Integral Stimulation Deconstructed: A Treatment Efficacy Study for Childhood Apraxia of Speech

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INTRODUCTION

Childhood apraxia of speech (CAS) is a rare neurological, sensorimotor speech disorder. A child with CAS demonstrates difficulties programming, combining, and sequencing motor movements needed for speech. These deficits often translate into poor intelligibility. Errors often include prosody errors, inconsistent consonant and vowel errors and difficulty with articulatory transitions.[1] CAS is hard to treat, with a slow response to treatment frequently reported. One reason for lack of evidence of improvement may be lack of treatment efficacy data for CAS.

INTEGRAL STIMULATION

Integral stimulation therapy is a motor-based treatment that incorporates cueing strategies with cognitive motor learning principles, including specific and repeated practice of the desired motor task. Treatment guided by cognitive motor learning controls practice amount, practice conditions (blocked vs. random practice, mass vs. distributed practice), and feedback (knowledge of performance vs. knowledge of results).[2] Motor learning principles suggest the need for specific practice of target speech sounds in various contexts that mimic real life situations.

Cognitive motor learning distinguishes between motor performance and motor learning. Motor performance is the accuracy of in-session performance while motor learning is how the client transfers that knowledge or generalizes skills outside of the practice session.[3]

STATEMENT OF THE PROBLEM

A few studies have shown that integral stimulation is effective for remediating speech errors in children with CAS.[4,5,6] To date no study has explored specific components of integral stimulation to determine what practice conditions are most beneficial.

PURPOSE OF STUDY

To explore the importance of frequency of target production in integral stimulation therapy.

RESEARCH HYPOTHESIS

Speech sounds treated with a higher frequency of production would show greater in-session production accuracy (motor performance) and generalization to untrained words (motor learning) than speech sounds treated with a lower frequency of production.

METHOD

Study Design

- Single-subject, alternating A-B design
- Two variations of integral stimulation
  - Treatment A (30-40 target productions)
  - Treatment B (100-150 target productions)
- A & B treatment phases implemented in each session
- Probes administered at end of each treatment phase to determine generalization
- 3 data collection phases:
  - Baseline (3-4 sessions)
  - Treatment
    - 5 - 10 weeks in length
    - 2 or 3 times per week
  - Post-treatment (1 session)

Participants

- Two male children
  - J, age 6;2
  - F, age 3;4

Procedures

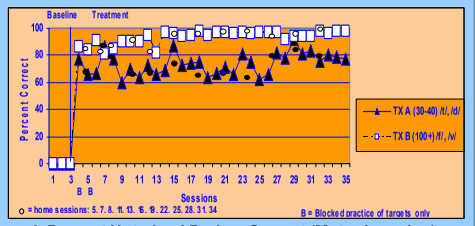
- Targeted speech sounds randomly assigned to A or B
- Speech sounds treated in 15 minute phases in randomized treatment order
- Audio & video recording

Analysis

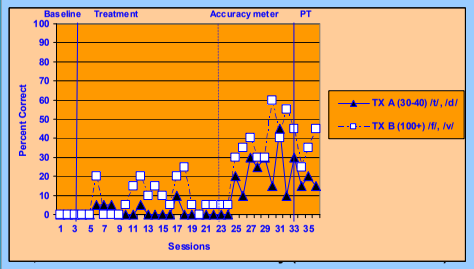
- # of correct productions tracked in each phase for each session
- Probes phonetically transcribed
- Pre- & post- speech samples compared to determine retention & generalization

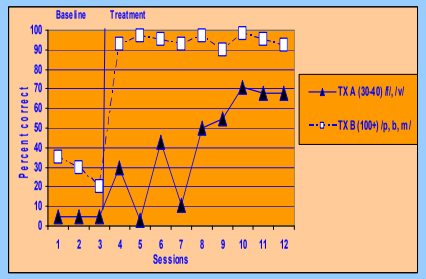
RESULTS

J, In-Session Production Accuracy (Motor Performance)

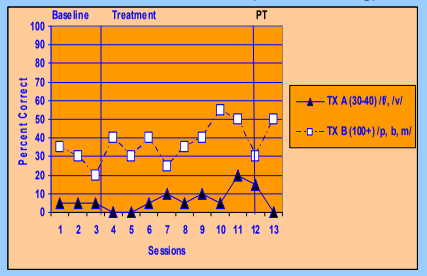


J, Percent Untrained Probes Correct (Motor Learning)





F, Percent Correct Probe Words (Motor Learning)



DISCUSSION

Integral stimulation therapy was used in both treatment types. In both Treatment A and Treatment B, integral stimulation was an effective treatment for target sounds.

Compared to Treatment A (30-40), Treatment B (100-150) targets showed:

- Higher in-session accuracy
- Greater generalization
- Higher levels of accuracy achieved in fewer sessions
- Less variability
- Better generalization to untrained words
- Better retention in post-treatment probes.

Results indicate that frequent and intense practice of speech sounds in the context of integral stimulation therapy resulted in faster acquisition of the targets, better in-session performance, and greater learning evidenced in transfer to untrained probe words for two children with moderate to severe CAS.

CONCLUSIONS

This study and previous studies show that integral stimulation is an effective treatment approach for remediating speech sound errors of children with moderate and severe CAS. While all aspects of integral stimulation are likely important for treatment success, this study highlights the importance of intense speech production to ensure treatment efficiency.

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