EBP

briefs

A scholarly forum for guiding evidence-based practices in speech-language pathology

Service Delivery for Children With Speech Sound Disorders: Evidence for the Quick Articulation! Model

Elizabeth Roepke, MS, CCC-SLP
Tamar Greenwell, MS, CCC-SLP
Françoise Brosseau-Lapré, PhD, CCC-SLP
Purdue University

Pearson

EBP Briefs

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

Structured Abstract

Clinical Question: Would a school-age child with speech sound disorder (SSD) benefit more from individual drill therapy (Quick Articulation!) or traditional school-based group therapy as measured by improved speech accuracy?

Method: Systematic Review

Study Sources: ASHAWire, Google Scholar, PubMed, and Scopus

Search Terms: speech sound disorder AND service delivery, school-age, intervention intensity, individual OR group

Number of Included Studies: 5

Primary Results:

1. Individual therapy sessions, at least twice a week, benefit school-age children with speech sound disorders.

2. A dose of at least 50 trials per target, per session is recommended.

Conclusions: There is limited research on the optimal intervention intensity for children with speech sound disorders (SSD). The evidence available suggests that high-frequency (Allen, 2013) individual sessions with a dose of at least 50, but preferably 70 or more, trials per session (Williams, 2012) may be most effective in treating this population. In addition, the majority of published studies report intervention intensity of two to three group sessions a week and an average of 50 perception or 77 production trials per session (Sugden, Baker, Munro, Williams, & Trivette, 2018). Therefore, we suggest that a Quick Articulation! model, treating children individually two or three times a week for 50–100 focused trials rather than in groups, may be appropriate for children with SSD. However, clinical decisions regarding treatment intensity would benefit from further research in this area.

Service Delivery for Children With Speech Sound Disorders: Evidence for the Quick Articulation! Model

Elizabeth Roepke, MS, CCC-SLP
Tamar Greenwell, MS, CCC-SLP
Françoise Brosseau-Lapré, PhD, CCC-SLP
Purdue University

Clinical Scenario

Julie, a speech-language pathologist (SLP) with 10 years of experience, has just ended her first year in a new position in a K–3 elementary building. She reviews student progress over the course of the year and determines the most effective service delivery models for all her students for the upcoming school year. Julie provides services to students identified with speech and language impairments through the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) with an Individual Education Program (IEP) and students receive speech interventions through a multitiered system of support (MTSS) intervention plan. This school year, Julie used two different service delivery models for speech production services. She used a traditional approach for children with IEPs for speech impairments, treating them twice a week for 30 minutes in a group of three children. She used a Quick Articulation! service delivery model to treat children with speech sound errors through an MTSS three times a week for 5 minutes individually. Julie compared the baseline and quarterly benchmark data she collected on all students to look for patterns of improvement. Her review of the results at the end of the year showed substantially more progress among the MTSS students who received the Quick Articulation! services versus those who received group instruction. Quick Articulation! students consistently demonstrated increased and sustained gains across all target sounds compared to their same-age peers receiving traditional group therapy for speech impairment.

In addition to student progress, Julie considered her schedule and how to manage her workload. Her scheduled time for three students in a Quick Articulation! model three times a week is 45 minutes. Her scheduled time for a group of three twice a week for 30 minutes is 60 minutes. When applied over multiple groups, this reduction in time for current services could allow time for additional student support services and programming to support student growth and achievement.

Based on student rate of progress and schedule management, Julie concluded that using a Quick Articulation! model for all students receiving speech production services should be considered. Julie shared her data analysis with her school principal and special education coordinator. Although the administration was interested in exploring alternative service delivery models, they were apprehensive of the increase in number of times children were pulled out of the classroom and the proposed decrease in actual service time. The administration requested further exploration of research to support serving all speech students using a Quick Articulation! model.

Background Information
Intensity of Service Delivery

SLPs make decisions about intervention intensity when planning treatment. Intervention intensity components include *dose form* (e.g., drill activity), *dose* (e.g., 25 trials), *dose frequency* (e.g., twice a week), and *total intervention duration* (e.g., 16 weeks). The *cumulative intervention intensity* is the total number of trials performed throughout therapy (Warren, Fey, & Yoder, 2007). In this case, the cumulative intervention intensity is 800 trials (25 trials/session x 2 sessions/week x 16 weeks). This paper refers to a "traditional model" of school therapy: small group pull-out intervention, usually for 30-minute sessions (Brandel & Loeb, 2011). This traditional model allows SLPs to meet the therapy requirements for high caseloads by seeing multiple children at one time. However, seldom do children's schedules allow for the group to focus on a single target. Often, children with phonological disorders may be seen together with children who have language goals, and the SLP must focus intervention on only one child at a time. When children with SSD are together in a group, rarely does each child mispronounce the same targets in the

1

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

same manner. This service delivery model may not be the most efficient model for children with SSD because it can keep children out of the classroom more than necessary. Nonetheless, school-based SLPs rarely vary the service delivery options they offer to the children on their caseload because of the challenge of coping with high caseload sizes (Brandel & Loeb, 2011).

Recent research has found that, not surprisingly, the service delivery intensity used by SLPs differs from the intensity used by researchers. Sugden et al. (2018) compared the clinical practices of SLPs in Australia with the practices reported in research articles. Sugden et al. (2018) found that most research articles reported two to three sessions a week, 30–60 minutes per session, and 100 trials per session. In practice, however, almost half of the Australian SLPs reported eliciting fewer than 50 trials per session, and the majority reported seeing children for therapy once a week. Similarly, SLPs in the U.K. reported seeing clients once a week and eliciting 10–30 trials per session (Hegarty, Titterington, McLeod, & Taggart, 2018). It is clear that there is a gap between research and practice when making decisions about intervention intensity for children with SSD.

Clinical Question

As recommended by the American Speech-Language-Hearing Association (ASHA), Julie formulated a PICO (population, intervention, comparison, outcome) question to direct her search for evidence. She identified (1) the **population,** school-age children with SSD; (2) the **intervention,** individual short therapy sessions two to three times per week (Quick Articulation! model); (3) the **comparison treatment,** group therapy twice per week; and (4) the **outcome,** speech accuracy.

Julie's clinical question was: Would a school-age child with SSD benefit more from individual Quick Articulation! or traditional school-based group therapy as measured by improved speech accuracy?

Search for the Evidence

Julie conducted a systematic review of studies examining service delivery options for phonological therapy with preschool and school-age children. She specifically wanted to find articles that reported improvements in speech accuracy following different service delivery

models, whether the time spent in therapy or the number of doses was more important for speech outcomes. Julie used ASHAWire, PubMed, Scopus, and Google Scholar to search for peer-reviewed articles that would help her answer her PICO question, using the search terms speech sound disorder AND service delivery, school-age, intervention intensity, individual OR group. She used the following inclusion criteria: (1) the research must be peer-reviewed, (2) the articles must be written in English, (3) the population must be school-age children with phonological impairments, (4) the research question must address intervention intensity, and (5) the studies must be in Levels 1 to 3 of the ASHA (2004) Levels of Evidence. She excluded articles that were expert opinion, surveys of clinical practice, and articles that dealt with motor speech disorders rather than phonology. She read the abstracts of 13 articles and identified nine that related to her PICO question. However, she excluded four of these articles from her review because they were either surveys of clinical practice or expert opinion.

She then scanned the titles of the references in the five papers that she read and found an additional six articles with titles related to her PICO question. However, upon reading the abstracts, she determined that these papers did not include outcome data relative to treatment intensity and therefore did not include these in her analysis. Figure 1 contains a flowchart detailing Julie's search for evidence.

Evaluating the Evidence

To evaluate the evidence she gathered, Julie considered two factors: the level of evidence and the quality of the study. Julie first used the Oxford Centre for Evidence-Based Medicine Levels of Evidence rating system (CEBM, 2009) to evaluate the level of evidence for the five relevant studies she had identified. CEBM is an evidence ranking scheme, with systematic reviews providing the highest level of evidence and expert opinions providing the lowest. According to CEBM, if there are consistent Level 1 studies for a clinical practice, then the findings receive a grade "A" for providing clinical recommendations. Consistent Level 2 or 3 studies receive a grade "B," Level 4 studies receive a "C," and Level 5 or inconsistent/inconclusive evidence receives a "D."

Because the studies used different methodologies and investigated different aspects of therapy intensity, Julie chose to evaluate each study individually. She used the

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

15-question Critical Appraisal of Treatment Evidence rating scale (CATE; Dollaghan, 2007) to evaluate the articles for quality. The first 10 questions of the CATE scale relate to the validity of the study. These yes/no questions address the study design, such as the presence of a control group; the randomization of group assignment; and measure validity. If 7–10 of these questions are answered affirmatively, then that study is said to have compelling validity. A total of four to six affirmative answers classifies a study's validity as suggestive, whereas fewer than four answers of yes classifies a study's validity as equivocal. Similarly, the last five questions relate to the study's importance. A score of 4–5 is compelling importance, a score of 3 is suggestive importance, and a score below 3 is equivocal importance.

Julie began with the systematic review *Service Delivery and Intervention Intensity for Phonology-Based Speech Sound Disorders* (Sugden et al., 2018). Sugden and colleagues investigated 206 studies on phonological intervention published between 1979 and 2016. These studies were coded by service delivery model, dose frequency, session duration, and dose. Findings included that the majority of published studies used individual therapy (75.5%) provided by an SLP (86.8%) between one to three sessions per week (71.7%) and between 30–60 minutes per session (61.2%). The average dose per session was 77 production trials (range: 23–200) or 51.5 perception trials (range: 10–120). Perception trials were calculated as the number of times a child completed an input-based teaching episode, such as raising a wand every time the child hears a target sound during a story (Sugden et al., 2018).

According to the CEBM hierarchy, a systematic review of randomized control trials receives a rating of 1a, whereas a systematic review of case-control studies receives a rating of 3a. Both types of studies were included in the systematic review by Sugden and colleagues. Because this article was not a treatment study, Julie used the Critical Appraisal of Systematic Review or Meta-Analysis (CASM; Dollaghan, 2007) to evaluate the review's validity and importance. This review was clear in its search methodology: search terms, databases, inclusion criteria, exclusion criteria, and coding system were provided. Inter-rater reliability for article coding was high (96.8% and 97.5%). The methodological transparency and reliability reported in this systematic review suggest a high level of validity to the study. However, the review did not conduct meta-analyses of the findings, so the CASM rated the importance of this study lower than its validity. One point in favor of this study's importance was

the relevance of the results for Julie's patients and practice. Overall, the review by Sugden et al. (2018) carried a high level of evidence and of validity, supporting Julie's decision to use the findings from this review in her clinical decision-making process.

The second article Julie evaluated, *Intervention Efficacy and Intensity for Children With Speech Sound Disorder* (Allen, 2013), was a randomized control trial that compared outcomes for children receiving different dose frequencies of intervention. As a randomized control trial, it received a CEBM rating of 1b, suggesting that the findings could be incorporated into clinical practice. Allen (2013) randomly assigned preschool children with SSD to one of three groups: (1) received intervention once a week, (2) received intervention three times a week, and (3) storybook control. The children in the intervention groups all received the same type of intervention, the Multiple Oppositions approach (Williams, 2010). In addition, each child received 24 sessions of intervention overall. This study resulted in a significant difference between the two intervention groups in the outcome measure—the change in percentage consonants correct (PCC) on the Goldman-Fristoe Test of Articulation (2nd ed., GFTA-2; Goldman & Fristoe, 2000)—transcribed by raters who were blind to the group assignment of the child. There was a medium effect size for the difference in PCC change between the intervention groups. This study received ratings of compelling for both validity and importance on the CATE, indicating that clinicians should consider adopting the findings into their own practice.

Although this study found that higher dose frequency results in improved speech production outcomes, this finding only addressed half of Julie's question. She also needed to determine how dose, or the number of trials produced in a single session, affects speech outcomes. Julie then evaluated the article *Intensity in Phonological Intervention: Is There a Prescribed Amount?* (Williams, 2012). This article reported the results for 22 individual children, ages 3–6 years, who received speech therapy across three different studies. The first study included 14 children and examined speech outcomes after 42 or fewer half-hour therapy sessions utilizing the Multiple Oppositions approach (Williams, 2010). The second study included four children who received Multiple Oppositions therapy for one target sound and minimal pair therapy for a second target sound. The third study also included four children and compared computer-based intervention and traditional intervention.

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

The outcome measure was the change in percentage correct of underlying representation. This measure was calculated based on the child's performance on the Systematic Phonological Protocol (Williams, 2002), which is a 245-word elicited sample. When comparing the children with high outcomes to those with lower outcomes, Williams (2012) concluded that these children benefited from a therapeutic dose of 70 trials. Further, a dose of less than 50 trials was limited in its effectiveness. This study received a CEBM rating of 3a, as a systematic review of three case-control studies.

Although this study directly addressed Julie's question of dose intensity, Julie noted some limitations in its validity and importance from the CATE. Overall, the validity of Williams (2012) was suggestive because of the lack of control group, lack of randomization, and lack of blinding. In addition, the article was unclear as to whether the methods and participants were specified prospectively. However, there were strengths to the validity of this article: the treatment was described clearly, the rationale was plausible, the outcome measure (Systematic Phonological Protocol) was valid, and the patients were representative and recognizable at the beginning and end of the study. Moreover, the importance of the study was rated as equivocal because the study did not report statistical significance, power, or effect size. Overall, Julie decided that this study was helpful but could not be the sole base of evidence for dose intensity.

The remaining two articles were single case studies, each with a single participant and no control. These studies both investigated whether intensive speech therapy led to significant gains in speech accuracy. Both studies were rated at Level 4 according to the Oxford CEBM scale.

Nissen, Peris, and Tanner (2017) conducted a "boot camp" treatment for an 8-year-old boy with interdental /s/ production. Treatment occurred over two consecutive days for 5.5 hours a day. No data were provided concerning the number of elicited trials. Therapy followed the traditional articulation hierarchy: moving up the hierarchy when the participant reached 90% accuracy at a given level. For example, when targeting the sound /s/, the child began by producing the sound in isolation. When the child reached 90% accuracy in isolation, the child then produced /s/ at the syllable level, followed by words, phrases, sentences, and finally conversation. Audio recordings were taken of a list of probe words both before and following treatment and used as the outcome measure. Overall, the participant made significant improvements on his articulation of /s/ following the intensive therapy. Because the case study lacked a control group and randomization, the CATE rating for validity was only suggestive. The importance was also rated as suggestive because there was not a clear substantial cost-benefit advantage to a "boot camp" style of articulation treatment compared to traditional treatment scheduling.

Lundeborg Hammarström, Svensson, and Myrberg (2018) reported on an intensive therapy program for a 4-year-old Swedish boy with severe SSD. This child received speech therapy four times a week for three weeks, followed by seven weeks of break, and then another block of four times a week for three weeks, for a total of 24 sessions. Target words were selected based on the Core Vocabulary approach (Dodd, Holm, Crosbie, & McIntosh, 2006) as well as nonlinear analysis of the child's speech. Seven words were targeted during the first block and 10 during the second block. The dose used was 30 productions of each target word during each intervention session. Following intervention, the child improved on measures of speech accuracy, including percentage consonants correct and word shape match. However, the article did not report statistical significance for the change in production accuracy, nor effect size. For this reason, the CATE rating for the importance of this article was equivocal. As in the previous case study, the validity was suggestive because there was no control group or randomization used. In addition, one possible factor that limits the application of these results is the diagnosis of the child's SSD. The authors hypothesized that the child's speech disorder might be caused by childhood apraxia of speech rather than a phonological disorder. Treatment approaches for these two types of speech disorder differ because of the different presentations of the disorders.

The Evidence-Based Decision

Julie began this review by asking which intervention option is more effective for children with SSD: group therapy or individual therapy. She knows that group therapy allows her to see more children at one time, but she seldom has children in the same group who produce the same error in the same way. With her high caseload, she is unable to see each child individually for 30 minutes a session, and she does not want her students to miss more class time than necessary. Will shorter sessions with a higher number of trials per session yield better results than longer sessions with fewer trials?

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

Julie knew that making an evidence-based decision that was appropriate for her caseload involved three factors: the scientific evidence, her clients' individual needs, and her clinical judgment. Based on her review of the scientific evidence, Julie felt confident in her decision to see children with SSD with high dose frequency (i.e., multiple times a week), because the Allen (2013) study showed that higher frequency therapy is associated with improved speech production outcomes. This study was a Level 1 study according to the CEBM rating system and compelling in its validity according to the CATE classification.

However, Julie found less compelling evidence regarding the optimal dose, or number of trials, to use in her therapy sessions. The systematic review by Sugden et al. (2018) reported that the average dose in peer-reviewed studies is 77 production or 51 perception trials. This article also referenced a finding from ASHA (2011) that individual therapy leads to better outcomes than group therapy, which Julie found relevant for her own clinical decision-making. The review of the three studies in Williams (2012) suggested that children with severe SSD benefit most from 70 or more trials per session, whereas fewer than 50 trials per session has limited effectiveness even for children with moderate SSD. In addition, the two case studies she reviewed suggested that high-intensity therapy can lead to improvements in speech accuracy, but these case studies lacked a control for comparison. Therefore, Julie found that the evidence was more compelling for 50–100 trials per session, depending on the severity of the child's SSD. Julie noted, however, that more research is needed in this area to help her make a more informed clinical decision.

A limitation of Julie's decision-making process is that the target numbers of trials reported in Williams (2012) were gathered using the Multiple Oppositions approach. Because Julie does not always use the Multiple Oppositions approach with her students, she had to consider whether these findings would apply to the children on her caseload. Julie reasoned that the Multiple Oppositions approach was used with a population similar to those on her caseload and that it shares many features with other approaches she uses, such as perception training and word production tasks that increase in difficulty with consistent feedback from the SLP. Beyond these shared features, Julie reasoned that the systematic review by Sugden and colleagues (2018) found that published studies on a variety of speech therapy approaches averaged 77 production trials per session, which aligns with the findings for Multiple Oppositions in

Williams (2012). Julie will track her students' progress to confirm whether her target number of trials is appropriate for her students, and she will continue to read published literature and update her approach if future findings suggest a different number of trials per session is optimal.

For an evidence-based decision, Julie needed to consider the individual needs of her clients and her own clinical judgment. One need raised by the school administration was for her students to maximize learning time in the classroom. Although the administration was concerned about the possible disruption of the increased number of pull-out sessions a week, Julie believed that if the children could make the same or better progress in 5–10 minutes of intensive treatment as in 60 minutes, they would experience less disruption by missing less classroom instruction. Julie noted that the children seen in a group missed class for 60 minutes a week, whereas those seen individually only missed class 15 minutes a week. Additionally, an informal survey of teachers with students who had participated in both the traditional and Quick Articulation! programs showed a preference for the more frequent shorter sessions versus the longer times out of the classroom. The teachers agreed the disruption of missing 5 minutes at a time was minimal compared to missing 30 minutes.

Julie's previous comparison of data for students who received therapy under the traditional model (groups of three children seen twice a week for 30 minutes) with data for those who received the Quick Articulation! service delivery (individual sessions three times a week for five minutes) showed that the Quick Articulation! students consistently demonstrated increased and sustained gains across all target sounds. Following her findings on the importance of dose and frequency versus the length of service time, Julie further compared individual student data by number of trials on target sounds within a session and across the week. All students targeted two sounds per session. The Quick Articulation! students' production dose was 50–70 word-level trials on each target per session, for three sessions per week. Students in groups produced 25–30 word-level trials on each target per session for 25+ productions on each target twice per week, a notably smaller treatment dose. The Quick Articulation! students produced three times as many attempts than their IEP peers. Julie attributed the high number of trials per session (dose) and the number of sessions per week (frequency) as the largest factors in the rate of improvement difference between the two groups of students. Using the Quick Articulation!

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

service model would allow all students working on speech sounds to achieve 50+ productions per target per session while receiving an additional session per week. Julie's data review aligned with the research she read about dose and frequency. Therefore, reducing the number of minutes of services will not negatively affect progress as long as dose and frequency are at recommended levels.

Finally, Julie needed to consider how the severity of the speech disorder impacted her decision-making. Julie decided to apply the findings of the Williams (2012) study by eliciting at least 70 trials per session for children with severe SSD and at least 50 trials per session for children with moderate SSD. In addition, some of the children on Julie's caseload had concomitant speech and language impairments. The service delivery for these children is typically three times a week for 30 minutes a session. For these children, Julie would provide SSD services using the Quick Articulation! model with an additional 30-minute language group once a week. She will keep data to evaluate whether the Quick Articulation! and weekly language group is sufficient to meet the students' needs.

After considering the evidence from the research combined with analysis of her data and clinical judgment, Julie will recommend the Quick Articulation! service delivery approach for all students with SSD to the administration. This approach will include seeing children three times a week at a dose of at least 50 trials per session for students with a moderate SSD and at least 75 trials per session for students with a severe SSD. Additional sessions to address language concerns for students with both SSD and a language impairment will be scheduled to ensure each student receives an IEP. Although the number of times children will be pulled from class will increase, their total time out of the classroom will decrease, resulting in less classroom disruption. With this approach, Julie will see each child individually multiple times a week, with a primary focus on trial target rather than strictly a time target. Additionally, Julie will adjust her clinical practice if future studies have compelling evidence for her to adjust the treatment dose or frequency.

Authors' Note

Elizabeth Roepke is a PhD student in speech, language, and hearing sciences at Purdue University studying speech sound disorders in children.

Tamar Greenwell is a clinical assistant professor in the Department of Speech, Language, and Hearing Sciences at Purdue University. Her clinical practice and education is in the identification, evaluation, and clinical management of speech and language disorders in school-age children.

Françoise Brosseau-Lapré is an assistant professor in the Department of Speech, Language, and Hearing Sciences at Purdue University. Her research and teaching focus on speech sound disorders in children and how speech perception impacts speech production and interacts with language factors in these children.

Corresponding author:
Françoise Brosseau-Lapré
fbrossea@purdue.edu
Purdue University, Lyles-Porter Hall
715 Clinic Drive
West Lafayette, IN 47906

References

Allen, M. M. (2013). Intervention efficacy and intensity for children with speech sound disorder. *Journal of Speech, Language, and Hearing Research, 56*(3), 865–877. doi:10.1044/1092-4388(2012/11-0076)

American Speech-Language-Hearing Association. (2004). *Evidence-based practice in communication disorders: An introduction.* Retrieved from https://www.asha.org/policy/TR2004-00001/

American Speech-Language-Hearing Association. (2011). *National outcomes measurement system: Pre-kindergarten national data report 2011.* Rockville, MD: National Center for Evidence-Based Practice in Communication Disorders.

Brandel, J., & Loeb, D. F. (2011). Program intensity and service delivery models in the schools: SLP survey results. *Language, Speech, and Hearing Services in Schools, 42*(4), 461–490. doi:10.1044/0161-1461(2011/10-0019

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

Centre for Evidence-Based Medicine. (2009). *Oxford centre for evidence-based medicine: Levels of evidence.* Retrieved from https://www.cebm.net/2009/06/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/

Dodd, B., Holm, A., Crosbie, S., & McIntosh, B. (2006). A core vocabulary approach for management of inconsistent speech disorder. *Advances in Speech-Language Pathology, 8*(3), 220–230. doi:10.1080/14417040600738177

Dollaghan, C. A. (2007). *The handbook for evidence-based practice in communication disorders.* Baltimore, MD: Paul H. Brookes.

Goldman, R., & Fristoe, M. (2000). *Goldman Fristoe Test of Articulation* (2nd ed.). Circle Pines, MN: American Guidance Service.

Hegarty, N., Titterington, J., McLeod, S., & Taggart, L. (2018). Intervention for children with phonological impairment: Knowledge, practices and intervention intensity in the UK. *International Journal of Language & Communication Disorders, 53*(5), 995–1006. doi:10.1111/1460-6984.12416

Individuals with Disabilities Education Improvement Act of 2004 (IDEA Reauthorized), Pub. L. No. 108-446, U.S.C.A. 118 et seq. Stat. 2647 (2004).

Lundeborg Hammarström, I., Svensson, R.-M., & Myrberg, K. (2018). 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. *Clinical Linguistics & Phonetics, 33*(9), 518–531. doi:10.1080/02699206.2018.1552990

Nissen, S. L., Peris, M. E., & Tanner, K. (2017). An intensive boot camp approach to the remediation of speech sound disorders: A case report. *Speech, Language and Hearing, 22*(2), 51–60. doi:10.1080/205057 1X.2017.1376495

Sugden, E., Baker, E., Munro, N., Williams, A. L., & Trivette, C. M. (2018). Service delivery and intervention intensity for phonology-based speech sound disorders. *International Journal of Language & Communication Disorders, 53*(4), 718–734. doi:10.1111/1460-6984.12399

Warren, S. F., Fey, M. E., & Yoder, P. J. (2007). Differential treatment intensity research: A missing link to creating optimally effective communication interventions. *Mental Retardation and Developmental Disabilities Research Reviews, 13*(1), 70–77. doi:10.1002/mrdd.20139

Williams, A. L. (2002). *Speech disorders research guide for preschool children.* Clifton Park, NY: Cengage Learning.

Williams, A. L. (2010). Multiple oppositions intervention. In A. L. Williams, S. McLeod, & R. J. McCauley (Eds.), *Interventions for speech sound disorders in children* (pp. 73–94). Baltimore, MD: Paul H. Brookes.

Williams, A. L. (2012). Intensity in phonological intervention: Is there a prescribed amount? *International Journal of Speech-Language Pathology, 14*(5), 456–461. doi:10.3109/17549507.2012.688866

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

Table 1. Selected Research Articles

Study	Oxford CEBM hierarchy of evidence	Participants	Intensity	Therapy approach	Relevant findings
Sugden, Baker, Munro, Williams, & Trivette, 2018	1a/3a	206 studies published between 1979 and 2016	2–3 sessions/week; 30–60 minutes/session; 77 trials/session	Multiple	Published studies use individual therapy at high intensity, in contrast to much clinical practice
Allen, 2013	1b	54 preschool children with SSD	3 conditions: (1) Therapy 3x/week for 8 weeks, (2) Therapy 1x/week for 24 weeks, (3) Control storybook intervention	Multiple oppositions (Williams, 2010)	Children who received therapy 3x/week made significantly greater gains than those receiving therapy 1x/week or the control group
Williams, 2012	3a	22 children ages 3:7–6:6 (Study 1: $N = 14$, Study 2: $N = 4$, Study 3: $N = 4$)	Varied across participants	Three studies: (1) Multiple oppositions, (2) Multiple oppositions and minimal pairs, (3) Computer-based intervention and traditional tabletop intervention with minimal pairs	The most effective intensity for children with severe SSD is at least 70 trials per session across at least 40 sessions, though gains were noted for moderate SSD with 50 trials per session across 30 sessions.
Nissen, Peris, & Tanner, 2017	4	Single case study, 8-year-old male	"Boot camp": 5.5 hours a day for 2 consecutive days	Traditional articulation hierarchy; target: interdental /s/	Production accuracy of target phoneme improved immediately, and gains were generally maintained at 1 week post-therapy
Lundeborg Hammarström, Svensson, & Myrberg, 2018	4	Single case study, male age 4:10	4 days/week for 3 weeks, then 7-week break, then 4 days/week for 3 weeks; target words were each elicited 30 times per session	Motor learning principles with targets selected from nonlinear analysis and core vocabulary	Improvements in CV word shape match and PCC after intervention

EBP Briefs Volume 14, Issue 2
November 2019

Service Delivery for Children With Speech Sound Disorders:
Evidence for the Quick Articulation! Model

Literature Search

Databases: Scopus, ASHAWire, PubMed, Google Scholar

Search terms: speech sound disorder AND service delivery, school-age, intervention intensity, individual OR group

13 articles returned → **Read titles and abstracts**

9 articles related to PICO question →

Apply exclusion criteria

Exclude expert opinion

Exclude survey data of clinical practice

Exclude motor speech diagnoses (CAS, Down syndrome)

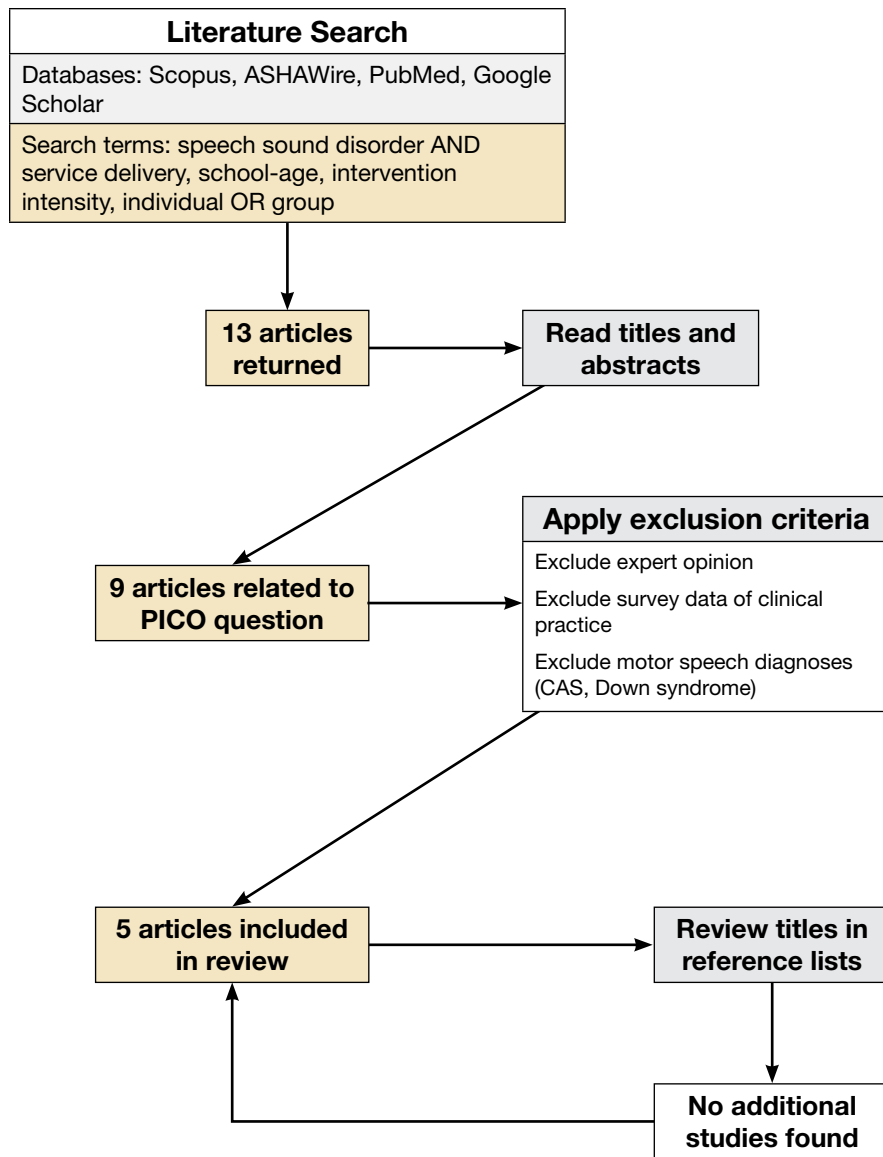**5 articles included in review** → **Review titles in reference lists**

No additional studies found

Figure 1. Process to Select Relevant Research