# Training perception in childhood apraxia of speech

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## BACKGROUND

➢ For Children with phonological disorders, training perception
- has included bombardment [1], auditory discrimination in another's production [2], and auditory discrimination in one's own production [3]
- has preceded or occurred concurrent with production training [1, 5]
- appears to be beneficial only for some children [2] and possibly only for children who have presumed weak underlying representations for resulting for fluctuations in hearing associated with recurrent otitis media with effusion [6]

➢ For children diagnosed with childhood apraxia, training in perception has typically not been included in treatment. Some researchers have identified perceptual issues [7,8] but have not addressed perception training.
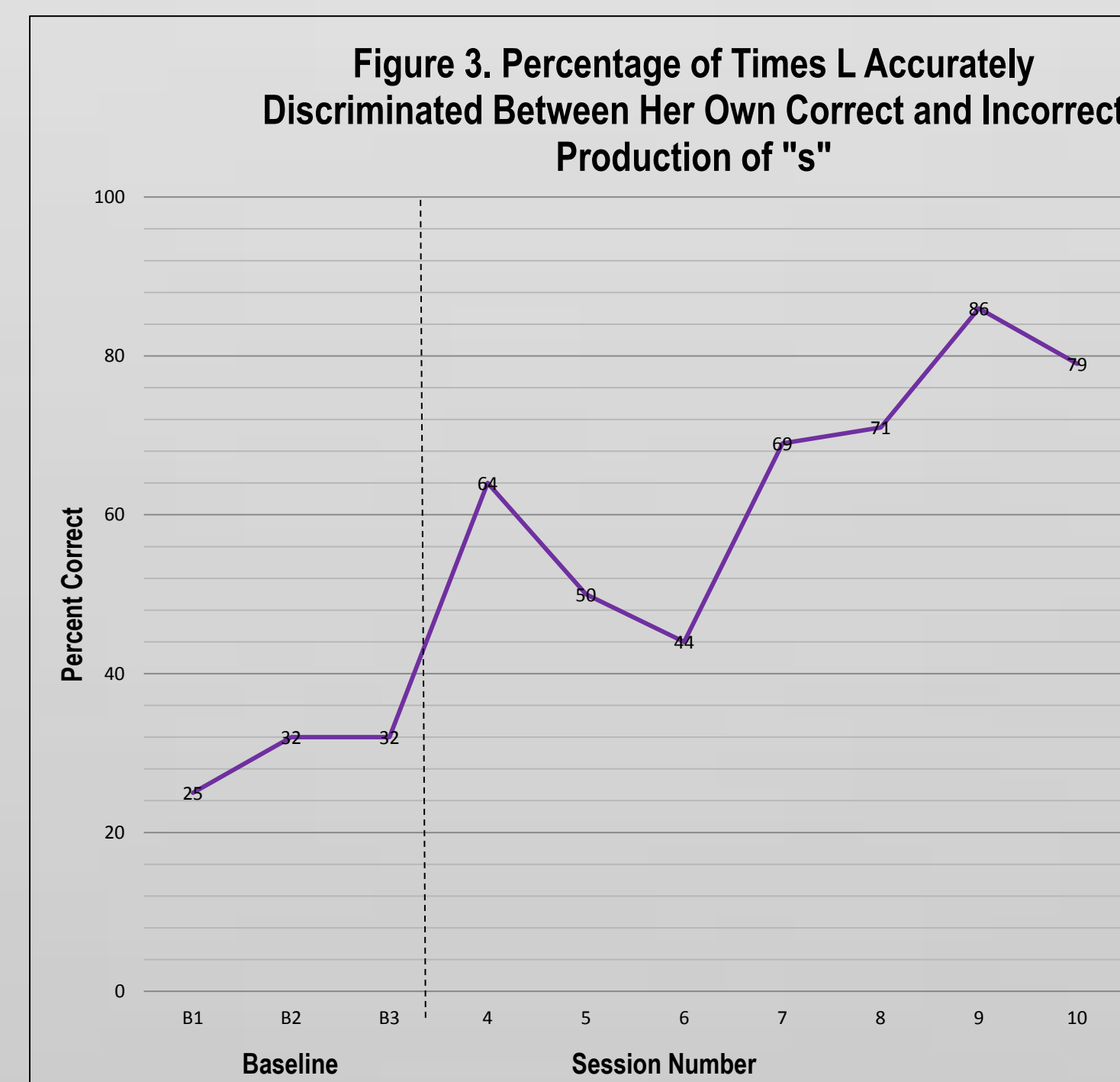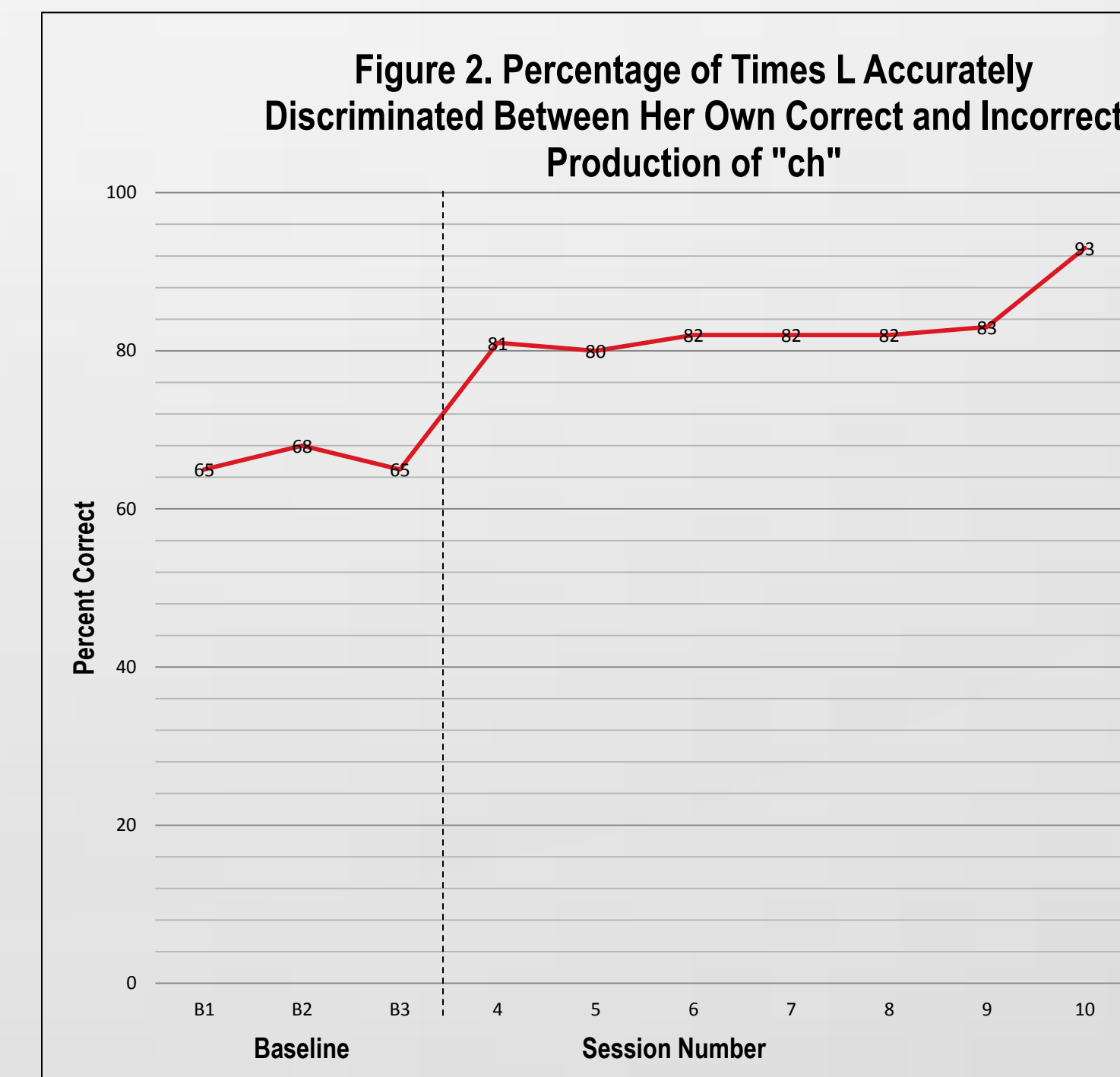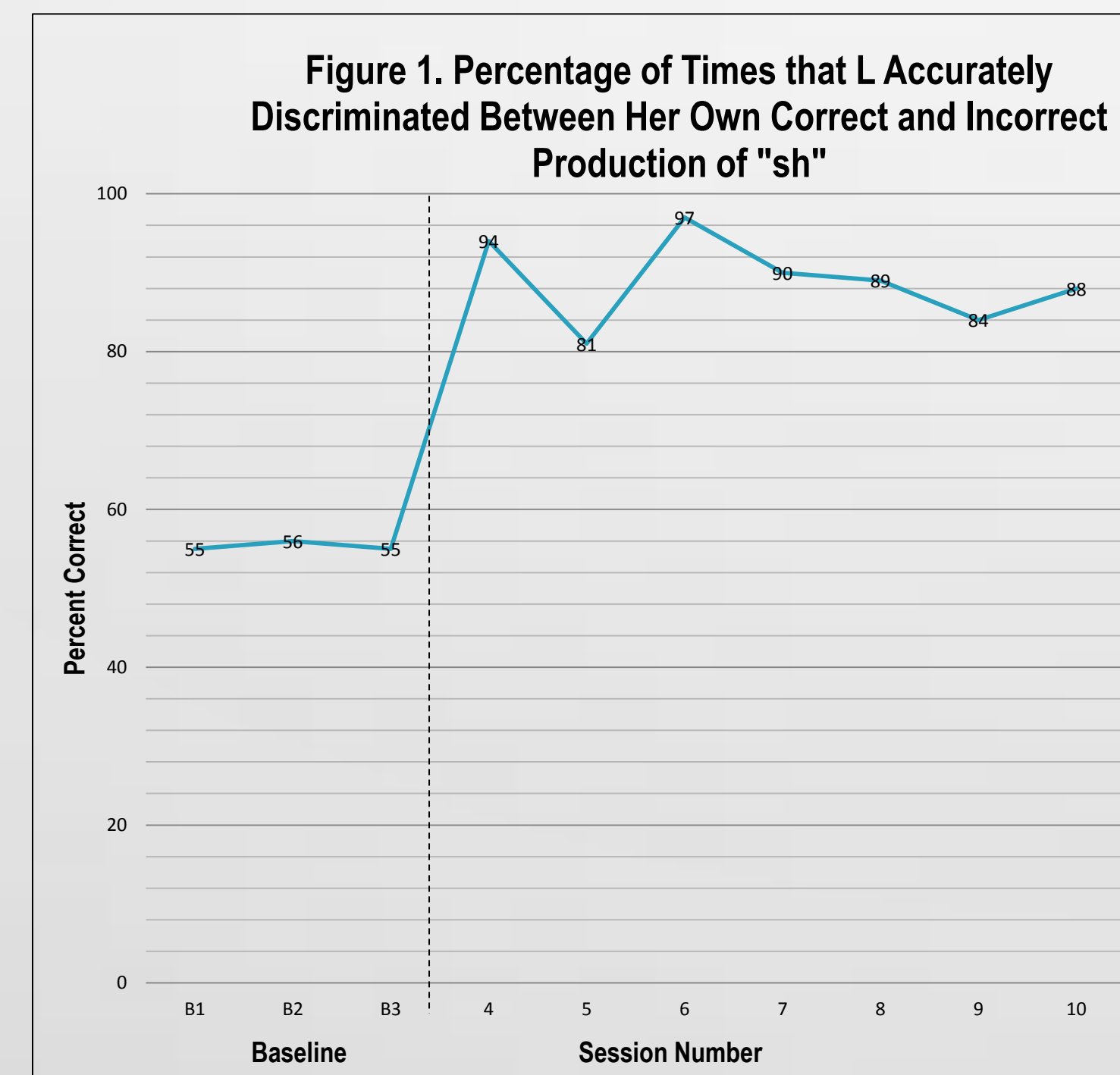
## METHODS AND PROCEDURES

*Participant*
➢ L's history prior to age 12;3 when she moved to Madison, WI
- Diagnosed with apraxia of speech; diagnostic criteria not provided
- Slow, but steady gains in receptive/expressive language and phonology in response to speech/language therapy during early childhood
- Slow, but steady gains in reading comprehension and decoding
- Unsuccessful treatment for lateral distortion of sibilants because of difficulties manipulating tongue placement
- Received occupational and physical therapy between ages 2 and 12 focusing on motor planning, postural stability, and bilateral integration

➢ L's history between 12;3 and 14;11
- Diagnosis of apraxia of speech was not confirmed through established nosological criteria.  L did demonstrate 6 of the top 11 criteria reported by 75 speech language pathologists when asked to identify three characteristics necessary for a diagnosis of developmental apraxia of speech [9]; these included:
  o Inconsistent production of speech sounds
  o General oral motor difficulties
  o Groping
  o Difficulty with voluntary speech movements
  o Slow progress in therapy
- Received speech therapy through the public schools and in a university clinic during each academic year
- Primary focus of treatment:  resolving a lateral distortion of sibilants using a variety of production strategies and working to train articulatory placement
  o Performance during treatment consisted of repeated improvement and regression cycles, both within and between treatment semesters
  o By 14;11 errors on sibilants had changed from lateral distortions to sometimes fronted, often whistled, and sometimes backed distortions
  o Relatively more success on voiceless versus voiced sibilants when production training focused on a set of five words per target and on the following specific behaviors:
    - For 'sh' – keep teeth closed, round tongue in mouth, keep tongue back in mouth, relax jaw
    - For 'ch' - keep teeth closed, round your lips, keep tongue in mouth, relax jaw
    - For 's'- keep teeth closed, make long "t" sound, keep tongue in mouth, smile, relax jaw, keep tongue up and behind front teeth

➢ L's history between 15;3 and 15;7, the period of the current study
- Continued speech therapy through the public schools and in a university clinic
- Production training continued to focus on specific behaviors for 'sh', 'ch' and 's'
- Perception training was added (see Procedures for details), only at the university clinic

*Perception-Production Training Approach*
➢ Practice Level: keyword with same word targeted repeatedly in the context of a meaningful activity to communicate a need or desire (e.g., To obtain pieces of playdough during a sculpturing activity, the clinician asks, "what do you want?"  The child responds, "some" and then acquires playdough; target different keywords in each session).

➢ Practice sequence for each keyword
- Perception  Task 1: child discriminates between target sound and errors in clinician's production during first few trials in the context of a meaningful activity. When the clinician's production is correct, child says "that's it"  and  the child or both the child and clinician briefly engage in the keyword activity;  each time the clinician's production is incorrect, the child instructs the clinician to "try again."

- Production Task: child attempts to produce target; clinician responds with  "that's it" or "try again" as appropriate. Clinician returns to perception task when child is not being successful, after which the clinician shifts between sets of perception and production trials as needed to minimize the child's production errors. Each time the child's production is correct, the child briefly engages in the keyword activity.

- Perception Task 2: child attempts to produce target and self-evaluate her production in terms of "that's it" or "try again."  Clinician confirms child's correct production/perception response and the child briefly engages in the keyword activity. When child recognizes that her production is incorrect, she indicates she will "try again."  When child does not recognize that her production is incorrect, the clinician returns to Perception Task 1, and then resumes Perception Task 2.

## RESULTS AND DISCUSSION

➢ See Figures 1, 2, and 3, for increases in the percentage of time L accurately discriminated between  her own correct and incorrect production of the voiceless sibilants over the course of the treatment period; data for each session are based on 20 attempts for each target.
- The immediate increase in the frequency  of accurate discrimination when perception training was added suggests that L had the ability to discriminate, but was not doing so because of focusing only on what she was doing to try to produce a target rather than also focusing on how her production sounded
- While her ability to discriminate fluctuated from session to session, her performance never returned to baseline levels
- Fluctuation in performance was associated with variations in energy level and attention to the task from session to session



Figure 1. Percentage of Times that L Accurately Discriminated Between Her Own Correct and Incorrect Production of "sh"



Figure 2. Percentage of Times L Accurately Discriminated Between Her Own Correct and Incorrect Production of "ch"



Figure 3. Percentage of Times L Accurately Discriminated Between Her Own Correct and Incorrect Production of "s"

➢ See Figure 4 for increases in the percentage of time L accurately produced each of the voiceless sibilants over the course of the treatment period; data for each session are based on 20 attempts for each target.
- There was an immediate increase in the frequency of correct production of all targets during structured treatment tasks following inclusion of perception training
- Frequency of correct production steadily increased over the course of treatment, with 's' continuing to be L's most challenging target
- In spite of improvements in performance during treatment tasks, L had not begun to generalize correct production to spontaneous conversational speech by the end of the treatment period



Figure 4. Percentage of Times L Accurately Produced a Target
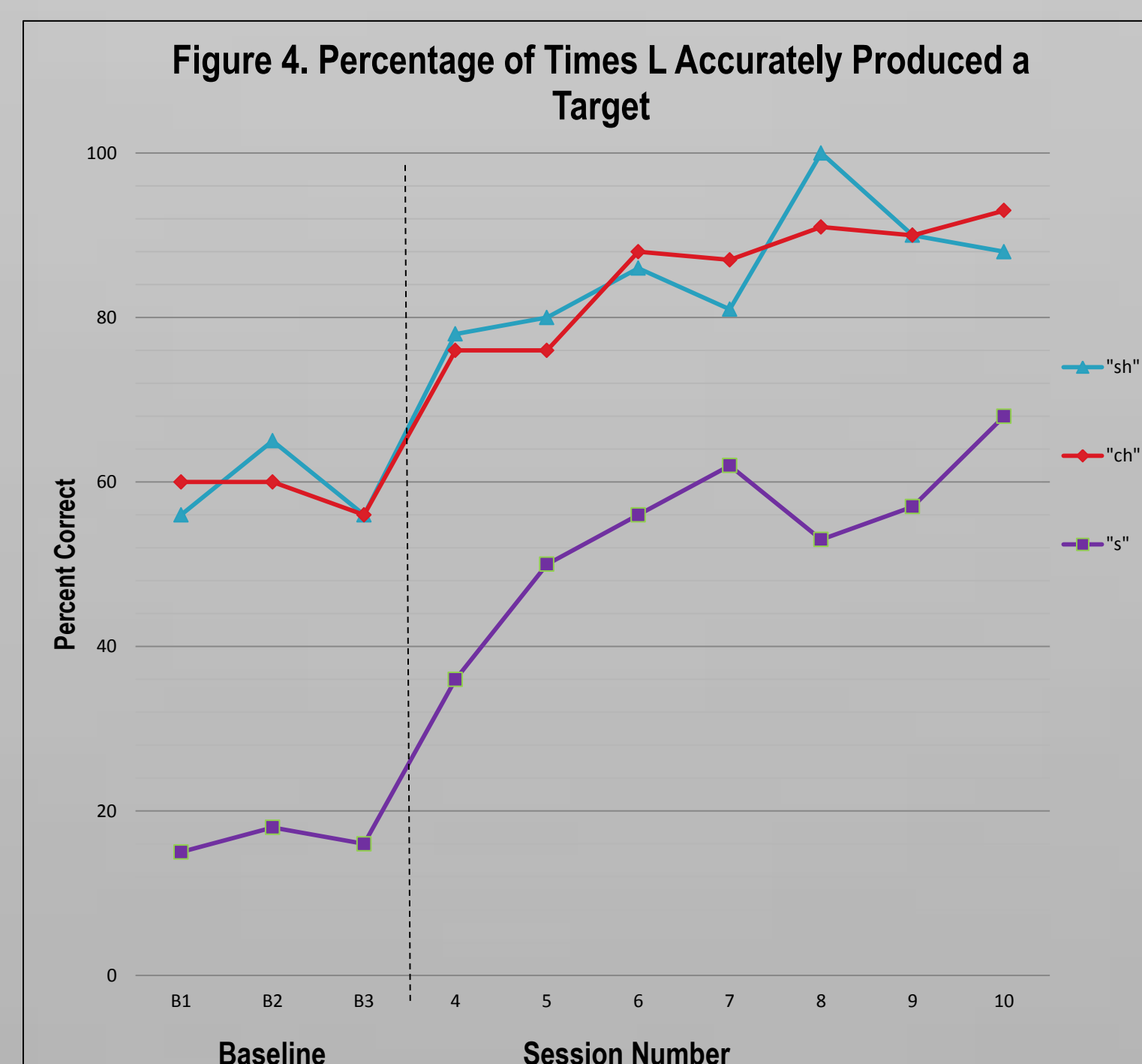
## RESULTS AND DISCUSSION CONTINUED

➢ See Table 1 for qualitative behavioral changes during treatment tasks following the  inclusion of  perception training in comparison to prior to perception training
- Almost immediate change was noted in L's confidence level during treatment tasks and in her willingness to "try again" to modify her production following an error
- Gradual changes were noted in L's ability to attend to how her production attempts sounded in addition to her articulatory placement, to recognize what she was/was not doing with her tongue, to modify and maintain the same tongue placement, and to independently identify and self-correct errors

## CLINICAL IMPLICATIONS

➢ Whether or not a child has a diagnosis of apraxia of speech, when there are significant speech issues and slow progress, consider the addition of perceptual training to support production training:
- It appears that perception training can facilitate the development of behaviors that support speech change (see Table 1)
- How perception training is structured to interface with production training may be critical;
  o Rotating between perception and production trials reduces the frequency of the child's incorrect productions and avoids frustration.
  o Using the words "try again" to respond to errors puts the focus on trying to achieve correct production which the child knows she is capable of, rather than putting the focus on the failure to achieve correct production.

Table 1. Comparison of L's behavior prior to and following  the inclusion of perception training

**Behavioral characteristics *prior* to perception training**

- Exhibited a lack of confidence and self-doubt as evident in her slumped posture and inappropriately soft, high pitched, and weak sounding speaking register

- Focused solely on articulatory placement  when attempting to produce a target sound

- Able to intentionally  change her tongue placement but was unable to immediately repeat the same production

- Unable  to identify where in her mouth her tongue was in terms of placement

- Easily discouraged and frustrated after each unsuccessful  attempt to produce a target . Resisted trying to modify correct responses to produce them in a natural way

- Required clinician feedback for each production attempt to know if she was or was not correct

**Behavioral characteristics *following* inclusion of  perception training**

- Comfortable and confident as evident in her upright posture and appropriate loudness, pitch, and speaking register.

- In addition to articulatory placement, she was focusing on what her production attempts sounded like.  In addition, she was developing an internal referent for correct production which initially was not always consistent with the clinician's referent but became closer as treatment progressed

- Able to change her tongue placement and repeat the same production at least once

- Able to identify  if her tongue was behind her teeth or between her teeth

- Immediately willing to "try again"  following each unsuccessful attempt to produce a target and was more receptive to working on producing targets in a more  natural way in terms of rate and intonation

- Began independently identifying her correct productions and spontaneously self-correcting her errors

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