti (Eds.), *Treatment efficacy research in communication disorders* (pp. 99–103). Rockville, MD: American Speech-Language-Hearing Association Foundation.
- Powell, T., Elbert, M., Miccio, A., Strike-Roussos, C., & Brasseur, J.** (1998). Facilitating [s] production in young children: An experimental evaluation of motoric and conceptual treatment approaches. *Clinical Linguistics & Phonetics, 12*, 127–146.
- Ratner, N. B.** (2006). Evidence-based practice: An examination of its ramifications for the practice of speech-language pathology. *Language, Speech, and Hearing Services in Schools, 37*, 257–267.
- Roehrig, S., Suiter, D., & Pierce, T.** (2004, November). *An examination of passive oral motor exercises*. Poster presented at the Annual Convention of the American Speech-Language-Hearing Association, Philadelphia.
- Ruark, J., & Moore, C.** (1997). Coordination of lip muscle activity by 2-year-old children during speech and nonspeech tasks. *Journal of Speech and Hearing Research, 40*, 1373–1385.
- Sackett, D., Straus, S., Richardson, W., Rosenberg, W., & Haynes, R.** (2000). *Evidence-based medicine: How to practice and teach EBM* (2nd ed.). New York: Churchill Livingstone.
- Shriberg, L., & Kwiatkowski, J.** (1994). Developmental phonological disorders I: A clinical profile. *Journal of Speech and Hearing Research, 37*, 1100–1126.
- Shriberg, L. D.** (1997). Developmental phonological disorders: One or many. In B. Hodson & M. Edwards (Eds.), *Perspectives in applied phonology* (pp. 105–127). Gaithersburg, MD: Aspen.
- Stanovich, K.** (2000). *Progress in understanding reading: Scientific foundations and new frontiers*. New York: Guilford.
- Tyler, A.** (2005). Planning and monitoring intervention programs. In A. Kamhi & K. Pollock (Eds.), *Phonological disorders in children: Clinical decision making in assessment and intervention* (pp. 123–137). Baltimore: Brookes.
- Tyler, A., Edwards, M., & Saxman, J.** (1987). Clinical application of two phonologically based treatment procedures. *Journal of Speech and Hearing Disorders, 52*, 393–409.
- Tyler, A., Lewis, K., Haskill, A., & Tolbert, L.** (2002). Efficacy of cross-domain effects of a morphosyntax and a phonologic intervention. *Language, Speech, and Hearing Services in Schools, 33*, 52–66.
- Tyler, A., & Sandoval, K.** (1994). Preschoolers with phonological and language disorders: Treating different linguistic domains. *Language, Speech, and Hearing Services in Schools, 25*, 215–234.
- Vandiver, V. L.** (2002). Step-by-step practice guidelines for using evidence-based practice and expert consensus in mental health settings. In A. Roberts & G. Greene (Eds.), *Social workers' desk reference* (pp. 731–739). New York: Oxford University Press.
- Van Riper, C., & Emerick, L.** (1984). *Speech correction: An introduction to speech pathology and audiology* (7th ed.). Englewood Cliffs, NJ: Prentice Hall.
- Velleman, S., & Vihman, M.** (2002). Whole-word phonology and templates: Trap, bootstrap, or some of each? *Language, Speech, and Hearing Services in Schools, 33*, 9–24.
- Vihman, M.** (2004). Later phonological development. In J. Bernthal & N. Bankson (Eds.), *Articulation and phonological disorders* (5th ed., pp. 105–138). Boston: Allyn & Bacon.
- Walley, A., Metsala, J., & Garlock, V.** (2003). Spoken vocabulary growth: Its role in the development of phoneme awareness and early reading ability. *Reading and Writing: An Interdisciplinary Journal, 16*, 5–20.
- Weston, A.** (2004, November). *Synthesis of research in treatment of childhood speech-sound disorders*. Poster session presented at the Annual Convention of the American Speech-Language-Hearing Association, Philadelphia.
- Weston, A., & Bain, B.** (2003, November). *Current v. evidenced-based practice in phonological intervention: A dilemma*. Poster session presented at the Annual Convention of the American Speech-Language-Hearing Association, Chicago.
- Williams, A.** (2005). From developmental norms to distance metrics: Past, present, and future directions for target selection practices. In A. Kamhi & K. Pollock (Eds.), *Phonological disorders in children: Clinical decision making in assessment and intervention* (pp. 101–108). Baltimore: Brookes.
- Ylvisaker, M.** (2004, November). *Evidence-based practice and rational clinical decision making*. Paper presented at the Evidence-Based Practice in Child Language Disorders Working Group, Austin, TX.

Received September 26, 2005

Accepted April 4, 2006

DOI: 10.1044/0161-1461(2006/031)

Contact author: Alan Kamhi, Department of Communication Sciences and Disorders, 300 Ferguson, UNCG, Greensboro, NC 27402.
E-mail: agkamhi@uncg.edu