Project PAIR: Parent-enhanced Articulation Intervention with Recast

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1.0 Background

Speech production plays a crucial role in the successful integration of deaf and hard of hearing (DHH) children into inclusive educational settings. Age-appropriate speech production skills, as well as good speech intelligibility, are recognized as vital factors contributing to their success in these environments (Ertmer, 2011). However, despite the documented importance of speech production skills in DHH children, there is limited contemporary evidence in this area. Many studies examining speech production in DHH children date back to the mid-1980s or earlier (Eriks-Brophy et al., 2013; Ertmer, 2011). At that time, hearing technology was far less advanced, and current standards for early identification and intervention were not yet established. There have been relatively few recent studies exploring the articulation abilities of DHH children and even fewer that investigate the effectiveness of interventions within this population.

2.0 Rationale and Specific Aims

Auditory Verbal Therapy (AVT) is an approach that prioritizes the use of hearing technology to facilitate speech and language development, with auditory input as the primary sensory modality. AVT service providers adhere to a set of principles that emphasize audiological management, early intervention, and extensive caregiver education and coaching. Caregivers receive training in various strategies aimed at enhancing listening and spoken language within the home. One such strategy is recast, where an adult promptly repeats a child's utterance in a corrected form, ensuring message fidelity while incorporating proper grammar and articulation. Recast can effectively target both grammatical structures (e.g., transforming "him break my toy" into "he broke your toy") and articulation (e.g., modifying "ah lie da" to "you like dogs"). Recast in the context of articulation, termed Broad Target Speech Recasts (BTSR) (Camarata et al., 2006; Yoder et al., 2005) has been well documented to improve speech sound production in various clinical populations (Yoder et al., 2018). However, it remains largely unexplored in the DHH population, particularly as a parent-implemented tool.

Caregivers trained through AVT are typically equipped with the skills to implement recast at home from the initial stages of early intervention. However, despite consistent implementation of this practice, some children continue to exhibit residual articulation errors that persist into the elementary school years. For these children, additional intervention beyond parent-implemented recast therapy may be warranted. Traditional interventions administered by a speech-language pathologist, which involve techniques like placement cues and drill, may offer a more effective and efficient approach to remediate these persistent sound errors.

This study aims to explore the effectiveness of parent-implemented recast therapy supplemented with traditional clinician-led articulation therapy on speech production in elementary-aged DHH children. To address these objectives, the following research questions will be investigated: (1) Does drill-based articulation therapy, administered by a speech-language pathologist, improve speech sound production in DHH children when parent-implemented BTSR is concurrently utilized at home? (2) Does the combination of parent-implemented recast and clinician-led traditional articulation therapy result in maintained speech sound accuracy post-intervention?

3.0 Inclusion/Exclusion Criteria

Inclusion and Exclusion Criteria for Target Participants

Inclusion Criteria	Exclusion Criteria
Age 4;0–9;11	Motor speech disorder (e.g., childhood apraxia of speech)
Permanent, prelingual sensorineural hearing loss	Oral structural functional disorder (e.g., cleft palate)
Uses spoken English as their primary home language (≥ 51% of the time)	Diagnosis of autism spectrum disorder
Standard score ≥ 70 on the TONI-4 or PTONI (age dependent)	Diagnosis of ADHD
Standard score ≥ 60 on the OWLS-II Listening Comprehension	Uncorrected vision impairment (i.e., identified vision loss without the use of corrective lenses)
At least two speech sound errors appropriate to target based on speech norms and general stimulability	

Note. Test of Nonverbal Intelligence, Fourth Edition, Third Edition (Brown et al., 2010), Primary Test of Nonverbal Intelligence (Ehrler & McGhee, 2008), Oral and Written Language Scales, Second Edition (OWLS-II; Carrow-Woodfolk, 2011)

4.0 Enrollment/Randomization

Participants will be recruited from the Mama Lere Hearing School at Vanderbilt (including past graduates within the age range), the Pediatric Speech-Language Pathology Clinic at Vanderbilt Bill Wilkerson Center, local schools, and local clinics, as well as through out-of-state speech-language pathologists / teachers of the deaf with pre-existing connections to our lab. These professionals are expected to be known by the VUMC study team members through shared professional activities. The individuals at the local schools, local clinics, and private therapy centers are not participating in research activities. Instead, they are being offered an opportunity to share recruitment information with potential participants.

We will also recruit with study flyers that contain a QR code that links to more information about the study and the consent form. The results enable the research team to determine if the child may be eligible for the study and to contact the child's family. Parents of prospective participants can then be sent study packets and/or schedule an eligibility session.

5.0 Study Procedures

All behavior assessment procedures are conducted by trained members of the CLIMB lab to include principal investigator Meganne Muir, M.A. and Jena McDaniel, Ph.D. The behavioral assessments will be audio and/or video recorded.

1. ***Inquiry from potential participant***
2. ***Consent***

Caregivers will sign consent form via Redcap form. Children will participate in assent process. Children will then complete a language assessment (OWLS-II), speech assessment (GFTA-3), nonverbal intelligence assessment (TONI-4 or PTONI depending on age), and an oral mechanism and motor speech screening using the Oral-Facial Examination Form (Shipley & McAfee, 2004) and a sequential motion rate (SMR) task (e.g., "pataka"). The child is asked to be seated in quiet location. The child's caregiver may be in the room with the child but may not assist with test questions.

3. ***Baseline, Intervention, and Generalization Conditions***

Data collection and intervention for all conditions will take place in person or virtually. Children's caregivers are permitted to be in the room with the child but are asked to not provide any assistance during intervention or assessment.

All children will initially participate in at least 3 baseline sessions, with one administration of the primary probe per session with the purpose of establishing stable baseline performance (minimal change, low accuracy). After 3-10 sessions, assuming stable baseline for the primary probe, children will enter intervention (i.e., staggered). The study's design is nonconcurrent, so the rate at which they enter intervention will depend on their time of enrollment. Children who remain in the baseline phase will complete the primary probe one time per week to verify continued baseline level performance. Each child will enter intervention after the child who entered intervention immediately prior demonstrates a treatment effect (i.e., consistent change in dependent variable). The first connected speech sample will be collected during this phase.

After the baseline phase is completed, recast parent training will commence, consisting of two 30–60-minute sessions. Each session will involve at least one parent, their child, and the interventionist. Training sessions will include general instruction on recast and parent practice with active coaching from the examiner.

Immediately following the completion of the second training session, the first intervention phase will begin. Parents will be expected to implement recast with their child within the natural environment during interactions throughout the day. Text messages will be sent to parents three times per week to serve both as reminders to continue using the strategy and as an opportunity to monitor compliance. Attached to these texts will be a survey asking the parent to rate their use of recast the previous day. Additionally, parents will be asked to send 5-10 minute video clips weekly to demonstrate their use of recast while doing an activity with their child. These can be collected on the parent's own smartphone at any time throughout the week. Parents will be sent a link to a participant-specific OneDrive folder via text that allows them to upload the video file. After the parent has uploaded the video, we will immediately transfer it to a location on OneDrive where only approved members of the research team have access.

Data collection of the child's performance throughout this phase will follow the same structure as the probe in the baseline phase. Data will be collected intermittently (approximately once per week) according to the multiple probe across participants design. The second connected speech sample will be collected at the last session within this phase.

When a child enters the clinician-implemented speech therapy phase, he or she will participate in 2-3 intervention sessions each week (approximately 30-45 minutes per session) in person or via a secure video conferencing platform. Sessions will be scheduled to meet family/school schedules. In each intervention session, the child will produce target words as they appear on flashcards. Feedback will be given for each production, and participants will be encouraged to reattempt words produced in error while integrating the clinician's feedback. The probe will be administered at the outset (10 minutes) of each session.

When intervention criteria have been reached or 6 weeks of no progress / regression, children will participate in a post-assessment session that includes the Goldman Fristoe, Third Edition as well as the final connected speech sample.

6.0 Reporting of Adverse Events or Unanticipated Problems involving Risk to Participants or Others

Adverse events will be reported to the IRB within 48 hours of the event. Any adverse event of a critical nature will be reported within 24 hours. The lab member will write up a summary of the problem and email it to the PI and to the IRB, followed with a phone call to the IRB.

7.0 Study Withdrawal/Discontinuation

The child's parent can request that the child would like to be withdrawn from the study verbally or in writing (e.g., email). We will use any data we have collected up until that point unless the parent requests that we do not use the data.

Children will also be removed from the study if they do not assent or if they show dissenting behaviors. Dissenting behaviors include crying, tantrums, refusal to talk with examiner, and/or stating that they do not want to participate.

8.0 Statistical Considerations

The researcher will continuously graph collected data. The researcher will use ongoing visual analysis of data to make data-based decisions and determine presence or absence of functional relations, as is the gold standard for single case research design. Data will be visually analyzed within tiers and across participants for trend, variability, consistency, overlap between data points across conditions, immediacy of change upon introduction of intervention, and level. Vertical analysis will be used to establish functional relations. At least three replications of effect of effect across tiers is necessary to demonstrate a relation. Experimental control will be established when introduction of intervention in one tier does not change performance data in other tiers. Upon introduction of the intervention, data are expected to remain similar to baseline, with a potential small increase in level noted immediately. It is expected that data will

demonstrate a slow but steady increase in trend before demonstrating a clear increase in level.

9.0 Privacy/Confidentiality Issues

To protect the privacy of individuals, each participant will be assigned a randomly generated five-digit code. The master list of codes will be stored on an encrypted spreadsheet stored on a Vanderbilt University Medical Center (VUMC) password protected and encrypted server. The research codes and spreadsheet are seen only by the project research staff.

Consent forms are stored in a locked storage room in VUMC (currently MCE 10222). All consent forms are maintained in a file folder labeled with IRB number. A log of consent forms is placed at the top of all consent forms and lists the date the consent was signed, who entered the consent on the log, the participant's name, and the participant's date of birth. This log is used for the IRB annual review. When the study is completed, the consent log and the consent documents will be destroyed.

The participant consent process may be conducted using a Redcap-based electronic consent form. The consent form has been developed in Redcap, a secure, web-based, HIPAA-compliant, data collection platform with a user management system allowing project owners to grant and control varying levels of access to data collection instruments and data (e.g. read only, de-identified-only data views) for other users.

Potential participants will participate in the consent process by: (1) Being approached in-person by a member of the key study personnel in an educational setting and accessing the Redcap survey via iPad or other portable electronic device and/or (2) Self-initiated access of consent forms on personal portable electronic devices using posted QR codes or weblinks on study posters, brochures, or websites. Self-initiated accessing of consent forms may occur in an educational setting or at home. During the in-person consent process, participants will be consented by a member of the key study personnel. A parent or legally authorized representative will provide consent. For self-initiated consent, contact information will be provided (email and phone) for parents or legally authorized representative of potential participants to contact a member of the key study personnel with questions, prior to consent.

10.0 Follow-up and Record Retention

This study is expected to run approximately 3 months. Records will be maintained in paper version in a locked filing cabinet, in a locked room on the 10th floor of the Vanderbilt Bill Wilkerson Center, to which Dr. McDaniel holds the keys. Electronic records will be maintained in a password protected Vanderbilt Box file, to which only lab members listed as KSP on the study will have access to. Data will be deidentified and kept indefinitely, unless someone requests their information be deleted, at which time all records associated with that code will be deleted.