Dynamic Assessment in Phonological Disorders
The Scaffolding Scale of Stimulability

Amy M. Glaspey, MS, CCC-SLP; Carol Stoel-Gammon, PhD

Dynamic assessment is applied to phonological disorders with the Scaffolding Scale of Stimulability (SSS). The SSS comprises a 21-point hierarchical scale of cues and linguistic environments. With the SSS, clinicians assess stimulability as a diagnostic indicator and use the measure to monitor progress across treatment. Unlike other phonological measures, the SSS is sensitive to phonological change that occurs in relatively short periods of time because it measures the changes in response to cues rather than independent productions. A case study of a 3-year-old girl with phonological disorder is presented to demonstrate how the SSS documented change in stimulability after 8 weeks of treatment. Examples of changes in stimulability are presented at the phoneme, sound class, and composite levels. Key words: dynamic assessment, phonology, scaffolding, scale, stimulability

Clinicalians have measured stimulability as part of assessment procedures in articulation and phonological disorders for the past 75 years (Travis, 1931). Stimulability refers to testing the client's ability to produce a misarticulated sound in an appropriate manner when "stimulated" by the clinician to do so (Bauman-Waengler, 2000). This is a general definition of stimulability because the types of stimulation that clinicians provide and the procedures that they follow have varied over the years. Most often, stimulability is assessed after the administration of a standardized test where target words have been elicited with a spontaneous production (i.e., non-imitated). The Goldman-Fristoe Test of Articulation (Goldman & Fristoe, 2000), for example, includes a stimulability subtest where the clinician reevaluates the targets that were produced in error and gives the child a verbal model in syllables, words, and sentences with these targets. If the child can then produce the target with a verbal model, the child is said to be stimulable.

Clinicians also assess stimulability with a variety of informal procedures. The differences across clinicians are based on the range of environments that are assessed and the cues that are given to the child. The environment refers to the linguistic context in which the phoneme is produced; for example, the child may be asked to produce a phoneme in isolation, syllables, words, sentences, or connected speech. Not all clinicians assess all environments. In addition, clinicians assess different types of cues. The most frequently used cues are in the form of verbal model and visual model (Carter & Buck, 1958; Goldman & Fristoe, 2000; Lof, 1996; Milisen, 1954; Scott & Milisen, 1954). The verbal model is accompanied by a visual cue where children are instructed to watch the clinician's face when the verbal model is presented. Some assessments of stimulability may also include placement cues in isolation (Rvachew, Rafaat, & Martin, 1999). While verbal and visual cues are informative, the benefits of stimulability may come from testing a wider range of cues that will likely be used as part of treatment.
Another variation of stimulability testing occurs in the number of opportunities that are presented to the child. Lof (1996) assessed factors that were related to stimulability in children, using a different definition of stimulability. Each child was assessed on a sound that was produced in error. The child was given 10 opportunities to produce a sound in a CVC word with initial error consonant +A+/ a stop or nasal consonant. The child was cued to listen and watch, then repeat the adult model. A target was considered stimulable if it received a score of 2 correct productions out of 10. Lof reported that the factors that were most associated with stimulability were visibility of the sound, age, socioeconomic status, and overall imitation skills. Other assessments have had the child first listen to multiple presentations and then respond after the model with one production (Goldman & Fristoe, 2000; Milisen, 1954).

Rvachew et al. (1999) examined the relationship between pretreatment stimulability and speech perception by assessing treatment targets in syllable-initial position using a 3-point stimulability scale. Three environments were assessed: isolation, word, and sentence. Each of the environments was presented with a verbal model after one trial with the exception of isolation where placement cues were given if the child was unsuccessful. Results indicated independence between stimulability and speech perception.

Although the methods of assessing stimulability vary, historically the primary purpose has been as a prognostic indicator (Carter & Buck, 1958; Diedrich, 1983; Farquhar, 1961; Irwin, West, & Trombetta, 1966; Kisatsky, 1967; Powell & Miccio, 1996; Snow & Milisen, 1954; Sommers et al., 1967). Clinicians have used stimulability as a marker for making judgments about how children might develop with or without speech treatment. When a child appears to be stimulable in the diagnostic phase, clinicians ask themselves several questions: Does the child have a speech disorder that warrants treatment? Or, does the child have an emerging system that will mature independently? This type of reasoning leads to prognostic statements about the likelihood a child would benefit from treatment.

While clinicians find value in assessing stimulability, the literature remains mixed regarding the actual interpretation of the results and the impact on outcomes for children (Diedrich, 1983; Powell & Miccio, 1996; Rvachew et al., 1999). Studies have documented that in the absence of treatment, stimulable children made greater gains over time than those who were not stimulable (Carter & Buck, 1958; Farquhar, 1961; Kisatsky, 1967; Snow & Milisen, 1954). Conflicting results have also been found when treatment was administered. When children who were stimulable received treatment, their gains were not as significant as those of children who were not stimulable (Carter & Buck, 1958; Sommers et al., 1967). Contrastively, Irwin and colleagues (1966) reported that children who were stimulable and received treatment made the greatest gains, and Sommers and colleagues (1967) found that all participant groups who received speech treatment improved significantly compared to those who did not. Overall, the discrepancies in the literature could be related to differences in assessment procedures.

Assessment of stimulability has also been used for planning treatment. Several treatment programs recommend the selection of treatment targets that are highly stimulable, whereas others prioritize targets that are least stimulable. Milisen (1954) recommended treating stimulable sounds first when using Integral Stimulation treatment. With the traditional approach developed by Van Riper, stimulability is considered along with the developmental sequence of sound acquisition and frequency of the sound in English when selecting targets for treatment (Secord, 1989). The most stimulable, frequent, and earliest developing sounds are targeted first, one at a time in sequence. In the Metaphon approach (Howell & Dean, 1994), the initial phase of concept instruction is followed by a second phase with targets that are stimulable.

In contrast, some treatment programs suggest that greater progress may be achieved
by choosing targets that are not stimulable or are of least "phonological knowledge" (Gierut, 1998). In Gierut's approach, one phoneme that best represents the missing pieces of the child's phonological system is selected for treatment. In this way, global change may be induced. Other researchers recommend targeting unstimulable sounds because these are least likely to be acquired without treatment (e.g., Miccio, Elbert, & Forrest, 1999; Powell, Elbert, & Dinnsen, 1991; Powell & Miccio, 1996). Given the differences in participants, treatment approaches, and measurement of progress across the studies cited above, it is difficult to make a definitive statement regarding the role of stimulability in selecting treatment targets. A recent study by Rvachew and Nowak (2001), designed to investigate this question, documented greater progress in children who received treatment with highly stimulable targets than children who received treatment with later-developing, less-stimulable targets.

STIMULABILITY AS A MEASURE OF PHONOLOGICAL CHANGE

A relatively new use of stimulability has been proposed and implemented in the last 10 years: stimulability as a measure of phonological change and progress across treatment. Bain (1994) proposed an expanded version of stimulability based on the concepts of Vygotsky's theories of dynamic assessment (Vygotsky, 1978, 1986). Bain had previously applied dynamic assessment in language disorders using a weighted scoring system of cues, from least supportive to most supportive, and suggested that a similar framework could be applied in phonology. The proposed framework suggests the application of scaffolding to phonological assessment through (1) manipulation of antecedents, such as placement cues, visual/tactile imagery, frequency of presentation, and phonetic context; (2) manipulation of responses, such as linguistic complexity and interaction with language components; and (3) manipulation of consequences, in the form of pragmatic events, schedule of reinforcement, and type of reinforcement.

Perrine (1999) applied Bain's framework of dynamic assessment and scaffolding to phonology with a study that assessed the construct validity of a proposed cueing hierarchy for nine target phonemes: /k/, /g/, /f/, /v/, /s/, /l/, /l/, /l/, /l/, and /d3/. Fifteen children aged 4 years 7 months to 6 years 5 months were assessed on two or three phonemes that were missing from their inventories. Scaffolding of these phonemes occurred in the environmental contexts of isolation, syllable, and word levels. Within each environment, seven antecedent cues were manipulated, from least to most supportive. The antecedent cues all included a verbal model that was applied indirectly or directly, and then additional manipulation occurred with visual, placement, or tactile cues. Results indicated that the children followed the expected sequence of the hierarchy. The assessed phonemes for each child were scored, summed, and averaged for an overall score of stimulability for that child. The scores fell across a range that indicated differences across the children. Each phoneme score improved with increased cueing or manipulation of the environment. The more the support provided, the higher the accuracy scored. The constructs of dynamic assessment were supported using this study.

The purpose of Perrine's study (Perrine, 1999) was to assess the construct validity of a cueing hierarchy in phonological disorders; however, the next step is to evaluate how stimulability changes across time. With this in mind, the Scaffolding Scale of Stimulability (Glaspey & Stoel-Gammon, 2002, 2004) was developed. The Scaffolding Scale of Stimulability (hereafter referred to as SSS) proposes a format using a gradient of stimulability based on a 21-point scale to assess a child's speech productions. Although similar to the scale presented by Perrine (1999), the hierarchy within the SSS differs in some respects. First, in the SSS, targets are elicited in seven environments: isolation, word, carrier phrase, novel phrase,
embedded in sentence, two-target sentence, and picture scene. Second, the SSS takes a range of the antecedent cues and groups them into four levels, specifically: Level 0—spontaneous or delayed model; Level 1—verbal instruction about articulatory place-ment; Level 2—verbal instruction plus verbal model; and Level 3—verbal instruction plus verbal model and prolongation, segmentation, simultaneous production, or tactile cues.

As shown in Figure 1, the traditional definition of stimulability is expanded in the SSS because phonemes and patterns are assessed across a gradient of 21 points rather than in a binary fashion. As a result, children's speech can be described at a specific point on the stimulability scale rather than stimu-lable or not stimulable. Children with disor-dered phonology often do not produce target patterns on their own; however, when they are given support, that is, "scaffolding," in the form of verbal modeling, instructions, and physical assistance, they are more successful at producing target structures. Using the SSS, clinicians assess phonemes, clusters, syllables, and shapes across seven different environments with several cueing options. Clinicians rate each phoneme or pattern on the 21-point scale by assigning the lowest scaffolding score where the child achieves success. Scores can then be evaluated individually or added together as a composite score of overall stimulability. Administration of the SSS should occur prior to treatment and then after treatment has been administered to compare changes in the phonological system.

<table>
<thead>
<tr>
<th>SSS Cue levels →</th>
<th>Level 0 Spontaneous or delayed model</th>
<th>Level 1 Verbal instruction about articulatory placement</th>
<th>Level 2 Verbal instruction, Verbal model</th>
<th>Level 3 Verbal instruction, Verbal model, Prolongation, Segmentation, Simultaneous production, Tactile cues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environments</td>
<td>Clinician prompts</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Not stimulable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td>Say _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word</td>
<td>What's this?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier phrase</td>
<td>Tell me about this. Start with It's a . . .</td>
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<tr>
<td>Novel phrase</td>
<td>Tell me about this.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Embedded in sentence</td>
<td>Tell me more about this.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-target sentence</td>
<td>Tell me about both of these.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture scene story</td>
<td>Tell me a story about this picture.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Figure 1.** The Scaffolding Scale of Stimulability (SSS), with lower scores representing less scaffolding support and higher scores representing greater support.
Seven environments are included on the SSS. The first and most supportive environment is production in isolation or in a syllable. The second environment, which gradually removes support, is at the word level. Most target words are CVC, with the exception of target words that assess syllable shapes such as CCVC or CVCC. The third environment is a carrier phrase, a repetitive phrase that begins with "It's a . . ." or "He can . . ." depending on whether the target word is a noun or a verb. At the fourth environment, a novel phrase three words in length is elicited with the target word appearing at the end of the phrase. For example, after a carrier phrase for /b/ is elicited, as in "It's a boat," the novel phrase for this word would be: "Row a boat." The novel phrase is slightly different from the carrier phrase because it will vary across targets. In the fifth environment, the target word is embedded in a short sentence about four words long with a word on either side of the target: "My boat went fast." The sixth environment includes two opportunities for the child to produce the target in a single sentence: "I found a bean in the boat." Both targets must be produced correctly to receive credit for this level of the hierarchy. Finally, in the least supported environment, the child must spontaneously produce at least two targets in connected speech while describing a picture scene.

LEVELS OF CUES IN THE SSS

Within each environment, the clinician manipulates cues that will assist the child in the production of the target. The clinician begins with spontaneous production where no cues are given and asks the child to name a single object picture. When the child is unsuccessful, the clinician adds cues. The cues start with as little support as possible by giving the child a verbal instruction that may relate to placement of the articulators or manipulation of the breath stream: "Pull your tongue back, and try again," for a /k/ or "Make the air come out," when the child is stopping /s/. If the child still continues to produce an error, the clinician will add a verbal model, which the child will repeat.

At the most supportive level, the clinician tries several different cues that vary in effectiveness across children and tend to be phoneme specific. The order of these cues is likely to vary, although the tactile cues are considered to be the most supportive of all the cue types. The choices for cues include prolongation, segmentation, simultaneous production, and tactile cues. When the clinician uses prolongation, the target sound is emphasized and drawn out. This type of cue will likely be best with a fricative; for example, the clinician will prompt the child: "Say s-s-s." The target can also be emphasized in a different manner through segmentation; for example, the clinician will prompt the child: "Say s—ong." Another cue is simultaneous production. With this cue, the clinician asks the child to say the word at the same time as the clinician. Often, prolongation is encompassed: "Join in with me s-s-s." Child says "s-s-s." Clinician says "ong" while the child is still saying "s-s-s" and then the child finishes with "ong." Sometimes, a tactile cue with physical manipulation of the articulators may elicit the sound or, for example, for a child who stops /s/, the clinician might slide a hand down the child's arm to demonstrate the length and frication of the sound. Overall, these cues are given only at the environmental level of isolation, word, or carrier phrase.

ADMINISTRATION OF THE SSS

The SSS includes probes for all phonemes of English in the initial and final positions of CVC words. In addition, /s/, /l/, and /r/ clusters and weak and strong syllable patterns are assessed across multisyllabic words. The phonemes, patterns, and syllables are assessed with four levels of cues and across seven environments. The environments were constructed to optimize stimulability; consequently, phonemes that might interfere with the target were avoided. For example, to elicit
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/s/, other stridents were avoided in the sentence construction to increase the likelihood of accurate production (Bankson & Bernthal, 2004, p. 253) as in "Sing; I can sing; He will sing; I sing all day; I eat soup and I sing." The same words, phrases, and sentences are used in subsequent administrations.

The administration of the SSS begins by first documenting a consonant inventory from a connected speech sample. For a sound to be considered part of the inventory, it must occur accurately at least two times in the sample (adopted from Stoel-Gammon, 1985). Sounds and syllable patterns that are correct within this inventory are assigned a score of 1 and are not assessed further for stimulability on the SSS. In this way, the length of the test is reduced. Next, assessment of phonemes or phonological patterns proceeds at the word level on the SSS. Each target is first elicited at the word level without cues or modeling to assess spontaneous productions. The clinician shows a picture to the child and says: "What's this." If the child produces the target in error, then the clinician will respond by adding cues, beginning with the least supportive cues and adding more supportive cues as needed. In contrast, if the child produces the target correctly at the word level, a production with increased environmental complexity is elicited, as illustrated in Figures 2 and 3. For example, if the child produces the phoneme correctly in a single word, the clinician moves to productions in a carrier phrase. The goal at this stage is to find the "threshold" of correct speech production, that is, the most complex environment with the least amount of cueing and support. If a child does not respond to the stimulus picture, the clinician describes the purpose of the object or uses a cloze procedure. If this still does not help the child, the clinician provides a delayed model in which the target word is named, followed by a filler sentence, and then a second elicitation, as in "Hook. It's something you use to catch fish. You say it."

The entire assessment takes about 40 to 70 minutes to administer. Although this may appear rather long, the advantage of the SSS is that scoring and administration occur simultaneously; therefore, extra time for analysis is not required after administration. Once stimulability is established at the least-supported level, targets are discontinued from testing in subsequent administrations, which shortens the length of administration. During the test, the clinician elicits a production with increased environmental complexity to carrier phrase or sentence and continue at cue level 0.

### Table: The Scaffolding Scale of Stimulability

<table>
<thead>
<tr>
<th>Step</th>
<th>Clinician's antecedent</th>
<th>Child's production</th>
<th>Plan for next step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Show picture of <em>comb</em> and say: &quot;What's this?&quot;</td>
<td>[koum] Correct response.</td>
<td>Reduce scaffolding by changing environment complexity to carrier phrase or sentence and continue at cue level 0.</td>
</tr>
<tr>
<td>![Attempting score of 16]</td>
<td>![Attempting score of 12]</td>
<td>![Attempting score of 13]</td>
<td>![Attempting score of 14]</td>
</tr>
<tr>
<td>Step 2</td>
<td>Show picture of <em>comb</em> and say: &quot;Tell me about this.&quot;</td>
<td>[itsa toum] Incorrect response.</td>
<td>Maintain carrier phrase environment, but add scaffolding in the form of instructional cue at cue level 1.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Give an instruction and say: &quot;Try again, but pull your tongue back.&quot;</td>
<td>[itsa toum] Incorrect response.</td>
<td>Maintain carrier phrase environment, but add scaffolding in the form of verbal model at cue level 2.</td>
</tr>
</tbody>
</table>

**Figure 2.** The Scaffolding Scale of Stimulability. Sample administration sequence for /k/ in word-initial position with a correct response on the first presentation.
assessment, clinicians reinforce children’s responses with tokens to activities and games. By rapidly changing token activities, clinicians maintain motivation of children as young as 3.

CASE STUDY

The application of the SSS is shown through a case study of a preschooler with phonological disorder. “Ann,” age 3 years 7 months, was referred for speech treatment because her parents felt concerned that her speech was difficult to understand. She had no history of ear infections and passed a hearing screening as part of the assessment. Ann scored in the average range on both receptive and expressive language assessments; however, she scored a percentile rank of less than 1 on the Hodson Assessment of Phonological Patterns (Hodson, 2004). Ann exhibited several phonological processes: stopping, fronting, gliding, and cluster reduction; her Percentage of Consonants Correct (Shriberg, Austin, Lewis, McSweeny, & Wilson, 1997) in connected speech was 65%.

Ann received treatment two times per week in an individual setting for 50-minute sessions for 8 weeks. The treatment was based on Cycles treatment (Hodson & Paden, 1991); target patterns were selected and rapidly changed from one week to the next without a preset criterion. During each session, Ann practiced four to six target words during play-based activities where she received a manipulative or game piece as reinforcement for correct productions. Practice words were different from those used in the assessments. The SSS was administered before and after the treatment cycle. Samples of Ann’s data are given below to illustrate how the SSS was used.

The first step in the administration of the SSS was to determine Ann’s inventory of singleton consonants, cluster, and syllable shapes that were accurately produced. Ann produced the following consonants in word-initial position at least two times in connected speech: /p, b, t, d, n, l, r, h/; her inventory in word-final position was more limited: /t, d, n, r/. As is often the case, there were fewer than two opportunities for many consonants in the connected speech sample, including word-initial /m, v, z, j, l, d, w/ and word-final /p, b, k, f, v, ð, s, j, 3, l, m, l, r/. Consequently, these phonemes were further assessed for stimulability. Ann produced strong and weak syllable combinations in words and CV, VC, CVC, CVCCV, CVVCV, CVVCVV word shapes. No consonant clusters occurred in the sample; therefore, some
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Weeks of Treatment

Figure 4. The Scaffolding Scale of Stimulability. Scores for /s/ in initial position and final position of words pretreatment and after 8 weeks of treatment.

/s/, /v/, and /r/ clusters were assessed. Based on the overall inventory set, 40 targets were assessed for stimulability using the SSS. To demonstrate the uses of the SSS, a sample of Ann’s data is presented in the text and figures by phoneme, class, and as a composite score.

Figure 4 shows data for the phoneme /s/ for a period of 8 weeks. The first administration of the SSS occurred prior to speech treatment. Ann received a score of 19 on the SSS for /s/ in the initial position of CVC words, meaning that she could make initial /s/ in a word after she was given all forms of cueing from cue level 3: verbal instruction, verbal model, and prolongation (see Figure 1 for a complete list of the SSS levels). Ann received treatment for s-clusters, velars, and stridents. After 8 weeks of treatment, the SSS was administered again; initial /s/ was produced in a carrier phrase with verbal instruction, verbal model, and prolongation. Thus, the score for initial /s/ showed improvement, decreasing from 19 to 15.

The pattern of change for word-final /s/ was slightly different. Prior to treatment, Ann’s score for final /s/ was 20; she could produce /s/ in isolation, but not at the end of words. After 8 weeks of treatment, the score for final /s/ was 11; at this point, Ann produced final /s/ in a novel phrase with a verbal instruction and verbal model only. Interestingly, final /s/ exhibited greater progress than initial /s/ after the 8 weeks of treatment, as shown by the difference in stimulability scores: 15 for initial /s/ and 11 for final /s/.

Ann’s example illustrates how SSS scores provide information about individual phonemes. Information about sound classes or error patterns can also be obtained when SSS phoneme scores are averaged together. Again, as an example, Ann’s progress on stridents (/f, v, s, z, ʃ, ʒ, dʒ/) and velars (/k, g, ɣ/) was analyzed. To obtain a sound-class score for the class of strident phonemes, the scores for all initial and final stridents were added together and divided by 15 (the total number of stridents), yielding an average score for this sound class. Ann’s average strident score prior to treatment was 19, meaning she was slightly stimulable for stridents. After 8 weeks of treatment, her average strident score was 16, indicating that stimulability for stridents had improved, as shown in Figure 5. For additional comparison, scores for the class of velars are also shown in Figure 5. In this example, the individual velar scores were added together and divided by five (total number of velars). Prior to treatment, Ann scored an average of 5 for velars, changing to a score of 3 after 8 weeks of treatment, once again showing improvement in production. Overall, velars were more stimulable than stridents.

In addition to the measures for phonemes, sound classes, and error patterns, the SSS can provide an overall composite score. This score is calculated by averaging the 48 individual phoneme scores, including all phonemes in initial and final position and select consonants clusters. When Ann’s scores for individual phonemes were averaged together prior to treatment, she received a score of 11; after 8 weeks of treatment, her productions had improved and the composite score was lowered to 8. The change in her score is illustrated in Figure 6.

Results from the phoneme level of analysis may be most beneficial for children who demonstrate only a few sound errors. Clinicians can document progress in terms of the progression for the one sound across the hierarchy. Children
with significant errors across classes or entire sound system may benefit more from an analysis of change by class, pattern, or as a composite score. A sound class analysis may be more helpful for children who exhibit phonological processes where a class is affected. Other patterns may also be averaged in this manner, such as a composite for initial consonants, final consonants, syllables, and consonant clusters. For children with severe phonological disorder, a composite score may be most beneficial when the entire sound system is impacted and emerging.

STRENGTHS AND WEAKNESSES OF THE SSS

The SSS was designed to provide many benefits throughout the entire treatment process. At the diagnostic phase, clinicians can use the SSS to test treatment and try different strategies for sound production. Static assessments typically document how a child compares to peers of the same age on a specified task or generate a score that will help qualify the child for speech services; however, most static assessments do not incorporate treatment activities such as cueing and manipulation of environmental complexity that would provide information about possible ways to begin treatment. Static assessments treat all children the same in comparison to a large group and are not adapted to the child’s unique abilities. Because the design of the SSS follows the constructs of Vygotskian learning (Vygotsky, 1978, 1986), it allows for individual differences across children. Children have different learning styles; one child may not need a lot of support to produce a sound correctly, whereas another child needs all possible cues and environmental support to be successful. With a dynamic approach to assessment, a unique and individualized treatment program can be developed.

Another potential use of the SSS involves the selection of treatment targets. With the SSS, levels of stimulability can be described in more detail; that is, a child can be described as a little stimulable, moderately stimulable, or highly stimulable for a particular phoneme. Whether a clinician selects targets that are highly stimulable or unstimulable, using a more detailed measure of stimulability can enhance decision making. Ultimately, the SSS may provide a basis for identifying an “optimal” range of stimulability associated with target selection.

Once a child qualifies for speech treatment, the SSS can be used to monitor change in the child’s phonological system. The SSS differs from other measures because it measures change on the basis of the child’s improved response to cues and the decrease in cues needed over time. The large number of cues and environments minimizes potential ceiling and floor effects. Some children score well on a single-word articulation test, yet in connected speech, intelligibility is low (Kent, Miolo, & Bloedel, 1994). The single-word test in this case has a ceiling effect, which does not reflect the child’s overall performance. Another child, however, may not produce any targets at the word level for a long period of time; in this case, the assessment has a floor effect and does not reach low enough to identify the needs of the child.

Finally, the SSS has the potential as a measure that supports evidence-based practice. Preliminary evidence suggests that the SSS is more sensitive to change across time than are other measures. In a previous study (Glaspey & Stoel-Gammon, 2004), the SSS was administered to two children with severe phonological disorder at four intervals across 9 months of treatment. The scores for both children showed a similar pattern of consistent development across time, with the SSS registering

Figure 6. The Scaffolding Scale of Stimulability. Average score for all phonemes in initial and final position of words pretreatment and after 8 weeks of treatment.
change prior to the other measures. With the increased sensitivity that the SSS provides, treatment efficacy may be better assessed in future studies and the SSS could be used as a measure to compare differences in treatment programs. Measures that are insensitive may not indicate that any change has occurred and clinicians may inappropriately assume that two treatments have the same effect.

In addition to its strengths, the SSS has some potential weaknesses related to administration, stimulus selection, and interpretation of scoring. As a dynamic assessment, the outcome is based, in part, on the relationship between the adult and child; consequently, the clinician’s ability to prompt the child and engage the child in participation may affect the child’s overall score. A more skilled clinician may facilitate the child’s ability to achieve a better score. As with any assessment, the child’s ability to attend will also affect the score outcomes. The clinician requires the child to attend and respond to a series of cues and environmental changes. Token reinforcement is used to encourage attention to the clinician’s cues with frequent changes in accompanying activities. Clinicians must be skilled in reinforcing behaviors to maintain the child’s participation.

In construction of the SSS, stimulus words were carefully selected for ease of production of the target phoneme or sound pattern; specifically, the vowels and adjacent consonants were selected to maximize the correct production of the target. However, it is well known that children with a phonological disorder may not adhere to the expected norms; consequently, the “facilitative” phonetic contexts that guided stimulus selection may not be effective. As a result, a child who is not stimulable for accurate production using the word from the SSS may be capable of producing the target in a different phonetic context.

Finally, the SSS uses a numeric system to label the levels of cues and environments in an ordinal hierarchy across the scale. Because the scale is ordinal, score changes do not necessarily reflect equal increments; for example, a change in score from 16 to 15 may not be quantitatively equivalent to a change in score from 19 to 18. In addition, a 1-point change may not be considered clinically significant, yet a change of five points may give a better indication of a clinically significant change in performance. The changes in increments may also be unique to individual children who exhibit different patterns as they progress from one level to the next. One child may struggle to move from the word level to the sentence level, whereas another child may have difficulty moving from presence to absence of verbal models.

In conclusion, we recognize that further study of the SSS is needed to fully understand its potential use as a clinical measure. Important questions include the following: What is the relationship between the SSS scores and the child’s age and/or the severity of the disorder? How stable are the SSS scores across time and across administrators? How do scores on the SSS predict scores on standardized assessments? Are there specific patterns of stimulability that will indicate prognosis? Use of the SSS with larger numbers of children and a range of clinicians should provide insight to these questions and provide important information on the developmental patterns of stimulability in children with phonological disorders.

REFERENCES


