2019

The Effect of the Cycles Phonological Remediation Approach: A Case Study

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THE EFFECT OF THE CYCLES PHONOLOGICAL REMEDIATION APPROACH: A CASE STUDY

A Thesis
Presented to
the Faculty of the Department of Communication Disorders
Murray State University
Murray, Kentucky

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by Elizabeth Ann Packard
May 2019

Abstract

The Effect of the Cycles Phonological Remediation Approach: A Case Study

The speech-language pathologist has many options regarding the course of action they deem the most efficient in remediating a phonological disorder. The purpose of this case study was to research the efficacy of using the Cycles Phonological Remediation Approach (Cycles Approach) as written by Hodson and Paden (Hodson & Paden, 1983; Hodson & Paden, 1991; Hodson, 2006; Hodson, 2007) on a six-year-old child with a moderate-to-severe phonological disorder with low intelligibility. This study included three phases: initial assessment, intervention, and the final assessment. One cycle of intervention over the course of approximately two semesters was administered to target three of the most prominent phonological processes as determined by the Cycles Approach protocol. The targets selected to remediate cluster reduction, syllable deletion, and gliding were /s/ blends, multisyllabic words, and initial /l/ and /l/ blends. Following completion of the targeted intervention cycle, a follow-up assessment was completed. Results demonstrated progress with severity ratings changing from moderate severity to mild severity as indicated on initial assessment results. While the client's phonological skills improved to a point of single-word accuracy in practice, generalization was not maintained or facilitated for conversational level with the Cycles Approach.

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Chapter I: Introduction

When treating children with severe speech sound disorders, the Cycles Phonological Remediation Approach is a widely used treatment approach in the field of speech-language pathology (Hodson & Paden, 1983; Hodson & Paden, 1991; Hodson, 2006; Hodson, 2007). This approach is designed to remediate highly unintelligible children with multiple speech sound disorders that hinder their speech in a shorter time period, typically ranging from 5 to 16 weeks (American Speech-Hearing Association, 2017). Due to its design, the population that typically uses this treatment is preschool and school-aged children (Rudolph & Wendt, 2014). The Cycles Approach is influenced by developmental phonology theories, principles in cognitive psychology, and phonology acquisition research (Hodson, 2007).

The Cycles Approach is designed to mimic normal phonological development; it uses individual phonemes to stimulate more intelligible speech sound patterns to emulate the gradual acquisition of phonological patterns found in typically developing children. This treatment approach is designed for children with the potential for oral communication, and has been found to be an efficient intervention. Three or four cycles with approximately 30 to 40 hours of therapy time with a practitioner are usually required for the subject to become intelligible (Hodson, 2007).

The intervention targets phonological pattern errors during a “cycle” which is a period of time. During each cycle one or more phonological patterns are targeted. The length of the cycle is dependent upon the number of error patterns the child demonstrates plus the number of erred phonemes that are stimulable. A phoneme is stimulable if the child can imitate or produce the sound with maximum cueing. The first cycle establishes a phonological foundation that allows the child early success in therapy on target patterns in production-practice words selected by the

clinician. Generalization usually occurs in the second or third cycle (Hodson, 2007). Each target phoneme within that pattern is targeted in therapy for sixty minutes. These cycles will continue and increase in complexity until the targeted patterns are exhibited in the subject's speech spontaneously. The Cycles Approach is used to facilitate correct production of speech patterns, but it is not an intervention that stimulates the mastery of each phonological pattern (ASHA, 2017).

While this treatment approach is a widely-used and respected method in the speech-language field, current research is lacking in studies using the cycles approach. Rudolph and Wendt (2014) found only four studies that examined the efficacy of cycles-based procedures in experimental or quasi-experimental designs. The results were mixed, with two finding little to no improvement following cycles training, and then two suggesting that the approach facilitates large and significant improvements. Additionally, they found only ten non-experimental case studies that used the cycles approach. Three of those ten studies used a modified cycles approach, while the other seven studies tested the Cycles Approach and its efficacy unmodified. More research is needed in implementing the approach as described by Hodson (Rudolph & Wendt, 2014). The purpose of this research project is to answer the following question: for a six-year-old child with a moderate-to-severe phonological disorder, will the Cycles Phonological Remediation Approach be an effective procedure?

Chapter II: Literature Review

The Cycles Phonological Remediation Approach has its beginning roots in 1975, and has evolved over time through research and scientific evidence (Hodson & Paden, 1983; Hodson & Paden, 1991; Hodson, 2006; Hodson, 2007). As stated by Hodson (2007), highly unintelligible children need the production practice of producing carefully selected targets, limited within number, in order to alter the child's kinesthetic image of the sound and also improve their auditory awareness. The Cycles Approach is not used for the generation of motor patterns, but to retrain the child's self-monitoring skills, and improve their phonological representations of articulatory gestures (Hodson, 2007). Instead of the focus of therapy being to target individual sound segments, this approach targets the more basic components of the child's phonological system (Hodson & Paden, 1991).

Underlying Concepts of the Cycles Approach

There are seven underlying concepts of the Cycles Approach. These concepts fuel the approach and comprise of the basis of the treatment strategy. Hodson (2004) states phonological acquisition is a gradual process, and this approach mirrors that concept. Children who have hearing within normal limits typically acquire the adult sound system primarily through listening. Since listening is so important in phonological development, there is another underlying concept that the phonetic environment can facilitate or inhibit correct sound production. If a child's ability to hear is compromised, or the model they are exposed to is too complex, this can impede correct development. Another concept which forms the basis of this approach is that children associate kinesthetic and auditory sensations as they acquire new patterns, enabling later self-monitoring. These kinesthetic and auditory images the children form are what guides the child during speech to form their speech patterns. The next two concepts are

that children are actively involved in their phonological acquisition, and they also tend to generalize new speech production skills to other targets. Lastly, an optimal "match" facilitates a child's learning (Hodson, 1997).

The Approach in Research

Hodson and Paden (1983) outline four case studies in their first book where their approach is used. Two additional subjects are included to demonstrate how Cycles can be modified for time, as well as how this therapy is effective on one subject with a very low level of phonological development prior to therapy. All participants were male with unintelligible speech. Their ages ranged from 3;6 to 8;9, and included a subject with a repaired cleft palate. The cycles administered to these subjects ranged from one to five- all subjects were discharged with measured improvements in their phonetic capabilities. A myriad of phonological processes were targeted within these case studies and subjects, demonstrating the approach can effectively work with all varied speech sound error patterns to increase intelligibility.

In the second edition of their work, Hodson and Paden (1991) describe three case studies selected to exemplify the need for individualization in planning treatment. The three case studies included the ages 3;1, 4;11, and 14;0; one female and 2 male subjects. All three had extreme difficulty being understood and all included the targets of /s/ clusters and liquid /r/, and then additional targets based upon their needs. All three depict success through treatment with increased intelligibility and measured improvements in production. The maximum number of cycles administered within these three case studies was three, with improvements being noted following completion of one cycle.

Hodson (2007) provides a subject example of the cycles approach performed with a highly unintelligible child at age 3;6. This child had seven phonological processes above 40% as

indicated by the Hodson Assessment of Phonological Patterns-3rd edition (HAPP-3), with a severity interval level of High Profound. The initial goal plan was to enhance the child's overall phonological system and increase intelligibility through stimulating the emergence of velars, liquids, /s/ clusters, and postvocalic singletons (word-final /p/ and /t/). Four cycles of phonological remediation, 52 contact intervention hours over 25 months, were performed before the criteria for dismissal from clinic was met and the child became intelligible. At age 4;7, percentages of occurrence were below 40% for all deviations except liquids. At the post-intervention age 5;7 the Total Occurrence of Major Phonological Deviations (TOMPD) was 30, placing the child in the severity interval level of Mild.

In a review performed by Hassink and Wendt (2010), six group studies were analyzed to determine the effectiveness and efficiency of the Cycles Approach as an intervention for phonological remediation. A total of 90 children exhibiting moderate to profound phonological disorders, and ranging in age from 2;9 to 5;7, were participants in the reviewed studies. Participants from two of the studies exhibited receptive and/or expressive language impairments in addition to their phonological disorders. Three studies were descriptive, while the other three were experimental group designs. One experimental study was a randomized control trial, and the other two were pre- and post-test control group designs. This review found that treated children exhibited improved consonant production in conversational contexts, the treated children with less severe phonological and language impairments improved in both language domains, and earlier intervention resulted in greater outcome improvement. Overall, the evidence presented in this review is limited, with the best evidence available suggesting that this approach is effective with children who exhibit severe phonological disorders both in isolation and in combination with other language disorders. The authors' ultimate conclusion urged clinicians to

be conscious of individual study limitations and refer to their own clinical expertise along with subject preferences when considering the implementation of this approach (Hassink & Wendt, 2010).

Using a modified cycles approach, Macleod and Glaspey (2014) researched how using acoustic analysis and speech adaptability instead of phonetic transcription may be more sensitive and attuned for measuring gradient change and consequently providing information about different dimensions of phonological knowledge. The researchers provided 16 sessions of patterned-based phonological treatment to three preschool-aged females who presented with multiple phonological patterns. Their severity ratings ranged from moderate to severe on the Hodson Assessment of Phonological Patterns- Third Edition. Using the guidelines set forth from Hodson and Paden (1991), the researchers modified the cycles approach to target four patterns over eight sessions. The researchers created two "mini- Cycles" each targeting stops, velars, stridents, /s/ clusters, or liquids (Macleod & Glaspey, 2014). The use of play-based activities, auditory bombardment, cues, and individualized instructions for each child were used concurrent with the Cycles Approach (Hodson & Paden, 1991). Each session, the child practiced four to six target words to represent the process being targeted, and treatment sessions were at the rate of approximately two sessions per week. Researchers measured the children's phonological systems three times: pre-treatment, between mini-Cycles (after eight weeks of treatment), and after the second mini-Cycle (after 16 weeks of treatment). Macleod and Glaspey (2014) chose a modified cycles approach in order to use a pattern-based phonological treatment that would acquire change over time and provide the children with language-specific cues that were necessary to develop phonologically.

In a comprehensive narrative review of intervention studies for children with speech sound disorders (SSD) by Baker and McLeod (2011), 134 intervention studies were identified. Intervention was typically conducted by a speech-language pathologist in a one-to-one individual format for 30-60 minute sessions two-to-three times per week. Each approach was backed with varying quantities and levels of evidence, according to research design. During their review, only 14 out of the total 134 studies utilized the Cycles Approach, six of those 14 studies contained a modified cycles approach. This finding demonstrates a need for more research utilizing the Cycles Approach unmodified, as described by Hodson (2007).

Rudolph and Wendt (2014) evaluated the efficacy of the Cycles Phonological Remediation Approach as an intervention for children with SSD. A multiple baseline design across behaviors was used to examine the intervention effects. Three children from ages 4;3 to 5;3 with moderate-severe to severe SSDs participated in two cycles of therapy, with three phonological patterns targeted for each child. Evaluations were administered during baseline, intervention, and follow-up phases to assess generalization and maintenance of learned skills. Two of the three participants exhibited statistically and clinically significant gains by the end of the intervention phase, and these effects were maintained at follow-up. The third participant exhibited significant gains at follow-up. Phonologically known target patterns showed greater generalization than unknown target patterns across all phases. Individual differences in performance were examined at the participant level as well as at the target pattern level.

When determining an intervention approach, a speech-language pathologist (SLP) has options to evaluate to select an approach that will best fit their subject, what the subject's family wants, and also what the SLP's experience has garnered. Researchers in the United Kingdom (UK) published their findings when they sent out a survey meant to investigate the clinical

management of phonological impairment by speech and language pathologists (SLTs in the UK) (Hegarty, Titterington, McLeod, & Taggart, 2018). This published paper is the most recent and largest survey of clinical practice with phonological impairment in the UK. When given a list of 13 interventions, participants of this research study were asked to rate how often, from a scale of always, often, sometimes, rarely, or never, they used intervention approaches in their clinical practices. Results of this study found that the top three intervention approaches rarely/never used by SLPs in the UK for remediating a consistent phonological impairment included what they called "the cycles approach" with 75.6% of the participants reporting their disuse of the approach and only 10.5% of the participants labeling the cycles approach as used always/often (Hegarty, *et al*. 2018). However, in their research, a definition of what their "cycles approach" entailed was not described. Not included in this research was a reference to Barbara Williams Hodson or Elaine Pagel Paden, the authors of the Cycles Phonological Remediation Approach, but references from some of the other 12 approaches were included in the references section. The question of how Hegarty, *et al*. (2018) intended the cycles approach to be perceived, and how the participants themselves understood the definition is unclear. However, the research did include how it appears some approaches to managing phonological impairment are not fully understood by all SLPs, thus possibly causing their limited implementation in clinical practice (Hegarty, *et al*. 2018). It is worth note that within this research, it was found that certain parameters within intervention were most commonly used by the participants. The parameters include total intervention duration, dose, dose rate, session length, dose frequency, and total intervention duration; all described parameters could be met using the cycles approach (Hegarty, *et al*. 2018).

Overview of Therapy Format

The Cycles Phonological Remediation Approach has prescribed steps for each session that focus on two overarching categories: stimulation and production. The general structure has been adapted and used effectively in schools, clinics, and hospitals. It includes seven steps and a home program is listed out and described explicitly by Hodson and Paden (1983; 1991; 2007). The steps include: review of previous session's production-practice word, auditory stimulation of the target pattern, production practice, experiential play production practice, stimulability evaluation, phonological awareness activities, and then a second round of auditory stimulation. Below is a summary of each intervention step (Hodson, 2007).

Review of previous session.

At the first evaluation session, this step would include the administration of the 12-word screening instrument from the Hodson Assessment of Phonological Patterns Third Edition. In the therapy sessions to follow, the child reviews the previous production-practice word cards. If a new pattern is being targeted for that week, the cards from the preceding session are kept for a later cycle. If the targeted phoneme for the session is within the same target pattern as the preceding session, for example /s/ clusters for each session; both sets of cards are included into some of the production-practice activities for the current session.

Auditory stimulation.

The clinician reads the session's listening list of about 20 words containing the target pattern. The clinician provides these words slightly amplified through headphone presentation for this stimulation, and this activity lasts for approximately 30 seconds. At the end of this activity, while still wearing the amplifying headset, the child will say some words into the microphone from a second list made up of potential production-practice words.

Production practice.

For this step, the child colors or draws at least one picture from the four or five selected production-practice words that have been controlled for phonetic environment. The cards are 5”x8” index cards. The subject will say each word prior to its selection as a target word for the session in order for it to be evaluated for possible assimilation effects, and for the level of difficulty of a particular word for the subject. The word will be written on the card, allowing adults to identify the picture, and for the child to increase in awareness of the grapheme-phoneme relationship to improve early literacy skills. The subject can even write the word independently.

Experiential-play production practice.

During play, typically in order for the subject to have a turn in the game they are playing, the subject must name the picture utilizing the target pattern for the session. Modeling and tactile cues are provided when needed so that the subject will achieve 100% success on the target pattern for these carefully selected words. Opportunities are provided in this step for some conversation in order to observe when phonological patterns start to emerge in spontaneous speech.

Stimulability evaluation.

To determine the next session’s target phoneme, the child will be asked to say words using the pattern of the next target process. For example, if /s/ clusters are the next target, the subject will be asked to say: spot, smoke, snow, sky, stop, boats, books, and tops. Tactile cues and amplification are used when needed for success. The most stimulable cluster is selected as the target, and then the next most stimulable cluster will be the target in two weeks, etc. Five stimulable words within each chosen process are then selected to use for the next session.

Phonological awareness activities.

These activities include can include rhyming, syllable segmentation, word manipulations, creating word families, and listing words that begin with the same sound and are to help children who may be at risk for developing literacy skills due to underlying phonological representation deficiencies. A phonological assessment tool is often administered in order to aid in identification of any areas that need facilitation.

Auditory stimulation.

The last step in the general structure of a therapy session includes a repetition of the listening activity. The same amplification and listening list of words is read to the subject that was used in the beginning of the therapy session.

Home program.

The caregiver is asked to participate in a daily home or school program lasting two minutes in duration. Each day, the listening list is read to the subject and the child then names picture cards containing the week's production-practice words. Additionally, the caregiver is asked to read a designated rhyme to the subject each night (Hodson, 2007).

Impacts of Stimulability

This treatment intervention approach relies on the stimulability of sounds each subject can produce and the targeted process and subsequent speech sounds. Stimulability is defined by Hodson (2007) as the ability to imitate a sound after a model or placement instructions facilitates remediation progress. It is the ability to produce a sound not currently produced spontaneously by a child when modeling and assistance is provided. Within treatment for speech sound disorders, it is suggested that the clinician selects targets that are within the child's zone of proximal development (ZPD) (Vygotsky, 1978). This entails what the child currently does independently and is able to do with sufficient support. When a child is stimulable for a sound,

this could suggest that the stimulable sound is within that child's ZPD, due to their potential to produce the sound with support (i.e. tactile cues, modeling). By staying within that child's ZPD, maximal learning may take place within that child's development. The fundamental component of the cycles approach stems from using target goals that are shown to be stimulable within the child's phonetic capabilities. A child is considered "highly stimulable" when they can accurately imitate after only being given a model by the clinician. If a child cannot succeed at the imitation, additional supports, such as amplifications, gesture cues, or tactile cues, are then provided by the clinician to elicit the word. Documentation of what cues and what level of prompting were necessary to be successful should be documented. If a child cannot produce certain sounds at the time of stimulability testing, these sounds are then referred to as "nonstimulable."

Stimulability in Other Approaches

Approaches such as the complexity approach (Gierut, 2001) determine treatment targets of later developing, and seemingly more complex, targets. This approach uses targets that are later developing, and therefore may not the most stimulable. Gierut (2001) found results in greater phonological gains using this complexity approach. Later, Gierut & Morrisetter (2012) found results that suggested late acquired words produced greater generalization, with an effect size four times greater than early acquired words, and the effects of word frequency were minimized. A more recent theory on stimulability considers that the ability to imitate a speech sound reflects underlying phonological knowledge about the phoneme (Powell & Miccio, 1996).

Powell and Miccio (1996) delved into the history of stimulability as a concept for being a prognostic indicator. Their article came to the conclusion that not only does assessment of stimulability assist the clinician in determining the severity of a disorder and the need for treatment in general, but also aides in how the clinician should prioritize sounds to target for

treatment programs. Their research led them to state stimulability is an important variable affecting generalization during treatment of speech sound disorders (Powell & Miccio, 1996).

Eighteen children with SSD were tested for their system-wide stimulability, percentage consonants correct (PCC), phonetic inventory size, and oral-and-speech-motor skills in an article published by Tyler and Macrae (2010). The nature of the relation between stimulability and the other variables were calculated using the Pearson Product Moment Correlations (PPMC). The PPMC calculations found strong correlations between PCC and stimulability accuracy, and between inventory size and stimulability. These findings suggest that there are strong relationships among characteristics of children's phonological systems and stimulability ability. Their findings suggest that stimulability can reflect both the underlying phonological representations (UPR) and the phonetic imitative skill. Their findings also suggest the impact poor stimulability has in children with SSD and limited phonetic inventories, showing not only the potential difficulty non-stimulable sounds pose at the word level, but the need for increasing stimulability in these children. This research was marked as a tribute to Miccio's intervention program, and to highlight the need for including stimulability in both efficacy and efficiency investigations (Tyler & Macrae, 2010).

In a research study completed by Rvachew (2005), the article addressed the question of the importance of selecting treatment targets that are the most or the least stimulable. The research then explored the best outcome for treatment of nonstimulable phonemes. A stated reason for this line of research argued that stimulability testing is an assessment of the child's phonological skills, with results that may give clear prognosis indications. Rvachew posits that stimulability reflects the structural and functional integrity of the speech mechanism, as well as the child in question's ability to access visual, tactile, and kinesthetic information about the

articulation gestures, imitation skills, and focus needed to imitate the stimulable sound (Rvachew, 2005). Using a randomized controlled trial, conclusions were drawn from the research suggesting that treatment of the most stimulable targets is likely to result in a greater rate of change for the least stimulable potential targets. The results of this study also suggested that a strategy for target selection that begins with the most stimulable and earliest developing phonemes will facilitate the development of spontaneous emergence of nonstimulable phonemes (Rvachew, 2005).

Auditory Stimulation

Another variable within the Cycles Phonological Remediation Approach is the use of what Hodson and Paden refer to as focused auditory stimulation. Hodson (2007) places the importance of auditory stimulation to develop auditory awareness of the pattern in order to develop a new and accurate kinesthetic image of the pattern as well as for integrative rehearsal. Hodson then prescribes combining a limited amount of production practice paired with slightly amplified auditory stimulation to improve the subject's phonological representations of articulatory gestures. This will then lead to the development and growth of accurate self-monitoring skills. Hodson stresses that this approach should not be used without the inclusion of slightly amplified auditory stimulation, especially during the first few cycles of treatment. Hodson (2007) maintains that children need precise models for accuracy to change and develop those kinesthetic images of the pattern.

Based upon the literature, there is limited recent evidence of the efficacy of the Cycles Phonological Remediation Approach. Within the research that has been done using the cycles approach, there is a tendency to use the modified application of the approach, as opposed to the unmodified. There is a difference between using cyclical targets in therapy, and using the cycles

approach: the cycles approach has a specific format of how therapy sessions proceed and even how each target is specifically targeted. Regardless of application technique, modified or unmodified, the Cycles Phonological Remediation Approach is tailored for the correction of the severely unintelligible.

Chapter III: Methods

The Subject

The subject in this case study was a male who has been receiving speech therapy at the Murray State Speech and Hearing Clinic once weekly for over two years. At the beginning of the study, the subject's age was 6;7. He is a monolingual English speaker with strong family support for speech therapy. No hearing or language concerns were established. Before enrolling in services at Murray State University Speech and hearing Clinic, the subject had previously received a diagnosis of Childhood Apraxia of Speech (CAS), and was receiving therapy services for speech and language at school according to his Individualized Education Program (IEP) set forth by his school. When enrolled in the research study his speech was characterized as frequently unintelligible with diminished syllable structures within words, and the presence of several phonological processes, including final consonant deletion, stopping, velar fronting, initial consonant deletion, cluster reduction, and deaffrication.

Informed Consent

Prior to the case study beginning, the researcher obtained a signed Informed Consent from his parents giving permission for the case study to be conducted. The Cycles Approach was explained to the parents along with the voluntary nature of their child's participation in the case study. It was explained to the parents that if they did not agree to their child participating, there would be no penalty, and he would continue to receive the same quality of services. Payment of services was waived during the case study. See Appendix I for the informed consent document.

Research Design

This study was a single case study design investigating the effectiveness of using the Cycles Phonological Remediation Approach technique for a six-year-old child with a moderate-

to-severe phonological disorder. A rationale for selecting a single case was secondary to the uniqueness of individuals with phonological disorders. Individuals with severe phonological disorders each carry individual clinical needs and circumstances in which a single case study design would be most appropriate to allow individual analysis. Additionally, a single case design allowed the researcher to test a well-formulated approach to phonological intervention, and ultimately contribute evidence regarding the effectiveness of the Cycles Phonological Remediation Approach. The benefit to using a case study design is that is allows the researcher to attain an in-depth and multi-faceted understanding of a therapy approach within a real-life context such as an implementation within a clinic (Crowe, et al., 2011).

Procedures

This study was conducted over the course of approximately 2 semesters, Spring 2018 and Summer 2018, with two additional treatment sessions and a follow-up session into the Fall 2018 semester. A semester is typically 4 months in length, or 16 weeks. The study included three phases: initial assessment, intervention, and follow-up assessment. All phases of the study were video recorded.

Initial Assessment.

The Hodson Assessment of Phonological Patterns – Third Edition (HAPP-3) was administered and a language sample was gathered at the assessment phase as well as after the completion of the cycle of intervention as a follow-up procedure. The initial assessment evaluated the severity level of the subject and selected the primary target processes for the cycle of intervention. Considerations for the subject included developmental appropriateness and stimulability of phonemes, percentage of occurrence of a phonological process being 40% or higher, and effect the associated process had on the child's intelligibility (Hodson, 2004).

During the assessment, stimulability was completed focused on target phonemes that were not correctly elicited at the word level to identify which targets the participant could produce when given maximum supports.

Intervention.

The processes selected based upon initial assessment were /s/ blends, multisyllabic words, and initial /l/ and /l/ blends. Protocol for the Cycles approach requires that new patterns be targeted before old patterns are fully learned (Hodson, 2007), thus, progression of treatment from one behavior to the next was time-based after all stimulable phonemes within each pattern were targeted. Intervention phase length was dependent on the primary phonological processes the subject exhibited, and an hour session on each stimulable phoneme within a target pattern was provided. The subject received one cycle of therapy due to time constraints and time spent within each target process. All three stimulable primary erred processes distinguished from the HAPP-3 were the focus of the study.

The sessions were one hour in length, with one exception at 45 minutes in length due to the subject's doctor appointment, and took place once weekly at the Murray State Speech and Hearing Clinic. All sessions were recorded using a video camera mounted inside the therapy room, thus all sessions were held within a therapy room and every treatment session was completed by the researcher under the supervision of a faculty mentor who is a licensed speech-language pathologist.

The two-way mirror within the therapy room was used as a visual schedule for each of the therapy sessions. The list of events for the session was written in Expo marker on the mirror for the subject to erase after completing each task. The subject developed a preference for this method of detailing the therapy session prior to the research study. To ensure procedural

reliability of the Cycles Approach, 81% of the sessions were analyzed by a second-year graduate researcher who was provided with the procedural steps and reviewed the session recordings to ensure all procedures were within Hodson and Paden's required format. See Appendix II for the procedural reliability template for each session.

Each therapy session followed the format specified by Hodson and Paden (Hodson & Paden, 1983; Hodson & Paden, 1991; Hodson, 2006; Hodson, 2007) and included review practice, two occurrences of auditory bombardment, stimulability probing, card coloring, production–practice activities, and phonological awareness activities. The researcher provided corrective feedback in the form of explicit verbal and visual cues, gestures, tactile cues, and modeling as needed for success. The words used as target selection during intervention activities were real words selected based on phonetic environment and age appropriateness.

Production-practice words were selected based upon the guidelines provided by Hodson (2007). Each target word was written on 5"x8" index cards, rand were referred to as "practice cards." With the exception of the target words for multisyllabic words, target selection was monosyllabic words with facilitative phonetic environments, therefore words were limited to attempt to exclude other target sounds as well as limited nonstimulable sounds. The goal was to promote as much immediate success for the subject to experience as possible. Attempts were made to avoid assimilation effects, thus target words containing phonemes at the same place of articulation as the substitute phoneme were avoided if possible over the course of treatment. Production-practice target words were selected to be appropriate for the subject's vocabulary level; target words smock and blaze were defined and explained prior to the start of the respective therapy sessions.

Follow-up assessment.

After the conclusion of one full cycle, the researcher administered the HAPP-3 and obtained a second language sample to compare the performance pre- and post-therapy using the cycles approach. Both the second HAPP-3 administration and the language sample were completed one week after the completion of one cycle of therapy.

Data Analysis

Analysis of the HAPP-3 results at the initial and final assessments were used to evaluate the degree of change across the phases of the study. In addition, language samples were taken both pre- and post-treatment to analyze and evaluate conversational speech during an unstructured activity. Performance of stimulus words on the HAPP-3 coupled with the language sample comparisons serve as the basis for measuring generalization. For reliability, both the faculty mentor and the researcher reviewed the recorded HAPP-3 videos to agree upon the transcription of the subject's 50 utterances of labeling items during evaluation. Both language samples were transcribed by the researcher.

Chapter IV: Results

First Stimulable Process: cluster reduction- /s/ blends

Session One- /sp/ blend

The first target process selected to target cluster reduction was all stimulable /s/ blends. The subject was highly stimulable with the probe reproducing the /sp/ blend compared to the other blend options. The focus was placed on including the cluster in the initial position of words. The subject took some adjustment time for acclimating towards a new therapy layout and requests to complete activities he had never previously completed in therapy sessions. This was evident in his behaviors such as erasing items on the visual schedule for the session out of turn and requiring moderate visual and verbal prompts and redirection to maintain focus to tasks.

For this first session, coloring pages were provided while the auditory stimulation was completed. The researcher read the targeted word list to him using an amplification system while he colored. He demonstrated reluctance on speaking into the microphone. When the researcher asked him to speak into the microphone, he immediately shook his head, and then took the headphones off of his ears. The researcher placed the headphones back on to complete auditory stimulation, and when asked again to speak into the microphone he still shook his head indicating that he was not willing to participate. He did not agree to say just one word, even when the researcher offered to leave the room, nor would he agree to bark into the microphone to pretend to be his favorite cartoon character. However, when offered a reward of a sticker if he barked, he complied. When another sticker was offered for him to say the word “sports,” the subject then repeated the word. His mother came in and then had to request that he follows directions during therapy. The researcher was able to get the subject to repeat the single word “sports” into the amplification system again.

The next activity completed in this first session was the introduction of target words. When introducing each of the target words, the subject was instructed to look at the researcher as she modeled the gesture cue for /sp/ while she said the target word. The gestural cue used to elicit production was using the index finger and sliding it down the forearm towards the hand for the /s/ phoneme, and once reaching the wrist, the index finger would go up and then down to approximate how a /p/ would be blended with the /s/ phoneme. The researcher would also use this gesture on the subject's own arm as a tactile cue to prompt for accuracy throughout the session. He would then repeat the gesture and make some guided attempts at the word, with feedback provided for improvement of direct imitations. While coloring the practice cards, some black and white pictures were provided for him to color in, and then others were blank for him to draw himself. The words were typed onto the cards, and he liked to try and sound out each target word.

Table 1 includes all /sp/ words selected as auditory stimulation and production-practice words.

Experiential-play production-practice activities chosen for this treatment session were selected based upon the subject's interests. Additionally, activities selected were optimal as far as eliciting production practice several times over the course of the session. Three activities were selected for stimulating practice opportunities with each activity estimated to last about 10 minutes in duration. While planned to last approximately ten minutes, the activity duration varied with the subject's interest. The first experiential-play production activity was fishing. The subject "fished" using a fishing pole with a magnet on the end of the line. Taped upon 20 foam fish with magnets on their backs, were pictures of each target words; four fish for each of the five target words were allocated. The subject would close his eyes to make this activity more

challenging. When the subject "caught" a fish, he produced the target word. Next, the experiential-play production activity of using a flashlight to find the target words hidden around the room was completed, but quickly moved on from in order to better manage some behaviors that were wasting time. The last experiential-play activity was basketball. Before the subject could take a turn shooting a basketball into a hoop, the researcher would hold up a production-practice card for the subject to produce before shooting the ball.

The subject needed modeling and cueing for accuracy, but his production accuracy improved as the session progressed, and the level and frequency of assistance was lessened the more practice the subject obtained. For example, at the beginning of therapy, the target word "spy" was produced as "pie" and he required modeling, prompting, the gesture cue, and multiple attempts for 100% accuracy in including the entirety of the initial blend. As therapy reached its conclusion, the subject required less prompting for independent success. Having him look at the researcher for a model was particularly facilitating towards improving his accuracy. Typically, only the verbal prompt of "try/do that again," or "one more time," would be enough for him to repeat the target and include both phonemes within the blend. He would even attempt another production if the researcher would merely make a facial expression to cue whether or not his attempt was correct. The target words "spot" and "space" were two targets that the subject produced consistently well for the entirety of the session.

The video camera did not seem to bother the subject or impact his behavior or performance in therapy. The subject did refuse to comply with the rules for drill play towards the middle of the session during the flashlight activity, and then again while transitioning into basketball. This could be accredited to a new therapy routine as well as the researcher's novice attempts at behavior management. The supervisor came in to model some direction at

incorporating ways to break up some of the repetitive drill to make the routine more "fun." This improved the subject's behavior throughout the rest of production-practice.

The subject preferred to draw on the mirror while he listened to the second auditory stimulation. He would draw and then the researcher would guess what he drew afterward. He again refused to speak into the microphone, and said, "boo" twice into the microphone before he attempted to say "spy." He did require some verbal prompts to include the blend in a second attempt.

During the probe, he immediately included the /sm/ blend in smell independently in each of the probe words. He self-corrected himself to include the /sn/ blend in 'snow' demonstrating that he was stimulable for this blend. The /sk/ blend was more inconsistent with some words requiring less modeling and prompting than others. The /st/ blend was ruled the least stimulable since even with multiple attempts and heavy prompting he still was unable to replicate the blend; 'stop' was /ɔt/ and 'stay' became /sʌe/. This blend was then labeled the least stimulable.

The researcher reviewed the /sp/ sound that is made when the letters "S" and "P" are together. A poem containing multiple instances of /sp/ words was used as a part of the phonological awareness activity, with the subject performing the gesture cue each time he heard a word containing the /sp/ blend read. He liked to read this poem himself, which distracted him from listening for the blend in the poem. Then, the subject was introduced to the concept of words that rhyme, or "sound the same." The researcher then read through the poem and highlighted the words that rhyme, or "sound the same." This poem was taken home and instructed to his mom to be read along with the home practice materials.

The subject was then instructed about his home practice materials of labeling the pictures of the target words with a parent at home once a day, and he did not enjoy having "homework."

Session Two- /sm/ blend

Following stimulability testing from the /sp/ session, /sm/ was selected as a target for Session two of /s/ blends. Table 2 contains the /sm/ words selected as auditory stimulation and production-practice words. The target word "smock" was defined, explained, and an actual paint smock was brought in as an example to show the subject due to it being an unfamiliar word.

The /sm/ blend was paired with the same gesture cue that was used for the /sp/ blend in order to make the s-blend process salient. The researcher used the index finger and slid it down the forearm towards the hand for the /s/ phoneme, and once reaching the wrist, the index finger would go up and then down to approximate how a /m/ would be blended with the /s/ phoneme.

The subject preferred to draw on the mirror while the researcher presented the auditory stimulation word list. This was continued throughout the rest of the therapy sessions. After the subject listened to the word list, he was much more willing to speak into the microphone than in the previous session. The researcher was easily able to get the child to repeat "smell," "smog," and "smart" from the list. He wanted to continue drawing on the mirror and not progress to the coloring of the production-practice cards. The subject briefly growled in frustration, but was able to transition smoothly into coloring the cards.

Immediately upon seeing the cards with the target words typed on them, he began to sound the words out, while including the entirety of the /sm/ blend, in some instances with a schwa breaking up the blend /sʌm/. He then wanted to change the target word "smash" into made-up words like "smashy." While coloring, he independently produced the /sm/ blend in "smoke" and "smart," but then during conversation, he needed modeling paired with the gesture and multiple attempts in order to include the /m/ phoneme within the blend.

The first experiential-play activity for production-practice was mini-golf. The subject used a toy putter to hit a plastic golf ball through "holes" that were through wooden stands placed around the therapy room. Before each stroke, the subject would produce the target word on the production-practice card that the researcher held up for him to see. The subject produced the target words while including the blends with minimum prompts for accuracy. After each attempt, the researcher affirmed whether he included the blend or not, and repeated the target word paired with the gesture cue to supplement the child with more accurate models. He tended to read the target word on the card and say "smock" or "smack" interchangeably regardless of the picture cue. This was thought to be a decoding error stemming from the subject's burgeoning reading development. The target word "smoke" he often would distort the vowel upon first reading the word, another possible decoding error since upon repeating the word the vowel is correct.

For the next experiential-play production activity, he played a game of matching the target words. Multiple cards with the target word pictures on them were laid face down upon the floor for the subject to turn over and attempt to match two of the same words. Less cueing for success was needed to facilitate correct productions during this production-play activity. "Smart" required the most verbal prompts for improved success. Finally, upon each production-practice card, the researcher placed a small pile of Lego pieces. In order for the subject to be able to take a piece, he needed to say the target word from the card. This activity did not produce as many repetitions of the target words for drill as the first two activities.

Overall, the subject needed less modeling and cueing for accuracy than compared with the previous week (target: /sp/ blend). His production accuracy improved as the session progressed. The target word "smock" required the most assistance from the clinician, with

modeling, gesture cues, and several trials needed for accurate productions. As the conclusion of therapy neared, the subject did not need assistance by way of prompting or cueing to create independent success. “Smart” and “smash” were produced consistently well throughout the session; the vocalic /r/ and the fricative /ʃ/ were not cued for accuracy- only the /sm/ blend was targeted.

During the probe, the researcher allowed the subject to continue to play with Legos while he listened and repeated back each word. The word “snow” was repeated and included the blends /sn/ within the first repetition independently. The blend /sk/ was inconsistent, but was stimulable. The subject was able to reproduce the /sw/ blend with multiple attempts and direct imitation. He was unable to reproduce the blend /st/ in “steep” even with modeling, but when provided a model, gesture cue, and multiple attempts he was able to say “stow” and “stay” and include the blend.

Another poem containing multiple instances of /sm/ words was read to the subject for him to hear and make the gesture when he heard the /sm/ blend. The poem was read to the subject, however it was not until he read it himself that he demonstrated awareness of the /sm/ blend within the words of the poem by making a gesture cue. When talking about rhyming words in the phonemic awareness activity, the child initially stated that “smart” and “smash” rhymed. When asked to think of a word that rhymes with “bike” he could not come up with a word, and when asked to rhyme with “tall” he said, “tail.” The researcher then asked him if “small” and “tall” rhymed, to which he said they did not. He was reminded that rhyming words sound the same. The subject then said “small” and “big” rhymed, and was then instructed that those words were opposites. However, when asked what rhymes with “ear,” he said, “fear.” He stated the nonsense word “tish” when asked to rhyme with “fish,” but quickly changed his answer to say

/fʌʃ/. He was reminded again what rhyming means and provided with another example. Then, he finally was able to rhyme correctly with “top” and “hop.”

The subject listened to the auditory stimulation with no qualms. This week, the researcher provided take home practice cards that the subject can color, since he requested that in the previous session.

Session Three- /sw/ blend

Following stimulability testing from the /sm/ session, /sw/ was selected as a target for Session Three of s-blends. The researcher used the same gesture cue used in the two previous sessions to cue for the /sw/ blend. Table 3 contains the /sw/ words selected as auditory stimulation and production-practice words.

Due to a state conference, this session occurred two weeks after the last. The session began with a review of the previous two session’s target words, which the subject produced accurately with little to no feedback. The subject followed the routine established in the previous sessions. The experiential-play activity selected for the subject was an egg hunt around the therapy room, with target words placed inside 20 eggs for him to collect, open, and say as practice. After he completed finding the eggs, the subject wanted to make the researcher find the eggs in the dark. Darts was the other experiential-play activity selected for this session.

Compared with Session Two, the subject required more prompting for accuracy. The /w/ had a tendency to overpower the /s/ in his attempts. Direct imitation with the gesture cue and verbal prompts were utilized to assist the subject reach accuracy. As the session progressed, his frequency of accuracy increased. The gesture cue was the most successful prompt to facilitate success efficiently, but by the second experiential-play activity, prompting was faded to facial expressions as feedback on accuracy, with occasional verbal prompts to try saying a target again.

He self-corrected two times. Periodically, the researcher asked the subject what two sounds they were working on that day. The target word “swat” proved to be the most difficult to get to 100% accuracy, while “swim” and “sweep” were targets the subject produced consistently with the most ease. The previous /s/ blend target words from /sm/ and /sp/ during drill play were also included into the experiential-play activities. When first attempting each of the past target words, the subject required a verbal prompt to repeat the word in order to improve his practice for accuracy, but after that reminder, verbal prompts were eventually faded as he improved in independent accuracy.

During the probe for the next target, the subject repeated the /sn/ blend without assistance. The subject was least stimulable with the target blend /st/. He self-corrected one attempt at /sk/, and demonstrated he was stimulable for this blend after being given one model.

The subject then glued on the ending of /sw/ words in order to complete the word. The concept of rhyming was again explained and discussed with the subject as the phonological awareness activity. The researcher would state a word, and then ask the subject to give an example of a word that rhymes with it. He primarily stated nonsense words as the word that rhymed, but this was counted as correct because he demonstrated he understood the concept of words sounding the same. When the asked if two words rhymed, the subject responded yes or no with 50% accuracy. He listened to the second round of auditory stimulation and received his home program portion.

Session Four- /sn/

Following stimulability testing from the /sw/ session, /sn/ was selected as a target for Session Four of s-blends. The researcher used the same gesture cue used to cue for the previous

s-blends. Table 4 contains the /sn/ words selected as auditory stimulation and production-practice words.

The session began with a review of the previous /s/ blend target words. The subject needed to correct three out of the fifteen words, and he only required a verbal prompt to repeat the word in order to make the necessary corrections for all three words. While transitioning from the auditory stimulation to the coloring of the production-practice cards, the subject erased parts of the visual schedule in an attempt not to have to do them later. While being introduced to this session's target words, the subject sounded out the word "snow" as /snaʊ/ and proceeded to call it that for several attempts despite models. However, the subject immediately included the /sn/ blend in his productions of the new target words, with only a one model each from the clinician. Even during conversation about a snake, the subject included the /sn/ blend each time he said "snake," and only needed one correction.

The experiential-play activities used were Candyland, "Go Fish", and a paper plate snake craft. The subject initially attempted the target words during the first activity in an apprehensive manner by prolonging the /s/ at the beginning of the word. He needed a gesture paired with a model during production-practice. His confidence in saying the target words increased as the board game progressed. During the second activity, previous /s/ blend targets were included along with the new /sn/ target words. He made one self-correction on the target word "snout." For the craft, before the subject could get a craft supply, or while he was coloring, the researcher held up a production-practice card for the subject to say. During the game "Go Fish" the subject did not need to use the production-practice cards, and when using the production-practice cards for the craft, the subject returned to prolonging the /s/ at the beginning of the word.

Compared with the previous session (Session Three), the subject required less modeling and cueing for independent accuracy of production targets. The subject was particularly focused upon reading each practice card before practicing the word, which may have been why he made a sustained /s/ while using the production-practice cards.

During the probe activity, the subject needed a gesture cue paired with a model in order to imitate the first /sk/ blend "skip." He attempted "skunk," but used a /sn/ to substitute for /sk/, however he repeated "ski" correctly. The probe word "skate" could not be repeated correctly, but he immediately replicated "scoop." The subject was easily stimulable for three-syllable words, he only required a gesture of tapping out the syllables with a finger.

A worksheet on rhyming completed the phonological awareness activity. The subject had to choose from an array of three the word that rhymes with the selected word. The researcher reviewed what rhyming meant before completing the worksheet. The subject then correctly completed the entire worksheet independently. He came up with a rhyming word for the target word "snake" on his own.

He listened to the second round of auditory stimulation and received his home program portion.

Session Five- /sk/ blend

Following stimulability testing from the /sn/ session, /sk/ was selected as a target for Session Five to complete the /s/ blends. The researcher used the same gesture cue used to cue for the previous /s/ blends. Table 5 contains the /sk/ words selected as auditory stimulation and production-practice words.

The session began with a review of all the previous target words. The subject stated all twenty past targets with independent success. While coloring the production-practice cards, the

physical prompt of running a finger down his arm and tapping his hand to signify the /sk/ blend elicited a correct attempt from the subject when modeling and multiple attempts were unsuccessful. The subject did not want to color the picture for "skin." The experiential-play activities used were fishing, basketball, and a game where the subject threw a pom pom ball into cups on the table that each contained a target word. Whenever the subject successfully tossed the ball into a cup, he practiced that word until all the cups were gone. While fishing, the subject stopped fishing and wanted to pretend to be a fish, and used the target words as "bait." He repeated which targets he liked best in order to "catch the bait." His focus was not on his speech during this activity. In order to get back on track, the researcher attempted to play a game where she gave the subject clues and he had to guess which target word she was referring to, and then they moved on to the next activity.

While playing basketball, he was rewarded when he produced a target on the first try by being allowed to shoot twice; this was the motivation he needed to focus more on his speech during the activity. The subject wanted the researcher to say the words and shoot the basketball. She produced the target words without the blend, and the subject corrected her by saying it the correct way each time. The cup game included targets from the previous sessions as well as the /sk/ ones. He primarily needed aid only on the /sk/ target words, but some /sw/ targets required multiple attempts for correction.

The /sk/ targets proved to be more difficult to produce with accuracy than the /sn/ targets of the previous session. In the beginning of the session, the researcher needed to break apart the /sk/ blend and practice blending the two phonemes before adding the rest of the word for practice. The researcher also utilized more physical prompts to facilitate correct attempts than in previous sessions. As therapy progressed, the subject would repeat the /s/ sound a couple of

times before attempting to produce the added /k/ to make the blend, particularly on the words "scoop" and "skip." This was just like the previous /sn/ blend session where he was prolonging the /s/ while looking at the target card. He gained confidence in his productions over time, and even self-corrected on an attempt of "skip."

The next target for probe was multisyllabic words. The subject consistently got the two syllable words correct with no issue, such as "magic," "money," "poison," and "outside." Three-syllable words were stimulable, when the researcher tapped out the syllables. Words containing four syllables were inconsistently correct.

For the phonological awareness activity, the researcher cut out /sk/ words and had the subject cut and paste words that rhyme underneath on a piece of paper. He was able to think of many examples of both real and nonsense words that rhyme, and could state if certain words rhymed or not. The concept of syllables was introduced during the phonological awareness activity, and he immediately counted syllables within words correctly.

He listened to the second round of auditory stimulation and received his home program portion. It was after this session that the subject's parent pointed out that she noticed an improvement on his sounds since beginning this case study.

Second Stimulable Process: Syllable Reduction

Session One- Multisyllabic Words

Following stimulability testing from the /sk/ session, three-syllable productions were selected as the next target process. The researcher used the gesture cue tapping the index finger on the forearm or table to emphasize completion of each syllable. Table 6 contains the multisyllabic words selected as auditory stimulation and production-practice words.

The subject began to erase tasks from the visual schedule on the mirror, and his mother tapped on the other side of the glass in warning to behave. He transitioned through the rest of the tasks without incident. When he was first introduced to the new target words, he read them on the cards and included all the syllables. He remembered what syllables within words were from the previous session, for example the /sp/ blend in “hospital.” While he colored the production-practice cards, he said, “fishing boat” correctly in conversation.

In an attempt to create a more communicative environment, the experiential-play activities all had a goal of creating more opportunities of communicative intent while using drill. The researcher initially had the subject play “Go Fish” to request the target words, but he wanted to play a matching game instead. Each target was talked about in a more conversational context through discussion of each one, and so the communicative goal was still maintained. The subject self-corrected “spaghetti,” which was the most difficult target for him during the session. For the next experiential-practice activity, he had to dictate how to draw a map to a treasure he had hidden in the room, and then also follow a map made by the researcher with each target word as a stop on the map. The last activity required the subject to call out the target words for bingo.

The subject preferred to call “baseball game” “baseball field” and “fishing boat” was turned into “hospital ship.” Since each substitution contained the same amount of target syllables, this was counted as accurate. The subject required the word “spaghetti” to be broken up by syllable and said at a slower rate in order to produce the overall blended word throughout the session, however the other targets were fluid when he practiced them.

The probe activity began with initial /l/ targets. A model and a gesture cue were successful facilitators to elicit a correct form. Next, /l/ blends were probed: /bl/, /kl/, /fl/, /gl/, /pl/, and /sl/. The subject needed multiple attempts, a gesture cue, and a model for success. The blend

/sl/ was the least stimulable. Finally, four syllable words were probed, and the subject repeated those with independent success demonstrating high stimulability.

The phonological activity was comprised of practicing to count out syllables within words, and then the subject completed a worksheet by placing a paint dotter on the correct number of syllables for each word selected. The subject required some assistance with the worksheet, but eventually was able to correct the clinician.

He listened to the second round of auditory stimulation and received his home program portion.

Session Two- Multisyllabic Words

The multisyllabic treatment process of targeting three syllable words was continued on into a second session. The researcher continued to use the gesture cue of tapping the index finger on the forearm or table to emphasize completion of each syllable within the word. Table 6 contains the multisyllabic words selected as auditory stimulation and production-practice words.

This session was cut short to 45 minutes due to the subject having a doctor's appointment. Therapy began with a review of the previous session's target words, which he produced completely independent of cueing. Experiential-play activities included bowling and creating a book using the words from Session One and Session Two of three syllable words. Most of the session time was centered on the making of the book.

At the start of the session, the subject required modeling and some gesture cues for accuracy, however the subject quickly completed the multisyllabic words independently. The target word from the previous session, "spaghetti," was produced much more fluidly and at a normal rate of production. The subject had a tendency to say /dʒamʌs/ for "pajamas" during conversational speech due to a shortened production of the word at home, however he did use the

full three-syllable word during production practice. As the session progressed, the subject required less corrected attempts. He was able to incorporate the three syllable words in their entirety independently, however it was noticed that he had to slightly slow his rate of speech in order to achieve a correct production.

During this session's probe, he continued to be highly stimulable for initial /l/, as well as with the /l/ blends /bl/, /gl/, /kl/, and /pl/. The blends /fl/ and /sl/ were inconsistent, and required maximum cues such as multiple attempts, physical prompts, and constant modeling for success.

The phonological awareness activity continued to target counting syllables within words. The subject completed a paint dotter worksheet, in the same format as the previous week's session. The subject completed the worksheet independently, and could give a correct number at a faster rate than previously seen in therapy.

Third Stimulable Process: Gliding and Cluster Reduction- Initial /l/ and /l/ Blends

Session One- Initial /l/ words

Following stimulability testing from Session Two of multisyllabic words, initial /l/ productions were selected as the next target. The researcher used the gesture cue of placing the index finger beside the mouth and extending the finger out to emphasize correct tongue placement. To verbally prompt him on manner, she referred to the /l/ sound as the "pointy tongue sound." Table 7 contains the initial /l/ words selected as auditory stimulation and production-practice words. Since this was the last therapy session for the Spring 2018 semester before a month-long break from treatment, the researcher allowed the subject to select the experiential-play activities of Hotwheels, Legos, and bowling.

The first target word the researcher introduced was "lion," and the correct /l/ placement took multiple attempts, modeling, and a gesture cue. He would place his tongue either in front of

his teeth, or twist it sideways. For the first activity, the researcher taped pictures of the target words on the toy cars, and had the subject practice productions by stating who won each race. Each attempt at producing a target word required verbal and gesture prompts from the researcher to guide the subject towards productive change. This activity was not the most conducive for a high number of repetitions for drill. However, as the activity progressed the researcher could fade the level of prompting to only provide a verbal prompt to facilitate a more correct change. The second production-practice activity consisted of Legos and drill. Each time the subject wanted a new piece, he had to say a target word using the entire blend. The subject was having difficulty following the building instructions, and became engrossed in the instructions and figuring out how the pieces fit together. Seeing his frustration with Legos, the researcher then began to provide clues for a target word and the subject had to guess the target word in order to increase more drill practice. When the researcher created situations of misunderstanding, the subject would demonstrate frustration by saying, “that’s what I said” to the clinician. The final production-practice activity was bowling, and the subject’s attempts were not consistently accurate, but there was noted improvement of tongue placement.

Gesture cues, modeling, and multiple attempts were all needed to facilitate an increase in catalyzing a productive change or accuracy throughout the session. The subject demonstrated awareness of when the researcher incorrectly produced the target word, but would continually replace /w/ for /l/ during practice. When he attempted to touch his tongue to his alveolar ridge, he continuously would twist his tongue to the side of his mouth. The researcher would give him a model, and usually he was able to correct his productions with increased accuracy.

The /l/ blends that were the most stimulable during the probe activity were /pl/ and /kl/, although they both required multiple attempts. The blends /bl/ and /gl/ were also stimulable with gesture cues and multiple attempts. The blend /fl/ was very inconsistent for the subject.

To complete the phonological awareness activity, the researcher and subject read a poem containing initial /l/ words, and the subject initially said there were no /l/ words in the poem in an effort not to have to read it. While the researcher read the poem, the subject did not signal when an /l/ word was read, but also said that cats have two legs. While reading the poem, he consistently substituted /w/ for /l/ in the word "legs." The subject could not point out any words that began with /l/ when asked. Then, the researcher asked what word rhymes with a specific word from the poem and he did not respond. He then did not want to listen to the second round of auditory stimulation, but allowed the researcher to place the headphones on his head with no protests.

He listened to the second round of auditory stimulation and received his home program portion. This was the last session before a month break from therapy.

Session Two- Initial /l/ words

This session was the first in a month, and upon beginning therapy the subject said he, "don't want to do it," when the researcher told him they were going to review the last session's words. He attempted two target words from the last session, but would replace /w/ for /l/ despite multiple attempts, gesture, and verbal cues. Then the researcher attempted to use a lollipop to physically pinpoint where to place his tongue, and he refused to allow the researcher inside his mouth. He indicated he wanted to use a flavored tongue depressor, but then refused again to open his mouth, saying, "nuh-uh, don't!" The researcher then explained that she would simply place it behind his teeth to show him where to put his tongue, and offered to show him on herself first.

He again refused, and began to get out the game planned for an experiential-production activity and saying he wanted to play with it now. The researcher was eventually able to convince him to place it in his mouth himself, and guided him to the correct spot using the mirror in the room. The mother came in to the session and offered a reward of a hot dog after the session if he listened and participated. This was motivating to the subject, and he then allowed the researcher guide his lollipop to the alveolar ridge. He told the researcher he could not feel the place behind his teeth, and that he, "never can." After a break where he told the researcher about his birthday, the researcher asked for the subject to show her where to put the tongue for a "pointy tongue sound," and he went to the correct place immediately, as well as in the rest of the review of last session's initial /l/ words.

Table 7 contains the initial /l/ words selected as auditory stimulation and production-practice words. While coloring the target cards, he would state that he did not want to color the cards. After this statement, the supervisor came in. He did not want to show her the place where the tongue goes for /l/, and would not produce multiple attempts for correction. While coloring the fourth and fifth production-practice cards, he correctly produced the initial /l/ for "lick" and "lemon."

Experiential-play activities for this session began with darts, and his accuracy was inconsistent. The researcher continued to use the gesture cue of placing the index finger beside the mouth and extending the finger out to visually emphasize correct placement, along with the verbal prompt to repeat the target word, because "that's not where we put our tongue." The subject wanted the researcher to guess which target card he was holding, and did not correct her when she glided while producing a target. The researcher asked the subject to say whether or not the she said the target correctly, and show her the correct way.

The next experiential-play activity consisted of the subject constructing a fish craft. Consistent modeling for accuracy was needed throughout the activity for each production to be correct of initial /l/. He continued to twist his tongue to the side or glide, however when provided with a model, the subject could imitate the correct sound.

This was the order from most to least stimulable in /l/ blends during the stimulability probe: /bl/, /pl/, /kl/, /gl/, with /fl/ requiring the most verbal and gesture prompts as well as modeling, and it was the most inconsistent.

The subject created word family houses for words ending in “at” as a phonological awareness activity. The subject had to think of real or nonsense words that end with “at” to put inside the word family houses. Initially, the researcher had to provide the first example, however he was able to think of two more words independently.

Finally, during the second auditory stimulation activity the subject repeated each word to himself after the researcher read the word list. He listened to the second round of auditory stimulation and received his home program portion.

Session Three- Initial /l/ words

Given the production quality in Session Two of initial /l/ productions, initial /l/ was continued as a target for intervention. The researcher used the same gesture and verbal cues as in Sessions one and two. The session began with a review of the previous initial /l/ target words. There was a marked increase in his production accuracy while reviewing the 10 previous targets and also while coloring the production-practice cards. Table 7 contains the initial /l/ words selected as auditory stimulation and production-practice words.

He twisted his tongue during practice at a decreased rate than seen previously. When he was given a model and he watched it, the subject did not twist his tongue. The experiential-play

activities chosen were matching and building a Paw Patrol gingerbread house. Past target words from the previous initial /l/ sessions were included in the matching activity. Less modeling and overall cueing was needed for this session compared with Sessions one and two for both the old and new targets. Often a simple facial expression was all the feedback necessary for accurate corrections. As the session progressed, his productions were more consistent in accuracy.

Probing for stimulability resulted in the following from most to least stimulable: /kl/, /pl/, /bl/, /gl/, and /fl/ were the least stimulable and still inconsistent.

The subject then created a word family house for the letters “ay” as a phonological awareness activity. The subject thought of words that end in “ay” to place within the word family house. Initially, the subject thought the word “daddy” would be applicable, but when it was explained to him that the letters “a” and “y” together make the sound “ay,” he immediately gave the example “pay.” He then proceeded to complete the activity independently.

He listened to the second round of auditory stimulation and received his home program portion.

Session One- /kl/ blend

Following stimulability testing from Session Three of initial /l/ words, /kl/ blend productions were selected as a target. The researcher utilized the gesture cue of using the wrist to bring the hand back with the index finger pointing and then extending the finger forward to emphasize the blend with the “pointy tongue”. Table 8 contains the /kl/ words selected as auditory stimulation and production-practice words.

The researcher began the session by telling the subject they were starting a new sound that used what he learned with the initial /l/ sound. The subject said, “no we don’t.” and began to try and distract the researcher by moving around in his chair. His mother had to knock on the

other side of the mirror in order to get him to say one word into the microphone during the first auditory stimulation activity. After that, he transitioned into the new blend without incident. While coloring the practice cards, he only needed a gesture cue and a model to facilitate correct production.

The experiential-play activities chosen were mini-golf and Guess Who. Initially during the production-practice activities, the subject's productions required a gesture cue to guide towards correct production practice, and he even attempted to self-correct. The subject would begin to twist his tongue, stop himself, and then use the correct position when practicing at the beginning of therapy. The subject was given a choice every so often between two target cards on which word he wanted to say before taking his turn. The researcher used the verbal cue "that's not where our tongue goes" or "you were so close, can you try that again?" to provide feedback in order to remind the subject to use correct tongue placement. Less modeling was used overall to promote accuracy when compared with the previous week. Particularly with the target word "clap," the subject produced a glide for the liquid. His accuracy was maintained with lessened modeling by the researcher at the end of therapy.

Probing for stimulability resulted in the following from most to least stimulable: /bl/, /pl/, /gl/, /sl/, and /fl/. The probes for /sl/ and /fl/ resulted in multiple attempts, maximum cueing, and inconsistent success.

The phonological awareness activity began with the researcher reading a poem containing /kl/ several times throughout the poem, however the subject was emphatic about not wanting to read the poem, and so the researcher went straight into asking the subject to count the amount of sounds he heard in the following simple words: moose, clap, cat, puzzle, his own name, Marshall, and Chase. He immediately answered correctly with the word moose, clap, and

cat. He even could state the correct sounds within the word. With the word “puzzle” he counted syllables at first, but with assistance by breaking down the word by sounds, he correctly stated the answer. He also needed help with his own name and Marshall, but he was correct with the name Marshall. He then asked to do more. He said that crayon was too hard, but correctly counted the sounds in “clock” and “cloud.” The word “clue” required assistance for the correct answer.

He listened to the second round of auditory stimulation and received his home program portion.

Session Two- /bl/ blend

Following stimulability testing from the /kl/ session, /bl/ was selected as a target for Session Two of /l/ blends. The researcher used the same gesture cue used to cue for the previous /l/ blend. Table 9 contains the /bl/ words selected as auditory stimulation and production-practice words. The word “blaze” was defined and explained to the subject before therapy commenced, and it helped throughout the session that he liked a particular monster truck named blaze.

The subject was able to choose the order of the experiential-play activities for production practice. He chose to play the “blaze find” game where the subject had to find all the pictures of blazes hidden throughout the room, and to “put out the blazes,” he had to practice both /kl/ and /bl target words. Then he chose to play the cup game, and finally bingo. During review of /kl/ target words, the subject correctly produced all five words on the first attempt.

As compared with Session one with /kl/ blends, less modeling and cueing for accuracy was needed to achieve correct production practice. While attempting a target word, his tendency towards tongue twisting was noticeably diminished. Gliding was noted primarily on the target words “bloom” and “blue.” His accuracy was maintained with lessened modeling over the course

of therapy. Often, the researcher would ask the subject to show her where he is supposed to put his tongue for the "pointy tongue sound," and then have him try the word again after showing her the correct place. This reminder proved beneficial for correcting attempts where his tendency to glide was consistent. The targets "blaze "and "blast" were more easily produced from the start for the subject.

Probing for stimulability resulted in the following from most to least stimulable: /pl/, /gl/, /fl/, and /sl/. Both /fl/ and /sl/ were inconsistent and required maximal prompting and effort on the subject's part to attempt.

The subject continued to count phonemes in words as the phonological awareness activity. For this session, he was given ten pictures of objects with multiple options to choose from to select the number of sounds heard in the word. The subject used a paint dot marker to select the correct number of sounds he heard. He would count on his fingers as he sounded out each of the words.

He listened to the second round of auditory stimulation and received his home program portion.

Session Three- /pl/ blend

Following stimulability testing from the /bl/ session, /pl/ was selected as a target for Session Three of /l/ blends. The researcher used the same gesture cue used to cue for the previous /l/ blends. Table 10 contains the /pl/ words selected as auditory stimulation and production-practice words. The experiential-play activities used were "Yeti in My Spaghetti", "Operation," a game where the subject raced to get a block across the room and break his "record" after practice of a word, and finally a Paw Patrol craft.

The session began with a review of all 10 of the past /l/ blend targets, and the subject demonstrated correct tongue placement for the /l/ sound without any modeling from the clinician. While coloring the target cards, the subject benefited most from modeling by the clinician. For the duration of the experiential-play activities, prompting by the researcher for accuracy was infrequent. In previous sessions, the subject would twist his tongue during production attempts. However, during this session, his incorrect productions were mostly substituting the /l/ phoneme for the phoneme /ʌ/. With practice, the researcher steadily progressed from saying /ʌ/ for /l/, to /pʌl/, and eventually to blending /p/ and /l/ in a more fluid manner. The subject would accurately include both phonemes in the /pl/ blend of "plane," but during conversation, would incorrectly produce "airplane" as "airpane."

Probing for stimulability resulted in the following from most to least stimulable: /gl/ then /fl/. There was improvement in his consistency with both blends, but particularly /gl/. He required less invasive cueing for direct imitation of the /gl/ blend probe word.

The subject continued to count phonemes within words as a phonological activity. The same kind of cards used as in the previous session were again utilized, only using new words. He counted phonemes within words with 100% accuracy independently.

He listened to the second round of auditory stimulation and received his home program portion.

Session Four- /gl/ blend

Following stimulability testing from the /pl/ session, /gl/ was selected as a target for Session Four of /l/ blends, and is the last stimulable phoneme within the process. The researcher used the same gesture cue used to cue for the previous /l/ blends. Table 11 contains the /gl/ words selected as auditory stimulation and production-practice words.

The subject was again able to select the order in which he played the experiential-play activities. He selected basketball, a dice and say worksheet where the subject practices the target word that corresponded with the number he rolled while competing with the clinician, and making a book. There was not enough time in the session to complete the book-making activity.

The session began with a review of all previous /l/ blend targets. The subject produced all fifteen previous targets with minimal prompting for accuracy. While coloring the /gl/ practice cards, he required modeling, multiple attempts, and a gesture cue. Overall throughout this session, the subject required more modeling for accuracy than in Session three to be correct. A particularly difficult target was the word "globe." For example, the subject would produce /gʌb/, then after modeling he could accurately produce the initial /glo/. He also glided for the /gl/ blend, in particular the target "glass," by substituting/w/ for /l/. The subject demonstrated awareness of the researcher incorrectly producing a target word, and could correct her accurately. The subject's twisting of the tongue diminished as the session progressed, particularly after the first experiential-play activity. The targets "glue" and "glad" were practiced with particular ease. While conversing with the clinician, he did not use his "pointy tongue sound" in phrases or conversation.

A wheel of various phonological awareness activities was used for the phonological awareness activity. The subject spun a wheel to determine what activity he practiced (e.g. say a rhyming word, count phonemes, count syllables, etc.). He could come up with his own rhyming word pairs, and think of words that rhyme with a certain word. He required some help with thinking of words that begin with the same sound, such as "log" and "ladder." He independently clapped the syllables within words. When he had to state what the last sound in the word "rope" was, he needed some help in differentiating that from rhyming with the word.

He playfully resisted listening to the second auditory stimulation activity, even when reminded this was the last time he had to listen with the headphones. However he easily allowed the researcher to place the headphones on his head.

Language Sample Analysis

Language samples collected during the initial assessment as well as during the follow up post-assessment were recorded and reviewed. Language samples were gathered during unstructured play with the researcher within the therapy room using materials provided by the researcher. Portions across the unstructured play recordings were transcribed to get 100 transcribed utterances for each sample. See Appendix III for the typed transcriptions of both language samples. Unintelligible utterances were marked using an asterisk(s).

Of the transcribed 100 utterances in the first language sample, 17 whole utterances were completely unintelligible in unstructured conversation, even when given a context. For 35 other utterances, only some of his words per utterance were unintelligible, and could not be deciphered within the context of the sentence. When the researcher or supervisor would ask the subject to clarify or it was made clear to the subject that he was not being understood, he would focus on his speech to speak more slowly in order to attempt correct the communication breakdown in most instances. Common phonological processes and speech production errors observed include but are not limited to a frontal lisp, vowelizations, gliding, final consonant deletion, and weak syllable deletion.

Of the transcribed 100 utterances in the second language sample, 13 whole utterances were completely unintelligible in unstructured conversation, even when given a context. For 18 other utterances, only some of the message was obstructed due to lack of intelligibility. Common

phonological speech processes observed included a frontal lisp, vowelization, gliding, and some syllable deletion.

HAPP-3 Assessments

The first HAPP-3 assessment was completed on February 28, 2018. Total Occurrences of Major Phonological Deviations (TOMPD) was a score of 69, placing the subject's severity rating according to the HAPP-3 as a "moderate." Word/Syllable Structure Omissions Sum was calculated to be a 30, while Consonant Category Deficiencies Sum was calculated to be a 39. The consonants /θ/, /ʒ/, /tʃ/, /dʒ/, /ŋ/, /l/, and /r/ were not used within the subject's consonant inventory when naming the objects. When gauging stimulability, the /s/ blends /sp/ /sk/ and /st/ were stimulable, as were the consonants /ʃ/, /z/, multisyllabic words, /θ/, and /l/. The /s/ blend /sl/, /r/, /ɝ/, and /ɚ/ were not stimulable at the date of the initial evaluation. See Tables 12 and 14 for the results of the initial HAPP-3 assessment.

The second HAPP-3 assessment was administered on September 5, 2018. Total Occurrences of Major Phonological Deviations (TOMPD) was a score of 41, placing the subject's severity rating according to the HAPP-3 as a "mild." Word/Syllable Structure Omissions Sum was calculated to be a 13, while Consonant Category Deficiencies Sum was calculated to be a 28. The consonants /tʃ/, /dʒ/ and /r/ were not used within the subject's consonant inventory when naming the objects. The frontal lisp was more prominent within the individual naming of stimulus items. See Tables 13 and 15 for the results of the final HAPP-3 assessment.

Chapter V: Discussion

When comparing the results of the initial HAPP-3 and language sample to those of the ones taken at the end of the cycle, the scores do suggest improvement across multiple categories of speech sound production and patterns. The marked differences in the HAPP-3 scores as well as the observed difference within the language samplings suggest the Cycles Approach was effective in remediating some phonological errors present in the subject's speech patterns, and increased overall intelligibility at the word-level.

The Cycles Approach allows for multiple processes to be targeted within a shorter time frame. The targets are intensely practiced with high levels of frequency within a therapy session, and it incorporates listening to the sound being modeled without the pressure of production through the two rounds of auditory stimulation as well as the home program. Hodson (2007) states that the first cycle forms the phonological foundation and provides early success to the child with carefully selected practice target words. Generalization into conversation is not typically expected until the second or third cycle.

Improved Score on the HAPP-3

A major testing component within the HAPP-3 is the Total Occurrences of Major Phonological Deviations (TOMPD), which is a sum total of the Word/Syllable Structure Omissions Sum and the Consonant Category Deficiencies Sum. The subject's TOMPD score improved due to the lessened occurrences of errors across all categories.

The Word/Syllable Structure Omissions Sum takes the occurrences of the subject's productions of omissions within syllables, consonant clusters (with and without stridents), and singletons (prevocalic, intervocalic, and postvocalic) in order to get this sum total. Within this case study, the HAPP-3 was administered two times. For the Initial HAPP-3 results, the subject's

primary omissions occurred within consonant clusters (25 occurrences), both with stridents and without, and he also had 1-3 occurrences within all subcategories of singletons (prevocalic, intervocalic, and postvocalic). Thus making his Word/Syllable Structure Omissions Sum for the Initial HAPP-3 a 30.

Comparatively with the Final HAPP-3 results, the subject's primary omissions also occurred within consonant clusters, but to a lesser extent (12 occurrences). He only had one occurrence of a prevocalic singleton error. Thus making his total Word/Syllable Structure Omissions Sum for the Final HAPP-3 administration 13, creating a decrease of 17 points from the initial administration.

The Consonant Category Deficiencies Sum takes the occurrences of the subject's productions of both omissions as well as the specified substitutions of: nonnasals for nasals, nonglides for glides, nonstridents for stridents, fronting, and backing. Two main categories of sonorants and obstruents are then broken down into subcategories. Sonorants are broken down into liquids (prevocalic /l/ and prevocalic /r/), nasals, and glides. Obstruents are then categorized into the subcategories of stridents (anterior and palatal), velars, and anterior nonstridents.

For the Initial HAPP-3 administration, the subject's primary occurrences within this sum were both prevocalic liquids (/l/ and /r/) with total occurrences being 19. Next was a total of 7 occurrences of anterior nonstridents, 5 occurrences of glides, a total of 4 occurrences within velars, and a total of 3 occurrences combined within both anterior and palatal stridents. When these errors were summed up, his total Consonant Category Deficiencies Sum for the Initial HAPP-3 administration was a 39.

Comparatively with the Final HAPP-3 results, the subject's primary occurrences within this sum were also both prevocalic liquids (/l/ and /r/), but to a lesser degree. His total

occurrences of /l/ and /r/ were 15. Next he had a total of 11 occurrences comprised of anterior and palatal stridents. This was an increase compared with the Initial HAPP-3 result of 3. There were, however, marked decreases within the category of glides, and there were no occurrences within both velars and anterior nonstrident subcategories. His total Consonant Category Deficiencies Sum for the Final HAPP-3 administration was 28. This score was an 11 point decrease from the initial administration. See Tables 12-15 for the complete breakdown of scores for both HAPP-3 results within Word/Syllable Structure Omissions and Consonant Category Deficiencies to accumulate the cumulative score for each respective TOMPD.

Breakdown of Improved Phonemes/Processes

Medial and final position within words.

The subject had no occurrences of errors within two subcategories in the final testing, the intervocalic and postvocalic singletons categories. Intervocalic singletons refer to the occurrence of omitting the consonant within the medial position of words and usually follow the consonant-vowel-consonant (CVC) structure. Postvocalic singletons refer to the final consonant of a word and follows the vowel-consonant (VC) structure at the final position of a word. The subject had errors within both of these categories prior to receiving intervention. Post Cycles Approach, the subject did not have errors present during the final HAPP-3 administration. One of the underlying concepts which guide the Cycles Approach is that children are apt to generalize new speech production skills to other targets (Hodson, 2007). The phonemes in the medial and final positions within words were not specifically targeted, but multisyllabic words were targeted. The subject was prompted and guided to include each syllable within target words. Based upon the underlying concept of the Cycles Approach, the subject learned the skill of including each syllable within word productions, and generalized that to also include not

omitting place-specific phonemes within word structures as well.

Consonant clusters.

The majority of the intervention cycle was spent on the initial consonant clusters of /s/ and /l/ blends. Hodson (2007) explains that phonemes within targeted patterns are used to facilitate the development and growth of the respective phonological patterns as a whole. When applying that logic to this case study, targeting the initial /s/ and /l/ blends was supposed to improve the phonological pattern of clusters as a whole. This does seem to be the case due to each of the tested categories of consonant clusters with/without stridents saw an increase in accuracy of production within the final assessment.

Prevocalic /r/, velars, and anterior nonstridents.

The Consonant Category Deficiencies Sum is a part of the calculation of the TOMPD. Within this category there were decreased errors in velars and anterior nonstridents post Cycle Approach, suggesting success due to the efficacy of using the intervention. The categories of velars and anterior nonstridents were free from errors in the final test. Anterior nonstridents include the phonemes of /p/, /b/, /t/, /d/, /θ/, /ð/, /m/, /n/, and /l/. Velars include the phonemes /k/, /g/, and /ŋ/ (Hodson, 2007). Targets within the Cycles Approach therapy included /sp/, /sm/, /sn/, /sk/, /l/, /kl/, /bl/, /pl/, and /gl/, and each of those consonant clusters included anterior nonstridents and velars. Each of these phonemes were targeted extensively during the cycle in drill, and facilitated through vigorous practice with gestures, verbal prompts, and physical prompts. Through this process of intervention, it can be suggested then that the production-practice during therapy facilitated an increase in skill of producing those phonemes. The subject increased in skill enough for his final HAPP-3 results to be absent of any occurrence of errors within those categories after receiving the intervention.

Liquid prevocalic /r/ was not a target in the cycle, but did also decrease in occurrences by one point. Again, this improvement coincides with the underlying concept of the Cycles Approach which states that children generalize new skills to other targets (Hodson, 2007). Prevocalic liquid /l/ was a target within the cycle, and the subject could have generalized the increased skill of this phoneme to the prevocalic liquid /r/.

Syllable structure within words.

Syllable structure in the form of three syllable words was chosen as one of the target processes during intervention. Prior to the intervention, the subject had the tendency during his connected speech to diminish syllable structures within words. When implementing the Cycles Approach during weekly therapy sessions, the researcher had the subject either tap his finger or hit the table with his hand to emphasize the multiple syllables within a word. He also counted the syllables within various words over the course of some phonological awareness activities. These activities all were used in an effort to promote the awareness of producing multiple syllables and ultimately keeping the words within his speech wholly intact with no sounds omitted. The final HAPP-3 test results have a decrease from a score of 30 to 13 in Word/Syllable Structure Omissions, which denotes the approach was effective in generalizing the multisyllabic targets from within therapy to that of the stimulus item targets within the HAPP-3.

Improved Severity Rating

To acquire the TOMPD score, both the Word/Syllable Omissions Sum and the Consonant Category Deficiencies Sum were added together for the cumulative sum of the TOMPD. This score is then used to determine the severity rating for the child who was given the HAPP-3. The Initial HAPP-3 administration on the subject garnered a TOMPD score of 69, which labeled the

subject with a moderate severity rating. The Final HAPP-3 administration on the subject had a decreased TOMPD score of a 41, labeling the subject with a severity level of mild. See Table 16 for the TOMPD score comparison for both HAPP-3 administrations. The subject's entire severity rating was improved from moderate to mild.

Hodson (2007) describes phonological severity on a continuum for children ages 3-8, with the noted difference between 'moderate' and 'mild' is described as 'mild' has few omissions and few substitutions, while 'moderate' has some omissions and some substitutions. Both ratings have distortions being common within speech (Hodson, 2007). The severity intervals vary per rating: 1-50 points is mild and 51-100 is moderate severity. Initially, the subject fell within the lower end of moderate (69 points), and improved to be classified within the higher end of mild severity (41 points).

Increased Occurrences of Errors

While the overall categories within the scoring components of the HAPP-3 (Word/Syllable Structures, Consonant Category Deficiencies, and all their respective subcategories) mostly decreased in the occurrences of errors post intervention, two subcategories of obstruents increased in errors after the Cycles Approach was implemented: stridents anterior and stridents palatal. Stridents anterior refer to the phonemes /f/, /v/, /s/, and /z/, and are more commonly referred to as fricatives. The anterior strident /s/ phoneme was within the cycle target process of /s/ blends. However, the goal for targeting the /s/ blends pattern was not to improve the accuracy of the /s/ itself, but to improve the accuracy of including both the /s/ and its respective blended phoneme. Stridents palatal are more commonly referred to as affricates, and include the consonants /ʃ/, /ʒ/, /tʃ/, and /dʒ/ (Hodson, 2007). These consonants were also not included within the Cycles Approach therapy targets, so the increase in their occurrences could

not have been due to an inefficiency of the therapy.

There are two possible explanations. One possible explanation for this increase in errors could be that since the researcher was not targeting fricatives and affricates throughout the cycle, the subject's self-monitoring of those sounds in production was diminished. Prior to the intervention, affricates and fricatives were therapy goals for the subject. The researcher and the subject worked together for three sessions where final consonants, affricates, and fricatives were the target goals, and he had at least one additional semester of fricative/affricate targets as well. The subject was familiar with being prompted to correct his speech when he did not correctly produce that manner of consonants. This intervention required the subject to do and say things he had not done previously in therapy, which may have impacted the development of the sounds he was working on immediately prior to his entire therapy changing. When the subject's speech skills were improving in the other areas, the researcher was not prompting the subject to correct his productions of fricatives and affricates, and so he may have grown accustomed to not monitoring his speech accuracy for those particular sounds.

Another explanation could be that while there is an increase in the occurrence of errors with fricatives and affricates, there also was a decrease in the subject's overall omissions. Therefore, he if he is producing them more, then perhaps the errors are increased as well. When omissions are decreased in frequency, the intelligibility of the subject is improved, even with errors of substitutions.

Target Selection Component: Phonetic Environments of Target Words

During implementation of the Cycles Approach, target words for each process were carefully selected in terms of their phonetic environments. Words containing phonemes the subject was not stimulable for were not selected as targets, however in some instances, such as

‘smash,’ ‘laugh,’ ‘leaf,’ ‘fishing boat,’ ‘smart,’ and ‘space,’ the target words contained final and medial fricative consonants or vocalic /r/ phonemes in which the subject was not highly stimulable. The researcher felt these were still acceptable given that the nonstimulable phonemes were counted for accuracy, merely the initial blend or the syllable inclusion was the target counted for accuracy.

Language Sample Comparisons

Both language samples comprise of 100 utterances recorded using a video recorder on a tripod placed in the corner of the therapy room during unstructured play. The first sampling was done early on in the Spring 2018 semester during baseline testing prior to implementing the Cycles Approach, however, it should be noted that the subject and researcher had interacted together for three previous therapy sessions, so a rapport had been established. Secondary to the subject being familiar with the clinical setting as well as having an established rapport with the researcher, the sampling was determined to be an accurate representation of the subject’s relaxed and natural speech. The second sampling was done in the Fall 2018 semester after the final administration of the HAPP-3 for the final testing immediately post Cycles Approach.

Language sample one.

The initial language sample comprised of 17 whole utterances that were unintelligible during unstructured conversation, even when given a context. For 35 other utterances, only some of his words per utterance were unintelligible, and could not be deciphered within the context of the sentence. The remaining 48 utterances, fewer than half the sample, were distinguished as intelligible when given a context. The subject’s ability to focus on his speech and slow his speech rate when it was apparent the listener could not understand demonstrates a burgeoning awareness of his speech patterns. The presence of multiple speech sound errors and

phonological processes including a frontal lisp, final consonant deletion, and weak syllable deletion negatively affected his overall intelligibility during the conversational sample.

Language sample two.

The second language sample obtained pot intervention comprised of 100 utterances, with 13 whole utterances that were completely unintelligible, even when given a context. This was a decrease from 17 in the first language sample. For 18 total utterances, only part of the message was obstructed due to the subject's lack of intelligibility. The remaining 69 utterances were intelligible when given context, which is an increase from the first language sample where only 48 could be perceived as completely intelligible. Noticed within the subject's speech were the phonological speech patterns of a frontal lisp, vowelization, gliding, and some syllable deletion. Errors on word structure in language sample two were subjectively observed to be decreased compared to instances in language sample one. Additionally, it was noted that the subject used longer utterances within the second language sample.

Lack of Carryover into Conversation

Based upon the increase in accuracy within the Final HAPP-3, the Cycles Phonological Remediation Approach could be deemed as effective in increasing speech intelligibility for a six year-old male with a phonological disorder. Although progress was demonstrated during intervention and post assessment methods, it was noted by the researcher that the subject did not exhibit consistent carryover into general conversation. However, generalization into conversation is not expected until the second or third cycle (Hodson, 2007). The subject's speech accuracy increased within the language samples as demonstrated by an increase in completely intelligible utterances within context, but not to the same extent as single-word speech intelligibility. During therapy sessions, the researcher would lead production-practice play activities and observe that

the subject could accurately label the target word, but when using the target word in a sentence or phrase, the accuracy decreased.

In an attempt to make the target words more conversational, one session was designed to get the subject to say the multisyllabic target words within a phrase level independently, and more naturally than drill-play. This feat was difficult to achieve using an unmodified Cycles Approach within the confines of the research study. The activities included a scavenger hunt/map-making activity, 'Go Fish,' and 'Bingo'. The scavenger hunt was limited to the therapy room due to the fixed camera in the room necessary to record each session for reliability, and the activity did not generate as much practice saying the words as drill-play facilitated. Both 'Go Fish' and 'Bingo' were successfully completed, however the subject had the tendency to merely state the card or say the 'Bingo' target, as opposed to stating the target within a phrase such as "Do you have a fishing boat," or "I need a piggy bank to get a bingo." This could be from the subject's lack of interest in the activity impeding his willingness to engage or stay on task.

Carryover at Word-Level

Some words selected as target words during the cycle of therapy were also stimulus items the subject had to independently label in the HAPP-3. 'Spoon,' 'leaf,' 'snake' and 'smoke' were all used as target words for /s/ blends and initial /l/. In the Final HAPP-3 assessment, only 'snake' was accurately and independently produced by the subject. The /s/ blend of /sk/ was also targeted in the cycles approach and the subject could not accurately replicate the cluster within the stimulus word 'square.' However, 'that particular target word is a separate cluster from /sk/ given the /w/ consonant also attached, and when asked to repeat, the subject did correctly produce 'square.'

Severity Rating

This phonological test only takes into account speech productions at the word-level through labeling of objects in order to determine the scores necessary for labeling the severity level. The subject had been in therapy long enough to be able to focus on his speech at the word-level during the HAPP-3. His connected speech is where a majority of his intelligibility is hindered. Out of 50 words, only 3 stimulus words are more than single-word level: cowboy hat, music box, and ice cubes. During testing, the subject performed better at the word-level, and so was only given a 'moderate' severity level. This system of rating does not truly take into account the full scope of the subject's capacity at intelligibility.

Word-Level Importance

This entire approach and testing process was reliant upon how well a child can perform at the word level. Hodson (2007) states that the phonemes within the targeted patterns are used to facilitate the emergence of the respective phonological patterns, so that by targeting the word-level, accuracy will generalize to the phonological pattern within sentences and ultimately conversation.

The subject was experienced with therapy enough to be able to produce individual words with more accuracy than in a phrase. Had the case study been able to provide more than one cycle of intervention, each process would have needed to be recycled in the next cycle to catalyze more emergence of generalization into conversation.

Repetitive Drill

The basis of therapy within the Cycles Approach is production-practice through drill-play in order to facilitate emergence of new and more accurate kinesthetic images and auditory awareness (Hodson, 2007). During the initial week of introducing a new target phoneme, the subject would say the same five words repeatedly during a 60 minute session. The constant

repetition of the five words could have been the factor that caused the subject to exhibit those behaviors not conducive for therapy, such as not staying on task or refusing to say words. This particular subject required activities that were especially engaging in order for him to be willing to cooperate. Finding "motivators" for this subject was critical during these sessions.

The subject within this case study was generally well-behaved, however using the unmodified approach with a child who has a more challenging temperament could prove to be problematic to keep motivated during the sessions where there are only five words to use for production practice. This was the case with the subject within this study. This approach is designed for a child who is cooperative and easy to engage. A different approach, or a modified approach could add more function and meaning to production-practice, especially with variation of target words. The limit to only five words for the first session could be considered too restrictive for some children and their individual levels of compliance.

Limitations of the Study

There were several limitations identified within this case study utilizing the unmodified Cycles Approach.

Time constraint.

A major limitation to this case study is due to time constraints there was only enough time to complete one full cycle. The one cycle did catalyze some positive results, but had there been ample enough time, a second cycle would most likely have yielded even more positive results such as a more developed kinesthetic image image of the correct productions of phonological patterns to better grow and develop a more precise self-monitoring system. With just one cycle, the subject did not exhibit many examples of self-correction or overall skills of self-monitoring. All corrections for accuracy were first prompted by the researcher.

Home program follow through.

Another limitation identified in this study was with the home program component and knowing how consistently and accurately the requested program was implemented. Part of the home program is the child receiving that auditory stimulation every day, and going over the target words for more practice between therapy sessions. The home program is a way to develop skills outside the therapy room and involve the parents with the phonological development. The limitation is that other than parent report, there is not a way to know if the home program is applied at home, or to what extent. The home program is another layer of therapy contributing to the remediation of phonological processes by reshaping the child's awareness of their own speech patterns. The program provides more depth by incorporating the parents and prolongs the experience of therapy for the child when followed through at home.

Target process selection.

Throughout this study, several measures were taken to ensure reliability. Specifically for transcription reliability, both the researcher and supervisor transcribed the subject's productions during testing. Due to the severity of the subject's intelligibility, the researcher and supervisor watched the recording again, and discussed their transcriptions in order to agree upon a settled transcription. The subject exhibited inconsistent errors and patterns. In order to comply with the percentage of occurrence being 40% or higher from the HAPP-3 results, the selected target processes used in the case study may not have been the targets that the researcher would have selected to target outside of this approach, in order to have the greatest impact on intelligibility.

Stimulability.

Ideally through the approach, the most stimulable phonemes within a pattern

would be targeted first. The order of the sequence of the targeted phonemes based on stimulability could have been a limitation. For example, the /sw/ blend was much easier for the subject to produce and thus more stimulable than /sm/, however /sm/ was targeted before /sw/. By beginning with the easier and more stimulable target, the subject would have built up more confidence in his success, and perhaps more progress would have been yielded.

Certain target words also contained nonstimulable phonemes. The inclusion of these words could have negatively impacted the progress made by the subject. Although the nonstimulable phonemes within the word were not targeted, the approach is centered on the process of stimulability and facilitative phonetic environments in order for the subject to experience immediate success (Hodson, 2007).

Co-occurring speech intervention at school.

Throughout this case study, with the exception of the summer semester, the subject was receiving other speech services through his school as mandated by his IEP. Any improvements in the subject's speech therefore might not be related to the Cycles Approach. Since the subject was receiving regular services at his school, it is unclear if his improvements in accuracy and overall intelligibility can be attributed solely to the implementation of the Cycles Approach.

Recommendations for Future Research

The purpose of this case study was to research the unmodified Cycles Phonological Remediation Approach, due to a lack of substantive and recent research on the approach as it was originally written. This case study was not exhaustive of the research needed to obtain the full scope of the approach. Further research should be completed in order to research its effects on phonological remediation.

For future studies on the efficacy of the Cycles Phonological Remediation Approach, multiple cycles should be administered. Another cycle would have allowed for more time to make gains, obtain more guided practice, and also perhaps generate more emergence of generalization into conversation. The Cycles Approach is designed to hit the surface of a process vigorously for a short amount of time, and move on to another target for stimulation of altering the phonetic placements that currently are not functional for intelligibility. However, multiple cycles are necessary to stimulate real change and this case study could only provide one.

Future research could also delve into the impact of the slight amplification during the auditory stimulation and the addition of having the child repeat each word from the list into the microphone. The potential impact of the child hearing back their production after all that practice during the session could yield some further progress of self-awareness skills. In future research, the incorporation of language samplings for comparison would be beneficial if included, in order to add more breadth of the phonological processes, the communication capabilities the child has, and the evaluation of progress. A program such as the Systematic Analysis of Language Transcripts (SALT) to transcribe the language samples, or a transcription program to be used along with written transcriptions of productions could contribute more precision and would add another level of reliability to the study. Using a computer program to supplement the transcription process with a severe phonological child would possibly aid in interpreting the sounds heard, when the production is unclear and intelligibility is low. It also helps in reducing human error. The use of a computerized program should be used to supplement what the researching speech-language pathologist has also collected using their clinician expertise and real-time involvement with the child and testing materials.

Another aspect to research would be the effect the nonstimulable sounds in target words

has in facilitating maximal change and accuracy within the subject's phonological patterns. Stimulability is a key part to this approach, and if a target word contains a nonstimulable phoneme, research could identify the impact, if any, that could potentially have on accuracy and development of new kinesthetic images.

Last, future research should look to determine the level of influence the home program has on participation, overall parent understanding, and potentially the subject's outcomes for success. Perhaps researchers could see if recording the parents completing the program each day at home offers any benefit to the approach, or researchers should look into if there is a process to ensure that the home program is completed as instructed with fidelity. The home program is a bridge from home to therapy, and has the potential to expedite the success of stimulating phonological development.

Chapter VI: Conclusion

The subject made progress with developing correct placement for the /l/ consonant in isolation as well as within blends. He exhibited a heightened sense of awareness with the initial /s/ phoneme within /s/ blends, and he began to learn about multiple syllables within words and how each syllable worked together to form the one word. The phonological awareness activities seemed to be beneficial for the subject as his literacy skills were burgeoning. The multiple facets of the approach came together to target and remediate the speech patterns that hindered this subject's intelligibility. The Cycles Phonological Remediation Approach seemed to improve the intelligibility and phonological development for the subject of the case study, and was successfully efficient at facilitating the emergence of new and more accurate kinesthetic images and auditory awareness of sounds.

Ultimately this approach is geared for a subject with multiple phonological processes hindering intelligibility. The Cycles Approach works well with getting started on targeting multiple processes in a short amount of time in order to spearhead treatment quickly. Due to the approach's design, it is for initial treatment of a process(es) at the word level and should be accompanied with a treatment schedule that would allow for ample time to complete more than one cycle.

Tables

Table 1

/sp/ auditory stimulation	/sp/ target words
speck	spoon
spout	spy
speed	space
spy	spot
spider	spin
spine	
special	
spiral	
spicy	
spit	
spoon	
spot	
spend	
Spain	
space	
spare	
spell	
speak	
sports	
spin	

Table 2

/sm/ auditory stimulation	/sm/ target words
smog	smash
smug	smoke
smirk	smack
small	smart
smell	smock
smart	
smite	
smear	
smash	
smack	
smile	
Smith	
smelt	
smooth	
smuggle	

smooch smoke smudge smush smock	

Table 3

/sw/ auditory stimulation	/sw/ target words
sweep sweet swim swing sway swerve swell sweater switch swoon swap swan swat swig swagger swirl swam swallow sweat swine	sweep sweet swing swat swim

Table 4

/sn/ auditory stimulation	/sn/ target words
snail sneak snort snow snack snout snot snake snack sneeze	snack snout snow snot snake

snub snuggle sneer snooze snare sniff snorkel snap snatch snip	

Table 5

/sk/ auditory stimulation	/sk/ target words
school scoop skate skin scold sky skit skirt scale scare skull skim ski scab skill skid scale skip scarf scope	ski sky scoop skin skip

Table 6

Multisyllabic Auditory stimulation (Session One)	Multisyllabic Target Words (Session One)	Multisyllabic Auditory stimulation (Session Two)	Multisyllabic Target Words (Session Two)
potato baseball game ice cream cone big sister mom and dad restaurant	fishing boat spaghetti baseball game piggy bank hospital	ladybug chocolate firetruck area holiday library	ice cream cone firetruck camping trip smelly skunk pajamas

garbage can bumble bee daffodil hamburger magazine basketball paw patrol piggy bank submarine fishing boat microwave spaghetti neighborhood sleeping bag		camping trip medium piano radio ladybug hummingbird ice cream cone crocodile bicycle telephone kangaroo pajamas bathing suit smelly skunk	

Table 7

Initial /l/ Auditory Stimulation (Session One)	**Initial /l/ Target Words (Session One)**	**Initial /l/ Auditory Stimulation (Session Two)**	**Initial /l/ Target Words (Session Two)**	**Initial /l/ Auditory Stimulation (Session Three)**	**Initial /l/ Target Words (Session Three)**
love lake lizard loud lamb Lego lick loop luck learn lion label lonely lazy lightening lamp llama lunch leaf lollipop	lion lamp leaf lake Lego	limb leap ladybug load line lemon lick lid loud light lick lap low lab loaf lash leak lizard lunch laugh	lick lemon ladybug lizard lunch	look lay lab loft loan letter lie leftover latch lash long large leg lady liberty lavish liquid laugh lid ladder	love leg lab laugh lid

Table 8

/kl/ Auditory Stimulation	**/kl/ Target Words**

claim clam clock closet clear clip close clown claw clasp clatter clue cliff class cloud climb club clay clever clap	clap claw clock clue cloud

Table 9

/bl/ Auditory Stimulation	/bl/ Target Words
blink blizzard blanket blue black blow blade blouse blew blaze bloom blonde blast blind block blast blind block bleak bleach blame blend	blue blast blaze bloom blow

Table 10

/pl/ Auditory Stimulation	/pl/ Target Words
plop play plot plant pluck plow plate plane plug place please plank plum plus pliers planet platypus plaid plenty plain	play plug plane plant plate

Table 11

/gl/ Auditory Stimulation	/gl/ Target Words
globe glad glove glass glue glum glee glow glide gloomy glasses glamorous glacier gladiator glory glisten glitch glitter gleam gloss	glue globe glad glove glass

Table 12: Word/Syllable Structure Omissions Sum for TOMPD, Initial HAPP-3

Word/Syllable Structures (Initial HAPP-3)	Consonant Clusters		Singletons		
Occurrences	With Stridents	Without Stridents	Prevocalic	Intervocalic	Postvocalic
	15	10	1	3	1
Word/Syllable Structure Omissions Sum	**30**				

Table 13: Word/Syllable Structure Omissions Sum for TOMPD, Final HAPP-3

Word/Syllable Structures (Final HAPP-3)	Consonant Clusters		Singletons
Occurrences	With Stridents	Without Stridents	Prevocalic
	6	6	1
Word/Syllable Structure Omissions Sum	**13**		

Table 14: Consonant Category Deficiencies Sum for TOMPD, Initial HAPP-3

Consonant Category Deficiencies (Initial HAPP-3)	Sonorants				Obstruents			
Occurrences	Liquids *Prevocalic /l/*	Liquids *Prevocalic /r/*	Nasals	Glides	Stridents *Anterior*	Stridents *Palatal*	Velars	Anterior Nonstridents

	10	9	1	5	1	2	4	7
Consonant Category Deficiencies Sum	**39**							

Table 15: Consonant Category Deficiencies Sum for TOMPD, Final HAPP-3

Consonant Category Deficiencies (Final HAPP-3)	Sonorants				Obstruents	
Occurrences	Liquids *Prevocalic /l/*	Liquids *Prevocalic /r/*	Nasals	Glides	Stridents *Anterior*	Stridents *Palatal*
	7	8	1	1	6	5
Consonant Category Deficiencies Sum	**28**					

Table 16: Comparison of TOMPD and Severity Ratings

HAPP-3 Results	**Initial Score/Rating**	**Final Score/Rating**
Word/Syllable Structure Omissions Sum	30	13
Consonant Category Deficiencies Sum	39	28
TOMPD	69	41
Severity Rating	Moderate	Mild

Appendix I

Research Participation Permission Form

Study Title: Is the Cycles Phonological Remediation Approach an Effective Procedure for a Six-Year-Old Child with a Moderate-to-Severe Phonological Disorder: A Case Study
Primary Investigator: Elizabeth Packard, graduate student in Speech-Language Pathology, and Stephanie Schaaf, Center for Communication Disorders
Co-Investigator(s): Dr. Sharon Hart and Alison Brown
Faculty Sponsor Contact: Stephanie Schaaf, (270) 809-3783, sschaaf@murraystate.edu

You are being invited to participate in a research study conducted through Murray State University. This form contains information you will need to help you decide whether to be in this research study or not. Please read the form carefully and ask the study team member(s) questions about anything that is not clear. You will be given a copy of this form to keep.

1. **Nature and Purpose of Project:** The purpose of this study is to look at the effectiveness of using the Cycles Phonological Remediation Approach on a child with a severe speech sound disorder in a clinical setting. This study will be completed by a graduate student in Speech-Language Pathology.

2. **Participant Selection:** You are being asked to participate because your child has demonstrated performance in previous speech therapy to suggest your child can benefit and improve in his speech production from this particular therapy approach.

3. **Explanation of Procedures:**
   This study will be used for research purposes. The study activities include: weekly scheduled therapy sessions with your child. Each therapy session will have the following steps: first, a review of the words from the previous session (on the initial session, this step will not be included), then your child will listen through headphones while the clinician reads the new target words .Next, the clinician will provide production practice of target words, followed by play activities designed to further practice target words, such as board games. A break will then be provided if needed. Following the break, the clinician will give an assessment of what sounds your child can imitate when given cues, and then proceed to speech sound awareness activities such as rhyming. At the end of each session, the clinician will read the target words list again to your child while they are listening through headphones of the same practice words. Practice activities will be sent home.

   The home practice portion lasts approximately 2 minutes a day, and requires a parent to read a list of the target words used in therapy to your child. The list will be given to you by the graduate clinician, Elizabeth Packard, or faculty supervisor, Stephanie Schaaf.

   Study duration: Therapy using this approach will be used in sessions for the Spring and Summer 2018 semesters, and additionally extend into the Fall 2018 semester. Therapy will be scheduled once weekly at a set time for 60 minutes.

4. **Recordings/Photographs:** Therapy sessions with your child will be video recorded. Videos will be used to analyze the graduate clinician's therapy procedures, and ensure the correct steps and procedures of the Cycles Phonological Remediation Approach are being performed as described. Your child's information (name, contact information, etc.) will not be used in any way.

   _____ I agree to have my child be video recorded.
   Initials

   _____ I do **not** agree to have my child be video recorded.
   Initials

5. **Discomforts and Risks:** The possible risks and/or discomforts associated with the being in the study include: sessions will be 1 hour in length, as opposed to the 45 minutes that has been provided prior to the study. Your child may not respond to the therapy techniques used during the study.

6. **Benefits:** We do not know if your child will benefit from being in this study. However, you may notice improved clarity of your child's speech or individual speech sounds during conversation or practice. This technique includes phonological awareness activities focused on promoting literacy skills, so your child will be exposed to potential aid in his development of literacy.

7. **Participant Compensation:** The therapy service fee will be waived for the duration of the research study (January 2018-December 2018).

8. **Confidentiality:**
   Your child's identity will be known to the researchers, but the information you provide will be kept confidential. Any written research on this case study will not include the name of your child. Any video recordings of therapy with your child will only be viewed by the primary and co-investigators for research purposes. Video recordings will be stored and viewed on a password-protected computer.

9. **Refusal/Withdrawal:** Participation is strictly voluntary and you are free to withdraw your child or stop participating at any time with absolutely no penalty.

10. **Contact Information:** Any questions about the procedures or conduct of this research should be brought to the attention of Stephanie Schaaf at (270) 809-3783, or sschaaf@murraystate.edu. If you would like to know the results of this study, please contact Stephanie Schaaf.

Your signature indicates that this study has been explained to you, that your questions have been answered, and that you agree to take part in this study.

The dated approval stamp on this document indicates that this project has been reviewed and approved by the Murray State University Institutional Review Board (IRB) for the Protection of Human Subjects. If you have any questions about your rights as a research participant, you should contact the MSU IRB Coordinator at (270) 809-2916 or msu.irb@murraystate.edu.

Participant's Name (printed): _____

_____ _____

(Parent/Guardian/ Legally Authorized Representative) (Date)

_____ _____

(Signature of Person Obtaining Consent) (Date)

Appendix II

Procedural Reliability Form for the Cycles Approach

Observer: ---------_____

Date: _____

Target sound for session: _____

Order of Steps following the Cycles Approach	Clinician fulfilled designated step (-/+)	Clinician followed order of steps (-/+)	List of Target words
1. Clinician reviews the preceding production-practice cards **For initial session: 12-word screening from the HAPP-3 is given first**	_____ _____	_____	**1.** **2.** **3.** **4.** **5.**

2. Clinician provides slightly amplified auditory stimulation of session's target pattern. **Word list is approximately 20 words.**	_____ _____	_____	
3. Picture-word cards (5) are developed on 5"x8" index cards.	_____	_____	
4. The child participates in production-practice play activities using 5 target words. **Models and/or tactile cues are provided as needed.**	_____ _____	_____	
5. Clinician gives an assessment of stimulability within the designated target pattern.	_____	_____	
6. Phonological awareness activities are engaged with the child for a few minutes.	_____	_____	
7. Clinician provides slightly amplified auditory stimulation of session's target pattern for the second time.	_____	_____	

8. Clinician provides a listening list to read aloud to the child daily until the next session.	_____	_____	

Appendix III

Language Sample One

Research Clinician	Context	Subject
	Playing with plastic animals	1. /**dɛə kʌm tu gɛ ju/
		2. /*********/
	Subject digs through plastic container of animals	3. /***dʌ wɪd gos/
What?		
	Child puts his hands up to indicate a lid to the animals	4./ tu pʌsɪn/
Oh okay		5. /*********/
	Subject arranges animals	6. /* gɛ ********** ɔn hiə/
		Child makes elephant noises
Ooh		7. /wupsiʂ/
		8. /*********/
		9. /ʂʌ * ʌ * bɪsɪ/
I don't know where the tree trunk is		10. /******* tu/
	Clinician gets out more rocks	11. /rɑkʂ/

Oooh rocks!		
	Child digs through toys to find rocks	12. /gɛ!n rɑks oʊt/
Here's a cat for you (to supervisor)		
		13. /hi go/
		14. /am ə bi ə ******/
	Researcher holds up an alligator with her finger	15. /am bi hɪm/
Oh, he'll eat my finger too!		
		16. /ɛ kænt hʌt mi/
		17. /ʌ æt tu/
	Subject hands an animal to the researcher	18. /ʌ æt dɪs wʌn/
	Subject hands an animal to the supervisor	19. /ænd dɪs̪ wʌn/
		20. /am gʌ kɪw jʌ/
Poor cat. Run away cat!		
		21. /***** kɪi kæ/
		22. /kɪi kæt kænt gɛ oʊt/
You trapped the cat!		

		23. /**** ** ʌm dɪʂ/
	Subject pulls out a group of dinosaurs	24. /****/
		25. /pot tu go la dɪʂ/
		26. /** mʌi ʌn dæi/
they go together, it's a little family		
		27. /nɔ dæi adɪn **/
That's the daddy		
What about this one?		29. /****/
		30. /he ʊ a gɔ fə/
Wow!		
Hey look, twins!		31. /a gɔt dɪʂ/
I got two of them!		
		32. /mi tu/
		33. /a fɪnk a hæ *****/
	Child holds up a whale shark	
That is a shark, that's a whale shark		34. /i ʂɑk/

		35. /i s̪ɑk?/
yes		
		36. /u a hæ tu s̪ɑks̪/
You do		37. /di ɑ s̪ɑk?/
That's a whale		
		38. /u/
		39. /jɛ nɔt tu * ** bʌ i/
Oh thank you!		40. /kæ bi jus̪/
	The subject puts a baby pig under the table	41. /* mæ bebɪ kɛ bi saf ʌndə hiə/
		42. /***** howt/
	Child pulls out a dog	
		43. /pʌpɪ/
A little puppy!		44. /******/
		45. /bihan dis wɑks̪/
Here's a tall one		46. /**** bihan dis wɑks̪/
Okay!		

		47. /ɔ bebis **/
		48. /bi tug ɛvə ***/
		49. /don ** diʂ wɑkʂ/
They're safe, the elephant will protect them.		50. /****/
They're super safe!		51. /and *** θɪngɪ/
	Subject makes animal noises	52. /doʂ/
Oh no!		53. /wet **** sef/
		54. /****/
		55. /*** dɛd/
		56. /*** ʌnd dis wɑkʂ **** ɛnd ** ɪn hiə/
	Playing with the Legos	
		57. /a dɪ wʌ tu bɪl dæt wʌn/
		58. /**/
What about this one?	Researcher holds out a different box	
		59. /jɛ/

		60. /***/
		61. /* jʌ kəw gɛ wɪs and jʌ kəw gɛ dæt wʌn θwi bæg/
		62. /jɛ ***/
	Child gets out a new bag of Legos	
		63. /ʌm bɪldɪ dɪs/
		64. /wɛdɪ go/
I don't think that goes there		
		65. /***/
	Clinician places a Lego piece on a part	
		66. /no/
It would be cool if Paw Patrol was in Captain America		
		67. /kæp məwsʌl/
		68. /***/
Marshall		
		69. /dæ ma pʌpɪ/

Tell me about your puppy!		
		70. /* pu * pi a hɪs kwet/
Yeah, puppies do that.		
		71. /**** jɛ hɪ kʌms ****/
		72. /** pʌ a koʊ ****/
		73. /jɛ/
Does Marshall sleep inside with you?		
		74. /i kant sip wɪ ʌs ** ma dæɪ dont lak *** ***/
Why?		
		75. /ma dædɪ dont lɛt ɪm s̪ip wtɪ ʌs̪/
Maybe he would wake you up! That's why.		
My dog used to always play in the rain and get really wet.		76./ ju hæp pʌpɪ/
	Supervisor: I don't have a puppy. I have a cat!	
	Supervisor: My cat is really mean!	77. /wʌt jʌ kæt do/

	Supervisor: I walk by her and she takes her tail and hits me with it! And then she bites my ankle! Silly cat!	78. /wʌt hɝ do tu ju/
		79. /** kɪtɪ kæt/
No I don't like cats.		80. /wa?/
I like dogs!		81. /** kɪtɪ kæt * ænd go aʊtsad and go pɔdɪ and pʌt jʌ kæt wʌt ju do/
		82. /hoʊ/
		83. /mebɪ hɝ pɔdɪ tend/
Is your puppy potty trained?		84. /no/
	Supervisor: Are you working on your puppy to get trained?	85. /ma məi ænd dædɪ/
Sometimes that can be tricky.	Supervisor: Who feeds your dog?	86. /mi and ma g̈ɪs̈ə **/
		87. /****/
Where'd you get Marshall?		88. /a kænt wimɛmbə vɛrɪ fɔ ʌwe/
Do you go and sell Girl		89. /****/

Scout cookies too?		
	I bet you can eat all the cookies too!	90. /jɛ nɔ ɔ dʌ **/
I love Thin Mints!		91. / a wʌ s̪ʌmoəs̪/
I like to put peanut butter on my samoas.		92. /*** bɑks̪/
		93. / a don bɛwif ju/
You don't believe me? Maybe one day you'll try it.		94. /***/
		95. /****/
		96. /rɑt naʊ ** rɑt naʊ/
		97. /ju ****/
	Subject pulls out a motorcycle man and hands it to the supervisor.	98. /****/
Oh, thank you!		
		99. /vɛwɪ fæs̪/
		100. /****/

Language Sample Two

Researcher	Context	Subject
	Playing with cars	1. /ʌ lak dɪs trʌk/
You like it?		2. /jɛ/
You can fit a lot on it		3. /s̪i/
		4. /ka ju hæn mi ðæt kɑə/
Here ya go		5. /ɪt kan ho ʌ lɑt s̪i/
	Child demonstrates the truck holding the car up	6. /***/
Oh yeah, that's handy		7. /nop/
I'm trying to find the one I found from 1982		8. /dɪs bot/
It is an old car. Older than me!		9. /haʊ old ɪz ɪt/
Well, you know it's...a while. Math is not my strong suite.		10. /a gɔt pɛfɛk/
You got a perfect idea?		11. /aɪdijə/
		12. /aɪdijə/
		13. /wi * dʌ wɛgos wɪ hɔt wɪls/
It's 36 years old! I just did the math. That means the car is 36 years old.		14. /*******/

		15. /ma dæ ɪz̪ odɤ ðæn ju/
		16. /ma dæd ɪz̪/
Really?		17. /***fodɪ θɤi no θɤdɪ foə a θɪŋk/
This one is called cyclops. That's its name.		18. /a * siklɑps bifə a hæf/
		19. /***/
Yeah, they have one eye, and this has one little window so that makes sense.		20. /no ɪt dont/
1982! This is the one that's 36 years old.		21. /a no ɪt wʌʃ dæt wʌn/
You knew it was? It does look pretty old, but it's still good.		22. /and jɛ ɑlso ʌm ʌ don si ɪt ʌm ***/
What year were you born?		23. /ʌm tu θaʊs̪ə etin/
2018? That's when you were born? Okay.		He nods
		24. /dun θɜ˞d/
Okay.		25. /** dun θɜ˞d/
		26. /**/
Oh, well you went there so much this summer!		27. /dɪs̪ jiɤ am pɑbi hævɪn ət wɛntʃə wɪvə/
		28. /no/

Last summer.		29. /wæs s̪ʌmə/
Yeah, you're right.		30. /* ðɪs̪ sʌmə an go bæk wɪs̪ */
		31. /** ðɪs̪ sʌmə wɪ tu sɪks̪ fægs̪/
Yeah? What was your favorite ride?		32. /wɔtə wad/
		33. /am pɪk bof/
		34. /ʌm ** and **/
And what?		35. /ɪt kʌndə lak ʌm e wɔtə pɑk/
Oh.		36. /a no e pes wɛɤ ju gɛt s̪ok/
		37. /a hid tʌ go tu ðɛ bæθwum/
You need to go to the bathroom? Okay.		38. /jɛ/
		39. /a don no wɛɤ ɪts̪ æt/
I can show you.		40. /**/
Oh okay, hold on.		41. /put ɪt ɔn dʌ fʌə/
		42. /** a kæn pɪk ɪt ʌp/
Guess what I touched this weekend?		43. /s̪nek/

		44. /wʌ/
A catfish.		45. /o a kʌt e a kʌt mənstə kætfiʃ/
Did you?		46. /ma dæ kɛt͡ʃd ə tʌsd ʌm/
		47. /**wɪf e gwʌv/
You didn't have a glove?		48. /i dɪd/
		49. /bʌt am kɛt͡ʃɪŋ sʌm bu am jusɪd ʌ gwʌv/
Mhmm.		50. /fengs̪ and ɪt kʌt ma dæd ** gwʌf s̪o tɪ dont kʌt mi/
Yeah I went to the river and my friend's uncle caught a little catfish		51. /e e** owmos ʌm kʌt mi ** ɪt baʊt tu dɛn ɪt ʌm hɪt sʌmwʌn ɛws an mi æand ** an ma bɛwi ʌ lɔŋ tam ʌgo/
		52. /o doet nɔt e mənsə kætfɪs̪/
Yeah it wasn't a monster catfish.		53. /ma dæd kɔt wʌn tu baʊt hiə/
	Gestures size with hands	
Wow that is so big! Almost as big as you!		54. /wɑk hiə **/
		55. /a dont no wʌt kand ʌ bot ɪs̪ θɪs̪/

Is it like a hoverboard boat?		56. /***/
Oh no, will that make all the tires flat?		57. /no/
		58. /mebi/
		59. /s̪i/
This one has a bone on it, like an animal skull bone.		60. /* hæf ʌ wu æt dɪs̪/
		61. /a lak dɪs̪ twʌk/
	Subject shoes the researcher a car	62. /o wʊk/
		63. /* dɪs̪ * hæ no wils̪/
		64. /ɪt wʊd gɛt totə/
Oh! This one has rice in it too!		65. /wɛt mi s̪i/
Want to take it out?		66. /jɛ/
		67. /***/
		68. /a hævɪ s̪i wʌn wɪ fo as bifə/
Oh my goodness!		69. /jɛ */
I don't even know what this is, is it a car?		70. /jɛ/
It's a weird car.		71. /ɪt ***/

		72. /***/
Oh		73. /a hæ dæt kɑ/
You do? At home?		74. /ju gɑt tu kɑs rat naʊ/
		75. /ɪt ɪs̪ dæt wʌn nɑt gʊ et hʌndɪd malz̪/
Eight hundred miles? Whoa.		76. /***/
		77. /***/
		78. /*** powɪs̪ kɑ ** ** e powɪs̪ kɑ/
Oh you want another police car?		79. /jɛ/
I'm surprised there's not one in there.		80. ***
There's a school bus!		81. / *** /
		82. /tʌk his aʊw hɛwp/
		83. ***
		84. /tu ***/
	Subject makes siren noises with car	
		/o/
		85. ***

You can't crash into an ambulance?		86. /no ju kæn do ðæt/
		87. /no dont do ðæt ɔn ju gɛt pɔwdovə/
		88. /gɛt hɪt ba ðɪs̪/
Better wear a helmet in that one!		89. /ma * * hæd wʌn ʌv ðis̪/
Look at this little small one.		/he/
		90. /no wɪ wʌn a lak/
		91. /a se θɪs̪/
		92. /** kɑ/
Is that your favorite?		93. /nɔ ma sɛkʌt fevɪt/
Which one's your first favorite?		94. /ðɪs ɪz/
What's your second favorite/		95. /nɔt bu wʌn/
That's a special taxi!		96. /wuk at ðɪs tasɪ/
		97. /no tæ bæs/
Oh a slug bug!		98. /ɪts ʌ sʌgbʌg tɑsɪ/
		99. /kɛ sʌgbʌg mi amgɑ ju/
		100. /ɪf ju gɑt sʌmwʌn ɛs bifə a gɑ bifə mi ju kæn s̪ʌbʌ mi bæk/

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