

***Online assessment and enhancement of auditory perception for speech sound errors  
(SCED)***

***Protocol NCT04858035***

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## PROTOCOL: STUDY 3

### Establish the efficacy of online perceptual training for children with RSE and atypical perception

#### OBJECTIVE:

Evaluate whether online perceptual training improves perception and production of /r/ in children with Residual Speech Errors (RSE) who have atypical perceptual acuity, as identified by our lab-based classification norms.

#### Participants

- **Sample:** 10 children with RSE affecting /r/
- **Age range:** 9;0–15;11 years, native English speakers

#### Eligibility

##### Residual Speech Errors (RSE):

Must have persistent speech errors specifically affecting the English rhotic /r/ sound.

- **Perceptual Classification:**  
Must be classified as having *atypical perception* based on a laboratory-developed classification model applied to standardized perception tasks.
- **Language Background:**  
Native speakers of English.
- **Cognitive and Language Proficiency:**  
Must demonstrate adequate nonverbal cognitive and language skills as assessed by standardized tests, including:
  - **Goldman-Fristoe Test of Articulation—Third Edition (GFTA-3):** Assesses articulation of speech sounds.
  - **Clinical Evaluation of Language Fundamentals—Fifth Edition (CELF-5), Recalling Sentences (RS) and Formulated Sentences (FS) subtests:** Evaluates expressive and receptive language functioning, focusing on sentence recall and formulation.
  - **LinguiSystems Articulation Test (LAT):** Measures production of specific speech sounds.

- **Sentence Repetition Task (SRT):** Assesses verbal memory and grammatical processing through sentence repetition.

- **Hearing Screening:**

Must pass an online pure-tone hearing screening at frequencies 1000 Hz, 2000 Hz, and 6000 Hz, at 30 dB intensity.

- **Medical History:**

Must not have a history of major neurobehavioral disorders or developmental disabilities.

- **DESIGN AND PROCEDURES**

- **Design:** Multiple-baseline across-subjects design; participants randomly assigned to varying baseline durations (4–10 sessions).
- **Phases:**
  - **Baseline:** Perception and production of /r/ are probed repeatedly without intervention.
  - **Treatment:** All participants complete 12 sessions of online perceptual training (3x/week, 4 weeks).
  - **Maintenance:** Post-treatment, perception and production are monitored for 3 sessions; no further training.

### **Assessment Measures:**

- **Perception:**
  - Online identification and category goodness judgment tasks
  - For ongoing assessment, 75 items are randomly drawn (with proper balance and difficulty stratification) to avoid item memorization
- **Production:**
  - Standardized word probes
  - Perceptual ratings are obtained from blinded online listeners

### **Perception Training (Treatment Phase)**

- **12 sessions** (30 minutes each, over 4 weeks; mostly self-administered online)

- **Task 1:** Focused perceptual training in a specific /r/ context with feedback; difficulty increases with improved accuracy.
- **Task 2:** Identification of items along a synthetic rake-wake continuum with feedback based on typical listener norms.
- **Task 3:** Broad perceptual training with a randomized set of items across all /r/ contexts and difficulties, with feedback.
- **Clinician Monitoring:** A study clinician virtually attends one session per participant each week to ensure engagement.

### **Summary Statement:**

This study will rigorously test whether online perceptual training leads to measurable improvements in both perception and production of /r/ in children with RSE and atypical perception, using a robust, randomized multiple-baseline design and blinded standardized outcome measures.