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A Comparative Treatment Approach for Childhood Apraxia of Speech

An Honors College Project Thesis

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The Department of Communication Sciences and Disorders

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In Partial Fulfillment

of the Requirements for

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by

Audrey Kinzinger

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This Project Thesis, directed and approved by the candidate's committee, has been accepted by the Honors College of Abilene Christian University in partial fulfillment of the requirements for the distinction

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Abstract

A single-study case study was conducted to determine the efficacy of using the *Kaufman Speech to Language Protocol*, melodic intonation therapy paired with the use of tactile blocks to treat childhood apraxia of speech. An *ABAB* format was utilized as a comparison for treatments approaches at the ACU Center for Speech, Language, and Learning. Results indicated that the child had improvement in his speech but could not be correlated specifically to the addition of the intonation blocks.

A Comparative Treatment Approach for Childhood Apraxia of Speech

Childhood apraxia of speech (CAS) is defined by the American Speech-Language-Hearing Association (ASHA) as “a neurological childhood speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits” (ASHA, 2017). This means that a child who has CAS experiences difficulties with the motor movements involved in speech. With speech disorders, a treatment approach will be implemented to improve the child’s speech that has been studied and is evidenced based. Each child will respond differently to treatment and requires an individualized intervention. The therapist tries a variety of therapy techniques based on the symptoms the child exhibits to find one that will work for the child. According to ASHA, the nature of CAS may require a multi-sensory approach in order to optimize results (ASHA, 2017).

Background

Childhood apraxia of speech was not an official diagnosis until the turn of the 21st century (Burns, 2011). The term apraxia first described a person that had difficulty planning, organizing, and performing motor movements specific to limb movement and not due to incoordination or muscle weakness. By the 1970’s, researchers began to identify speech characteristics that fit the concept of apraxia (Burns, 2011). These characteristics were specific to adult apraxia of speech, but as research continued, it was observed that some children displayed many of the same characteristics when treated for articulation disorders. This led to a clearer picture of childhood apraxia of speech. Due to the neurological component of CAS, neuroimaging and electrocortical stimulation have provided great insight to the speech processes effected. An exact cause or area of impact has not been able to be determined (Burns, 2011). There are usually no other

neurological or neurobehavioral disorders to go along with CAS that can assist with a diagnosis (Burns, 2011).

CAS affects the motor planning and programming aspect of speech. It is because of those motor planning issues that the child can produce the same sound in a variety of ways within the same session (Nancarrow, Kaufman & Burns, 2009). This makes it a difficult disorder to treat. With other speech disorders, the therapist usually knows the etiology, but with CAS, the etiology is usually unknown and it makes determining the cause of the errors even more complicated.

Importance of Prosody

One of the aspects of speech that is often impaired in a child with CAS is prosody. Prosody is the pattern of intonation and stress used in language and speech. It is the way voices rise and fall when speaking. Prosody is a very important piece of a child's developing speech and language—the stress patterns give a framework for word representations in early speech that is later developed into adult-like production. Prosody has six key features— stress, intonation, rhythm, juncture, duration, and tone of voice (Fish, 2016). A child with CAS will often put equal stress on all syllables of a word, not just where appropriate. Prosody occurs in sentences and phrases, as well as in single words. Intonation, or the rise and fall of words in sentences, is also an area of difficulty for a child with CAS. In addition to struggling with intonation, they can have difficulty with the natural rhythm that language follows. If a child has difficulty with how to stress a word, they will likely have difficulty learning how to use stress to build rhythm in a sentence. Juncture refers to the pauses a speaker uses in connected speech. A child with CAS may not be able to fully utilize the concept of pausing, resulting in telegraphic-like speech (Fish, 2016). Duration refers to the acceptable length of time a speech sound is produced for a language system.

Children with CAS may have inconsistent or inappropriate durational production of some speech sounds in their connected speech. Children with CAS can also demonstrate difficulty with tone of voice. Tone of voice is used to reveal many things about language such as irony, mood and sarcasm. The inability to express such mannerisms can lead to monotonic speech.

It is never too early to begin addressing prosody with a child who has CAS, as this aspect of speech is normally absent (Fish, 2016.) It can be difficult for the child's voice to naturally rise and fall because of how CAS affects the child's motor planning, but prosody addresses basic speech skills that the child can build upon. A study conducted in Sweden researched the importance of prosody in language development in forty-four typically developing children. The study took prosodically-controlled words and nonsense words and tested how well the children were able to pronounce and remember them based on segmental word length and prosody. When the words were presented prosodically, the children were able to produce the words and non-words the same. However when broken up segmentally, the children showed difficulty in producing them (Sundstrom, Samuelson & Lyxell, 2014). It is evident that prosody is an integral part of speech and language development, and it is therefore an important treatment component for speech sound disorders such as childhood apraxia of speech.

Melodic Intonation Therapy

Melodic intonation therapy (MIT) is a prosodic therapy method in which a therapist introduces new stimuli in a three-tier hierarchy that uses melody (prosody) as a tool to help the client achieve speech. The therapist introduces a target word or phrase in a sing-song voice showing the client where their voice needs to rise and fall. The clinician will prompt the client to mimic the melody while both tap their finger. Tiers one and two are multi-syllabic words and

short phrases. The third tier consists of phonologically complex utterances and sentences. All tiers are introduced in a melodic fashion that follows a high note- low note pattern that mimics how the words and phrases would be said in everyday speech (Lagasse, 2012). This can be done in conjunction with tapping out a rhythm to further enhance the melodic aspect of MIT. One of the benefits of using MIT is that it can be adapted to the client's needs. Figure A shows the basic outline of how MIT is used. The therapist uses melody to aid the client in producing an “up and

FIGURE A

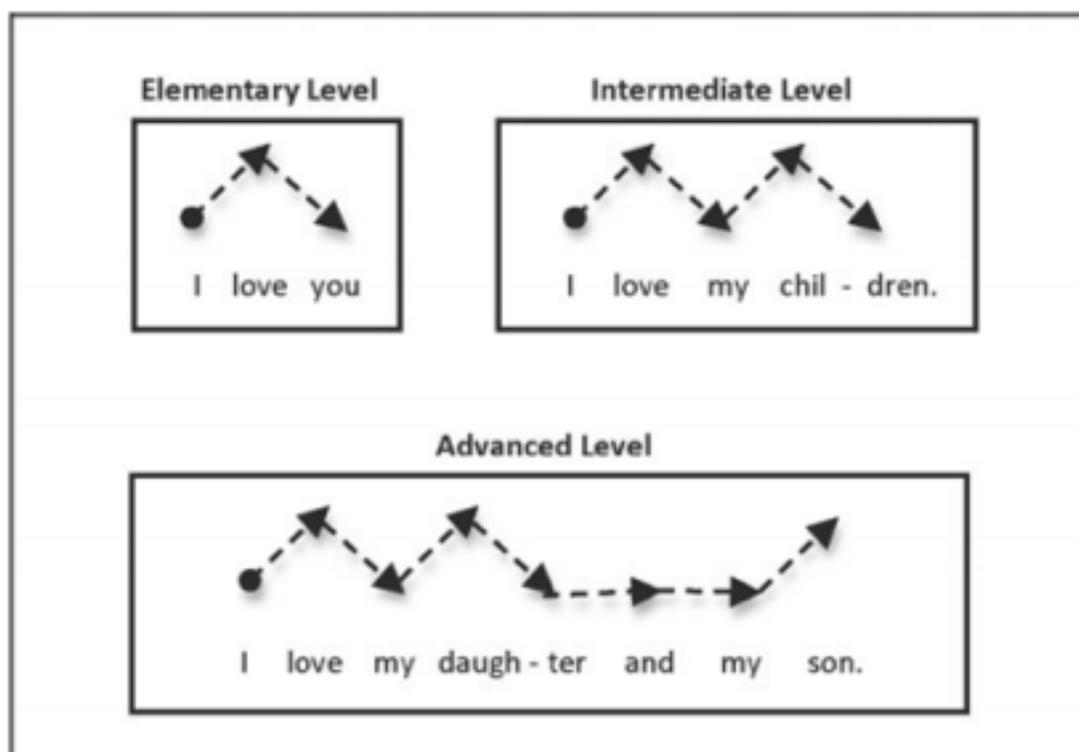


Figure 2. Melodic phrase construction: Phrases are sung on just two pitches; melodic contour is determined by the natural prosody of speech (e.g., stressed syllables are sung on the higher of the two pitches); phrases increase in length and difficulty (Elementary: 2–3 syllables; Intermediate: 4–6 syllables; Advanced: 6–9 syllables) as patients progress through the three levels of treatment. Summarized from Helm-Estabrooks *et al.*³

(Figure A. Melodic phrase construction. Adapted from “Melodic Intonation Therapy” by Norton, A., et al., 2009, *Annals of The New York Academy of Sciences*, 11(69), 431-436. doi:10.1111/j.749-6632.2009.04859.x, 432.

down” voice in melodic fashion, improving their prosody. Through the use of melody, the therapist’s goal is to improve speech fluency and expressive output (Norton, Zipse, Marchina & Schlaug, 2009). Another benefit of MIT is that it can be used with visual cues, such as arrows that demonstrate that direction of intonation. The combination of melodic and visual cueing increases the likelihood of client success. The use of melody enhances the client’s ability to hear each phoneme without having to take time to process what sound is coming next. This allows them to produce the sound without focusing on the production, increasing motor memory (Lagasse, 2012).

A study was completed in 2012 by Lagasse to determine if MIT had any merit as a treatment option for CAS, as it had historically been used with patients with acquired apraxia of speech in adults. A single-case study was conducted with two children who were diagnosed with CAS where MIT therapy sessions were patterned with traditional articulation speech therapy sessions in an ABAB format for four weeks. At the end of the four weeks, it was discovered that both traditional articulation speech therapy and MIT produced improvements in the children’s speech, but some drawbacks were noticed. For instance, the subjects showed significant progress while engaging in MIT, but that progress sometimes failed to transfer over into every day speech. The clients also lacked motivation while doing MIT. A clinician involved in the study noted that “there is nothing in the program on MIT that is intrinsically rewarding or stimulating. After the initial novelty of the program, the clinician must be creative to ensure continued participation” (Lagasse, 2012, p. 53). This study showed that MIT by itself may not be the best treatment option for a child with CAS due to the lack of interest the children showed, but it could have potential if used in conjunction with another treatment method (Lagasse, 2012).

Kaufman Speech to Language Protocol

Another treatment option for CAS is the *Kaufman Speech to Language Protocol (K-SLP)*. The *K-SLP* focuses on building words from simple to complex by using syllable shapes. The therapist helps the child target sounds and syllables similar to the target word. The protocol uses flashcards with pictures on the front and the target word deconstructed phonetically on the back. The words are separated into categories based on syllable shape and where they are produced in the mouth. The therapist shows the child the card and prompt them to say the target word. How advanced the child is in the program will determine the complexity of the target word. For example, when targeting the word “bubble” (/bʌbəl/), the therapist will prompt the child to say “buh” (/bʌ/). The therapist then progresses to “buh-o,” (/bʌo/) followed by “bub-o” (/bʌbo/) then “bubbo” (/bʌb.bo/) and then the child is asked to say the full word- “bubble.” (/bʌbəl/) (Kaufman, 1995). The *K-SLP* has two kits that a clinician works through with the client to achieve intelligible speech. In the *Kaufman Kit 1*, the probe cards are organized into the following categories:

1. vowel-consonant (VC)
2. consonant-vowel (CV)
3. consonant-vowel-consonant (CVC)
4. consonant-vowel-consonant-vowel (CVCV)

This therapy model can take time to accomplish. The kits allow the clinician to model the sounds as they increase in phonetic difficulty to reroute the motor planning pathways in the child’s brain, which is referred to as the mirror neuron mechanism (Nancarrow et al., 2009). Starting with phonetically simple sounds decreases errors and allows the child to establish

correct motor pathways. The *K-SLP* is effective because it targets several different aspects of speech acquisition. It focuses on syllables being the foundation for words, and allows the child to acquire the skills to later have intelligible production. It uses the auditory aspects of speech as well, using acoustic and visual components of speech production in conjunction with each other (Nancarrow, 2009). The *K-SLP* incorporates fun with drill work so that the child remains engaged through the entire session.

The *K-SLP* also focuses on the importance of repetitive practice. In order for a child to learn a new motor pathway, the skill must be practiced in succession. This repetition allows the child to distinguish for themselves when the sound is being made correctly and incorrectly. Fish (2016) lays out a three-step approach for incorporating repetitive practice in therapy. She says that the first step is the pre-practice phase where the target sounds will be introduced. That leads into the activity stage where the target sound is practiced intensely. She recommends that at least one hundred responses be elicited in a session, with that number reaching as high as three hundred in a thirty -minute session. The final step is the review phase. In this step, the target sound is reviewed and repeated before the child leaves the therapy session. This three step structure gives the therapist a basic outline to follow, but allows for flexibility within the session so that the child does not grow bored and lose focus. The activity and how long each step lasts can vary from session to session depending on the client.

This review leads to the question of what a comprehensive treatment for CAS looks like. Is there a way to combine these treatment options and achieve a more successful outcome from therapy? To answer that question, a single-case study was conducted to determine the efficacy of using the *K-SLP* in conjunction with MIT paired with the use of tactile blocks in treating CAS.

Methodology

A single-case study was conducted to determine the efficacy of using the *K-SLP* in conjunction with MIT paired with the use of tactile blocks in treating CAS. The child was a three-year-old native English speaker with no history of hearing loss who had been diagnosed with CAS. Parental consent was obtained and the study was conducted in the ACU Center for Speech, Language and Learning under the supervision of a certified speech language-pathologist. IRB approval was given for the study. The child was treated using the *K-SLP* before the study began. Therapy sessions also included what the client referred to as a “notebook” that was filled with pictures of people and objects the child used everyday to increase the intelligibility of his functional language. Figure B shows the intonation blocks that were developed to be used as a tactile reinforcer in conjunction with MIT. The arrows on the blocks can be arranged to point up,

FIGURE B

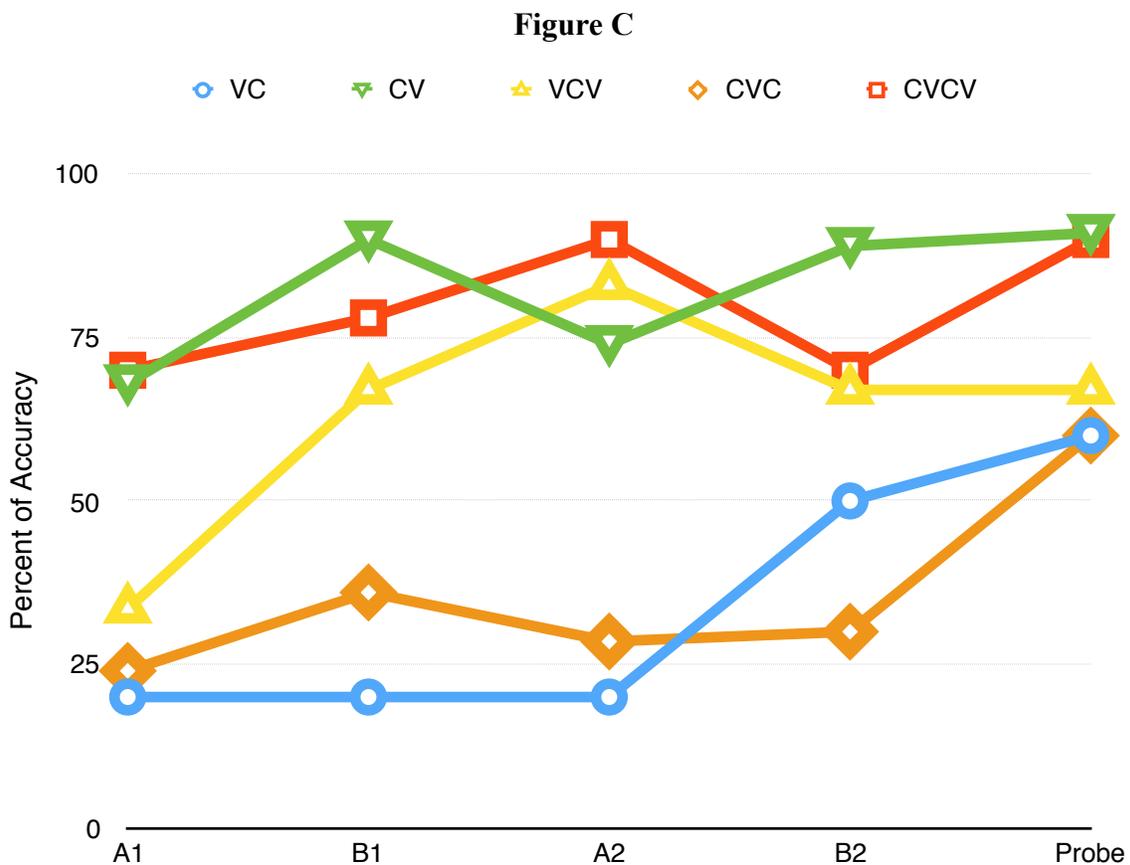


down or horizontally, depending on desired intonation, and blocks can be added or removed based on the required amount of syllables. The child worked through *Kaufman Kit 1* which has

the simplest syllable structures, not exceeding three syllables, requiring only three blocks. The sessions were patterned in an *ABAB* format and occurred for 45 minutes, twice a week. *A* sessions were implemented using only the *Kaufman Kit 1*, while *B* sessions used both *Kaufman Kit 1* in conjunction with MIT, using the intonation blocks as a tactile cue. There were three weeks of *A*, followed by three weeks of *B*, then two weeks of *A* and two weeks of *B*. The study ended with a week of data collection to determine the efficacy of the addition of the intonation blocks. Sessions were structured with the following time allotments: 15 minutes of the *K-SLP*, 15 minutes of play-based therapy used to address functional speech, 15 minutes of the *K-SLP*.

Results

Figure C demonstrates the average percent of accuracy from each set of *A* sessions, each set of *B* sessions and the probe sessions. Data focused specifically on VC, CV, VCV, CVC and



CVCV syllable structures. While there are positive trends, the numerical data shows no conclusive results on the efficacy of adding MIT and intonation blocks to the *K-SLP*.

Discussion

It is difficult to assess the efficacy of using MIT and the intonation blocks in conjunction with the *Kaufman Kit 1*. The child demonstrated age-appropriate receptive and expressive language skills as indicated by a speech and language assessment conducted at the ACU Center for Speech, Language, and Learning. There were several factors that impacted delivery of the therapy as planned. The child was tardy for several sessions, causing a variation in the duration of those sessions. The child's attention varied in each session as well. He was ill in several sessions, causing him to be lethargic and inattentive. In other sessions, the child was active and often brought a toy or object with him into the session that would distract him from achieving the goals set for each session. He attempted to converse about the pictures that were on the card, instead of practicing the target sound. There were a total of five missed sessions over the course of the study due to child and clinician sickness, which caused the rhythm of the study to be disrupted. The child demonstrated greater difficulty focusing in the first session back after a missed session than in ones that occurred sequentially.

The child responded well to the intonation blocks for the first two sessions they were implemented. He repeated what the clinician said and pointed to each block with each syllable as instructed. However after several sessions of use, the blocks appeared to become more of a distraction, as he attempted to take the blocks off the table and play with them. It is not possible to correlate the use of intonation blocks to the positive data trends due to this distractibility and inconsistent use during *B* sessions.

From week to week, the child's ability to produce target sounds varied greatly. This is not uncommon when treating CAS. Accuracy can vary in spontaneous versus elicited speech, as well as in repetitious speech (ASHA, 2017). The child also demonstrated improvement in his prosody, intonation, and speech intelligibility. He continued to demonstrate below average intelligibility for a student of his age, however, improvements were noted. Clinicians who were involved with the child the previous semester commented that they noticed considerable changes in his overall conversational intelligibility. The graduate clinician also reported he was able to respond to and engage in conversations with greater ease than when sessions began. It is not possible to specifically correlate these observations to the use of intonation blocks. However, improvements to the child's speech were still observed over the course of the study, as evidenced by the increase in accuracy seen from baseline to final probes.

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