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Guest Editor: Kimberly Farinella, PhD, CCC-SLP

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)
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.

Then and Now

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

* indicates a key moment in the development and implementation of the Rapid Syllable Transition approach.
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

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

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

(Shriberg, Potter, & Strand 2012)
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’

$R^2 = .91, \text{ adjusted } R^2 = .90, F (4, 38) = 87.45, p = < .001$
Approach

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

Rapid Syllable Transition treatment (ReST)

Three components

- Polysyllables
- Pseudowords
- Motor learning principles
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 /kæŋɡəroʊ/
  › Weak-strong – Koala /koʊəla/
Principles of Motor Learning

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

- **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

Richard A. Schmidt
1941–2015

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)
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?


---

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?

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?

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

### 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 (‘mapadu & ma’pidu)
mipuda (‘ mipada & ma’puda)

etc...

### EXAMPLE II

Errors: Voicing, Frication, Diphthongs

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

3-Syllable Pseudowords (set a):
3Cs and 3Vs - harder
pai-bi-ta (‘ paibata & pa’bita)
ba-di-pai (‘badapai & ba’dipai) ...
or
2Cs and 2Vs - easier
pai-bi-pi (‘paibapi & pa’bipi)
ti-bai-ba (‘tibaba & ta’baiba)

### Task

What is the task and what is a correct response?

#### TASK

Read independently if possible or Repeat after clinician ...

fargeber fegarber
bofegee befogee
forbitty febortty
toofeber tefoober
goobetee gebootee

vary complexity as needed...
strufungen 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
Example of Pre-Practice

https://youtu.be/LSvxfek4kKQ

Example of Practice

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

---

**Standard Delivery**

<table>
<thead>
<tr>
<th>Sessions</th>
<th>50-60 minutes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Standard mode</th>
<th>4 days / week x 3 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>= 12 hours and a minimum 1200 trials</td>
</tr>
<tr>
<td></td>
<td>delivered by clinician</td>
</tr>
<tr>
<td></td>
<td>no home practice</td>
</tr>
<tr>
<td></td>
<td>most children need more than one “dose”</td>
</tr>
</tbody>
</table>

*(and more on mode in a minute)*
## 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

A randomized control trial of treatments for childhood apraxia of speech

### 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
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:

Stimulus variations:

Randomized control trial:
Reference List: ReST

Dose variations

Alternative delivery modes:

Other developments:

References List: General