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Three different phonological approaches moving one child towards intelligible speech

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"Three Different Phonological Approaches Moving One Child towards Intelligible Speech"

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Capstone Approval Page

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"Three Different Phonological Approaches Moving One Child towards Intelligible Speech"

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Honors Thesis Abstract

For my Capstone, I will research, contrast, and then apply three different phonological approaches to therapy to the same four year old female with unintelligible speech. The three different phonological approaches are multiple oppositions, phonemic categories development, and construct of complexity. Each phonological approach has different targets to therapy but all have the same ultimate goal of intelligible speech. Multiple oppositions use multiple sound pairs to help the child reduce homonomy and integrate their knowledge of sound sets. Facilitating underlying phonemic category uses complete emersion of phonemic sounds though training and assessments in hope that the mass quantity of input will aid in the correction of the child's phonological disorder. Construct of complexity uses complex target clusters in therapy in hopes that the complexity of the targets will allow the mastery of simpler tasks.

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"Three Different Phonological Approaches Moving One Child towards Intelligible Speech"

By:

Kelly Walus

Phonology is defmed as "the study of [the] sounds of speech" (Plante and Beeson, 2004). Linguists have been studying phonological development since the early 1900's (Plante and Beeson, 2004). But, the majority of current phonological studies focus on discovering the rules required to combine speech sounds in syllables and words. For each language there is a set of phonological rules. There are numerous different phonological rules in the English language. An example of a rule in the English language deals with the */st/* and */str/* clusters. The */st/* cluster can occur at the beginning (e.g. 'steep') or end of a word (e.g. 'best'), where as the */str/* cluster can only occur at the beginning of a word (e.g. 'street').

The majority of people appropriately use many phonological rules of their language without actually being aware there are such rules. However, even young children begin to become aware that specific structures are not allowed in English. Phonological awareness typically occurs in childhood and continues into adulthood. As one progresses into adulthood they usually become more conscious of the awareness of the sounds that make up words in speech, but they may not be able to give an explanation as to why. A few examples of phonological awareness are when a child makes 'bug' plural. They know to use a */z/* instead of an */s/* to mark plurality, where when they make the word 'bike' plural they use the sound/s/. They also become good concepts like rhyming words or counting syllables. These are all examples of phonological awareness.

According to Hoff "around 18 months of age children's productions become more consistent in their articulation of speech sounds, although still not adultlike. They appear to have developed systematic ways in which to alter the sounds of the target language so that they fit within the repertoire of sounds they can produce. These systematic transformations are called phonological processes" (2005). Phonological processes are typically a way for young children

to make sense of adultlike speech; the children use their simpler articulatory gestures to replace the complex adult like model that their communication system will not allow them to produce with simplified structures. Some common phonological processes found in children's speech are whole-word processes such as weak syllable deletion (e.g. 'tato for 'potato'), final consonant deletion (e.g. 'bi' for 'bike'), reduplication (e.g. 'baba' for bottle), consonant harmony (e.g. 'tip' for 'sip' and 'ship') consonant cluster reduction(e.g. 'no' for 'snow'), or segment substitution processes such as velar fronting (e.g. 'tup' for 'cup') (Hoff, 2005). Most of these phonological processes occur in typical children as they develop. However, the process persists past the age when it should be suppressed, concern arises.

"Whole-word processes, which alter the adult word most drastically, are especially typical of younger children (up to age three or four), whereas in some normally developing children, some of the segment substitution processes persist into the early school years" (Hoff, 2005). When a phonological process continues for a child past four years of age, an examination of speech sound errors is typically done, which is called a phonological profile. For most children their misarticulation may seem random, but through further examination of the child's speech, patterns can typically be identified. If the clinician finds that the child continues "to use a simplification process beyond the time when others their age use them" they are typically diagnosed with a phonological disorder. Phonological disorders range from mild to severe. Their levels have to do with the complexity of their phonological processes and the frequency to which the child uses the processes.

When providing therapy for a child with a severe phonological speech disorder there are multiple different therapy options to choose from. The three that will be focused on in this paper are multiple oppositions, phonemic category development, and construct of complexity. All three

of these phonological processes are directly treating a phonological impairment for a child with a severe phonological disorder in order to increase speech intelligibility. Although each approach has different recommended targets for therapy; the ultimate goal is always the same for all three approaches: intelligible speech. With the goal of intelligible speech being the outcome of each therapy approach it is up to the speech-language pathologist to choose which approach would be the most beneficial for the child. The three approaches will be explained and then shown how they could be applied to a four year old child with unintelligible speech.

Approaches

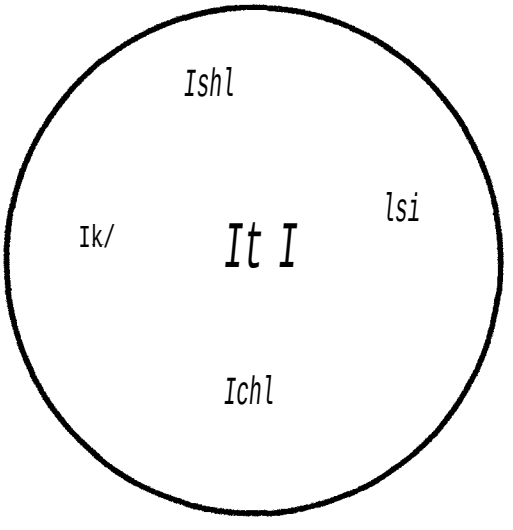
Multiple oppositions approach is a contrastive approach used in therapy for children with severe phonological speech disorders. The approach of multiple oppositions "directly addresses the multiple absences of adult [phonological] sounds that [then] result in extensive phoneme collapses" (Williams, 2000). The substitution of one sound for a variety of other sounds results in homonymy of speech; this means that different words sound as if they are the same word due to the phonemic collapse the child is exhibiting. This approach uses a larger phonemic treatment set that directs intervention across the child's error pattern rather than addressing an isolated aspect of the child's system or rule. The approach of multiple oppositions allows for the therapy to be unique and directly addresses the child's individual phonological system rather than a more general treatment set. The goal of intervention is to eliminate homonymy that is the result of extensive phonemic collapse; clinicians do this by inducing multiple phonemic splits. This is done in order for the child to understand the single sound that they are producing for multiple different sounds is incorrect. The goal is for the client to understand that they are producing one sound for a group of sounds which causes communication breakdowns; this allows for the client to make the needed split and produce all the sounds in the correct instances. When a child

produces extensive phonemic collapses their speech is most likely going to be less intelligible due to the severity of their phonological impairment. . Multiple oppositions approach is constructed around the concept of broad training. Broad training according to Elbert and Gierut "incorporates intervention that is distributed across a large and varied treatment set" (Williams, 2000). Broad training results in significantly higher generalization performances for a child with severe phonological impairments.

Multiple oppositions approach works by using a larger set of phonemic contrasts to a sound to aid in expanding the child's phonological system. This approach is often compared to the minimal pair's approach, which is when a single target sound is contrasted in therapy. For example, if the child produces [t] for [k] the approach of minimal pairs would compare two words that differ by only that sound difference such as 'tea' verses 'key', using both visual and auditory cues. The approach of minimal pairs is better suited for children with mild to moderate levels of phonological impairments. An example of multiple oppositions approach would be when a child had difficulty producing the voiceless obstruents and substitutes a [t] for them. The therapy might then include multiple voiceless obstruents such as [k,s,ch,sh]. This example explains how multiple opposition's deals with a larger treatment set of phonemic contrast.. So, in William's phonological process of multiple oppositions she would use words such as kip, sip, chip, and ship to contrast it with tip. She does this to show children that there are differences between each initial sound of the words. In William's therapy the words are all paired with a picture; some pictures are make-believe, such as an alien or monster. In order for the treatment approach to work there needs to be a visual cue presented with each word in order to show the contrast of the different sounds in each word. The child will then pick a picture for the word he/she believes that they have heard. So, if the child chose Kip, a picture of a monster, for the

word tip we know that the split has not been made by the child and that the child is still using the phoneme /t/ for every sound in the group. This intervention pattern assumes that by having the child focus hislher attention to the fact that changing a sound in a word changes its meaning will allow the client to confront their incorrect phonological process and then change must occur.

An illustration that the therapist can use to diagram the child's speech production in multiple oppositions is a circle that includes all of the phonemes that the child has grouped in the same category. An example is shown below:



The second approach of phonemic category development is a method of perceptual training that facilitates appropriate phonemic categories by making distinctions between sounds. This approach is centered toward children who have a severe phonological impairment that is characterized by inappropriate underlying phonemic categories. A phonemic category is the cognitive representation of a particular sound. Even though the /l/ in 'ladder' is produced by putting the tongue tip further forward in the mouth than it is for the /l/ in 'ball', adults cognitively categorize both sounds as /l/.

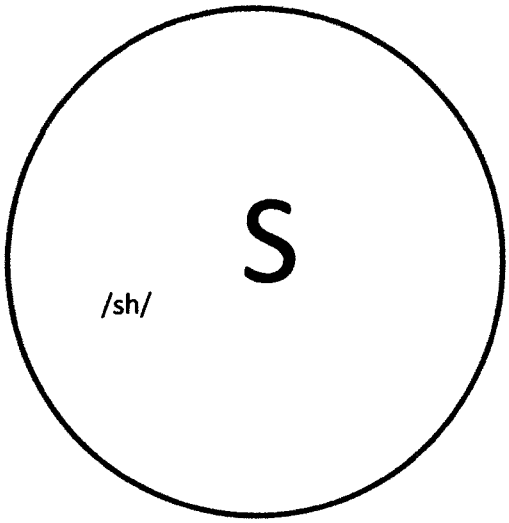
In therapy phonemic category perception is gained by listening to both good and bad examples of a sound in a word; this is done so that the child can hear the difference between the sounds and be consciously aware of them. This method is more effective than just hearing the sound produced correctly due to the fact that it provides a reference point to which he or she can compare the single sound. Rvachew provides a good way to illustrate this; if an adult were trying to learn to speak Japanese, which has sounds very different from English, it could be very difficult for him or her to be able to clearly develop a phoneme category in their own mind just by hearing a new sound. However, if this sound was compared to another sound that was very similar, it may point out more clearly the details or distinctive features of the sound he or she is trying to learn. It would enable them to "hear" the sound more accurately.

With Rvachew's technique, the child works with a computer program called Speech Assessment and Interactive Learning System (SAILS). The child then looks at two pictures on a screen, one of an object they can identify, and the other of just a big "X" to signify that the picture shown was not produced. The child listens to a digitized production of the word, and has to select either the picture shown, if it was the word produced, or the "X" if it was not. For example, if the picture is of a ship, and the computer said "ship", then the child would select the ship picture. If the picture is a ship and the computer said "sip", then the child would hit the "X", assuming that they can hear the difference.

The treatment plan starts with sounds that vary greatly (for example *lm!* and 'sh' are acoustically very different), in order to show the child how to use the program, as well as to build his or her confidence. For example, if a ship is pictured, the word produced might be "sip". After a few turns, the sound produced could be the sound as the child would produce it, where he or she might say "sip" rather than ship. If the computer says "sip", the child should hear the

difference and hit the "X". At first they might not hear the difference, and select the "ship" button. This wrong identification would point out the lack of development of the phonemic category. Rvachew believes incorrect identification suggests the child will not be able to learn to produce the sound correctly because they have not established a phonemic boundary that separates the two different sounds. As the treatment plan progresses the child should start to be able to hear the differences as his or her phonemic categories develop. A benefit of the program is that the user can play any recording of the sound that he or she wants the child to hear, including the child's own productions. This allows for the child to see ifhe or she is producing the word correctly or incorrectly. As treatment progresses, the child eventually compares two pictures that are minimal pairs. This is different from the one picture and the "X." The child then has to hear the difference between the minimal pairs in order to select the correct picture. After the child has mastered sounds, the treatment can move to clusters of sounds. But the actual production process will not begin in therapy until the child has demonstrated that a phonemic category for that sound has been created.

This method of treatment focuses on perception and listening, rather than working on sound production. That is the essential thing about phonemic category development that makes it so unique. The belief behind this treatment is that the child will more likely learn a sound if he or she can develop a phonemic category for it and understand the sound apart from others rather than just producing it. An illustration that the therapist can use to diagram the child's speech perception is a circle that includes all of the phonemes that the child has grouped in the same category. An example is shown below:



This illustrates to the therapist that the child has only developed the phonemic category for lsi, and they are using that for four other phonemes. This means that the child has the /s/ production for all the other phonemes within the circle.

The third phonological approach is Construct of Complexity. This phonological approach is for a child who has a severe phonological disorder with difficulty in contrasts and a limited phonetic inventory. The process works by a speech-language pathologist selecting complex target sounds that reveal an overall improvement and generalization in organization, representation, storage, and intelligibility globally across the sound system. The goal of this approach is to increase intelligibility of the child.

Complex targets are chosen first with the belief that children will fill in easier targets without direct treatment. In order to discover the appropriate level of complexity, a phonemic inventory must be obtained of the child's sound productions. From that inventory the clinician determines the distinctive feature contrasts that are evident in the child's phonological system.

The hierarchy created by Dinnsen and colleagues determines which contrasts the child has already mastered. The following are the features used in Dinnsen's hierarchy.

- Vocalic or syllabic are phonemes that have no greater constriction that what is used for /i/ and /u/ (Ravachew, 2005).
- Consonantal are phonemes that have constriction in the vocal tract (Ravachew, 2005).
- Sonorant means there is limited constriction of the vocal tract and the sounds are "vowel" like.
- Coronal sounds are phonemes with blade raised (Ravachew, 2005).
- Voicing means the vocal folds are vibrating during the sound (Ravachew, 2005).
- A continuant has no complete blockage of airflow (Ravachew, 2005).
- A delayed release means there is a complete closure of the vocal tract before sound comes out like as in a stop or an affricate (Dinnsen, 1990).
- Nasals are sounds produced when air flows into the nasal cavity and the velum lowers (Ravachew, 2005).
- Strident refers to sounds produced with more noise.
- Lastly lateral refers to air flowing over both sides of the tongue during production (Ravachew, 2005).

The Hierarchy of phonetic features has five levels, with level "E" as the most complex and level "A" as the least complex. Level "A" includes: syllabic, consonantal, sonorant, and coronal. A plus or minus will be designated to each feature to indicate if the contrast is or is not present in the child's phoneme inventory. Level "B" brings in the distinguishing of voice, again either a plus or minus is allotted for the distinguishing feature. The next level, "C" brings in the two features continuant and delayed release, again this level is described by using a plus for if the child has this feature or minus if the child does not have the feature. Level "D" distinguishes between nasality. The final level "E" features strident and lateral phonemes. Through the hierarchical structure of the levels all phonemes will be distinctively separated from one another (Dinnesen, 1990). In order to distinguish a target further the following distinctions can be used: clusters + singletons -, nonstimulable + stimulable -, paring of two new sounds, high-frequency words + and low-density neighborhoods + (Gierut, 2001).

In order to determine which level a child is at, one must go through a sample of their phonetic inventory while asking the following questions.

- LevelA
  - Does the child have one vowel? - syllabic
  - Does the child have one consonant? -consonantal
  - Does the child have one liquid, glide, or nasal and one stop, fricative, or affricate? -sonorant
  - Does the child have on phoneme produced in the front of the oral cavity and one produced at the back of the oral cavity? -coronal
  - *If one of these are met than the child passes at level A
- Level B
  - Does the child have one voiced phoneme and one voiceless phoneme? -voice
  - *If this is met then the child also passes at level B
- Level C
  - Does the child have one liquid, nasal, glide, or fricative and a stop or affricate? - continuant
  - Does the child have one stop or affricate and one liquid, nasal, glide, or fricative? -delayed release
  - *If one of these are met then the child passes at level C
- Level D
  - Does the child have one nasal and one liquid? -nasal
  - *If this is met then the child passes at level D
  - Does the child have one fricative and one affricate? -strident
  - Does the child have both /l/ and /r/? -lateral
  - *If this is met then the child passes at all levels.
- Level E
  - Does the child have clusters and singletons? - Cluster
  - Does the child have non-stimulable and stimulable? - non-stimulable
  - Does the child have paring of two new sounds; high-frequency worlds and low-density neighborhoods? - High-frequency and low-density neighborhoods

If a child is close to level "E" then they should begin with the sounds /skwl/ as the most complex target. The clinician can use pictures to help the child distinguish the sound cluster /skwl/ from other sounds, thus filling in the gaps in the lower levels. Possible target words can include the following: squirt, squish, squad, square, squirrel, squirm, squiggle, and/or squash. (Gierut, 2001). However, if a child is far away from level "E" other levels may have to be the

starting point in order to fill in some key sounds in the lower levels. Then the client can move up to using /skwl/ as the most complex target..

The idea behind picking the most complex targets for treatment is that a child will be able to fill in less complex targets on their own after learning the most complex target.. For instance, if a child does not know the phoneme /l/ and that is the target chosen for therapy, all sounds with contrast below Level D in which the distinctive feature of +I-lateral is present..

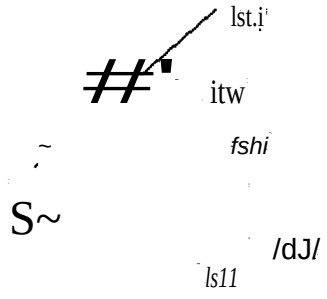
Application

Now that there is a set understanding of what each phonological approach consists of, they will be applied to a four-year old with unintelligible speech. The four year old is a female, who is beginning preschool.. She has fairly unintelligible speech. Her parents rated her single-word speech intelligibility as 80 %.This higher level is expected on behalf of them spending everyday with her. The speech-language pathologist rated her single word speech intelligibility to be 60%. In addition the administration of a standardized articulation test, The Goldman-Fristoe test of articulation-2, the child and speech-language pathologist engaged in naturalistic play so conversation speech could be analyzed. The Goldman-Fristoe and the naturalistic play samples were then transcribed to better understand what the client's phonological groupings were. The Goldman-Fristoe test provides information about a child's articulation ability by sampling both spontaneous sound productions. The child names picture plates with single-word answers that include all of the consonant sounds in English. Clinicians use this test to measure articulation of consonant sounds, determine types of misarticulation, and compare individual performance to national, gender-differentiated norms, which helps with determining if the child

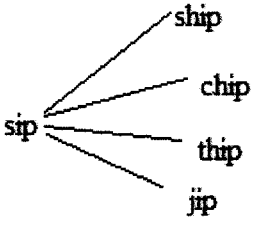
has a phonological disorder or not. A transcribed copy of the Goldman-Fristoe that was used to assess this given four year old is in Appendix a.

Application to each approach

If the multiple oppositions' approach was chosen for the four-year old female with unintelligible speech, the goal of therapy would be to reduce homonymy through different phonological collapses resulting in intelligible speech. The four-year old client had many different incorrect groupings. The largest grouping dealt with her *lsi* phoneme, she put multiple different phonemes to *lsi* grouping. The client replaced *lsi* for /th/, *Ish!, Ich!, Ij/, Is1/, 1st!.* This is the examples of the contrastive sounds.



Four examples would be chosen to use as target words for each session.



So, in the case of multiple oppositions there is a maximum of four different contrasts that can be looked at when doing production training at one time. In multiple oppositions each sound would be paired with a picture. So for this client the *lsi* sound would be for sip and it would be paired

with a cup and a person drinking out of it; the /th/ sound would be for thip, which we could have it be the name of a make-believe character; the /ch/ sound would be for chip, which would be paired with a picture of a chip; the /j/ sound would be for jip and there would be a picture with money; and finally the /sh/ sound would be for ship and would paired with a picture of a ship. The combination of the sound, word, and picture is essential for the therapy to work.. The child has to be able to see that each of the words, which contain a different initial sound, has a different picture associated with it.

The client will be exposed to multiple different sounds at once allowing for treatment to progress faster as well as to be more efficient.. The treatment can be done making pictures and cutting them out manually or there is a computer program called sound contrasts in phonology created by McKinley and Williams that generates pictures once the SLP inputs the child's error pattern. The sound contrast in phonology software contains over 8,000 illustrated treatment targets to help individualize therapy sessions for each student.. The multiple oppositions approach is individualized for each client with the phonological disorder. There are also 2,350 real words and about 6,000 nonsense words, which allow for virtually any word to be paired to a picture (Williams, 2000). The clinician would then give the child picture options to choose from and the child would then be trained to hear the differences in the sounds and select the correct picture. Initially, the speech-language pathologist would start off by assessing the child's phonological processes by doing a phonological analysis. Then the clinician would choose which target sound to begin therapy with. The therapy sessions can vary in time according to the severity of the child's disorder. There are four phases to multiple opposition training. The first level deals with the client obtaining "70% accuracy across two consecutive training sets" a treatment set for multiple oppositions depends upon the number of contrasts being made but can vary anywhere

from 20-50 responses (Williams, 2000). Once this is achieved the treatment is then switched to "spontaneous roduction when the treatment criterion of 90% accuracy across two consecutive training sets was achieved" (Williams, 2000). If the generalization does not occur with the untrained words the treatment would then continue at the same level with additional contrasts. This would include new pictures and would continue the production training. Then if this level is met but the child is not generalizing as well as she should be, the clinician would move on to a "conversational based approach of naturalistic speech intelligibility training," which would be the final phase in the multiple oppositions training (Williams, 2000).

For this four-year old, the goals of therapy would be to "provide opportunities for her to discover the rules that are being trained, provided focused practice on the new targets in order for them to become automatic" that can be done through the computer program, "provide the child with linguistic/communicative feedback with regard to the semantic meaning of the child's production, and provide opportunities to practice the new targets in naturalistic play activities" (William, 2000). The hope would be that after the client went through extensive multiple opposition's therapy she would be better equipped to generalize her new rules that she learned for other targets. The client should be able to generalize the rules to other clusters more easily and efficiently.

If the phonemic category approach was chosen for the four-year old girl with severely unintelligible speech, the goal would be to establish accurate phonemic categories. This specific child has many different phoneme production errors. In order to illustrate the phonemic category development method for the child, the /s/ phoneme error set will be the looked at in further detail to demonstrate how this method would work.. The child produces the /s/ phoneme for the following targets: /th/, /dz/, /sh!, and /ch!. Through extensive therapy the child should be able to

separate the difference between the phonemes and allow her to expand her phonemic category instead of having only one */si* category. The Speech Assessment and Interactive Learning System (SAILS) software would be used in therapy to accomplish the goal of the phonemic category splits.

The clinician would work with the client on one target sound at a time. So, one could start with the *Ish!* phoneme, which with this client she perceives under the */si* category. The client would use the SAILS program, which would allow her to view one picture on the computer screen. The client would then be shown the picture with a correct phoneme production attached to it. This allows for the client to hear the correct production of the sound and the child must be able to identify the correct sound with the picture before moving on to a more complex activity. After the client has associated the picture with the correct sounds of the word the client will then progress to having two pictures on the SAILS program. The client would then have a picture of a ship as one button and a picture of an "X" as another button. The program on the computer will then sayan adult production of the word ship. The client would then be expected to be able to distinguish the word "ship" as the word ship and push the ship button. Next, the program on the computer could say the word lip and again the program would have a picture of a ship button and a "X" button. The client would be expected to select the "X" button due to the fact that the onsets to these target sounds are quite different in both the production and manner that the sounds are produced. Once the client has shown that she can do this task which is seen as a simpler task the client would progress to a task more complex.

Then the client would go back to the *Ish!* phoneme, which would be paired with the word shoe. The program for this word would present a picture of a shoe with the word shoe and next to the shoe picture there would be a picture of an "X". The computer will say the word shoe. The

client would then be expected to select the shoe picture. Now, the clinician would again show a picture of a shoe, but they would have the computer say the word "Sue" instead. The computer would still show the pictures of the shoe and the X. We would hope that the client would select the "X" button, but at this point the client might select the shoe, even though she did not hear the word shoe but rather the word sue. Depending on her performance, we would then continue to show alternative pictures of words starting with *Ish!* and *lsi* phonemes. Some of the words would not correspond with the pictures and some would. The computer program would also use different pronunciations of the words in order to make sure the child has a clear understanding of the word being produced. So, the child might hear the word shoe produced by an adult,, a child, and a computer generated voice, as well as their own voice.

This is a progressive program. The client will start the program off with one picture next to an "X". Then, after several tries the client will then progress to having two pictures, where the client will have to distinguish between which picture she believes was said. Throughout the session the clinician will put in a word with a completely different sound than the target sound to better help the client make the distinction between the sounds. So, if we were still using the example of ship the clinician could say a word like fan in one trial. The idea is that the */f/* phoneme is completely different from the *Ish!* phoneme and this distinction should be fairly easy for her.

The client would then be evaluated after each session. If the clinician sees an improvement at a particular level that the client is on, the clinician would then progress the client to the next phoneme that the child produces the *lsi* phoneme for. The clinician would continue to work with the client until the split was made for all of the phonemes that she produced *lsi* sound for. After the client has demonstrated a phonemic category of the target phoneme, meaning that

she correctly selects the appropriate target after numerous trials on the SAILS program the actual production training of the phonemes can then begin. The production training for the client would not start until she could show that the phonemic category was made.

The construct of complexity therapy approach is for a child who has a severe phonological disorder with difficulty in contrasts and a limited phonetic inventory (Gierut, 2001). A clinician would select complex target sounds for the client that reveal an overall improvement and generalization in organization, representation, storage, and intelligibility globally across the sound system. The goal of this approach is to increase intelligibility of the client. The target in this therapy must be complex; this is in order for the client to functionally grasp all other sounds below the most complex sound. In order to discover the right target a phonemic inventory must be taken of the child's sound productions. From that inventory the clinician follows the hierarchy of phonetic features and the descriptive literature following complex targets.

When following the hierarchy, created by Dinnsen, distinctive features are used to determine if a child has mastered certain sounds (Dinnsen et al, 1990). The following are the features used in Dinnsen's hierarchy (Small, 2005).

Distinctive Features	Definition
Vocalic or syllabic	Phonemes that have no greater constriction that what is used for *lii* and *luu*
Consonantal	phonemes that have constriction in the vocal tract
Sonorant	limited constriction of the vocal tract and the sounds are "vowel" like
Coronal	phonemes with blade raised
Voicing	the vocal folds are vibrating during the sound
continuant	no complete blockage of airflow
delayed release	there is a complete closure of the vocal tract before sound comes out like as in a stop or an affricate
Nasals	sounds produced when air flows into the nasal cavity and the

	velum lowers
Strident	refers to sounds produced with more noise
lateral	air flowing over both sides of the tongue during production

The Hierarchy of phonetic features has five levels, with level "E" as the most complex and level "A" as the least complex. Level "A" includes: syllabic, consonantal, sonorant, and coronal, which will all be or plus or minus if the phoneme in the inventory has that feature (Dinnsen et al, 1990). Level "B" brings in the distinguishing of voice, either plus or minus. The next level, "C" brings in the two features continuant and delayed release (plus or minus). Level "D" distinguishes between nasality. The final level, "E," features strident and lateral phonemes. Through all the levels all phonemes will be distinctively separated from all other phonemes. In order to distinguish a target further the following distinctions can be used: clusters + singletons -, nonstimulable + stimulable -, paring of two new sounds, high-frequency worlds + and low-density neighborhoods + (Gierut, 2001).

In order to determine which level a child is at, one must go through their phonetic inventory from one sample while asking the following questions (Dinnsen et al, 1990).

Level	Phonemic Qualification	Distinctive Feature
Level A	Does the child have one vowel?	+I-syllabic
	Does the child have one consonant?	+1-consonantal
	Does the child have one liquid, glide, or nasal and one stop, fricative, or affricate?	sonorant
	Does the child have on phoneme produced in the front of the oral cavity and one produced at the back of the oral cavity?	coronal
Level B	Does the child have one voiced phoneme and one voiceless phoneme?	VOIce

Level C	Does the child have one liquid, nasal, glide, or fricative and a stop or affricate? Does the child have one stop or affricate and one liquid, nasal, glide, or fricative?	continuant +I-Delayed release
Level D	Does the child have one nasal and one liquid?	*+/-nasal.*
Level E	Does the child have one fricative and one affricate? Does the child have */11* and */r/?*	strident lateral

If a child is close to level "E" then they should begin with the sounds *Iskwl* as the most complex target (Gierut, 2001). The clinician can use pictures to help the child distinguish the sound cluster *Iskwl* from other sounds, which would then fill in all gaps in the lower levels. Possible target words can include the following: squint, squish, squad, square, squirrel, squirm, squiggle, and/or squash. However if a child is far away from level "E," other levels may have to be the starting point in order to fill in some key sounds, and then the client can move up to using *Iskwl* as the complex target.

The idea behind picking the most complex targets for treatment is that a child will be able to fill in less complex targets on their own after learning the complex target.. For instance, the client does not produce the phoneme */1/*and that is the target chosen for therapy, all sounds below */l/* in the levels will be filled in.

Her phonetic inventory is as follows:

1_~_ns_e_t	I_;_O_da

t	m
f	d
b	n
f	s
h	ng
w	v
t	P
d	f
m	l
j	t
v	er
k	
p	

Thus the client's phonological system would correspond to Level D in Dinnsen's hierarchy, because she does not have the contrast *+1-* lateral and *+1-* strident that are required in Level E.

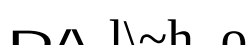
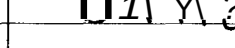
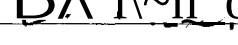
Therefore, therapy would begin with words that include laterals, stridents, or clusters. The intention is to force her phonological system to fill in the missing elements and because a higher level indicates lower level contrasts are mastered (Ravachew, 2005). Gierut suggests the use of the complex onset */skw/* with words such as squirt, squish, squad, square, squirrel, squirm, squiggle, squash, and squid. Following procedures set out in Gierut's multiple case studies, she will attend 19 treatment sessions three times a week for one hour. The therapy includes five sampling points where the child's inventory will be evaluated: baseline, phase shift, post treatment, two weeks post treatment, and two months post treatment. The child will begin with baseline where the clinician will have flash cards containing pictures that represent words beginning with the sound */skw/*. In therapy, the child names the word; the clinician gives no feedback on correctness but uses encouragement with the response. In each session the words remain the same but the order and the occurrence will vary and the picture will vary. The next phase is imitation in which the clinician says the word and the child repeats it. Feedback is

allowed during this phase in a fixed loop model.. If the child says the word incorrectly the clinician corrects the child, then if the child says the word correctly the clinician gives encouragement, but if it is said wrong the clinician moves to the next probe. This phase continues for seven weeks or before the child achieves 75% accuracy. Then the probe is repeated like in the baseline phase. The next phase is the spontaneous phase where the word is produced without a model by the clinician. The visual and the feedback during this phase would stay the same as in previous phases of therapy. This phase last 12 sessions or before the child achieves 90% accuracy over three sessions. The goal is not to have the child accurately produce the clusters, but to acquire the contrasts that are not yet a part of her phonological system of lateral and strident..

So, with a variety of phonological approaches to choose from, it is up to the clinician to adequately select the phonological approach that is most suitable for the client.. Typically, if a child has a phonological disorder the goal of therapy is to improve the child's phonemic ca~ories, which in turn will improve his/her speech intelligibility. Stated previously, are just three of many phonological processes that one could have selected to do therapy for the four-year old child with unintelligible speech. These were the selected three, because they were believed to be the three that would be most beneficial to the given child. No matter what phonological approach is selected the long term goal in therapy is usually the same: intelligible speech.

Appendix A

Target word	Target transcription	Child's production	Target sound	Produced sound
house	h aʊ̄s	haʊs	h	h
			s	S
tree	+ɣ=ı	twi	tr	-tw
window	wɪndo	wɪndos	w	\N
			d	d
telephone	+ɛlɪfon	+ɛɅfonz	t	+
			f	f
cup	+ʌp	+ʌo	k	+
			p	p
knife	nɔɪf	fɅalf		
			f	f
~s~p_o_on-~~~~o~lu~~.~~~~~~~~~~f~l~)--n~L=~~~~~~~~~S~p_~~p_~				
girl	ŋ ~ı	rlaTr	g	d
ball	bɔl	bɔl	b	b
			ı	\
wagon	w ægən	wædən	g	0\
shovel	ʃʌvl	Sʌvl	f	$
			v	V
monkey	mʌŋkɪ	mʌti	m	m

Target word	Target transc_r_iP_tio_n	--'~ch-i-ld-'-Spr-od-u--ct-i-o-n—~T-ar-g-et-'--P--ro-d-uced	sound	sound
monkey			k	-+-
banana			n	
ZŁpper			z	
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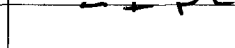
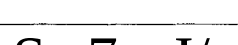
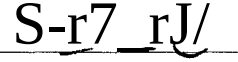
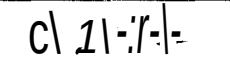
			z	~
duck			d	d
			k	l'f-
quack			kw	~v-J
yellow			j	tj
vacuum			v	V
watch			+(	t~
plane			pl"	1)t}.)
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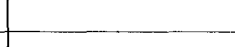
			m	rv\
watches			tr	+r
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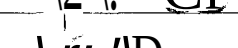
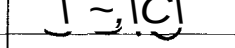
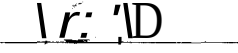
car			er	jy
blue			bi	hG\.J

Target word	Target transcription	Child's production	Target sound	Produced sound
rabbit	ræbɪt	wæbɪt	r	u.J
			b	h
~c_ar_r_o_t	~~~k~E~·_Y~L~+_~	~KE.VT~	2r	r
			t	--\-
orange	ɔrɪndʒ	oʊntz	dʒ	n
fishing	fɪʃɪŋ	fɪsɪŋ	f	f
			ʃ	s
chair	tʃɛr	tʃɛɚ	tʃ	s
feather	fɛðɚ	fɛdɚ	ð	d
pencils._	C~c,c..\f\,S Z,\1_ \	. Pot+::itS=-------c--_~p-~	---+~D-	i!
			s .	~
this	ðɪs	N A.,-~'~:T	Cr-	—
bathtub.	bæθtʌb	baftʌb	θ	f
~---~_~~-------------~~---------------~t			-----~--+~~	
			b	h
bath	bæθ	bæf	θ	f
ring	rɪŋ	wɪŋ	ŋ	n
finger	fɪŋɚ	fɪndɚ	ŋ	ng
thumb	θʌm	sʌm	θ	s

Target word	Target transcription	Child's production	Target sound	Produced sound
jumping	dʒʌmpɪŋ	sʌpɪŋ	dʒ	dʒ
pajamas	pədʒæməz	pʌʒæməz	j	ʒ
flowers	flaʊwɚz	fwaʊ ɚz	fl	fw
brush	brʌʃ	bwʌʧ	br	bw
			ʃ	ʧ
drum	drʌm	pwʌm	dr	ɹ
			m	m
frog	frɔg	fwɔd	fr	fw
			g	d
green	grin	[illegible] ɪn		gɹw
clown	klaʊn	[illegible] n	kl	k
			n	n
balloons	bəlunz	bəwunz	l	w
crying	kraɪŋ	twaɪŋ	kr	tw
glasses	glæsəz	gæsəz	gl	g
slide	slaɪd	saɪd	sl	s
			d	d
stars	stɚz	tɚz	st	t
five	faɪv	faɪv	v	v

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