



Introduction

Childhood apraxia of speech (CAS) is a type of speech sound disorder (SSD) (Preston, Brick, & Landi, 2013). CAS is characterized by deficits in planning and programming movements for speech (Preston, Brick, & Landi, 2013). Many theories indicate that CAS has a neurological basis, however; the exact etiology of CAS is unknown (Preston et al., 2014).

ASHA states that there are 3 core features of CAS:

- ✓ “inconsistent errors on consonants and vowels in repeated productions of syllables or words” (Murray, McCabe, & Ballard, 2015).
- ✓ “lengthened and disrupted co-articulatory transitions between sounds and syllables” (Murray, McCabe, & Ballard, 2015).
- ✓ “inappropriate prosody, especially in the realization of lexical or phrasal stress” (Murray, McCabe, & Ballard, 2015).

Rapid Syllable Transition Treatment (ReST)

ReST uses repeated practice of polysyllabic pseudo-words with different lexical stress patterns to help children with CAS decrease difficulty in stress placement within words (Maas, Gildersleeve-Neumann, Jakielski, & Stoeckel, 2014). According to Murray, McCabe, and Ballard, ReST treatment simultaneously addresses sound accuracy, transitions between syllables, and lexical stress (2016). ReST uses reduced feedback, which in turn leads to stronger maintenance and generalization of skills learned during therapy (Thomas, McCabe, & Ballard, 2014). Both high and low dose frequencies have been studied, and results indicate that lower dose frequency, 2 days per week for 6 weeks compared to the traditionally seen 4 days per week for 3 weeks, has similar effects for acquisition and generalization (Thomas, McCabe, & Ballard, 2014). However, maintenance of skills learned during therapy, although still stable, does not improve in children given lower dose frequency therapy (Thomas, McCabe, & Ballard, 2014).

Treatment Backgrounds

There are a variety of treatments currently being studied, many of which are motor-based. Three such treatments are Rapid Syllable Transition Treatment (ReST), Nuffield Dyspraxia Programme - Third Edition (NDP3), and biofeedback treatment.

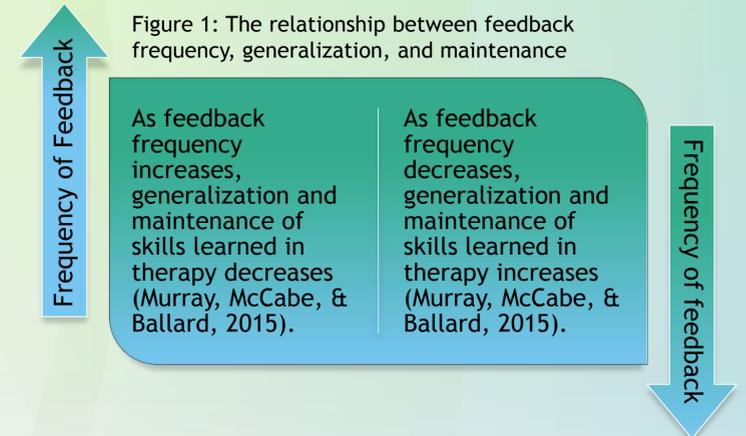
Nuffield Dyspraxia Programme - 3rd Edition (NDP3)

Contrary to the ReST approach, NDP3 begins with isolated speech sounds, and the child works towards simple syllable shapes, complex syllable shapes, sentences, and eventually connected speech (Murray, McCabe, & Ballard, 2015). This approach utilizes frequent feedback, blocked practice, and includes phonological awareness skills (Maas, Gildersleeve-Neumann, Jakielski, & Stoeckel, 2014). The use of frequent feedback results in decreased maintenance, as seen in the comparison between ReST and NDP3 (Murray, McCabe, & Ballard, 2015). However, treatment effects in terms of accuracy have shown to be stronger for NDP3 than ReST, which makes sense when considering the frequent amount of feedback given throughout the NDP3 (Murray, McCabe, & Ballard, 2015). NDP3 is generally used in conjunction with other treatment approaches for CAS, such as phonological awareness intervention (Murray, McCabe, & Ballard, 2015).

Clinical Implications

There are a multitude of treatment approaches available for treating childhood apraxia of speech, however; there is not one single treatment that has been endorsed as the “best” treatment. Age, severity, and comorbid disorders can have a great effect on whether a certain therapy is successful. What clinicians can do with the existing evidence on treatment approaches, is to evaluate each client specifically and find the best match for them in terms of treatment approach. A younger child, with a more severe case of CAS may benefit from frequent feedback and NDP3 may be the best option. An older child who relies less on feedback may be best suited for the ReST approach. A child with persistent CAS, who has participated in other therapies without much success may be a good candidate for biofeedback treatment. Additionally the amount of feedback should be evaluated based on each child’s age, severity, and overall motivation during therapy, as studies have shown that feedback has an impact on maintenance and generalization of skills learned during therapy. Ultimately, the best treatment will depend upon the specific child’s needs.

Figure 1: The relationship between feedback frequency, generalization, and maintenance



Biofeedback Treatment

Biofeedback treatment provides the child and speech-language pathologist (SLP) with visual feedback of the movements of the tongue and contact points between the tongue and the palate in real time (Preston, Brick, & Landi, 2013). Both ultrasound biofeedback and electropalatography can be used, however; electropalatography requires that a piece to fit your hard palate called a pseudoplate be custom made for each patient (Preston, Brick, & Landi, 2013). For this reason, ultrasound biofeedback is becoming more popular as it is the less expensive option (Preston, Brick, & Landi, 2013). Although this is a relatively new treatment, results from a study on children with persisting CAS focusing on rhotic sounds indicated that the visual feedback leads to generalization to phonetically similar untreated words (Preston, Brick, & Landi, 2013).

Conclusions

Overall, results show that children with CAS who receive ReST and NDP3 increase segmental accuracy, co-articulatory accuracy, prosodic accuracy, and decrease inconsistencies on individuals sounds, indicating that these treatments affect all three of the core features of CAS as defined by ASHA (Murray, McCabe, & Ballard, 2015). Biofeedback treatment has shown promising results as well, however; further research needs to be done on each of these treatments. Continuing to study different treatment approaches for CAS will give clinicians greater insight into each therapies’ effects, and including more participants in these studies will help identify the most effective treatment for children of different ages, severity levels, and with different individual characteristics.

Table 1: Recommended age and severity levels for treatments

Treatment	Recommended Age	Recommended Severity
NDP3	-4-12 years old	-Mild to severe -Must be verbal
ReST	-Recommended for older children, but ranges in studies seen from 4-12	-Mild to moderate -Must be verbal
Biofeedback Treatment	-Not recommended for younger children -Mostly seen in persistent cases of CAS (over age 9)	-No recommended severity level, but usually used in persistent cases -Must be verbal

Adapted from (Maas, Gildersleeve-Neumann, Jakielski, & Stoeckel, 2014)