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CONTINUED

Current Best Practices in the Evaluation & Management of CAS: A Multidimensional Approach

Guest Editor: Kimberly Farinella, PhD, CCC-SLP

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Part 2: Rapid Syllable Transition Treatment for Childhood Apraxia of Speech

Kirrie J Ballard PhD

Moderated by:
Amy Natho, MS, CCC-SLP, CEU Administrator, SpeechPathology.com

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Rapid Syllable Transition treatment for childhood apraxia of speech:

Foundation
Principles
Practice

Kirrie J Ballard PhD
Professor and ARC Future Fellow
CPSP (Aust) and CCC-SLP (USA)

CONTINUED

Learning Objectives

- Identify the principles behind the Rapid Syllable Transition treatment approach.
- Describe the standard protocol for Rapid Syllable Transition.
- Describe how to develop goals to implement the Rapid Syllable Transition approach with their clients.

CONTINUED

Then and Now

Foundation

1980s – 1990s: Developed by Prof Donald A. Robin now at University of New Hampshire; used routinely in his clinical practice with children and adults with apraxia of speech *

2007: Pilot testing initiated by Ballard and Robin in Sydney

2010: First published test by Ballard Robin McCabe MacDonald 2010

2010 - 2017: 10 published papers by 2 Honours students and 2 PhD students, including 1 randomised control trial.

2017: website with support materials for clinicians (McCabe)

2017 onwards:

Testing in USA: Masters student testing variations with Robin and Ballard

Testing in Sydney:

2 PhD students testing variations with McCabe (eg comparison with phonetic placement)

Ballard & Robin: pilot testing with adults, neuroimaging, software for home practice

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Foundation

What is childhood apraxia of speech

Three segmental and suprasegmental features, consistent with speech motor programming deficit, are agreed upon:

- Inconsistent errors on consonants and vowels in productions of syllables and words (*not repeated consecutively*)
- Lengthened and disrupted coarticulatory transitions between sounds and syllables (*segregation*)
- Inappropriate prosody, especially in the realization of lexical or phrasal stress

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Foundation

Shriberg Potter Strand 2012

Required: Vowel distortions plus 3/more other features in 3/more tasks

Strand's 11-point Checklist	ASHA
1. **Vowel distortions**	Articulation
2. Difficulty achieving initial and transitory movements	Transitions
3. Syllable segregation	Transitions
4. Equal stress or lexical stress errors	Prosody / Transitions
5. Distorted substitutions (including vowels)	Articulation
6. Silent groping	Articulation
7. Intrusive schwa	Articulation / Transitions
8. Voicing errors	Articulation
9. Slow rate	All
10. Slow diadokinetic (DDK) rate	All
11. Increased difficulty with polysyllable words	All

(Shriberg, Potter, & Strand 2012)

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Foundation

CONTINUED

Experimental Analysis: Murray McCabe Heard Ballard 2015

- To be diagnosed with CAS....

Using the Test of Polysyllables (Gozzard et al 2008)

- ↑ high occurrence of **syllable segregation, *AND***
- ↓ low percentage of **lexical stress matches, *AND then***
- ↑ a higher **PPC score** *(huh?)*

AND

On the OMA, *assuming intact structures*
(Robbins & Klee 1987)

- ↓ Low score **on accuracy of 'pataka'**

R^2 = .91, adjusted R^2 = .90, F (4, 38) = 87.45, p = < .001

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Foundation

CONTINUED

ASHA Position Statement 2007

These features change in their relative frequency of occurrence with

Task complexity

Severity of involvement

Age

(influences teatment planning – support needed, task difficulty, explanations, stimulus materials, number of trials)

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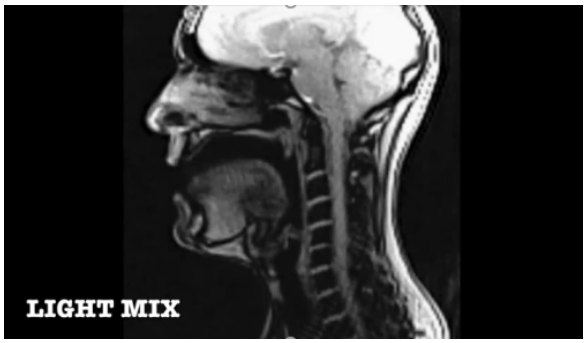
Approach

Think in terms of movement – patterns of movement and transitions between movements, not specific phonemes or words



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Rapid Syllable Transition treatment (ReST)

Three components

Polysyllables

Pseudowords

Motor learning principles

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CONTINUED

Why Polysyllables?

› They are difficult, evoking discriminant behaviours (Shriberg 1997)

› Address core impairments - ***challenging*** for

- › Syllable motor plans – articulation
- › Syllable-to-syllable transitions – syllable segregation
- › Controlled stress variations – lexical stress

› Strong-weak - Kangaroo /**kæŋgəru**/

› Weak-strong – *Koala /**kəwalə**/*

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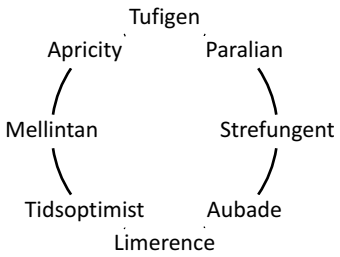
CONTINUED

Why Pseudo-Words?

› Simulate learning new words

› Unfamiliar

- › No existing habitualized errors



› Ecologically valid (Gierut Morrisette Ziemer 2010)

- › pseudowords vs (vs real words) "induced *greater, more rapid system-wide generalization* as a function of treatment" and these changes were retained after treatment

› Easy to control characteristics of your stimulus set(s)

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Principles of Motor Learning

- Performance vs. **Learning**
  - Acquisition
  - Retention (across sessions, post-treatment)
  - Generalization (across behaviours and contexts)

Richard A. Schmidt
1941–2015

- Treatment Session Part I: Pre-Practice
  - Every session, and may fill the session at the start
  - Stimulability
  - Understand task and what is counted as a correct response
  - Experience correct responses – use any / all your skills and tricks
  - Motivate

(Schmidt 1992; Maas et al 2008)

Principles of Motor Learning

Treatment Session Part II: Practice … remove the supports

Practice structure
- Trial order (random vs. blocked)
- Variability (varied vs. constant)
- Complexity (complex vs. simple)

Feedback structure
- Frequency (high, low, summary)
- Type (knowledge of results or performance)
- Timing (immediate, delayed)

Practice

CONTINUED

Things to consider before you start

Child and Family
Does the child have a diagnosis of CAS?
Aged 4+?
If 4-5 years old - is the child resilient?: Do they tolerate some level of failure without giving up? Have they had any therapy previously or started formal schooling?
Is the child producing some consonants and vowels correctly and consistently?
Is CAS the only significant developmental diagnosis?
Can the child stay on task for about 10 minutes at a time?
Can the child tolerate a 50-60 minute speech therapy session?
Can you as a parent tolerate your child getting things wrong?
Can the child come to treatment at least 2 times a week, for 12 sessions?

Modified from http://sydney.edu.au/health-sciences/rest-media/Readiness-checklist.pdf (McCabe, CRICOS 00026A)

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Practice

CONTINUED

Things to consider before you start

Clinician
Can you stick to a set program?
Are you resilient to children having limited success in the early stages of therapy?
Can you give reliable knowledge of results feedback?
Could you give feedback on only some of the child's productions?
Can you take clinical data before treatment, every 4 sessions and after treatment on real words to check the work you are doing in ReST therapy is making a difference to the child's everyday speech?

Modified from http://sydney.edu.au/health-sciences/rest-media/Readiness-checklist.pdf

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Selecting targets and designing stimuli

Decide on level of difficulty

- How many different consonants and vowels in the set?
- How many challenging phonemes vs mastered phonemes?
- How many syllables in a pseudo-word?
- Will you focus on one movement type or multiple?
- How many different sounds in a word?

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Selecting targets and designing stimuli

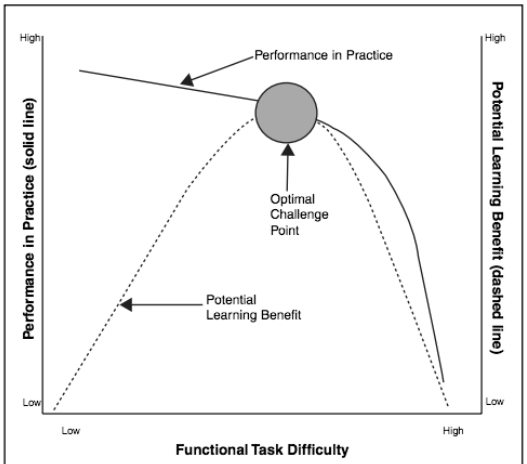

FIGURE 3. The relation between learning and performance curves and the optimal challenge point related to tasks of different levels of functional complexity. The point of functional task difficulty where learning is optimized is not the point at which practice performance is optimized.

*"The point of functional task difficulty where learning is optimized is **not** the point at which practice performance is optimized."*

from Guadagnoli & Lee (2004). Challenge Point: A Framework for Conceptualizing the Effects of Various Practice Conditions in Motor Learning. *Journal of Motor Behavior*, 36(2), 212–224.

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CONTINUED

Examples

EXAMPLE I

Select phonemes that are correct in monosyllabic words

Example phoneme set:
(a) m, p, d + a, i, u
ma, mi, mu, pa, pi, pu, da, di, du

3-Syllable Pseudowords:
3Cs and 3Vs
ma-pi-du (‘mapədu & mə’pidu)
mipuda (‘mipəda & mə’puda)

etc…

EXAMPLE II

Errors: Voicing, Frication, Diphthongs

Example phoneme sets:
(a) p, b, t, d + a, i, ai
pa, pi, pai, ba, bi, bai, ta, ti, tai, da, di, dai
(a) p, b, f, v + a, i, ai
(b) f, v, s, z + a, i, ai

3-Syllable Pseudowords (set a):
3Cs and 3Vs - harder
pai-bi-ta (‘paibəta & pə'bita)
ba-di-pai (‘badəpai & bə’dipai) …
or
2Cs and 2Vs - easier
pai-bi-pi (‘paibəpi & pə’bipi)
ti-bai-ba (‘tibəba & tə’baiba)

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CONTINUED

The Goal

› What is the task and what is a correct response?

TASK

Read independently if possible or Repeat after clinician
…

fargeber	fegarber
bofegee	befogee
forbitty	feborty
toofeber	tefoober
goobetee	gebootee

vary complexity as needed…
strefungent geboo
I have/They saw/Here is a fegarber

CORRECT RESPONSE

✓articulation – **Sounds**
✓lexical stress – **Beats (1)**
✓syllable transition – **Smoothness (2)**

↓

(1) schwa in weak syllable
(2) no hesitations, restarts, or segmentation

Practice

Example of Pre-Practice

https://youtu.be/LSvxfek4kKQ

Practice

Example of Practice

https://youtu.be/xsmAydtvQig?t=15m32s

CONTINUED

Summary: How to do it....

Each session has the same format:

PRE-PRACTICE (about 10-15mins)

Explain requirements & motivate

Have child produce the pseudo-words – can focus on ones that need work

Provide immediate feedback on what worked well / what needs to improve

- Explain sounds, beats, smoothness

Use cues – artic, tapping, train/block pieces to bring syllables together

Once ~5 correct, move to practice (can come back to pre-practice if success rate is very low)

PRACTICE (about 40-45 minutes)

Pseudo-words randomly presented

- sets of 20 – 25 trials (total of 100)
- 2-min break between sets with child-selected game / activity

Child reads / repeats pseudo-word

Clinician gives feedback (✓ / ✗) on 50% trials –

- 10 of the first 10 trials …
- any 9 of the second 10 trials
- any 1 of the last 10 trials

3 sec feedback delay

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CONTINUED

Standard Delivery

Sessions	50-60 minutes
Standard mode	4 days / week x 3 weeks = 12 hours and a minimum 1200 trials delivered by clinician no home practice most children need more than one “dose” (*and more on mode in a minute*)

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CONTINUED

Evidence and Variations

First evidence:

Ballard, Robin, McCabe, McDonald 2010
A novel treatment of prosody in children with CAS

Stimulus variations:

van Rees, Ballard, McCabe, MacDonald da Silva, Arciuli 2012
Training production of lexical stress in **typically developing children** with **orthographically biased stimuli** and principles of motor learning

McCabe, Macdonald-D'Silva, van Rees, Ballard, Arciuli 2014
Orthographically sensitive treatment for dysprosody in children with **childhood apraxia of speech** using ReST intervention

Randomized control trial:

Murray, McCabe, Ballard 2012
A comparison of two treatments for childhood apraxia of speech: Methods and treatment **protocol** for a parallel group randomised control trial

Murray, McCabe, Ballard 2015

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CONTINUED

Evidence and Variations

Dose variations

Thomas, McCabe, Ballard 2014
Rapid syllable transitions (rest) treatment for childhood apraxia of speech: the effect of **lower dose frequency**

Alternative delivery modes:

Thomas, McCabe, Ballard, Lincoln 2016
Telehealth delivery of rapid syllable transitions treatment for childhood apraxia of speech

Thomas, McCabe, Ballard in press
Combined clinician **parent delivery** of Rapid Syllable Transition treatment for childhood apraxia of speech

Other developments:

Murray, McCabe, Ballard, 2011
Using ReST intervention for **paediatric cerebellar ataxia**: A pilot study

Ballard, Robin **unpublished data 2017**
Behavioural and neuroplastic effects of Treatment for Establishing Motor PrOgrams **(**TEMPO) in **acquired apraxia of speech**

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Funding Sources

Ballard: Australian Research Council Future Fellowship
University of Sydney International Research Development Fund

Robin: University of Sydney International Research Development Fund

McCabe: Childhood Apraxia of Speech Assoc. of North America
Ian Potter Foundation

Murray: Douglas & Lola Douglas Scholarship on Child and Adolescent Health
Speech Pathology Australia's Nadia Verrall Memorial Scholarship
James Kentley Memorial Scholarship
University of Sydney Postgraduate Research Support Schemes

Thomas: Australian Postgraduate Award, Australian Federal Government

Reference List: ReST

First evidence:

1. Ballard, Robin, McCabe, McDonald (2010). **A novel treatment** of prosody in children with CAS. *Journal of Speech, Language & Hearing Research 53*, 1227–1245. DOI: 10.1044/1092-4388(2010/09-0130)

Stimulus variations:

1. Van Rees, Ballard, McCabe, MacDonald da Silva, Arciuli (2012). Training production of lexical stress in **typically developing children** with **orthographically biased stimuli** and principles of motor learning. *American Journal of Speech Language Pathology 21*, 197–
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Randomized control trial:

1. Murray, McCabe, Ballard (2012). A comparison of two treatments for childhood apraxia of speech: Methods and treatment **protocol** for a parallel group randomised control trial. *BMC Pediatrics*, DOI: 10.1186/1471-2431-12-112
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Dose variations

1. Thomas, McCabe, Ballard (2014). Rapid syllable transitions (rest) treatment for childhood apraxia of speech: the effect of **lower dose frequency**. *Journal of Communication Disorders. 51*, 29-42 DOI: 10.1016/j.jcomdis.2014.06.004

Alternative delivery modes:

1. Thomas, McCabe, Ballard, Lincoln (2016). **Telehealth delivery** of rapid syllable transitions (ReST) treatment for childhood apraxia of speech. *International Journal of Language & Communication Disorders*. DOI: 10.1111/1460-6984.12238
2. Thomas, McCabe, Ballard (in press, accepted 31 March 2017). Combined clinician **parent delivery** of Rapid Syllable Transition (ReST) treatment for childhood apraxia of speech. *International Journal of Speech Language Pathology* DOI 10.1080/17549507.2017.1316423

Other developments:

1. Murray, E., McCabe, P, & Ballard, K. (2011). Using ReST intervention for **paediatric cerebellar ataxia**: A pilot study. *Stem-, Spraal-en Taalpathologie* (17) S55.
2. Ballard, Robin (**unpublished data, 2017**). **Behavioural and neuroplastic effects of** Treatment for Establishing Motor PrOgrams **(TEMPO) in acquired apraxia of speech**.
3. Website with manual and resources: http://sydney.edu.au/health-sciences/rest/

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