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Effectiveness of speech intervention methods in children with speech delays

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**A Systematic Review: Effects of Intervention on Children with Speech Delays,
Ages Six Months to Thirteen Years**

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Author Note

This paper is submitted in partial fulfillment of criteria for maintaining Honors Status in Williams Honors College and School of Nursing, University of Akron

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Abstract

Many children suffer from speech/language delays, which are when children are not progressing in accordance with the developmental standard and struggling with phonological, receptive, primary, and expressive difficulties. These delays can present as early as six months of age and have lasting physical and emotional impacts. Speech/language delay interventions range greatly with no clear single intervention. Therefore, this systematic review aimed to answer the following PICOT question: In children, ages six months to thirteen years, with speech/language delays, how does the addition of innovative and supplemental interventions, compared with standard interventions alone, affect improvements in the delays? Based on twenty primary publications, significant progress has occurred which includes combining numerous speech/language interventions and involving parents; but no clear-cut intervention stood above the others. There are new modern techniques showing promising outcomes, however these remain in the early stages of testing and need future research.

A Systematic Review: Effects of Intervention on Children with Speech Delays, Ages Six Months to Thirteen Years

Speech/language delays are when children are not progressing according to the developmental standard in terms of speech and language. Although signs of speech/language delays vary from child to child, some common signs include: the inability to say simple words by 12-15 months of age, inability to understand simple words by 12-15 months of age, or lack of the ability to talk in short sentences by three years old (McLaughlin, 2011). Consequences to having a speech delay can be short or long lived and include delays in education, difficulty, or failure to fit in, bullying, and even the development of long term mental and emotional, self-esteem, social, or behavioral problems (McLaughlin, 2011). Speech delays encompass issues with phonological and vocabulary difficulties (Cummings et al., 2019; Manipusopika et al., 2019; Taghizadeh, 2021), receptive difficulties (Hampton, 2017), primary speech delays/language delays and disorders (Alina, 2021; Namasivayam et al., 2020), and expressive language disorders (McLaughlin, 2011; Roberts, 2015). Throughout the world, as many as 10% of kids, ranging from ages six months to five years, are diagnosed with speech delays, with many more undiagnosed cases (Staff, 2020). Speech sound disorders are the second highest occurring speech delay disorder treated in school settings, according to a 2018 American Speech-Language-Hearing Association school survey (as cited in Byers et al., 2020). Treatment of speech delays has been an ongoing problem with limited consistent findings supporting best practice. However, there is evidence of positive outcomes from speech-language therapy in children with expressive language disorder (McLaughlin, 2011). According to a systematic review on screening for speech and language delays (Wallace et al., 2015), interventions for those with speech delays have resulted in improved elements of articulation, language, and

stuttering, with little to no adverse effects due to the interventions. However, children with speech delays are still at a higher risk for developing behavioral, emotional, or social problems later in life (Wallace et al., 2015).

Many parents choose to begin various forms of speech intervention therapy when their children are first diagnosed, which is where nurses play primary roles in aiding in the deliverance, care, and progression of therapy that the children receive. Primarily, nurses assist in direct intervention approaches, which focus on the individual or group treatment of the child, depending on the age and needs of the children and available facilities (Law, 2017).

It is the nurse's role to ensure the child feels comfortable and knows they are in a safe, caring, and supportive environment free of judgement. Types of speech interventions vary from child to child, due to the need to specialize the form of treatment based on the cause and type of the speech delay. Furthermore, many speech interventions include additional approaches to help increase effectiveness, such as utilizing parents' participation when outside of therapy or combining multiple interventions of speech therapy in hopes of the best possible outcomes. These additional and combined forms of speech/language interventions are considered indirect interventions, and are often perceived as a more naturalistic approach, e.g., involving adults already within the child's environment to become part of treatment (Law, 2017). The purpose of this systematic review is to critically appraise the evidence about the effects of adding innovative and supplemental intervention components to traditional interventions in children with speech delays, ages six months to thirteen years of age. The review will answer the following PICOT question: In children, ages six months to thirteen years, with speech/language delays, how does the addition of innovative and supplemental interventions, compared with standard interventions alone, affect improvements in the delays?

Methods

When going about searching for research publications to answer the PICOT question, there are many different search methods to consider, such as searching appropriate journals, retrieving publications about the topic, and selecting studies answering the PICOT question. With the topic of interventions in speech delays, the first thing to determine was the population, which is children with speech delays, ages six months to thirteen years. As of right now, the topic involved looking at multiple interventions focused on one sort of speech issue or delay. Along with this and for the purpose of this honors project, there was not a specific focus on children with specific medical conditions, such as cleft palates, hearing problems, or autism. That does not necessarily mean that these conditions could not be contributing factors to the child's delay in speech, but these conditions were not intentionally being included in key words searched to find the research journals. Therefore, these medical conditions were not included as inclusion or exclusion criteria. Research publications and journals must fit certain inclusion criteria, such as: being primary sources, published in peer-reviewed journals, journals that have studies primarily based in the United States, and publications written by medical and healthcare professionals. Some exclusion criteria included: articles that were secondary sources and articles that did not fit the age range of six months to thirteen years.

For this project, the databases included CINAHL, Medline with Full Text, and Psychology and Behavioral Sciences Collection through the University of Akron libraries website. When searching for research publications, key words included: age group, speech delay type, and interventions. Once publications were retrieved, the collection was narrowed down, based on inclusion criteria listed above and on study focus and methods. Each publication was

critically evaluated on sample size, how the study was conducted, who conducted it, methods, findings, and statistics. Overall, publications were selected regardless of findings, aiming to decrease bias of any sort. Each study was evaluated equally to show full knowledge on the topic and PICOT question. See Appendix A for PRISMA flowchart of how evidence was selected. See Appendix B of the Table of Evidence of the selected articles.

Review of Literature

Description of Studies

This systematic review answered the following PICOT question: In children, ages six months to thirteen years, with speech/language delays, how does the addition of innovative and supplemental interventions, compared with standard interventions alone, affect improvements in the delays? Twenty intervention studies were included in the systematic review. All were published from 2014 to 2021 with about 90% conducted in the United States and in settings of schools, clinics, hospitals, and homes. Generated levels of evidence ranged from I through V and included six randomized controlled trials. Sample sizes ranged from a small case study sample of one participant to a randomized controlled trial of 897 participants.

All studies focused on interventions for speech and language delays and included different types of delays, such as phonological and vocabulary difficulties (Cummings et al., 2019; Manipusopika et al., 2019; Taghizadeh et al., 2021), receptive difficulties (Hampton, 2017) primary speech delays/language delays and disorders (Alina, 2021; Namasivayam et al., 2020), and expressive language disorders (Roberts, 2015). Interventions were matched with speech/language delays and included clinician administered, expressive syntax, group and individual interventions, and trained parent implemented interventions. Clinician administered

and individual interventions have been the predominate and more traditional forms of treatment, where speech-language pathologists control all aspects of the therapy and interventions are delivered one on one with patients. Supplementing more traditional interventions with innovative interventional components has been examined to determine if increased overall intervention effectiveness resulted, compared with effectiveness of traditional interventions alone. Innovative approaches included group and parent involvement, as well as trained parent implemented interventions. In the following sections, studies about the use of parent involvement, grammatical interventions, and various other innovative intervention components will be described.

Findings

Parent Involvement

The addition of parent involvement with traditional speech/language therapies has been highly studied and has shown significant positive outcomes. Parent involvement recognizes that parents play a vital role in communicating with their children. Findings support that parent involvement plays a crucial role in language development (Manipusopika et al., 2019). Specifically, parent involvement in speech delay interventions has resulted in more spoken target words (Alina, 2021; Hampton et al., 2017; Roberts, 2015), more positive communication and social environments (Herman et al., 2016; Feldman, 2019), and increased likelihood of adherence to speech/language therapy (Hampton et al., 2017; Manipusopika et al., 2019; Roberts, 2015). Parental involvement strategies have been found to benefit both caretaker and child. These strategies incorporate an increased focus on the adult and parent-child interaction to encourage speech and language development, such as sitting and playing with child, following the child's lead, commenting on the child's activities, or reducing questions to the child

(Feldman, 2019). The strategies also aim to promote communication and a positive social environment for caregivers and children, this being particularly important in those with speech delays (Hampton et al., 2017; Herman et al., 2016; Manipusopika et al., 2019; Roberts, 2015; Tambyraja et al., 2020, Walters et al., 2021). This approach recognizes that the social environment is a major factor in the forming of a child's speech/language development and that speech/language delays are not simply rooted in physiology (Herman et al., 2016). Traditional speech/language interventions have been practiced for decades with moderate success, but utilizing parental involvement, those most trusted and constant in children's lives, has been found to be key to an even greater success in speech delay interventions.

Children with speech/language delays have also been found to benefit from intensive practice and reinforcement-based therapy when parental involvement is utilized. Tambyraja et al. (2020) found improved outcomes when parents are involved, especially in children's completion of between speech language session homework (Hampton et al., 2017; Roberts, 2015; Tambyraja et al., 2020). For instance, speech language pathologists (SLP) frequently send homework home for the child to complete after therapy, and it is highly encouraged to be completed with parent involvement. Due to consistent findings about improved outcomes with parent-involvement in speech/language therapies, it is becoming a standard additive in speech/language interventions for children with delays (Hampton et al., 2017; Roberts, 2015 Tambyraja et al., 2020).

Restructuring Oral Muscular Phonetic Targets

Throughout the years there have been various innovations in speech/language therapies, such as methods to restructure oral muscular phonetic targets (Namasivayam et al., 2020). Different approaches are used in a few different ways depending on the speech/language delay. For instance, Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) therapy is

used as a therapeutic treatment for children with moderate to severe speech motor delays (SMD) (Namasivayam et al., 2020). The PROMPT intervention starts by setting goals and then specific techniques are used to stimulate a sensory input with this intervention performed twice a week over several weeks during sessions conducted by certified Speech Language Pathologists (Namasivayam et al., 2020). The goal of PROMPT is to improve vocabulary, intelligence, and communication skills of children with SMD (Namasivayam et al., 2020).

Assessment Methods

There have been advancements in measurements of improvement and growth in children receiving interventions. An example is the Bankston-2 Language Assessment Test (Alina, 2021) and the TOCS-30 (Davis & Hodge, 2017), both are used to measure outcomes of interventions. The assessment tests are used to measure initial and final outcome results, which are compared to determine the progress in linguistic development in children with speech/language delays, in particular children with pronunciation disorders (Alina, 2021; Davis & Hodge, 2017). These interventions are being tested, studied, and evaluated to enhance the understanding related to measuring the effectiveness of therapy methods for speech delays and to evolve and innovate from basic stages in order to help create more effective treatment methods.

Conversation-based Interventions

When creating and working with new interventions, trial and error can be used although systematic research generates evidence for practice. From rigorous studies and analyses of data, researchers can decide what needs to be used or changed to be more effective. For instance, Enhanced Milieu Teaching (EMT) is a teaching method that uses conversation-based strategies and skills to enhance the early stages of communication development in children (Hampton et

al., 2017). Many researchers have examined conversation-based intervention approaches in children with speech/language delays (Hampton et al., 2017; Soto & Clarke, 2017). For example, Soto and Clarke (2017) examined the effects of a conversation-based intervention on certain skill outcomes that ranged from expressive to grammatical. While the EMT therapy intervention group did not show significant improvement over the one-year period when data was collected, the researchers speculated that earlier and more intensive intervention may have been more beneficial (Hampton et al., 2017). But this is not to say that conversation-based interventions do not work. Based on other findings such as research from Soto and Clarke (2017), there have been positive effects of these therapies in children with severe speech disorders and expressive language delays. Since interventions differ quite a bit depending on types of speech delays, it is possible that Hampton et al. (2017) found no effect of EMT because the sample was comprised of children with receptive and expressive language delays, rather than children with motor speech disorders and expressive language delays, found by others to be positively affected by EMT therapy (Hampton et al., 2017; Soto & Clarke, 2017). Depending on types of speech delays, the intervention may need to be replaced or altered to better help the child at hand and in need. Furthermore, the Soto and Clarke study from 2017 was primarily aimed at conversation-based intervention for children with speech disorders that also use augmentative or alternative communication. In the study of eight children, “a conversation-based intervention was provided for each participant, in which they were supported to learn and use linguistic structures essential for the formation of clauses and the grammaticalization of their utterances” (Soto & Clarke, 2017). Overall, it was discovered that the children showed improved use of spontaneous clauses and a greater use of nouns, verbs, and bound morphemes.

Intensity of Intervention Delivery

Researchers have studied the effects of intervention delivery intensity. An example can be found in Cummings, et al. (2019) who compared interventions with lexicality and interventions with more intense sessions. The researchers found that when it comes to interventions, the lexicality of the words has a smaller impact on the outcomes, compared with more intensive interventions (Cummings et al., 2019). By knowing that the intervention intensity has greater effects, Speech Language Pathologists (SLPs) can develop treatment plans with interventions that progressively grow in intensity, resulting in more positive results in the long run. Researchers in Sweden examined the effects of direct intensive intervention as opposed to interventions that only occurred once per week. The sample was one ten-year-old boy with severe speech sound disorder. The intensive delivery was a “4 days weekly for 3 weeks in two periods with a 7-week intervening break and a post therapy assessment” (Lundeborg Hammarstrom et al., 2019, p. 518). The researchers found that this frequent, intensive therapy had positive outcomes and proved to be beneficial for a child with a severe speech sound disorder. Another study that was conducted in Ottawa, Canada aimed to determine how effective an alternate service delivery model would be for a certain subgroup. This service delivery model followed a “one-to-one parent education and goal setting session [and] treatment was delivered twice weekly over an 8-week period” (Hodge et al., 2017). In the ten children that participated in the study, they found significant changes in several speech behaviors that the parents were also able to observe.

These findings are consistent with Farquharson et al., (2020) who used a pre/posttest measures of spontaneous speech production and language ability over a period of one academic year. The researchers found that higher numbers of therapy sessions were associated with a more

positive percentage of correct consonants. Similarly, in another study in a school setting, intervention intensity and service delivery were examined among school-age children with speech-sound disorders (Byers et al., 2021). The researchers compared the business-as-usual (BAU) service delivery with a shorter, more frequent, individual model identified as (experimental (EXP). A significant difference was found with the BAU model group receiving the more therapeutic input and production trials than the children in the EXP model group (Byers et al., 2021). Similarly, another study included (a) interventions to reduce negative consequences of speech delays in children (Taghizadeh et al., 2021), such as negative effects on education, communication, and self-confidence, (b) examining relationships between mobile media usage and expressive language delays (Van den Heuvel et al., 2019), and (c) investigating the effects of early childhood education that included integrated speech therapy for children found to have language delays in combination with support of personality traits (Ullrich et al., 2014). They found that integrating speech therapy into early education improved overall development and academic achievement of children with speech/language delays.

Grammatical Interventions

A type of intervention commonly used with patients with speech/language delays is interventions using a grammatical approach. This type of intervention can be adjusted based on the child's age and diagnosis. The treatment involves setting basic goals and using activities, such as reading a book, worksheets, and playing with educational material, during timed sessions over several weeks to meet that goal set in the beginning (Finestack & Satterlund, 2018). Using a survey to examine current practice and effectiveness of child grammar interventions by SLPs, Finestack and Satterlund (2018) found that grammatical interventions were commonly used by practicing SLPs. Finestack and Satterlund also found that many SLPs target grammatical

weaknesses in children they are working with and individualize grammatical treatments being used to improve the child's speech/language delay (2018). Overall, SLPs reported much success with the grammatical interventions currently being used in practice (Finestack & Satterlund, 2018).

Components of grammatical interventions have also been studied and include use of grammatically correct words or phrases or phrases that involve telegraphic input (Venker et al., 2019). Telegraphic input includes shortening words or phrases, but they aren't grammatically correct. An example described by Venker et al. (2019) is a telegraphic phrase "ball under" instead of the grammatically correct phrase of "the ball went under" (p. 676). Grammatical interventions are tailored based on child need. For example, if children aren't speaking at all, then the SLP may want to just stimulate some sort of word production, and telegraphic therapies may help with that. But if the goal is to expand the vocabulary and have the child understand and speak more intelligibly, then the telegraphic may not be the most beneficial method compared to grammatically correct interventions (Finestack & Satterlund, 2018; Venker et al., 2019). Most grammatical interventions are commonly used across age groups unless children have developmental problems that call for alterations in the level of intervention. In summary, grammatical interventions are commonly used among practicing SLP's (Finestack & Satterlund, 2018), but when it comes to the use of telegraphic input, it may not be viewed as the most beneficial form of intervention despite common use (Venker et al., 2019). Having a general understanding of the use and effectiveness of grammatical interventions gives researchers and SLPs evidence about using these interventions or adjusting them accordingly to improve outcomes.

Critical Appraisal of Evidence

Strengths and Limitations

Throughout the critical appraisal of the twenty research articles, many strengths and limitations became known. A significant strength towards many of the studies included having six randomized controlled trials. By utilizing this method, there is a decrease in threats of internal validity. Furthermore, the studies conducted were not only in the United States, but also in other countries. Having findings and research from multiple countries diversifies the state of the science and this systematic review. On the other hand, the limitation of studies includes small samples and convenience sampling which decreases generalizability of findings. Further, internal validity threats were addressed less in quasi-experimental noncontrolled studies. Additionally, the method of delivery for speech/language interventions was quite vast. Most studies utilized a verbal test to gather their population, while others used surveys or standardized tests. There were a handful that simply did random sampling, while others were selected completely based on the speech delay diagnosis. Lastly, the variability of the sample size was quite large, causing a major threat to the validity and conclusions of the twenty articles. From these articles, the sample sizes varied from 1 to 893 children, with varying sizes in between these ranges. The age of the participants also ranged between the ages of six months to thirteen years, causing an issue in determining the level of success and improvement over different articles.

Validity and Reliability

Validity and reliability are crucial in the development of furthering research, education, and clinical practice. In each of the research studies reviewed the theoretical basis is to serve as a building block on which additional data analysis and collection will be done. Validity is essentially concerned with the interpretation of a scale that has been reliable over time. On the other hand, reliability is simply concerned with the consistency of how well a scale is being measured (Bannigan et al., 2009).

In this systematic review, different types of studies procured different levels of validity and reliability. The studies ranged from cross-sectional, descriptive, experimental, non-experimental, and qualitative. Cross-sectional studies are considered to have validity and reliability due to the numerous outcomes that arise and can be utilized in further studies. However, the weakness of these studies include difficulty in interpretation of the numerous results and the bias that may occur due to those who chose to participate vs. the population (Bannigan et al., 2009). Our cross-sectional studies included Manipusopika et al. (2019) and Van den Heuvel et al. (2019). Randomized controlled trials were a large chunk of the studies due to the topic of the systematic review. These trials must be internally valid; therefore, the design and conduction of the study must eliminate any possibility of bias. However, lack of external validity (lack relevance in a particular clinical setting) is their most frequent limitation and criticism. The randomized controlled trials in this systematic review include Alina (2021), Cummings et al. (2019), Hampton et al. (2017), Herman et al. (2016), Namasivayam et al. (2020), and Roberts (2015). Lastly, many of the studies examined utilized a scale based on the severity and type of speech delay to do their research. This can hinder the reliability of the research due to the lack of knowledge and testing in how this scale measures not only the speech delay but the effectiveness. Cummings et al. (2019), Farguharson et al. (2020), Hampton et al.

(2017), Lundeberg et al. (2019), and Walters et al. (2021) all measured their results off a personalized measurement scale.

Synthesis of Evidence

This systematic review has evidence collected from twenty sources that work in combination to explain the effects of interventions for adolescents with speech delays specifically between ages six and thirteen. The interventions evaluated were divided into six categories consisting of parent involvement, restructuring oral muscular phonetic targets, assessment methods, conversation-based interventions, intensity of intervention delivery, and grammatical interventions. Separating these different types of interventions into categories helps the reader better understand the effects of each and helps the systematic review flow better. It is important for each piece of evidence to relate back to the original PICOT question: In children, ages six months to thirteen years, with speech/language delays, how does the addition of innovative and supplemental interventions, compared with standard interventions alone, affect improvements in the delays?

The first category found that involving parents in interventions was beneficial and showed great improvement to the child's speech delay as parents are often the most trusted and constant in children's lives. This category ties into the intensity of intervention delivery as further evidence showed that children with speech/language delays have been found to benefit from intensive practice and reinforcement-based therapy when parental involvement is utilized. This particular study could have fit into either category and introduces a new idea that a combination of high intensity and parental involvement, or any two types of interventions, could be more effective than just one type. Furthermore, prompts for restructuring oral muscular phonetic targets, PROMPT for short, or the concept of setting goals to find specific techniques to

stimulate a sensory input was found effective if this intervention was performed twice a week over several weeks. This type of intervention is most always conducted by certified Speech Language Pathologists. Another type of intervention focused on different assessment methods which aims to increase the understanding of how to aid in the measurement of therapy method effectiveness in order to evolve and innovate from basic stages to help create more effective treatment methods. The last two types of interventions coincide with one another as conversation-based and grammatical interventions and have the potential to overlap in some ways. Conversation-based interventions showed improved use of spontaneous clauses and a greater use of nouns, verbs, and bound morphemes. This improvement can in turn improve grammar in adolescents with speech delays. Moreover, most grammatical interventions are commonly used across age groups unless children have developmental problems that call for alterations in the level of intervention. Lastly, another key aspect that ties the evidence together and makes it more well-rounded is the fact that sources from various countries were used and all of the publications used are less than twelve years old.

Recommendations

Throughout this systematic review, it is evident that there are many speech interventions currently being used in practice along with new developments in the works that are being tested. There are many types of speech delays that could develop in children and therefore is no clear-cut solution that exists for all speech delays due to many differentiating factors. As discussed earlier, children could have phonological and vocabulary difficulties (Cummings et al., 2019; Manipusopika et al., 2019; Taghizadeh et al., 2021), receptive difficulties (Hampton, 2017) primary speech delays/language delays and disorders (Alina, 2021; Namasivayam et al., 2020), and expressive language disorders (Roberts, 2015). So, depending on the type of delay, the

course of treatment may vary. There are many interventions that healthcare professionals may be able to do to ensure children are receiving proper and effective treatment.

A possible recommendation for healthcare professionals to consider is the development of early screening tools that can help identify what course of treatment may be best for a child that is at risk for or who has developed a speech delay. As discussed previously by Soto and Clarke (2017), although there was evidence on the ineffectiveness on a conversation-based therapy, EMT, further research showed that it may not have been used for the appropriate speech delay or started early enough. Hence, developing a screening tool to help make identification of the speech disorder needing to be treated and the appropriate intervention required might result in more effective outcomes. Having tools to evaluate a child's progress can also help healthcare professionals and researchers know if the current interventions being used for treatment are effective. If interventions and treatments are ineffective then they know adjustments may need to be made. Additionally having a specific tool provides parents, children, and healthcare professionals with an actual measurable impact and it can be seen that the child's speech improvement goals have been reached, which can provide reassurance and satisfaction to the patient and family.

Conclusion

Speech and language delays are common in children, and it is something that can potentially cause difficulty when they get to a school aged level. This review highlighted the evidence surrounding different types of speech and language delays along with multiple interventional approaches to determine the effectiveness of the various treatment methods. It is evident that more research and adjustments are warranted in order to continue to improve the assessment tools and intervention methods used with these patients. As always, things within the

medical field constantly evolve, change, and work to improve the practice of these healthcare professionals. Continued research in this field will yield best practice approaches that will benefit children with speech and language disorders.

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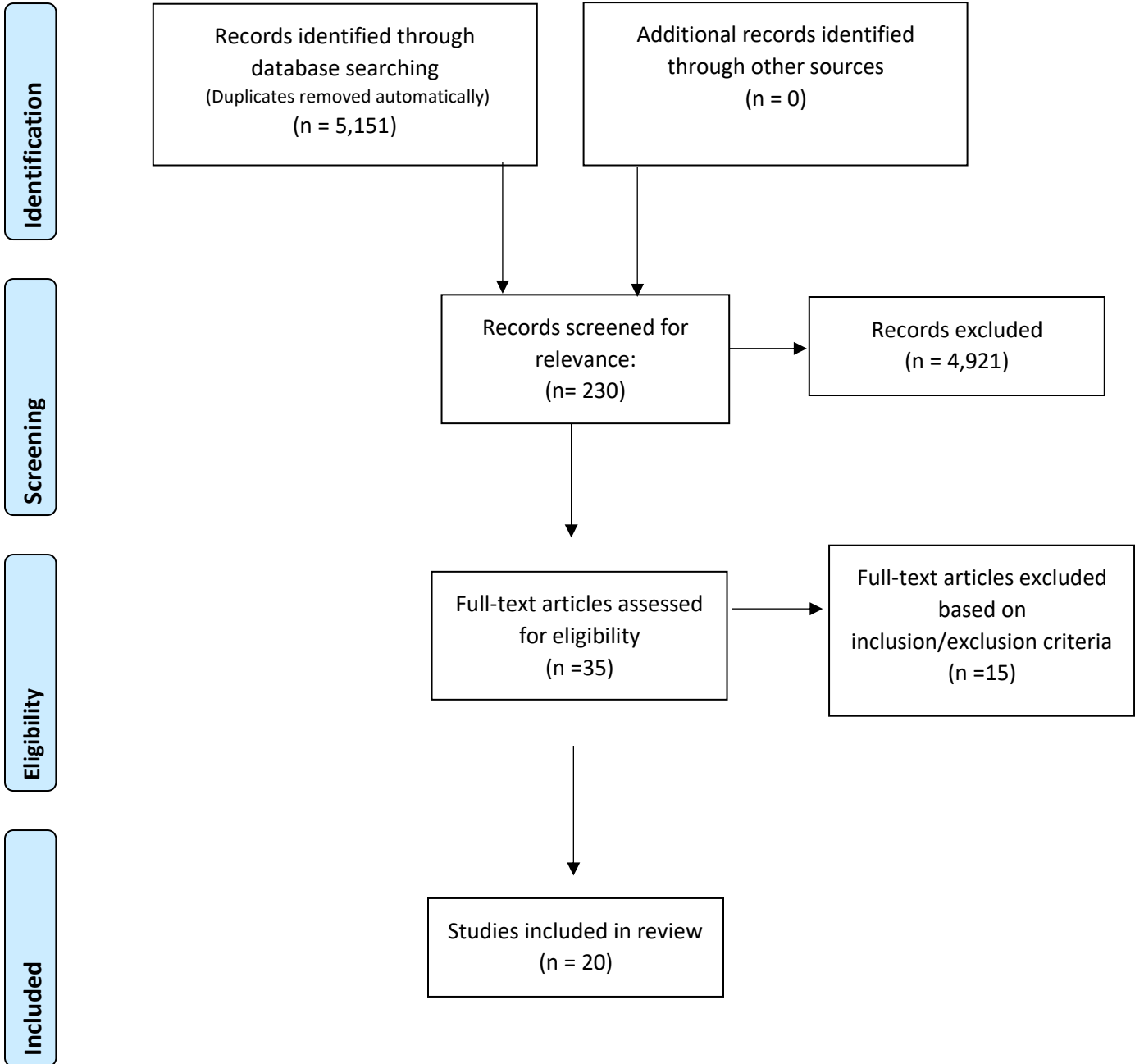
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Walters, C., Sevcik, R. A., & Ronski, M. (2021). Spoken vocabulary outcomes of toddlers with developmental delay after parent-implemented augmented language intervention.

American Journal of Speech-Language Pathology, 30, 1023–1037. https://doi-org.ezproxy.uakron.edu:2443/10.1044/2020_AJSLP-20-00093

Appendix A

PRISMA 2009 Flow Diagram



Appendix B

Systematic Review Table of Evidence

APA formatted reference:	Purpose statement: Research question:	Clinical Practice: Setting, Sampling methods, Sample size.	Design: Level of Evidence:	Findings Conclusion	Practice & Research Implications	Critical Appraisal: Strengths and limitations:
Alina, D. (2021). Evaluation and intervention in the linguistic structures of children's language. <i>Journal of Innovation in Psychology, Education, & Didactics</i> . Vol. 25 Issue 1, p 19-28.	This randomized controlled trial tested the level of effect a caregiver-implemented communication intervention had on language outcomes of toddlers who have a risk for persistent language delays. Does Bankson-2 Language Assessment Test (BLT-2) affect the development of linguistic structures of the language development process?	Preschoolers aged 5-7 years old Verbal testing before and after intervention was administered. Sample size not given.	RCT with Standardized test format of the verbal test given before and after Primary: Level 2 evidence	Children who underwent the trial group and received the BLT-2 intervention greatly improved on their pronunciation skills compared to the control group.	Utilize BLT-2 as a speech intervention in children aged -5-7 when dealing with pronunciation disorders.	Study did not state sample size which decreases level of credibility. The trial conducted was the first one done, so results are not sufficient as of yet. More tests need to be considered with changes in the independent variable.
Byers, B. A., Bellon-Harn, M. L., Allen, M., Saar, K. W., Manchaiah, V., & Rodrigo, H. (2021). A Comparison of Intervention Intensity and Service Delivery Models With School-Age Children With Speech Sound Disorders in a School Setting. <i>Language, Speech & Hearing Services in Schools</i> , 52,	This study examined intervention intensity and service delivery with school-age children with mild or mild-moderate speech sound disorders. The commonly used business-as-usual (BAU) service delivery model and a shorter, more frequent, individual model (experimental [EXP]) were compared.	School Recruited from an elementary school 22 children	Quasi-experimental and comparison of two interventions on outcomes Primary: Level 3 evidence	Significant group difference between the BAU and EXP groups. Cumulative treatment intensity was not different between groups.	Dose calculated as therapeutic input and production trials plays an important role in understanding the impact of cumulative intervention intensity	They had a small sample size and I feel that the experimental group should have been given longer than 5-minute sessions or more days per week

<p>529–541. https://doi-org.ezproxy.uakron.edu/2443/10.1044/2020_LSHSS-20-00057</p>	<p>How do different intervention intensity and service delivery models compare in school-age children with speech sound disorders?</p>					
<p>Cummings, A., Hallgrimson, J., & Robinson, S. (2019). Speech intervention outcomes associated with word lexicality and intervention intensity. <i>Language, Speech, and Hearing Services in Schools</i>, 50(1), 83-98. https://doi.org/10.1044/2018_lshss-18-0026</p>	<p>The purpose was to evaluate how lexical representations and intervention intensity affect phonological acquisition in children with speech disorders</p> <p>Does lexical representation and intervention intensity work together to aid in improvement or does one impact children more than the other?</p>	<p>Speech intervention program</p> <p>A single-subject multiple baseline design where each child served as their own control.</p> <p>24 children</p>	<p>Randomized controlled trial</p> <p>Primary: Level 2 evidence</p>	<p>Word lexicality does not have a significant influence on children's intervention outcomes. A more intense intervention had a greater impact on phonological change.</p>	<p>A combination of word lexicality and intensity can possibly have a greater impact than just one word type.</p>	<p>There was an effectiveness seen with this intervention in children with speech disorders but many children are different, the intensity and type of intervention that works for some may not work for all. The sample size was relatively small, I would reconduct the study with a larger sample size and maybe combinations of different intervention methods.</p>
<p>Davis, E., & Hodge, M. (2017). Reliability and validity of TOCS-30 for young children with severe speech and expressive language delay. <i>Canadian Journal of</i></p>	<p>The purpose of this experiment was to evaluate a change in speech and expressive language delays of young children who underwent the TOCS-30 therapy.</p>	<p>School Children were selected in three groups who differed by diagnosis, which were age-</p>	<p>Quasi-Experimental study</p> <p>Primary: Level 3 evidence</p>	<p>TOCS-30 provides a reliable, valid, and efficient procedure to measure phonetic behaviors of children with severe speech and expressive</p>	<p>The training and transcription conventions developed for the study likely contributed to the high level of reliability.</p>	<p>Small sample size but did not seem to affect the results.</p>

<p><i>Speech-Language Pathology and Audiology</i>, 41(1), 92- 104.</p>	<p>What are the effects of the TOCS-30 procedure and how effective is it when measuring behaviors in children with different speech</p>	<p>typical speech/language, speech sound disorder with age-typical language, and severe speech and expressive language delay.</p> <p>30</p>		<p>language delay based on the phonetic transcription conventions described. Two groups of children with speech disorders/delays would score significantly lower than the group of children with typical speech development</p>		
<p>Farquharson, K., Tambyraja, S.R., & Justice, L.M. (2020). Contributions to gain in speech sound production accuracy for children with speech sound disorders: Exploring child and therapy factors. <i>Language, Speech, and Hearing Services in Schools</i>, 51(2), 457-468. https://doi.org/10.1044/2019_lshss-19-00079</p>	<p>To explore the extent of child and therapy factors and how that contributes to speech sound production and accuracy in children with speech disorders in relation to school-based services.</p> <p>What therapy level shows the greatest improvement in helping improve speech in children with delays?</p>	<p>Public school setting</p> <p>Assessments given in order to collect data</p> <p>126 kindergarten, first and second graders currently receiving speech therapy services.</p>	<p>Pretest-posttest design</p> <p>Primary: Level 2 evidence</p>	<p>Results found that the total number of therapy sessions in a year positively impacted the percentage of consonants correct (PCC) gain on the posttest whereas, individual therapy sessions negatively impacted that gain score.</p>	<p>It is important to consider the severity of a child’s speech production and also age does not predict PCC gain.</p> <p>Overall, frequent group sessions may result in more of a change over time.</p>	<p>There was a good testing group and it did show one form of intervention could benefit many children. But, the intervention at hand focused on language and not speech production abilities, so there are certain things to take into account when working with children. This may not work for all.</p>
<p>Finestack, L.H., & Satterlund, K.E. (2018).</p>	<p>The purpose of this study was to understand</p>	<p>American Speech-Language</p>	<p>Nonexperimental and</p>	<p>There were 9 goals set when</p>	<p>This study gives current practice</p>	<p>Due to this being a survey, the</p>

<p>Current practice of child grammar intervention: A survey of speech-language pathologists. <i>American Journal of Speech-Language Pathology</i>, 27(4), 1329-1351. https://doi.org/10.1044/2018_ajslp-17-0168</p>	<p>grammatical interventions and to understand and evaluate their effectiveness which could provide a better guidance when further developing and evaluating grammatical interventions.</p> <p>Are grammatical interventions a successful intervention in improving speech delays in children.</p>	<p>Hearing Association. Survey, online 338 SLP that work with young children.</p>	<p>Descriptive study Primary: Level 4 evidence</p>	<p>conducting the research and all the results are listed for each goal individually. Overall, the results support implementation of evidence based grammatical interventions</p>	<p>guidelines and can help guide SLP in what intervention may be effective for their individual patient.</p>	<p>largest limitation is that it is a self-reported tool but it does focus on one intervention and how that intervention can be a successful tool when working with children.</p>
<p>Hampton, L., Kaiser, A., Roberts, M. (Nov 2017). One-year language outcomes in toddlers with language delays: an RCT follow-up. <i>Pediatrics</i> vol. 140, p1-9.</p>	<p>This randomized control trial shows the effectiveness of teaching parents the speech/language procedures for not just responsive interaction, but also incidental teaching. Therefore, children increased the level of their verbal behavior due to the increase in exposure to the speech/language intervention.</p> <p>Does Enhanced Milieu Teaching (EMT) and parent involvement aid in speech delays?</p>	<p>Community setting 3-month trial run with follow-ups at 6 and 12 months 97 toddlers' totals</p>	<p>Randomized control trial Level 2 evidence</p>	<p>Immediate effects of EMT were shown in the children who received the training, but at the 6- and 12-month mark, no significant improvement was shown when compared to the control group.</p>	<p>EMT is not a sufficient intervention LONG-TERM for speech interventions utilized in the toddler age range.</p>	<p>The sample size of the study (97 toddlers) was a good size for the first round of the trial and the follow-up was also key in understanding the long-term impacts of the intervention. Overall, the intervention did not work so the limitation of this study is that it is not beneficial in treating children with speech delays.</p>
<p>Herman, K.C., Cohen, D., Owens, S., Latimore, T.,</p>	<p>The study investigates the effect of inadequate</p>	<p>Conducted across a few sites</p>	<p>Randomized Controlled Trial</p>	<p>Language skills in the first grade mediate the</p>	<p>When looking at interventions to improve</p>	<p>The study had a large sample size and may</p>

<p>Reinke, W.M., Burrell, L., McFarlane, E., & Duggan, A. (2016). Language delays and child depressive symptoms: The role of early stimulation in the home. <i>Prevention Science, 17</i>(5), 533-543. https://doi.org/10.1007/s11121-016-0647-2</p>	<p>learning in the home when it comes to children with language delays could lead to child depressive symptoms in the years to come.</p> <p>What is the role of early stimulation in the home on depressive symptoms in children with speech delays?</p>	<p>A longitudinal study was conducted among children that were age 3</p> <p>587 children</p>	<p>Primary: Level 2 evidence</p>	<p>effect of the home health environment on depressive symptoms. Effective home learning is a vital part of early childhood development</p>	<p>language delays, it is important to monitor the child’s mental health to prevent depressive symptoms.</p>	<p>have shown an effect of language delays. Did not have much on a specific intervention to help.</p>
<p>Hodge, M., & Gaines, R. (2017). Pilot Implementation of an Alternate Service Delivery Model for Young Children with Severe Speech and Expressive Language Delay. <i>Canadian Journal of Speech-Language Pathology & Audiology, 41</i>, 34-57.</p>	<p>The purpose of this article is to describe a pilot implementation of the LST service delivery model by First Words clinicians to 1) determine its feasibility in their work setting, 2) report measures of the children’s speech behaviors obtained before and following treatment, and 3) report parents’ feedback about their experiences and their perceptions of their children’s experiences with the program.</p> <p>What alternative service delivery models for young children with severe speech and expressive language delays</p>	<p>Children’s hospital</p> <p>First cases of First Words S-LPs</p> <p>10</p>	<p>Quasi-experimental</p> <p>Primary: Level 3</p>	<p>Significant increases in percentage consonants correct, percentage vowels correct, and percentage word shapes correct.</p>	<p>Ten 3-year-old children identified with severe speech and expressive language delay of unknown origin and age-appropriate receptive language showed positive changes in at least some measures of phonetic accuracy.</p>	<p>Lacked sufficient rigor to endorse the effectiveness of LST based on scientific evidence.</p>

	should be implemented?					
Lundeborg-Hammarström, I., Svensson, R.-M., & Myrberg, K. (2019). A shift of treatment approach in speech language pathology services for children with speech sound disorders – a single case study of an intense intervention based on non-linear phonology and motor-learning principles. <i>Clinical Linguistics & Phonetics</i> , 33(6), 518–531. https://doi-org.ezproxy.uakron.edu/2443/10.1080/02699206.2018.1552990	The purpose of the present case study was to investigate the effects of an intensive specialist therapy, based on non-linear phonological analysis and motor learning principles. The participant was a boy aged 4:10 years with severe SSD, who previously had received indirect therapy from age 3 with, very limited results. What are the effects of an intensive specialist therapy, based on non-linear phonological analysis and motor learning principles?	School Random sampling 1	Descriptive and nonexperimental single Case study Primary: Level 4 evidence	Severe cases of SSD require clinical knowledge and skills that only a SLP can provide	Explore more ways that children with severe cases of SSD can get clinical knowledge and skills.	This was based off of a singular case study making a definitive solution unclear. Having a larger sample size would help reflect results that were average among other children.
Manipusopika, Y., Sudarwati, E. (2019) Phonological Development of Children With Speech Delay. <i>Retorika: Journal Ilmu Bahasa</i> , Vol. 5, Iss 1, pp 12-22.	The present research aims at documenting phonological development of three subjects who were enrolled in a therapy. This descriptive, cross-sectional research aimed to document the phonological development of speech delayed children whose ages are between 2-4 years.	Speech therapy for phonological development Verbal testing through an extended period of time 3 subjects in total	Descriptive, cross-sectional case research Level 5 evidence	Development of speech is impacted by exposure to language in the home setting as well as early neglect of the child.	Speech therapy can only help to an extent, a child's home life needs to be filled with language exposure as well. Implications to this means the child's support system needs to be fully involved in	This study was only conducted on three subjects, need way more evidence to prove their conclusions are correct, but it is a nice starting thought process, just needs more research and trials.

	Does early neglect and exposure to language at home effect children obtaining and overcoming speech delays?				their therapy as well for them to obtain the best results.	
Namasivayam, A. K. Huynh, A. Granata, F. et al. (01 May 2020). PROMT intervention for children with severe speech motor delay: a randomized control trial. <i>Pediatric Research</i> 89, 613-621.	This randomized control trial (RCT) study examined the effectiveness of Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) intervention to improve the outcomes in children with SMD. We hypothesized that children with SMD receiving PROMPT intervention would improve more in the measured outcomes than those waitlisted and receiving home training. Improvements in: speech intelligibility, articulation, and motor control; but weak improvements in overall functional communication and sentence-level intelligibility. Does PROMPT aid in the improvement of children with speech delays?	2 groups, intervention or control group, children were either given 45 min of PROMPT intervention two times a week for 10 weeks OR received home training instructions 49 children total	Randomized -controlled Trial. Level 2 evidence	PROMPT training children had significant improvements in their speech delays, such in: speech intelligibility, articulation, and motor control; but weak improvements in overall functional communication and sentence-level intelligibility	Utilize PROMPT interventions when dealing with children with severe speech delays since it has been proven effective in the primary trial.	Would do a second trial with more a larger group; as well as, diversify the speech delays to see if it makes a difference in the improvements of the speech intelligibility at sentence level and overall functional communication.

<p>Roberts, M (2015). Early intervention for toddlers with language delays: a randomized controlled trial. <i>Pediatrics</i> 135(4): 686-693. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4379460/</p>	<p>This randomized controlled trial tested the effects on language outcomes of a caregiver-implemented communication intervention targeting toddlers at risk for persistent language delays.</p> <p>Is caregiver-implemented speech interventions more successful than standardized practices?</p>	<p>Caregiver implemented communication setting</p> <p>Toddlers who scored below a 1.33 standard deviation of the normative mean; no other developmental delays for the participants</p> <p>97 toddlers (between 24 and 42 months)</p>	<p>Randomized control trial</p> <p>Level 2 evidence</p>	<p>Shows short-term effects that caregiver instruction has on toddlers with a diagnosed speech delay are shown to help in a greater capacity than traditional speech and language interventions</p>	<p>Due to this trial, future research into trials and interventions should utilize family and caregivers more heavily in the process of deliverance of the particular speech intervention.</p>	<p>This study further proves that implementing caregivers into the child's speech and language interventions has been proven beneficial. A major limitation of this study is the fact that it is still in the preliminary phases and its sample size was 97. For its results to be more conclusive, more trials and large sample sizes will need to be studied.</p>
<p>Soto, G., & Clarke, M. T. (2017). Effects of a Conversation-Based Intervention on the Linguistic Skills of Children With Motor Speech Disorders Who Use Augmentative and Alternative Communication. <i>Journal of Speech, Language & Hearing Research</i>, 60(7), 1980–1998. https://doi-org.ezproxy.uakr</p>	<p>This study was conducted to evaluate the effects of a conversation-based intervention on the expressive vocabulary and grammatical skills of children with severe motor speech disorders and expressive language delay who use augmentative and alternative communication</p> <p>What are the effects of a conversation-</p>	<p>School Children were selected according to a set of 11 different criteria they met</p> <p>8</p>	<p>Quasi-Experimental intervention with no randomization</p> <p>Primary: Level 3 evidence</p>	<p>Participants showed improvements in their use of spontaneous clauses, and a greater use of pronouns, verbs, and bound morphemes.</p>	<p>Employ different types of recasts and different levels of recast density.</p>	<p>A small sample size was used due to the fact that it was a single subject experimental design but no differences were revealed between groups.</p>

on.edu:2443/10.1044/2016_JSLHR-L-15-0246	based intervention on the linguistic skills of children with motor speech disorders who use augmentative and alternative communication?					
Taghizadeh, E. Hendevalan, J.F. Navidinia, H. (2021). Pronunciation problems of children with speech delay in the initial, middle, and final position of words: Evidence from Persian-speaking girls and boys aged 3 to 8 years in Birjand. <i>Directory of Open Access Journals. Vol. 13, no. 39. pp. 213-233.</i> https://doaj.org/article/7d2563c0ffc8403d9c973a927265db15	This study investigated the pronunciation problems of children with speech delay and its relationship with their age and gender. More specifically, it tried to examine if there are differences among the children's pronunciation problems with the initial, middle and end positions of the words and to investigate the possible relationship that the number of problems may have with the children's age and gender. Does a child's age and gender have an effect on the type of speech delay and pronunciation problem?	Birjand Speech Therapy Center Purposive sampling based on age and gender of children 20 (10 boys and 10 girls)	Descriptive and non-experimental Primary: Level 4 evidence	No significant difference in the age or gender (not a factor) of the child in terms of their particular speech delay and/or pronunciation problems.	No need to specialize the speech interventions due to gender or age.	Study only had 20 participants and varied by 5 years in age, which is a great change in mental capabilities from ages 3 to 8 years. Need a bigger study group and smaller age range to determine credibility of research.
Tambyraja, S.R. (2020). Facilitating parental	This study investigated the extent to which speech-language	Unknown setting Survey	Descriptive nonexperimental	The study sought out to find out communicati	A way that can be used to improve completion	Parent involvement in homework

<p>involvement in speech therapy for children with speech sound disorders: A survey of speech-language pathologists' practices, perspectives, and strategies. <i>American Journal of Speech-Language Pathology</i>, 29(4), 1987-1996. https://doi.org/10.1044/2020_ajslp-19-00071</p>	<p>pathologists (SLPs) facilitate parents' completion of homework activities for children with speech sound disorder (SSD). In addition, this study explored factors related to more consistent communication about homework completion and strategies considered particularly effective for supporting this element of parental involvement.</p> <p>Is there consistency in participation from parents and follow ups from SLP about parental participation?</p>	<p>156 respondents to the survey</p>	<p>Primary: Level 4 evidence</p>	<p>on levels between SLP and parents and how to improve that. Results showed that face to face discussion shows a more successful rate in communication and effective completion of the homework.</p>	<p>of homework and communication could be follow-up reminders such as a text or quick phone call.</p>	<p>for children with speech delays is the main focus of this study. A limitation of this study is that it is a self-report tool that was used. So, the extent of actual practices of these SLP is unknown.</p>
<p>Ullrich, D., Ullrich, K., & Marten, M. (2014). A longitudinal assessment of early childhood education with integrated speech therapy for children with significant language impairment in Germany. <i>International Journal of Language & Communication Disorders</i>, 49(5), 558-566. https://doi.org.ezproxy.uakron.edu:2443/10.</p>	<p>The study's focus is to determine the value of early language-/speech therapy treatment in combination with support of personality traits during the pre-school and primary school period on the long-term social and academic development of children with significant language-/speech delay</p>	<p>Lower Saxony, Germany preschools</p> <p>Discharges from a speech therapy kindergarten up to 19 years previously</p> <p>71 children</p>	<p>Quasi-experimental</p> <p>Primary: Level 3 evidence</p>	<p>Preschools that integrate speech therapy improve long-term development and academic outcome of children with language delays.</p>	<p>Considering different personality traits is also important in improving long-term development and academic outcome of children with language delays.</p>	<p>Including children that were in speech therapy kindergarten up to 19 years earlier seems a bit too long. Also has a small sample size and very specific to a location.</p>

<p>1 111/1460-6984.12092</p>	<p>Are early childhood education treatments helpful and effective for children with significant language impairment?</p>					
<p>Van den Heuvel M., Ma J., Borkhoff CM. Et al. (2019), TARGet kids! collaboration. mobile media device use is associated with expressive language delay in 18-month-old children. <i>J Dev Behavioral Pediatric</i>. https://pubmed.ncbi.nlm.nih.gov/30753173/</p>	<p>This cross-sectional study tests the correlation between a child’s reported mobile media device use and level of communication delay. Does limiting mobile media screen time aid as an intervention in speech delays for children aged 18 months?</p>	<p>TARGet Kids Survey 893 children</p>	<p>Descriptive/nonexperimental, Cross-sectional study Level 5 evidence</p>	<p>Study demonstrated a significant decrease in expressive speech delays in kids that are 18 months old when decreasing their mobile media device time.</p>	<p>This can be used as a second intervention to a typical speech intervention treatment in order to see quicker/more progress.</p>	<p>The study shows a correlation, but not necessarily a definite causation of screen time to speech delays. The study did last for four year and had a large sample size, so the results are of good credibility.</p>
<p>Venker, C.E., Yasick, M., & McDaniel, J. (2019). Using telegraphic input with children with language delays: A survey of speech-language pathologists’ practices and perspectives. <i>American Journal of Speech-Language Pathology</i>, 28(2), 676-696. https://doi.org/10.1044/2018_ajslp-18-0140</p>	<p>The purpose is to evaluate perspectives and practices of SLP’s use of telegraphic input when working with children who have speech delays at the prelinguistic, one-word, or two-word stages of spoken language/speech development. Should simplified input be telegraphic or grammatical when working with children with language delays?</p>	<p>Participants recruited from a university sponsored conference Survey electronic and onsite verbally 93 participants</p>	<p>Descriptive nonexperimental Primary: Level 4 evidence</p>	<p>Results showed that a majority of SLP’s report using telegraphic input but only around 30% of them found it useful in aiding children with language delays.</p>	<p>When simplifying things for children it is okay for phrases to be short but important to try and make them grammatically correct.</p>	<p>The sample size was a good size but there was among the participants they were all women. I would try and conduct another study with male and female SLP. There was good information on this type of intervention and why it is used among children.</p>

<p>Walters, C., Sevcik, R. A., & Ronski, M. (2021). Spoken Vocabulary Outcomes of Toddlers With Developmental Delay After Parent-Implemented Augmented Language Intervention. <i>American Journal of Speech-Language Pathology</i>, 30, 1023–1037. https://doi.org.ezproxy.uakron.edu/2443/10.1044/2020_AJSLP-20-00093</p>	<p>This study aimed to (a) characterize and analyze the speech sound development of toddlers with developmental delay who participated in a parent-implemented language intervention; (b) examine the accuracy of speech sounds among toddlers who participated in an augmented language intervention using speech-generating devices and toddlers who participated in a traditional, spoken language intervention; and (c) examine the relationship between baseline factors (i.e., receptive and expressive language skills, vocal imitation, and number of unintelligible utterances) and the number of spoken target vocabulary words after intervention</p> <p>Does parent implemented augmented language intervention help the spoken vocabulary outcomes of toddlers with</p>	<p>Home Random sampling 109</p>	<p>Quasi-experimental study Primary: Level 3</p>	<p>Intervention group and baseline receptive and expressive language skills significantly predicted the number of spoken target vocabulary words produced at the end of intervention</p>	<p>Children's speech sound accuracy was not significantly different across intervention groups.</p>	<p>They used a decent sized sample in this study but they could've been more specific about the augmentative and alternative communication intervention.</p>
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	developmental delay.					
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