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**Assessment and Treatment of Childhood Apraxia of Speech: The Perspective of Current
Speech-Language Pathologists**

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Abstract

“Childhood apraxia of speech (CAS) is a neurological childhood (pediatric) speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (e.g. abnormal reflexes, abnormal tone)” (ASHA, 2007b, Definitions of CAS section, para. 1). The role of speech-language pathology in conjunction with childhood apraxia of speech is the treatment of whichever speech sound disorders exist. The variable nature of CAS creates challenges for SLPs. Presently, “there are no validated diagnostic features that differentiate CAS from other childhood speech sound disorders.” (ASHA, 2007b, Signs and Symptoms, para 1). Due to this lack of definitive diagnostic markers, there remains much to be learned in the understanding of the disorder, and a need for additional research, so that practitioners will be better able to diagnose and treat this puzzling condition.

The purpose of this study is to collect data via online survey to gain information on the assessment and treatment of childhood apraxia of speech by SLPs working in a variety of settings. This project will consist of attaining, ideally, five hundred participants who are licensed speech-language pathologists. In order to recruit a large sample, participants will be incentivized through the possibility of winning a one-hundred-dollar VISA gift card in a raffle. Participants will answer ten multiple-choice questions which range from questions about themselves to their caseloads. The goal is to compare and contrast information about CAS from assessment to treatment.

Background

Childhood apraxia of speech is commonly found in one to two per every thousand children (ASHA, 2007b). It can be difficult to differentiate childhood apraxia of speech from other speech sound disorders. There are a few ways that CAS is typically seen; “Inconsistent errors on consonants and vowels in repeated productions of syllables or words. Lengthened and disrupted coarticulatory transitions between sounds and syllables. Inappropriate prosody, especially in the realization of lexical or phrasal stress.” (ASHA, 2007b). Although there are ways CAS is typically seen, “these features cannot be considered necessary and sufficient to identify CAS, in part because the trajectory of the disorder may change relative to task complexity and age.” (Dale & Hayden, 2013). Childhood apraxia of speech stands out due to its difficulty to diagnose as well as rates of misdiagnosis. Many symptoms of CAS are consistent with those of other speech sound disorders, developmental delays, and more. The variability of CAS can lead to beginning treatment later due to delayed diagnosis or even lack of treatment completely. Childhood apraxia of speech does not affect intelligence and children with CAS have the capability to be as intelligent as any other child. Speech therapy can be very effective in assisting people and greatly improving the symptoms of CAS.

Purpose of Study

The purpose of this study is to compare and contrast data from the perspective of speech-language pathologists in the United States. The goal of this study is to reduce the amount of variability in childhood apraxia of speech by increasing research on the subject. CAS is being diagnosed and treated, but there could be improvement in the field if the data speech pathologists

are discovering through daily trial is documented. There could be methods or trends happening in one part of the country that could be shared and implemented in another part of the country. Research has found that when it comes to diagnosis; “Reliability was fairly good but needs more extensive examination, especially across a larger number of clinicians who have different levels of experience.” (Strand, E. A., Duffy, J. R., Clark, H. M., & Josephs, K. 2014). There is a deficit in research in this field and this survey is a step into working on closing that deficit. Some research says; “the core deficit in apraxia of speech is imprecise and unstable transcoding of linguistic representations of segmental features, phonemes, syllables, words, and lexical stress to motor plans and programs for manifest speech.” (Shriberg, Strand, Fourakis, Jakielski, Hall, Karlsson, . . . Wilson, 2017). The most updated ASHA information on CAS clearly states the areas where understanding on CAS is lacking. This survey asks about diagnosis, diagnostic tools, prevalence of CAS in a caseload, and more. “Prevalence estimates of CAS are unreliable due to the inconsistency of diagnostic guidelines (Shriberg, Aram, & Kwiatkowski, 1997), lack of adequately validated diagnostic tools (McCauley & Strand, 2008), and small sample sizes in relevant studies.” The way to combat small sample sizes is through funding and incentives to receive adequate participants for valid information. The purpose of this study is to create a method so simple, through concise virtual survey, to receive a large enough sample size to truly make a difference in the understanding of CAS.

Method

Participants

Participants in this study will be licensed, speech-language pathologists working in a variety of settings across the United States. This study will be conducted completely virtually

and in full conjunction with COVID-19 regulations throughout the duration of the project and with approval from the Institutional Review Board. SLPs will be recruited through professional networks and social media. They will then be incentivized to participate through a raffle for a one-hundred-dollar VISA gift card. There will be a raffle after every one hundred participants. The participants will be given a deadline they need to meet in order to be considered for the raffle in order to ensure completion of survey. Ideally, five hundred participants will be found for this research. This will mean five of the five hundred participants will be recipients of one-hundred-dollar gift cards. The gift cards will be VISA and will be of a generally beneficial value.

Materials

Materials for this project are very minimal and financially feasible making this project efficient as well as effective. The finances for this project will be spent on incentives for the participation, while the materials are costless. This survey will be constructed on the program, Qualtrics. Qualtrics is free through University of Arkansas resources and is able to produce a successful virtual survey. There will be a link available to the participants for them to follow. The link will lead to a Qualtrics page which contains information for the participants to read. The first page is a summary of the project and will allow the speech pathologists to be prepared before they begin the survey. A button will lead them to a new page which will contain the ten questions in an easy-to-read format. The survey will be structured as ten multiple choice questions, aside from an optional space for typing labeled “other” on some questions to allow for more information intake. This survey is designed to appear short and easy to maneuver as to not dissuade participants from engaging, but also will collect a lot of information.

Procedures

Once participants have agreed to take the survey, the study will officially begin. I will send the participants the completed survey via Qualtrics. The survey will not be timed and participants can spend as much time as they need on the survey. The survey will consist of ten multiple-choice questions. The participants will go through all ten questions choosing the best option for them. On certain questions, if none of the options apply there will be a fill in the blank option on then end to allow for elaboration.

Questionnaire Design and Background

The survey has three main topics which the questions stem from: education, clinical questions, and treatment. The following flow chart is designed to replicate the direction of the survey. This outline provides intentionality and direction within the formatting of the survey. It begins with knowledge and experience prior to seeing clients. It then goes into experiences with clients. It ends with how clients are improving and eventually finishing speech therapy due to treatment.

Education

The education section of the survey focuses on clinical training and preparedness prior to seeing clients with CAS. Research shows there are few specialists in this area so educating clinicians is even more important. With limited resources for referral, it puts more emphasis on their ability to effectively diagnose and treat. ASHA has an abundance of continued educational opportunities for clinicians. Online and in person there are over a thousand available resources on their website. These are great resources for already practicing clinicians to learn about new research and reeducate themselves on CAS. As research increases, younger clinicians will learn

different information in undergraduate and masters' programs. Continued education is so important in a field which is advancing so rapidly. As we finish school and begin work in the field it is important to stay caught up on the best practices and treatments to benefit our clients.

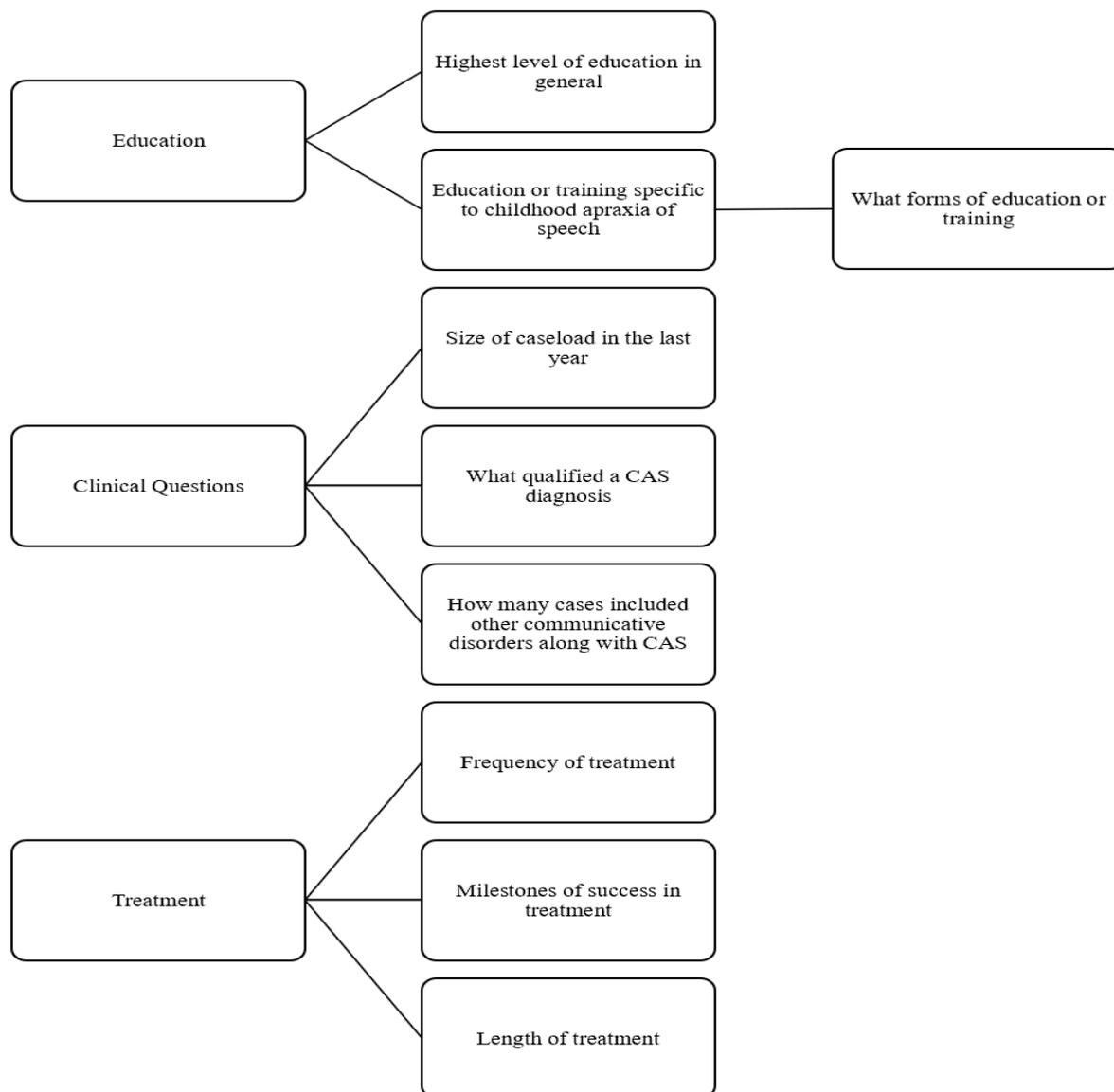
Clinical Questions

The clinical questions are designed to reveal information about making an initial diagnosis and numbers of cases. This is necessary as, "The primary need in CAS research is explicit criteria for one or more speech processing constraints posited to be a core CAS deficit. We define a core CAS processing deficit as one that underlies the onset and persistence of CAS. (Shriberg, Strand, Fourakis, Jakielski, Hall, Karlsson, . . . Wilson, 2017)." I agree with this notion and it was one of the guidelines I considered when choosing clinical questions for this section of the survey. I have found these types of statements to be consistent in published research articles pertaining to CAS. Most contain statements with limitations and needs for future research.

Treatment

In looking at other research on treatment of childhood apraxia, it is clear that more intensive and consistent treatment over time is most effective. According to a study titled, Treatment and Intensity of Childhood Apraxia of Speech, "The results indicated that only higher intensity treatment (2x/week) led to significantly better outcomes for articulation and functional communication compared with 1x/week (lower intensity) intervention. Further, neither lower nor higher intensity treatment yielded a significant change for speech intelligibility at the word or sentence level. In general, effect sizes for the higher intensity treatment groups were larger for

most variables compared with the lower intensity treatment group.” (Namasivaya., Pukonen, Goshulak, Hard, Rudzicz, Rietveld, Maassen, Kroll, & Van Lieshout, 2015). This information from the study shows the duration and frequency of treatment which proves most beneficial for improving symptoms of CAS. These findings are what led me to ask questions in my survey to reveal what specific types of treatment, frequency, duration, and milestones of improvement. I wanted to expand on known knowledge and dig deeper to find more intel on treatment results.



Qualtrics Materials

Consent Form

When a participant first opens Qualtrics to access the survey they will see a consent form. The form is one of two pages including the survey. This outlines the expectations of the participant and makes them aware of all information before they choose to participate.

“My name is Sabrina White and I am an undergraduate student at the University of Arkansas in the Communication Sciences and Disorders program. The following document is a digital survey about childhood apraxia of speech. This survey is part of my thesis and graduation process. I, as well as my Faculty Supervisor, are available to answer any and all questions you may have about the research. You can contact me at sgw005@uark.edu or Dr. Kimberly Frazier at kimfraz@uark.edu.

The purpose of this research is to increase the general knowledge of childhood apraxia of speech, discover how practicing clinicians are being trained, and how they are treating children. The survey will ask you ten questions and take you no longer than fifteen minutes to complete. The purpose of the survey is to gain knowledge on your understanding, experiences, and education in regards to childhood apraxia of speech. I will be taking your answers into account in a larger comparison of data from all of the surveys collected in this research. You will have the option to include your name and email in the survey. The names will be collected for a raffle and five winners will be chosen at random. The winners will receive a one-hundred-dollar VISA gift card. Participation in the raffle is voluntary and designed solely to thank participants for their time. If you do not feel comfortable using your name it will not affect your survey. Any and all

personal identifiers will be removed from this survey once the data collection portion of the research is complete to protect your privacy. If you choose to continue beyond this page knowing this information you are thereby consenting to participation in the study. Participation is voluntary, and refusing to participate will not adversely affect any other relationship with the University of Arkansas or any researchers involved. If you have any further questions about your rights as a participant, please contact Ro Windwalker, the University's Human Subjects Compliance Coordinator, at 479-575-2208 or irb@uark.edu. Thank you so much for your consideration.”

Survey

- 1) What degree do you have? (A) Bachelor's (B) Master's (C) PhD (D) SLPD (E) Other
- 2) Did you receive specific or extra training for CAS? (A) yes (B) no
- 3) If you answered yes to the question above, what specific or extra training have you received? (A) Online Resources (B) Extra Classes (C) Conventions/Seminars (D) Other (E) Doesn't Apply
- 4) How many children were in your caseload in the last year? (A) 0-10 (B) 10-20 (C) 20-30 (D) 30-40 (E) 40-80 (F) 80+
- 5) What qualifications were met in order for you to determine CAS as your diagnosis for the child? (A) Word Inconsistency (B) Error in pattern of omission (C) Insufficient vocabulary (D) Disfluency (E) Other
- 6) How many children with CAS were diagnosed with other communication disorders as well? (A) (10%) (B) (20-40%) (C) (50-70%) (D) (80-100%)

- 7) On average, how many times per week did you meet with your child with CAS? (A) Less than once per week (B) Once (C) Twice (D) Three or more
- 8) What was/is your plan for treatment? (A) Shaping (B) Sensory Cueing Approaches (C) Motor Programming Approaches (D) Linguistic Approaches (Other)
- 9) What were the major milestones for success in their treatment? (A) More consistency in speech production (B) Overall increase in fluency (C) Increase in vocabulary (D) Other
- 10) On average, how long did you keep CAS cases for? (A) 1-5 months (B) 6-12 months (C) 1-2 years (D) 2-4 years (E) 4+ years (F) Other

Once all questions have been answered, the participants have completed their portion of the study. I will take all the information from the survey and compile it so that it can be analyzed once the study is completed. There will be several deadlines' participants must complete the survey by in order to be considered for the raffle to incentivize promptness and meet the timeline created for this project.

Analysis

After a sufficient number of surveys have been completed, the data collection portion of this project will be finished. All of the data will be compiled to create a large pool of information. This information will be sorted through, compared, and analyzed. Each question will be singled out and compared across the other hundreds of submissions. These ten questions, when put together, will allow a visualization of the assessment to treatment process for CAS. The hope is that this information will show similarities in diagnosis, commonalities in treatment, and what is overall showing success. After completion of this project, the compilation and

publication of this information could allow speech pathologists to gain understanding from their peers. This understanding could allow professionals to be able to help children even more successfully.

Preliminary Results

This research is still ongoing, but early results are able to show a few trends. The survey is showing that younger or more recently trained clinicians have received higher levels of education or training on CAS. Although there are few specialists on this topic, education has improved in recent years. Results show least one case in each clinician's caseload and success through regular treatment over a period of months to years. This shows that although CAS is not as common as other communicative disorders, it is still relevant. Research is showing that consistent and frequent treatment is necessary for reaching and maintaining milestones. There is cause for concern in low socioeconomic areas or school speech pathologists with higher caseloads. Lesser resources and time can make these instances of misdiagnosis or infrequent treatment higher. These preliminary results give some information, but also affirms the need for further research. In order to solidify these trends or uncover more, further participation is necessary.

Limitations

Throughout the course of this research, I noticed a few limitations to it being fully successful. The first limitation was finding enough participants to draw results from. Even with the incentives and grant money getting participants was the most difficult part of this project. In

order for this research to be more effective a greater sample size is vital. The way this has an impact is to not only get greater numbers of applicants, but diverse applicants.

Another limitation I found was that the participants I did find were centralized to one area, Northwest Arkansas. My goal for this work was to take the perspectives of speech pathologists from around the country and compare and contrast them. Having participants from one area will reduce variety in experiences. Likely, people from the same geographic area will have received similar training and education. They would probably attend the same yearly conventions or continued educational opportunities. Their clients may be more similar in demographic or socioeconomic level than clients from opposite sides of the country. I do not believe that this survey can be as effective as possible without diverse participants from around the country.

A third limitation I found was needing more information on question six, “How many children with CAS were diagnosed with other communication disorders as well? (A) (10%) (B) (20-40%) (C) (50-70%) (D) (80-100%)”. This question is important as children who have with other communication disorders may be in treatment longer, present in other ways, etc. I think it would be beneficial to modify the survey to include an option for a text response after this question. This could help determine what other communicative disorders are typically presenting with CAS, if any. This could show more trends or other commonalities. If there were to be a link then a child which is diagnosed with the other common communicative disorder could be more carefully tested for CAS.

Conclusions and Future Directions

My time as an undergraduate student at the University of Arkansas has come to an end, but I believe this research is still at its beginning. I am continuing my education at the U of A and have the opportunity to continue relationships with my mentor, committee, and peers. I intend to continue to seek participants and see if I can find enough to have significant results. I am genuinely interested in neurological disorders and advancing research and knowledge on childhood apraxia of speech. In the future, I plan to use different means of seeking participants to try and see if that is more effective. So far, I have found participants through professors and other resources at the U of A. In the future, I would like to utilize social media groups or other communication methods which connect ASHA members from a larger area. I think expanding my connections and announcements outside of the University of Arkansas community would be beneficial. I am hoping that through these efforts I will be able to overcome the limitations I have been facing so far. I think improving on areas which have delayed full results on this project could allow it to reach its intended potential. Whether through myself or others, I do hope research continues on this topic. I think increased knowledge would benefit the field and allow for better treatment for all children with CAS.

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