Section 1:

INTRODUCTION TO THE *GDAP*

The *Glaspey Dynamic Assessment of Phonology (GDAP)* is an individually administered dynamic assessment used to measure speech sound production and speech adaptability. A graduated prompt approach is implemented that includes a hierarchy of cues and linguistic environments for children aged 3 to 10. The assessment provides an innovative and novel method for evaluating speech sounds and changes in skills over time. The *GDAP* incorporates Vygotsky's social development theory along with stimulability and speech adaptability procedures from speech-language pathology (Vygotsky, 1978). Speech adaptability reflects the amount of assistance and cues a child needs to produce speech sounds; thus, the *GDAP* is used to determine the child's speech sound errors and also the extent of help a child needs (Glaspey, 2012; Glaspey & MacLeod, 2010). The measure may be used for diagnostic and prognostic purposes or to monitor progress and document treatment efficacy. Like a chameleon that changes in relation to its environment, children's speech skills also may change when elicited in different linguistic environments. The *GDAP* provides a way to assess the breadth of a child's speech production abilities.

The *GDAP* measures a child's potential for learning phonemes and phonological patterns through a systematic presentation of instructions, models, cues, and linguistic environments (Glaspey & Stoel-Gammon, 2005, 2007). This assessment requires the child to produce sounds, words, sentences, and/or connected speech and to modify error productions when given cues and support. The *GDAP* is intended to be used by speech-language pathologists who need a sensitive measure of speech sound and phonological pattern production. Most currently available tests for speech production are "static" and offer clinicians only a summary of the product of a child's current abilities, rather than assessing the child's learning potential and speech adaptability. The limitations of static measures become apparent when trying to differentiate a speech sound disorder from a cultural difference, when examining the extent of a child's difficulties, when determining a starting point for treatment

once a disorder has been determined, and when measuring change over time. In contrast, dynamic assessments such as the *GDAP* measure learning potential, not just mastered skills. In other words, clinicians assess what a child can learn, not just what a child already knows. This information can better help clinicians to differentiate between a cultural difference and a disorder, measure the severity of a disorder, and document a more precise baseline for planning treatment and evaluating treatment change (Gutiérrez-Clellen & Peña, 2001; Hasson, Camilleri, Jones, Smith, & Dodd, 2012). The following section provides an overview of the theoretical background of the *GDAP* including dynamic assessment principles, the advantages of using dynamic assessment over static measures, and the structure of the *GDAP*.

OVERVIEW OF DYNAMIC ASSESSMENT

Evaluation is a high-stakes practice that often determines whether or not a child receives speech-language pathology services and, if so, informs the type of treatment that is implemented. In their evaluation process, speech-language pathologists typically use "static" assessments, in which a child's skills are measured at one time without examiner assistance and environmental factors are held constant (Donaldson & Olswang, 2007). The theoretical foundation of static testing is often attributed to Binet (Sternberg & Grigorenko, 2002). This approach to testing was developed to predict future success, quantify developed abilities without assistance, and summarize pre-existing skills. Static assessments tend to be product oriented and emphasize current skills rather than process oriented with a focus on learning capabilities (Hasson & Joffe, 2007). This focus on current, mastered skills from a static assessment may lead to test bias and misinterpretation of a child's functional abilities (Peña & Iglesias, 1992). In addition, children may be over- or under-identified with communication disorders on the basis of test selection. Further problems with static assessments can include reduced sensitivity to skill differences among children and, as treatment is implemented, reduced sensitivity to treatment change over time. These challenges during the evaluation process have led clinicians to consider alternative procedures that may better inform the diagnostic process and clinical decision making.

Dynamic assessment provides an alternative approach that may resolve some of these issues and offer advantages over static assessment (Hasson & Joffe, 2007; Petersen, Chanthongthip, Ukrainetz, Spencer, & Steeve, 2017). The theoretical foundation of dynamic assessment comes from the cognitive literature and is attributed to Vygotsky's view of children's development (Vygotsky, 1978). Dynamic assessment involves sampling treatment strategies, engaging in instruction, and observing a child's responses. Clinicians offer feedback during the testing process and build a two-way relationship with the child that supports cultural goals. Furthermore, dynamic assessment emphasizes the emergence of skills by measuring the zone of proximal development (ZPD), the distance between where an individual performs with assistance and where he or she performs without

assistance. As clinicians have observed, some children need very little assistance to be successful, whereas others need considerable assistance even though they may receive the same score on a test. Understanding the differences in abilities leads to better and more individualized treatment planning. Furthermore, dynamic assessment is highly advantageous when assessing skills across diverse cultures and can be used to distinguish cultural difference from disorder (Hasson et al., 2012; Peña & Iglesias, 1992). Because the *GDAP* is grounded in a dynamic approach, it may be used to identify speech sound disorders in children with high diagnostic accuracy and simultaneously inform intervention.

Two broad categories of dynamic assessment have been most commonly used by language researchers: (1) test-teach-test and (2) graduated prompt. The test-teach-test approach involves a separation of testing and instruction phases (Lidz & Peña, 1996; Peña, Gillam, & Bedore, 2014). In contrast, the *GDAP* uses a graduated prompt approach, which includes a simultaneous merger of testing and instruction (Campione & Brown, 1987; Gutiérrez-Clellen & Peña, 2001; Ram, Marinellie, Benigno, & McCarthy, 2013). Children are presented with one test item at a time. Initially the test may appear static as the child is typically not given assistance during the first prompt. If the child completes the item correctly, the clinician moves to the next item or increases the complexity of the task. However, if the child does not demonstrate independent mastery of the task, the clinician gives a graded series of cues that may vary in number and type, depending on the needs of the child. The process continues across test items. Scores reflect the amount and type of support needed by the child. The graduated prompt approach has been used to study morphological analysis (Larsen & Nippold, 2007; Ram et al., 2013; Wolter & Pike, 2015); requests for information by children with autism (Donaldson & Olswang, 2007); expressive syntax for children who use augmentative and alternative communication (Binger, Kent-Walsh, & King, 2017); and eye-gaze in children with severe disabilities (Olswang, Feuerstein, Pinder, & Dowden, 2013). The *GDAP* employs a graduated prompt approach to measure speech sound production and speech adaptability, offering clinicians a unique approach to understanding the specific skills and needs of the children whom they serve.

Dynamic Assessment of Speech Sound Disorders: Articulation, Phonology, and Stimulability

Often speech sound disorders are divided and characterized as either an articulation disorder or a phonological disorder (American Speech-Language-Hearing Association, n.d.). The term articulation disorder is typically used when a child has difficulties with the form of speech sounds, which may include structural or motor-based challenges. The term phonological disorder is typically used when a child has difficulties with the functional organization of sounds in the language system. However, as seasoned clinicians can attest, this dichotomy is not always so straightforward. A child may initially have difficulties producing a sound and

then, once production is achieved, not know what to do with it in the context of language. Indeed, recent research has begun to group together children with reduced intelligibility under the term speech sound disorder.

The *GDAP* provides a framework for analysis from either a phoneme or phonological error pattern perspective. A single phoneme may be assessed from an articulatory viewpoint, or multiple phonemes can be assessed and combined to highlight a particular pattern from a phonological perspective. Ultimately, the goal of the *GDAP* is to assess production of targets in the context of language—in connected speech when describing a picture scene. The structure of the *GDAP* offers clinicians considerable flexibility when choosing targets for measurement.

Historically, stimulability assessment has represented the closest form of dynamic assessment for speech sound disorders and has been used for nearly 90 years (Bain, 1994; Glaspey, 2012; Powell & Miccio, 1996; Travis, 1931). Stimulability testing has included a global correction score across sounds (Carter & Buck, 1958) and an evaluation of individual phonemes (Miccio & Williams, 2010). It has been used as a prognostic indicator (Carter & Buck, 1958; Diedrich, 1983; Powell & Miccio, 1996; Snow & Milisen, 1954) and for treatment planning (Gierut, 1998; Rvachew, 2005; Secord, 1989; Snow & Milisen, 1954). Linguistic environments have included syllables (Miccio, 2002), words (Carter & Buck, 1958), and sentences (Goldman & Fristoe, 2015). Cues given to children have ranged from a verbal model (Carter & Buck, 1958) to the inclusion of placement cues (Rvachew, Rafaat, & Martin, 1999), tactile cues (Bain, 1994), and even multiple repetitions of a verbal model (Lof, 1996). Typically, clinicians summarize the results of these variable procedures simply by stating that sounds are stimulable or not.

The *GDAP* expands the traditional definition of stimulability to fit the framework of dynamic assessment (Bain, 1994; Glaspey & Stoel-Gammon, 2005, 2007). The *GDAP* describes a child's productive abilities along a gradient of 15 points, or, in Vygotsky's terms, potentially a 15-point ZPD (Glaspey & MacLeod, 2010). The 15 points represent the number of scaffolds available to the child in the production of a phoneme. Consequently, the goal of assessment is to use as few scaffolds as necessary, thereby providing the least amount of support the child needs to produce each sound or pattern. The clinician must find the child's threshold of correct speech production – the most complex linguistic environment in which the child can produce the target sound with the least supportive cues. In the *GDAP*, a low score of 1 is best and indicates that the child produced the target sound independently (i.e., with no instructions or verbal cues) in connected speech. In contrast, a high score indicates that the child needed many support strategies to produce a single sound in isolation. By assessing a child's responsiveness in greater detail with the *GDAP*, it is possible to measure how a child responds to cues across a range of systematically varied linguistic contexts.

Several researchers have provided evidence to reduce misconceptions regarding the challenges of using dynamic assessment (Hasson & Joffe, 2007; Petersen et al., 2017). The *GDAP* provides additional evidence in favor of using dynamic assessment. For example, low procedural reliability has been identified as

a potential challenge during dynamic assessment. However, the *GDAP* provides a standardized sequence of steps in response to each child's productions, eliminating these kinds of reliability concerns. Another challenge that has been suggested is that dynamic assessment is time-intensive. However, with the *GDAP*, clinicians can streamline the process by selecting only the targets of interest. In addition, because testing, teaching, and scoring occur simultaneously, no lengthy analysis follows administration. The process is further streamlined with the use of the ATP Online computer-assisted interface. The ATP Online system automatically navigates the examiner through the *GDAP* decision matrix, assigns raw scores, performs score conversions, and produces a score report. Furthermore, the wealth of information gathered far exceeds any concerns with time restraints. Training of the procedures has also been identified as potentially challenging on other dynamic measures. However, the *GDAP* procedures can be easily learned, and training videos are available that greatly enhance the learning process.

Structure and Use of the *GDAP*

The *GDAP* is organized on a 15-point scale of speech adaptability that combines and manipulates six linguistic environments and four clinical cues. First, the *GDAP* assesses speech production abilities within six different environments. The environment is the linguistic context in which a sound is produced. The clinician changes the environment by manipulating language in response to the child's production. If the child's production is correct, then the environment is made more complex. Conversely, if the child's production is incorrect, then the environment is made less complex. Following are the environments from the least complex to the most complex. Examples for each environment are given for the target /m/ in the word-initial position.

- *Isolation*—the target is elicited alone or in a syllable with "uh" (CV or VC), depending on the characteristics of the individual phoneme or cluster. The isolation environment always includes a verbal model of the sound from the clinician, and cues may be added.
  - Example: ***mmmm***

- *Word*—the target is elicited in a CVC word with the exception of targets for multiple syllables and clusters. Dynamic assessment of each target in the *GDAP* begins at the word level.
  - Example: ***mop***

- *Three-word sentence*—the target is elicited in a three-word sentence with the target in a word at the end of the sentence.
  - Example: *Use the **mop**.*

- *Four-word sentence*—the target is elicited in a four-word sentence with the target in a word in the middle of the sentence. The word with the target may be the second or third word in the sentence but may not occur at the beginning or end of the sentence.
  - Example: *The **mop** is dirty*.

- *Two-target sentence*—the target is elicited in a four- to five-word sentence with the target occurring in two words. The words with target sounds may occur anywhere in the sentence.
  - Example: *The **mop** is by the **mat***.

- *Connected speech*—the target is elicited in connected speech with the target occurring in at least two words. The productions must be in connected speech (i.e., a minimum of two connected words). Single-word productions, such as labeling, are not considered correct productions. A verbal model is not specified for this level.

Second, the *GDAP* includes a structured range of cues that are used to facilitate productions across the linguistic environments. The clinician adds cues in response to the child's error productions. With the advancement of each cueing level, more support is added. The cues are grouped together in four levels:

- Spontaneous production without support—the child is able to produce the target sound in the single-word, two-target, and connected speech environments without instruction, verbal model, or cueing beyond the initial elicitation cue.

- Verbal instruction about articulatory placement and verbal model—if the child is unable to spontaneously produce the target in a word, the clinician gives an instruction followed by an immediate verbal model. Specific instructions and models for each target are provided. The instruction is dependent on the error and may include feedback about the error, a cue to attend to the clinician's face, or a placement cue about how to position the articulators.
  - Example: Child says *"op"* for **mop**.
    Clinician says, *"Not quite. Look at me. Lips together. Say, **mop**."*

- Verbal instruction and verbal model plus prolongation or segmentation—if the child is unable to produce the target after verbal instruction and model, the clinician gives an additional verbal model with segmentation or prolongation to emphasize the target sound. Specific models for each target are provided, and the type of cue depends on the characteristics of the sound. For example, stops are segmented, and fricatives and nasals are prolonged. *Segmentation* involves breaking a word apart into the target sound and the remainder of the word. *Prolongation* involves extending the duration of the target phoneme. In both cases, the production is modeled

in the context of the single-word or three-word sentence environment. Verbal instruction may still be given in combination with the other cues at this level.

- ○ Example: For incorrect pronunciation of /k/ in **comb**, the clinician would use segmentation and say, *"Not quite. Look at me. Say, **c omb**."*

- ○ Example: For incorrect pronunciation of /m/ in **mop**, the clinician would use prolongation and say, *"Not quite. Look at me. Say, **mmmmop**."*

- Verbal instruction, verbal model, and prolongation or segmentation plus tactile cues—at this level the clinician may choose a variety of tactile-visual strategies, depending on the child's error and the characteristics of the target sound. Tactile cues may include manipulation of the articulators or a tactile representation of the sound, such as a tap on the hand for a stop or a slide down the arm for a fricative. Suggested tactile cues are provided for each target. If a child is defensive to tactile cues, the cue may be administered on the clinician and shown to the child for a tactile-visual representation. The tactile cues are combined with a verbal model and may include all previously used cues (e.g., instruction and segmentation or prolongation).

  - ○ Example: *"Look at me. Say, **mmmmm**."* Clinician gently touches child's bottom lip and pushes bottom lip to upper lip.

Together, the linguistic environments and cues have been systematically organized into a 15-point scale (see Section 4: Interpretation, for an explanation of the scale). Using this scale, clinicians can assess syllable patterns, phonemes, and consonant clusters. Syllable patterns include weak-Strong-weak and Strong-weak-Strong-weak words. The phonemes include 24 phonemes of standard American English in initial and/or final position of words and are organized across Sound Classes that include Glides, Nasals, Stops, Velars, Stridents, Interdentals, and Liquids. Clusters include word-initial and word-final clusters with emphasis on /l/, /r/, and /s/ in combination with other consonants. Vowels are not assessed with the *GDAP*. Each item begins in the middle of the scale (score of 10) with an attempt to elicit the target in a single word and progresses up or down, depending on the responses of the child. Assessment rules were developed to include stopping points within the measure. These rules, along with the cues and environments, are more specifically defined in Section 3: Administration and Scoring.

The *GDAP* is flexible in the targets that clinicians may choose to elicit, and it can be used to assess skills on individual targets, Sound Classes, or as an Overall score across the sound system. Therefore, it can be used with children who have a wide range of abilities and speech assessment needs. Clinicians may choose items to measure the targets that are most useful for each child. Because of the flexibility of target selection, the test provides information for children with single-phoneme errors where clinicians are using a traditional approach for remediation.

Furthermore, because of the breadth of target choices, the measure may also be appropriate for children with multiple-phoneme and pattern-based sound errors where clinicians are using a phonological approach.

Each target can be assigned a score from 1 to 15 as described above. In addition, the scores from all the items in a Sound Class can be added together and converted to a Sound Class scaled score. Finally, the scores from all the items can be added together and converted to an Overall standard score. Additionally, if all targets are administered, standard scores for Initial Position Phonemes and Final Position Phonemes can be calculated. Clinicians may decide whether it is most appropriate to consider the child's needs from the perspective of an individual target, a Sound Class, or the total system.

The *GDAP* is a multi-functional tool that can be used not only diagnostically and prognostically but also as a measure of change over time during the course of treatment, even in short increments of time. The sensitivity of the measure gives clinicians information that can be used to systematically develop treatment programs and make appropriate changes as needed. Because the measure is essentially a "sample" of treatment, it can be used for evaluating response to invention and to support evidence-based practice. The *GDAP* may be administered as a pre- or post-treatment measure or as a measure of treatment data for individual sessions. First, clinicians may choose to administer the entire *GDAP* or portions of it prior to treatment. Then, after specified intervals, the clinician will administer the test again to compare the child's pre-and post-treatment scores (e.g., after each academic quarter in a school system). Readministration of the *GDAP* following treatment, or at specified intervals during treatment, allows for demonstration of changes across time.

Clinicians may also use the *GDAP* scale to evaluate performance at the end of an individual treatment session. Using the same strategies, a clinician can document the level that a child achieved by the end of a treatment session. For example, imagine a child who is working on the /r/ sound and needs many cues, including tactile cues, instructions, and verbal models, during a treatment session. The child was successful in producing the sound at the level of the syllable or in isolation, but he or she could not manage production without support. At the end of this session, the child would have a score of 14 on the *GDAP* scale. This score can be documented at each session for comparison over time and for comparison with pre- and post-treatment measures. It is strongly recommended, however, that clinicians not practice the target words that are used on the *GDAP* during treatment sessions and instead reserve these words for pre- and post-treatment assessment procedures.

Conclusion

The Glaspey Dynamic Assessment of Phonology *(GDAP)* is a new standardized, dynamic assessment of speech sound production. It offers versatility of measurement that can be applied across speech sound disorders. The *GDAP* provides two

convenient administration and scoring options: paper-based Record Forms and decision matrix, or computer-assisted administration via the ATP Online interface. The *GDAP* can be used for determining the presence of a disorder, measuring a baseline, planning treatment, and documenting response to treatment over time. The *GDAP* has been nationally standardized, and the criterion- and norm-based comparison data will meet the demands of educational and medical authorities for standardized scores for qualification of services. Overall, it meets many of the needs of speech-language pathologists to better understand their clients.