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Speech-Language Pathologist Preferences for Treatment Types for Childhood Apraxia of Speech

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## **Abstract**

Childhood Apraxia of Speech (CAS), also known as developmental apraxia is, “a motor speech disorder that makes it hard for children to speak” (American Speech-Language-Hearing Association). While the child knows what he/she wants to say, the signals going from the brain to the mouth are not delivered correctly, resulting in the mouth not moving appropriately to produce the desired sounds. There are several methods used by speech-language pathologists to treat CAS including motor-programming, a linguistic approach, a combination of motor-programming and linguistic methods, sensory cuing and rhythmic approaches. Through surveying local practicing school speech-language pathologists, I will learn their preferred treatment methods for CAS and the perceived effectiveness of these methods. As an aspiring speech-language pathologist (SLP), the results of this research will allow me to be informed of the benefits of treatments for CAS. The information gained can also be beneficial for other individuals curious about the topic.

## **Motor Programming Approach to CAS**

One of the treatment methods utilized for childhood apraxia of speech is the motor-programming approach. ASHA describes motor-programming approaches as those that, “utilize motor learning principles, including the need for many repetitions of speech movements to help the child acquire skills to accurately, consistently, and automatically make sounds and sequences of sounds” (American Speech-Language-Hearing Association). It is evident there are many methods of implementing motor-programming treatment methods, some well-known methods being the Kaufman Speech to Language Protocol (K-SLP), the Nuffield Dyspraxia Program (NDP3®), and Dynamic Temporal and Tactile Cueing (DTTC). The K-SLP uses behavioral principles, shaping small units including consonants, vowels and syllables at a level the child is

capable of producing and building them back up to age-appropriate motor-speech skills (American Speech-Language Hearing Association). Similarly, the NDP3® is a “bottom-up” approach where phonemes and syllables are used to build accurate speech (American Speech-Language-Hearing Association).

Maas, Gildersleeve-Neumann, Jakielski and Stoeckel (2014) attribute a DTTC-type integral stimulation approach as having the strongest evidence base as a motor-based intervention. In DTTC, “functional words and phrases are targeted primarily, although nothing in the approach precludes targeting other speech elements (e.g., syllables, words)” (Maas, Gildersleeve-Neumann, Jakielski & Stoeckel, 2014 p. 5). DTTC is an integral stimulation approach that involves imitation and motor learning principles (Maas et al., 2014). The clinician models and cues the target sounds for the specific child’s therapy goals, drilling the target sounds until the goal is reached. Additionally, DTTC is hierarchical, “in that supports are lessened as the child’s independent speech movements increase in accuracy, successful application of DTTC requires a rapid and fluid increase and decrease of supports based on each individual’s needs” (Maas et al., 2014 p. 7). This approach appears to be tailored directly to the child receiving therapy, as the target sounds and goals will be chosen based on the progress, or lack thereof, made by the child.

### **Linguistic Approach to CAS**

Another form of treatment for childhood apraxia of speech is the linguistic approach. One type of treatment for the linguistic approach is phonological awareness intervention. Moriarty and Gillon (2006) state that “children with CAS may have severe and persistent phonological awareness and phonological processing difficulties” (p. 715). Phonological awareness and phonological processing difficulties can lead to school-aged children with CAS having trouble

reading and writing, which is detrimental to their learning and can often lead to the children falling behind in school. Phonological awareness is “an important variable in reading and spelling acquisition. Children who approach literacy instruction with poor phonological awareness are likely to struggle in early word recognition and decoding tasks” (Moriarty & Gillon, p. 715). The idea that children with poor phonological awareness during literacy instruction in early word recognition and decoding tasks further support the claim that children with CAS can fall behind in school. Phonological awareness intervention is essential in targeting the specific speech and literary deficits the individual child displays.

The intervention, itself, for phonological awareness should “place emphasis on manipulating speech subunits and speech production” (Moriarty et al., p. 717). Based on the deficits the child is currently displaying, treatment should target phonemes that will increase phonological awareness levels and speech production. The intervention should also then continue to increase in complexity as the child progresses. Additionally, “the requirement of speech production during phonological awareness activities allows children the experience of arranging phonemes into larger linguistic structures such as syllables and words” (Moriarty et al., p. 717). Here, the authors are saying that simply learning to read and write the phonemes and arranging them into complex syllables and phrases is not enough on its own; being able to produce the phonemes in speech is crucial to this intervention for CAS. The children receiving the therapy need to generalize the treatment to be able to utilize these skills in environments outside of therapy, such as in school. Phonological awareness intervention can be an effective tool in treating childhood apraxia of speech.

### **Combination of Motor Programming and Linguistic Approaches to CAS**

Iuzzini and Forrest (2010) applied a combined treatment approach in therapy for four children, utilizing a modified Core Vocabulary Treatment (mCVT) and a stimulability training protocol (STP). The STP “focuses primarily on increasing the inventory of speech-delayed children” and the mCVT targets “both phonological inventory expansion and consistent sound production in children with CAS” (p. 336-337). This approach utilizes the treatment aspects of consistent sound production from motorprogramming and the phonological inventory expansion of the linguistic approach. Specifically for the mCVT, the phonological targets were presented in all word positions, with the vocabulary chosen specifically by the child and his/her family, to best incorporate important elements of the child’s daily life (Iuzzini et al., 2010).

When providing the combined treatment, the mCVT and STP protocols contained two phases, imitation and spontaneous production (Iuzzini et al., 2010). The children were given a model of the target phoneme, and if they were able to correctly imitate the model a set number of times they would move to spontaneous production. As a result, “the combined STP and mCVT procedures provided greater benefits than was demonstrated in the independent application of each protocol” (Iuzzini et al., p. 341). Treatment should be individually tailored to meet the child’s specific needs, and this study provides evidence that combining multiple treatment approaches may be needed for different children. Targeting multiple goals at the same time, such as increasing consistency of sound production and the phonetic inventory, is necessary for reaching results in a timely manner while increasing the child’s ability to generalize skills learned in therapy to other environments. Combining treatment approaches is especially beneficial if the child is displaying multiple facets of CAS, and/or if there are other disorders present in addition to CAS (Iuzzini et al., 2010).

### **Sensory Cueing Approach to CAS**

One of the methods of the sensory cueing approach is the touch-cue system. Bashir, Grahamjones, and Bostwick (2008) state that “the touch-cue method of treating developmental dyspraxia is based on the assumption that the child has difficulty in firmly establishing and integrating voluntary oral motor movements necessary for purposes of speech and sound production” (p. 128). The assumption is that the child knows the speech sounds so treatment is not a matter of learning the sounds, but one where the touch-cue system is needed for sequencing the speech sounds. This is a method of learning articulation, the ways in which the mouth needs to move, for different combinations of consonant and vowels (Bashir, Grahamjones & Bostwick, 2008).

Bashir et al. describe the touch-cue method as one that contains three discrete stages. The first stage is “dependent on the child’s ability to produce the target phoneme in isolation, and it incorporates a series of articulation exercises of increasing difficulty” (2008 p. 128). Within this stage the speech-language pathologist provides the touch cues themselves; the topographic indicators are designated by touching specific areas on the lower face and neck and are provided simultaneously with auditory and visual cues. The second stage incorporates the learned articulatory movements and sequences into nonsense and meaningful words. The third stage is carryover of the learned articulatory movements and production strategies into spontaneous speech and solicited speech (Bashir et al., 2008). The sensory cueing approach holds value for children with developmental apraxia who are unable to articulate phonemes and sequences of phonemes, by physically cueing and modeling the desired articulatory movements.

### **Rhythmic Approach to CAS**

The rhythmic treatment approach discussed by Ziegler, Aichert and Staiger (2010) focuses on the rhythmic-melodic aspects of speaking. This therapy approach follows the natural

rhythm of natural speech as opposed to speech sounding more robotic. To attain this goal, “rhythmical cueing of speech during apraxia of speech treatment that should not be metronome-like, but rather should respect the rhythmical properties of natural speech to provide the patient with metrical information about the utterance she/he is going to produce in an exercise” (p. 64). This provides the child with skills to produce typical rhythmical properties of speech that are applicable to everyday speech outside of therapy. Some specific techniques utilized in rhythmical cueing are internal pacemakers such as tapping or counting, a pacing board, external cues or metronome pacing (Ziegler et al., 2010).

The rhythmic cueing consisted of “a sequence of short tones representing the rhythmical skeleton of the target utterance was presented repeatedly via headphones, and the patient was required to first internalize the rhythm and then join in by producing the target word or phrase in approximate synchrony with the auditory signal” (Ziegler et al., p. 64). This allows the child to become accustomed to the rhythm before attempting to produce speech in that pattern. The researchers tailored the intervention by changing the rate of rhythmical templates, and the length and the complexity of the training materials, based on the child’s needs and current performance level (Ziegler et al., 2010). As with other therapy approaches for childhood apraxia of speech, a goal of rhythmic therapy is that the skills learned in therapy are generalizable to everyday speech in multiple environments.

### **Augmentative and Alternative Communication (AAC) with CAS**

In addition to the approaches for direct treatment of childhood apraxia of speech, augmentative and alternative communication (AAC) techniques can supplement communication during therapy and in everyday life, if needed. Cumley and Swanson (1999) describe the case of an elementary-aged child who received AAC intervention in addition to speech therapy for CAS.

The child was given “low-technology options, such as theme-specific communication boards, a symbol communication dictionary, and a remnant book” to provide a means of initiating interactions, setting topics, and repairing communication breakdowns (p. 116). The child was instructed on the use of the AAC through modeling, and was directed to point to a symbol on the board to repair a communication breakdown (Cumley & Swanson, 1999). A remnant book can also be used to share past events with the speech-language pathologist, family members, and friends (Cumley et al., 1999). Overall, the purpose of an AAC is to incorporate functional vocabulary and phrases that the child can use in general conversations.

### **Research Design for the Current Study**

In order to garner information from speech-language pathologists regarding the treatment types they use for childhood apraxia of speech, a survey was created and emailed to practicing speech-language pathologists in the Southern Service Area of Michigan. To generate interest in participating in the survey, the researcher attended a meeting of the speech-language pathologists in the Southern Service Area of Michigan to present the research topic and ask for participation in the survey. Upon distributing the survey by email, 10 speech-language pathologists responded, with their answers to each question anonymously recorded. The results were then analyzed, and the responses were compiled and placed into figures.

### **Survey for the Current Study**

The survey consisted of five questions with comment boxes for answers (see Appendix A). Ten speech-language pathologists completed the survey, with each person reportedly spending about ten minutes answering the questions. The questions pertained to the number of students the SLP has on their caseload for the schoolyear with childhood apraxia of speech and

the treatment methods most often implemented in therapy for CAS. The responses provided data regarding the speech-language pathologist preferences for treatment types for childhood apraxia of speech.

## Survey Results

### Question 1

*How many students with a diagnosis of Childhood Apraxia of Speech (CAS) are on your caseload in the 2018-2019 school year?*

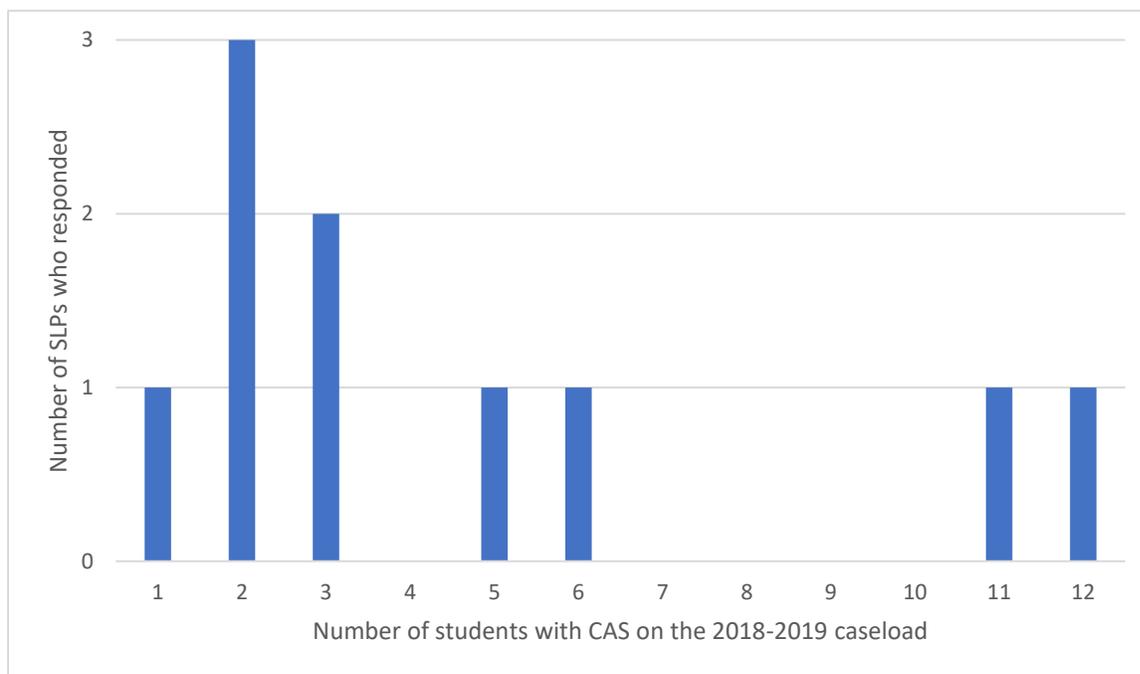


Figure 1

Four of the speech-language pathologists responded that the children on their caseload did not have an official diagnosis of childhood apraxia of speech, although they displayed characteristics of CAS. One SLP stated that the children on her caseload were being treated for CAS as well as other speech disorders. Research shows there are generally other disorders present along with CAS (American Speech-Language-Hearing Association).

## Question 2

*For each student included in question number one, estimate how long each student has received treatment for CAS.*

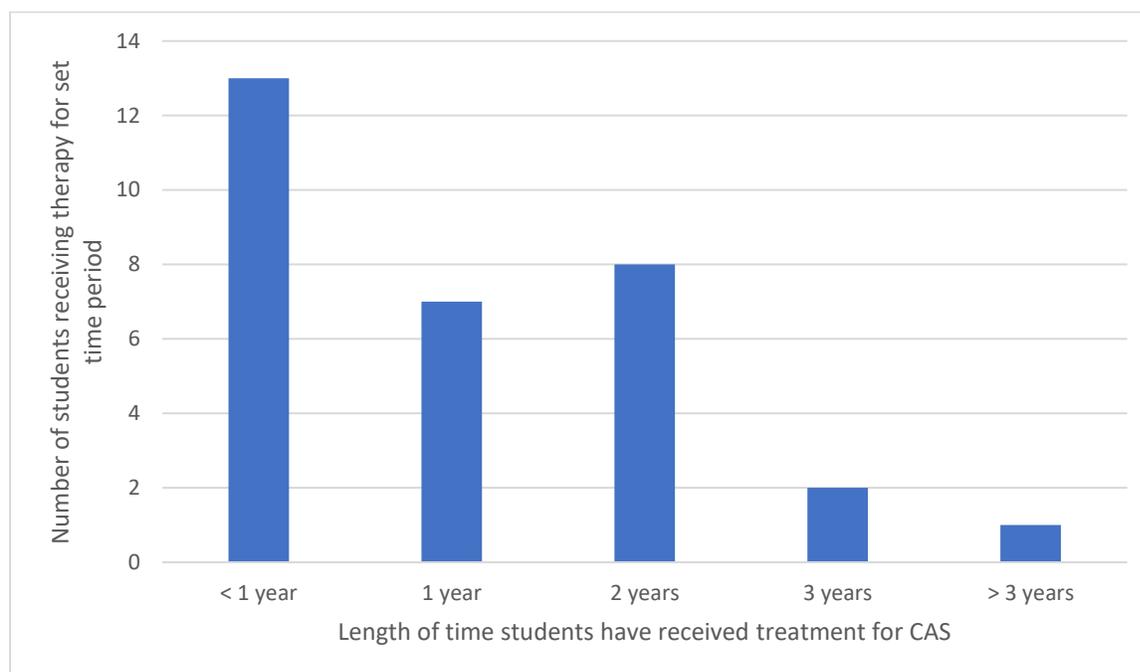


Figure 2

Figure 2 shows that the majority of students receiving therapy for childhood apraxia of speech have done so for less than a year, and only one student received therapy for more than three years. A potential reason for the greater number of students receiving therapy for less than a year is that students may only require a year or two of therapy before no longer needing services, indicating that treatment is effective. One survey response indicated that most of the speech-language pathologist's younger students had only been recently diagnosed with CAS, resulting in a shorter time period of receiving CAS therapy. It can be surmised that a high number of the children receiving therapy for a shorter amount of time are younger than the children receiving therapy for longer periods of time.

### Question 3

*What treatment methods do you believe are most effective for your treatment of children with mild-moderate CAS? For example; motor-programming, linguistic, combination of motor-programming and linguistic, sensory cueing, and rhythmic approaches.*

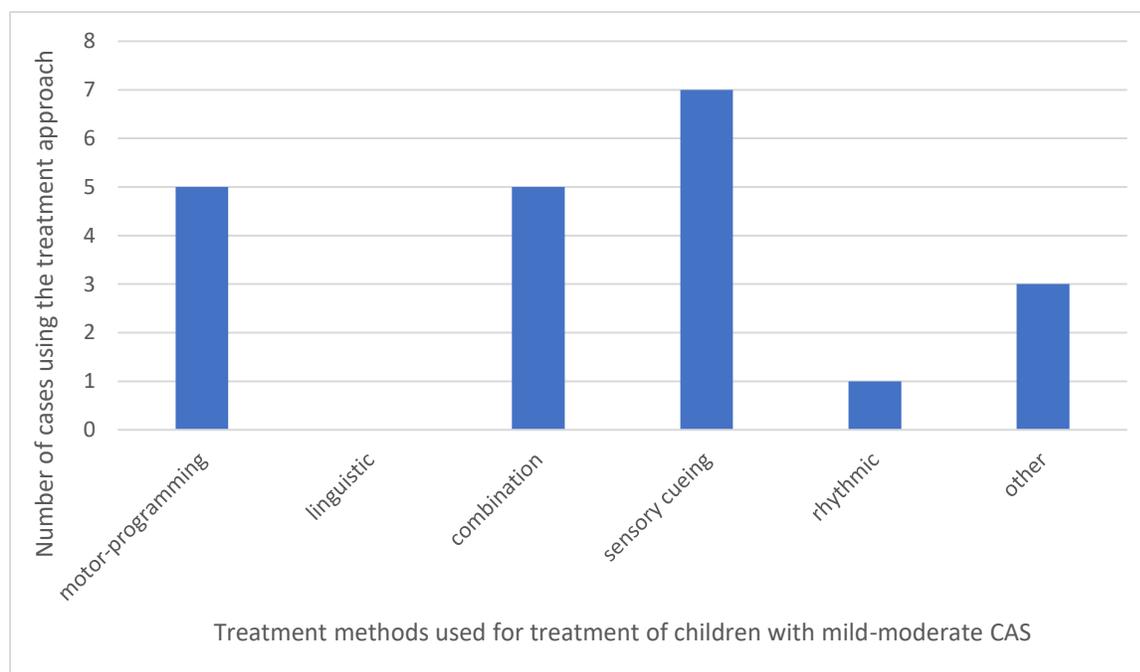


Figure 3

Responses indicated the most frequently used therapy approaches for mild-severe childhood apraxia of speech are motor programming, a combination of motor programming and linguistic methods, and sensory cueing. Ninety percent of the responses described use of more than one treatment approach. The linguistic approach was never employed outside of a combination approach, while motor programming was used on its own and in a combination approach. Other treatment approaches speech-language pathologists employed included use of visual and auditory feedback to improve self-awareness and monitoring, correction/revisions, and a large emphasis during treatment on functional communication skills.

#### Question 4

*What treatment methods do you believe are most effective for your treatment of children with moderate-severe CAS? For example; motor-programming, linguistic, combination of motor-programming and linguistic, sensory cueing, and rhythmic approaches.*

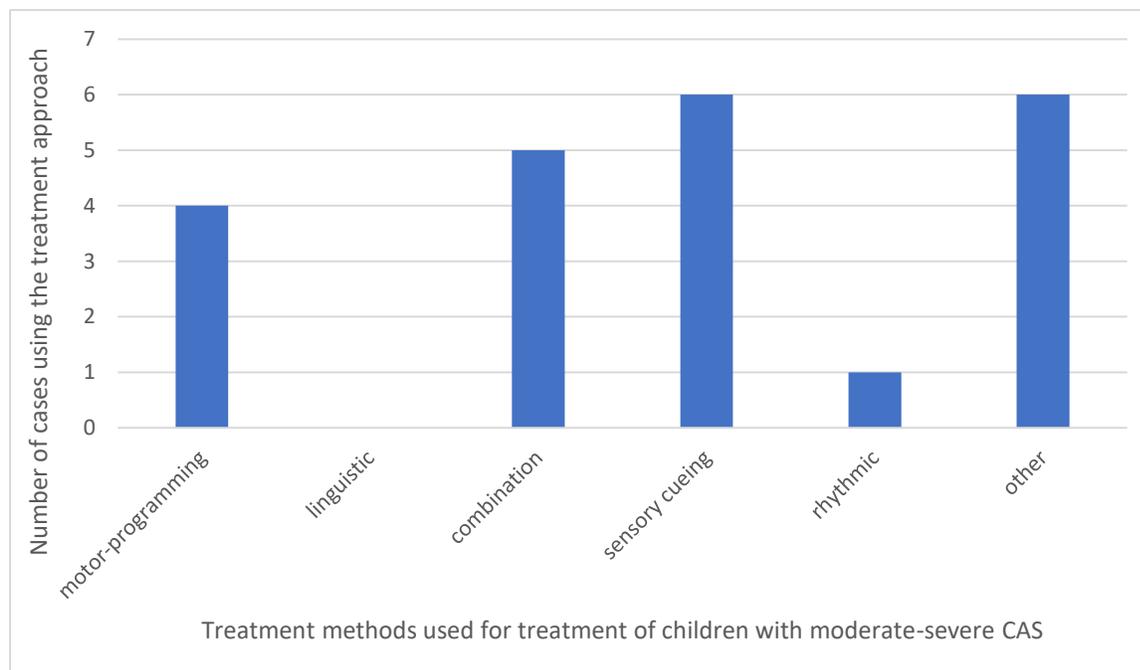


Figure 4

The data regarding the treatment approaches used for moderate-severe childhood apraxia of speech closely mirrored those used for mild-moderate CAS. The largest difference between treatment methods for mild-moderate CAS and moderate-severe CAS was that for moderate-severe CAS, where there were a greater number of approaches in the ‘other’ category. Other approaches listed include the use of AAC techniques, use of visual and auditory feedback to improve self-awareness and monitoring and correction/revision. One SLP indicated that since treatment for moderate-severe CAS is so intense, there is a need to implement other approaches to reduce the child’s frustration and achieve maximum progress.

### Question 5

*Please add your observations of students' responses to particular treatment methods.*

Responses listed in Appendix B.

### Discussion

The results of the survey show the approaches most used by speech-language pathologists in the treatment of childhood apraxia of speech to be motor programming, a combination of linguistic and motor programming, and sensory cueing approaches in addition to other supports. A large emphasis was placed on the idea that each child is an individual case and the treatment provided should be reflective of the child's specific needs and how best to achieve results. Each child is complex and unique in his/her disorder, and the treatment methods needed to see results. This was supported by the fact that only one SLP out of the ten who submitted survey responses listed only one treatment method employed for CAS.

In comparing the literature reviewed to the survey responses the literature seems fairly representative of actual practice. Maas, Gildersleeve-Neumann, Jakielski & Stoeckel (2014) discuss the implementation of Dynamic Temporal and Tactile Cueing (DTTC), and one of the speech-language pathologists listed DTTC as a treatment method she employs. Responses also indicated that AAC techniques are implemented in addition to therapy, reflected in the writing of Cumley & Swanson (1999). Each treatment method reviewed was listed in the survey responses as a method utilized by the surveyed local speech-language pathologists. While the main treatment methods of motor programming, linguistic, combination of motor programming and linguistic, rhythmic, and sensory cueing approaches were all indicated as being utilized by practicing SLPs, there were other specific treatment methods listed that were not mentioned in

the literature. These methods include visual and auditory feedback to improve self-awareness and monitoring, correction/revisions, a focus on functional communication skills, movement, and the use of AAC techniques. From this information it can be assumed that treatment methods discussed in literature typically encompass overarching treatment types, while in practice more specific types are used in combination with one another.

### **Further Directions**

Further research can survey a broader span of practicing speech-language pathologists and conduct a longitudinal study of a few specific children on a caseload. While ten speech-language pathologists are a representative sample size for the Southern Service Area of Michigan, a larger sample size would garner better results. As the survey responses emphasized, each child is an individual case and has different needs. Gathering more information on treatment methods implemented with other children could result in varying responses. A longitudinal study could further research and determine how treatment approaches shift as a result of the severity of the childhood apraxia of speech. This study was informative about effective treatment types for CAS and the speech-language pathologists' insights on their approaches to selecting and implementing treatment.

## Appendix A

1. How many students with a diagnosis of Childhood Apraxia of Speech (CAS) are on your caseload in the 2018-2019 school year?
2. For each student included in question number one, estimate how long each student has received treatment for CAS.
3. What treatment methods do you believe are most effective for your treatment of children with mild-moderate CAS? For example;
  - a. motor-programming,
  - b. linguistic,
  - c. combination of motor-programming and linguistic,
  - d. sensory cueing, and
  - e. rhythmic approaches
4. What treatment methods do you believe are most effective for your treatment of children with moderate-severe CAS? For example;
  - a. motor-programming,
  - b. linguistic,
  - c. combination of motor-programming and linguistic,
  - d. sensory cueing, and
  - e. rhythmic approaches
5. Please add your observations of students' responses to particular treatment methods.

## Appendix B

- I notice that when AAC is introduced with students with severe CAS, sometimes verbal output improves with consistency due to auditory and visual feedback.
- For the single student receiving intervention, progress has been slow but steady. As this child has progressed into school, she seems to be improving her speech sound production as she improves phonological awareness of individual phonemes as connected to early literacy skills. Use of the Lively Letters program has been helpful – it seems that using a multiple modalities approach to provide input to the child helps her to better recognize speech sounds both when produced correctly and incorrectly.
- I really love the Kauffman approach. It has yielded the most results.
- I have adjusted my treatment methods based on the progress a student is making during therapy.
- The students demonstrate growth in their motor movements.
- The preschool students with mild-moderate CAS usually make significant gains in 1 year. The students with moderate-severe CAS typically make slow gains, most often needing at least two years of specific CAS treatment. Often, these students continue to need speech intervention, with less motor programming emphasis, (only specific sound errors remain) as they enter elementary school.
- Students respond better when I use visual and tactile cues in addition to the motor planning for speech. Breaking words into individual speech sounds and coordinating those individual sounds with block placement, clapping, stomping, bouncing.
- The Kaufman provides a combination of motor, sensory and imitating which I have seen have the most success.

- Currently, my student with CAS is a preschooler. Due to his age, treatment is embedded within play and other age appropriate activities. He is making a great deal of progress given his developmental level, but I expect that he will be better able to identify errors and utilize strategies independently as he gets older.
- Being able to provide more support in the beginning so that children can start producing targeted speech sounds in syllables with more support gives them a chance to learn that they are capable of producing the sounds (e.g., using facilitative vowel contexts, simultaneous models, external facilitators – such as tongue depressors, etc.).

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