New ways to support struggling readers: Evidence from some recent interventions

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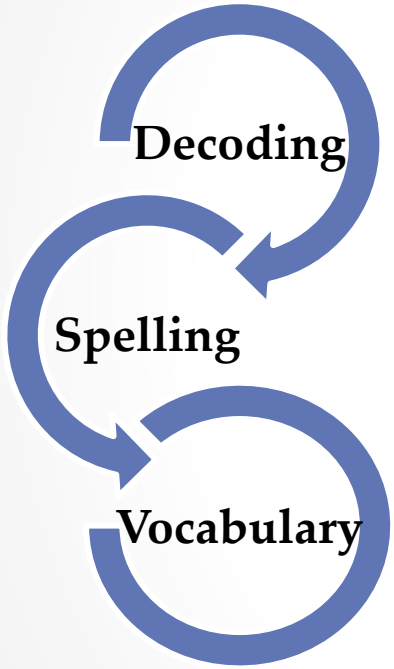
The Importance of Early Intervention

- Early intervention is crucial to the prevention of reading difficulties and raising literacy standards.
- 1 in 5 children struggle with literacy
- Up to two thirds of poor readers can learn to read at age-expected levels with appropriate early intervention (e.g. Savage, Carless, & Erten, 2009)
- The principled assessment of evidence-based quality teaching allows the exclusion of 'environmental deficit' in candidate cases of developmental dyslexia

Current Best Practices

- Focus on systematic teaching of **phonics – the assembly of pronunciations of words from component speech sounds** (e.g. McArthur et al., 2012)
- Teach letter-sound knowledge (grapheme to—phoneme correspondences) and phonological awareness
- Expose children to books e.g. shared book reading
- Teach vocabulary
- Teach for and with practices to assist comprehension
- **Quality** teaching differentiated to needs

- Intervention 1: Kindergarten
  - Parental early involvement interventions with technology.
- Intervention 2: Grade 1
  - A) Direct Mapping and Set for Variability(DMSfV).
  - B) Current and Best Practices (CBP)
- Intervention 3: Grade 2
  - Spelling Intervention using the Simplicity Principle.
  - Vocabulary-taught control
- Intervention 4: Grade 3
  - Morphological Awareness and Vocabulary Intervention.



Design: 4 sub-studies with teacher training and direct student support

New theory-driven interventions

- One view is that reading fluency is the use of accurate automated Grapheme Phoneme (GPC) and other letter-string data to access word knowledge within a connectionist network (Ehri, 2015)
- **So: opportunities to automate GPC links in words richly represented in real texts likely to be important**
- Consider the words ‘w’ ‘a’’s’’p’ and
- ‘b’ ‘e’’l’’t’

Set-for-Variability

- English is opaque or 'deep' (Seymour et al., 2003)

- So: strategies for dealing with depth (especially variable vowels) are important
- **A 'set for variability'** Elbro et al., 2012; Tunmer & Chapman, 2012)
- **ESSENTIALLY – the idea that we need to do more than apply phonic rules to access stored pronunciations (and this MAY be particularly true in a deep orthography)**

Set-for-Variability

Elbro et al. (2012, Elbro & de Jong, 2017)

- Decoding is:

- A) phonemic assembly e.g. 'd'-'o' –'g'.

- B) matching a 'spelling pronunciation' to a known word in their lexicon … e.g. 'dog'
- **A '2 process model' of assembly**
- **The first part has historically been emphasized in education**

Set-for-Variability

SfV predicts growth in regular and exception word reading (Elbro et al., 2012).

SfV is associated with vocabulary knowledge and reading (Tunmer & Chapman, 2012)

What happens if we ***teach*** **decoding** as:

A '2 process model' of assembly

- **Does it measurably improve decoding, word and sentence reading and spelling over common /best practices?**

Methodology

Design

- A CONSORT quality dual site 2-arm cluster RCT
- Tier 1 and Tier 2 Pre-post-test design and grade 2 delayed post-test

Participants

- **Tier 1**
- Quebec, Alberta *n* = 429 grade 1 students
- Nested in 50+ classrooms in 26 schools teachers
- **Tier 2**
- All at-risk participants after fall semester (*n*= 201)

Winter tier 2 Intervention

- **Mid-test: Re-screened and identified 'at-risk' = all children below the 30th % -ile on WRAT word reading test (*n* = 201)**
- BY school groups of 3-4 children in one of 2 interventions:
- 1) A novel R*t*I phonics / word reading intervention called DMSFV: **D**irect **M**apping and **S**et for **V**ariability
- 2) A standardized '**C**ommon or **B**est **P**ractices' (CBP) phonics / word reading intervention
- For winter semester (average time per child = 10-11 hours) 30 minutes 2-3 times per week outside

Intervention 1: DMSfV

The DMSfV (Direct Mapping and Set for Variability) intervention:

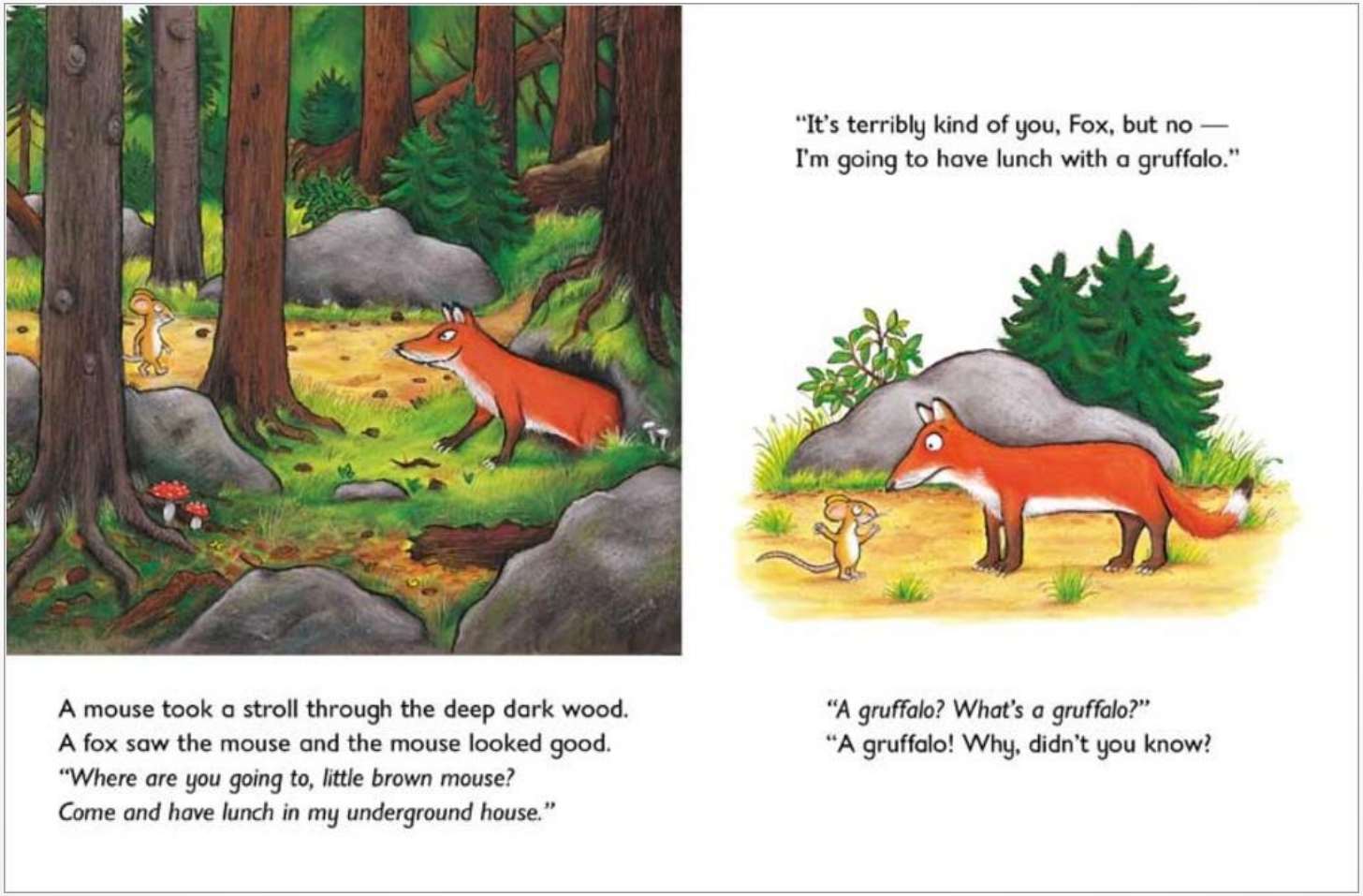
- Systematic synthetic phonics: Taught phonic rules (esp variable multiple vowels e.g. 'ou' and 'magic e' rule
- Taught SfV principles and to substitute ('flip') GPCs from given rules to find a word in lexicon that makes sense
- Trained children to use either alternative phonics rules when decoding did not work (e.g. '*wasp*', '*shoulder*' regularized)
- Shared book reading with text for each session embodying the specific taught graphemes or exception words *of that day*
- ALL differentiated for the reading levels of children and sense of 'playfulness / games / active learning

Intervention 1: DMSfV

- We first taught the *concept* that phonic rules do not always yield a clear pronunciation of words and that a second process (a 'strategy') is needed.
- A staged 5-step plan for variable vowels:

1. Children blend phonemes of a letter string, looking for and applying well-taught phonic rules.
2. Children evaluate their first attempt to synthesize a pronunciation: 'Is this a word I know?')
3. If no, children then replace the vowel with an alternative vowel pronunciation they know
4. Children synthesise this revised phoneme string
5. Children re-evaluate this blended string using the same reflective lexical decision process as above.

High densities of taught units in shared book reading



A mouse took a stroll through the deep dark wood.
A fox saw the mouse and the mouse looked good.
"Where are you going to, little brown mouse?
Come and have lunch in my underground house."

"It's terribly kind of you, Fox, but no —
I'm going to have lunch with a gruffalo."

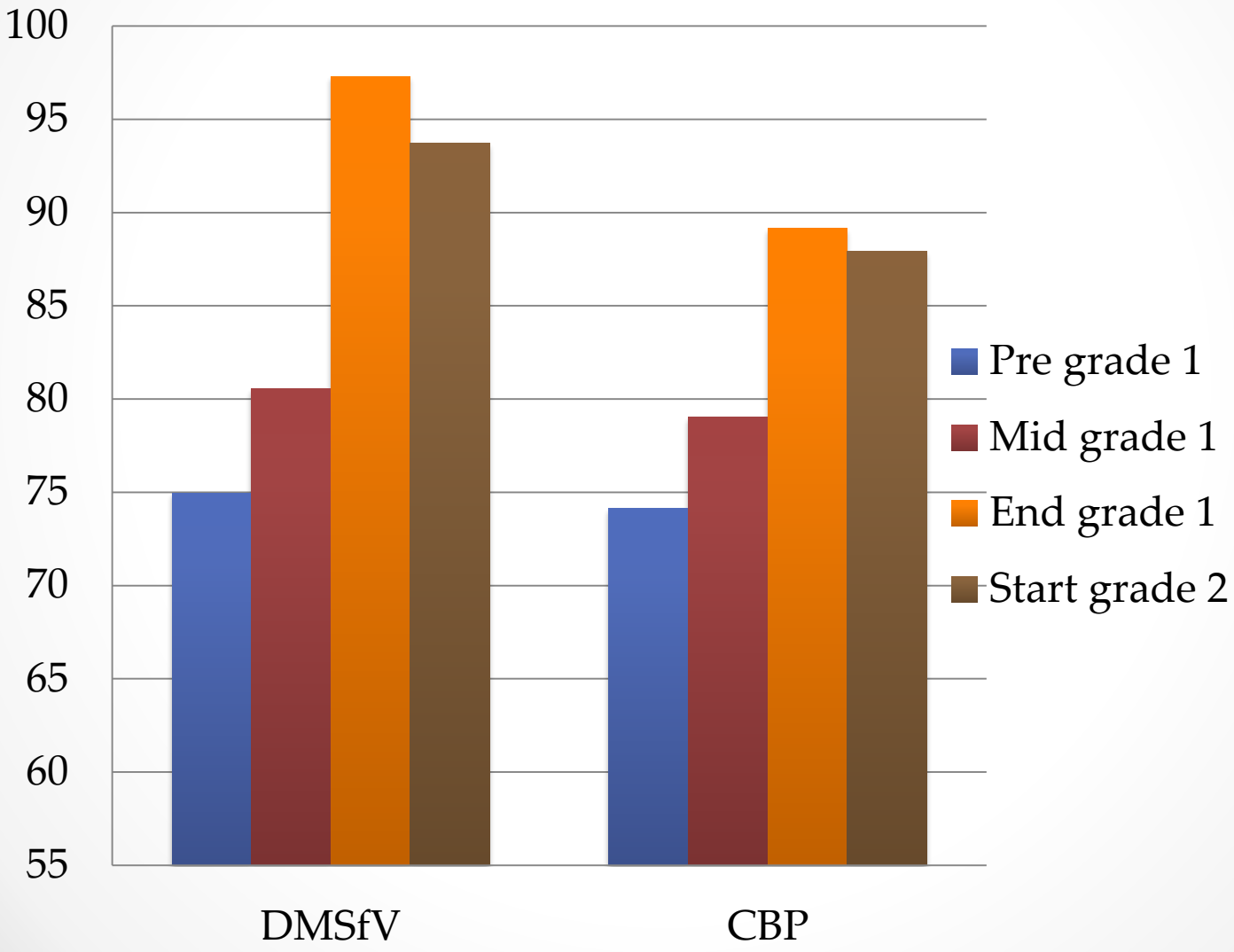
"A gruffalo? What's a gruffalo?"
"A gruffalo! Why, didn't you know?

Intervention 2: CBP

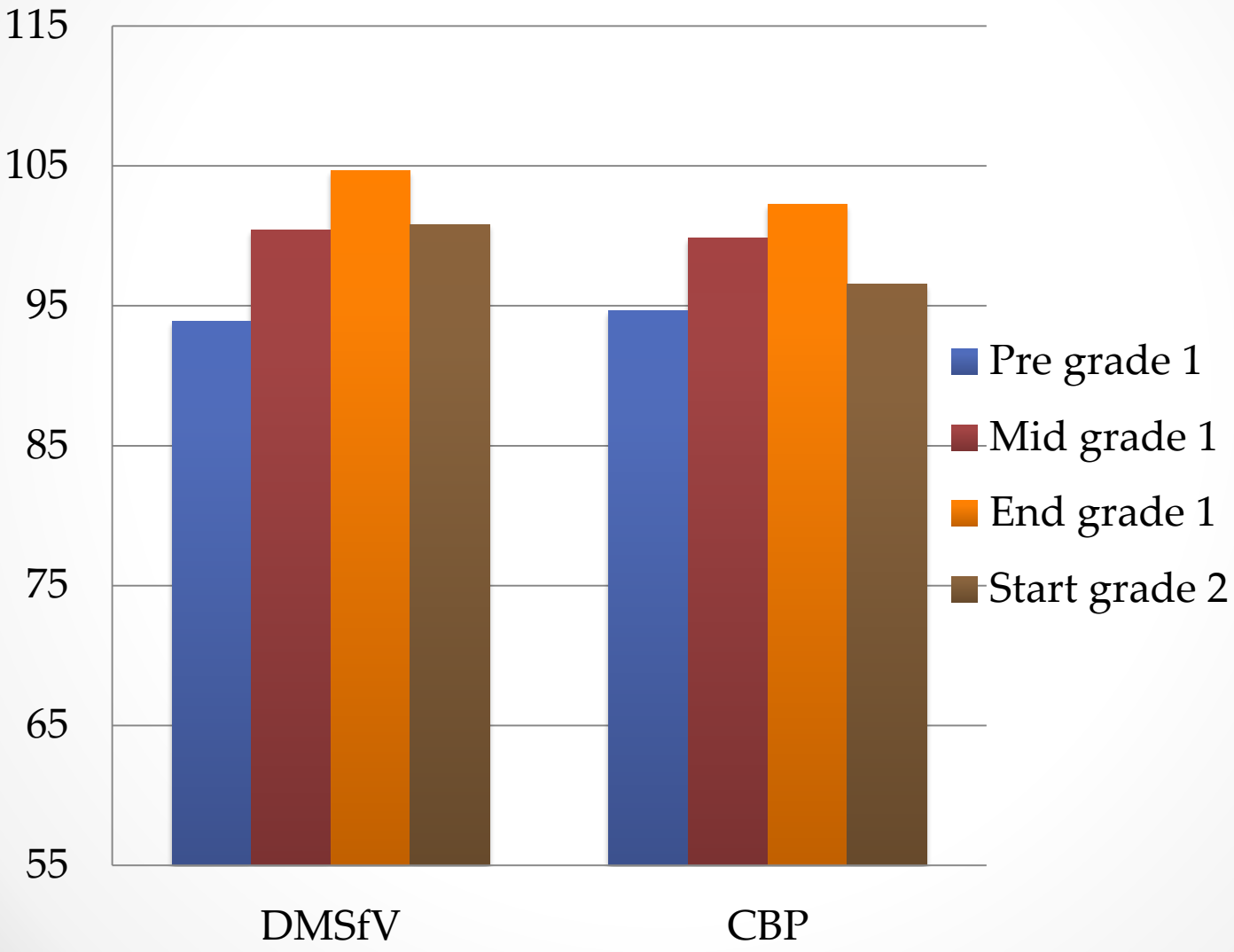
The Common and Best Practices phonics / reading intervention had the following characteristics:

- Equal time spent on 'dual foundations' of regular phonic rules (synthetic phonics) and high frequency exception 'sight words'
- Taught common phonic rules for common words (e.g. some vowels and 'magic e') BUT DID NOT teach production of words from variable rules
- DID NOT train children to use either alternative phonics rules or wider context when decoding did not work (e.g. '*wasp*', '*shoulder*' regularized)
- Shared book reading DID NOT embody the *specific* taught graphemes or exception words of the day (but was differentiated for reading levels of children)
- Did have same differentiation and 'playfulness'

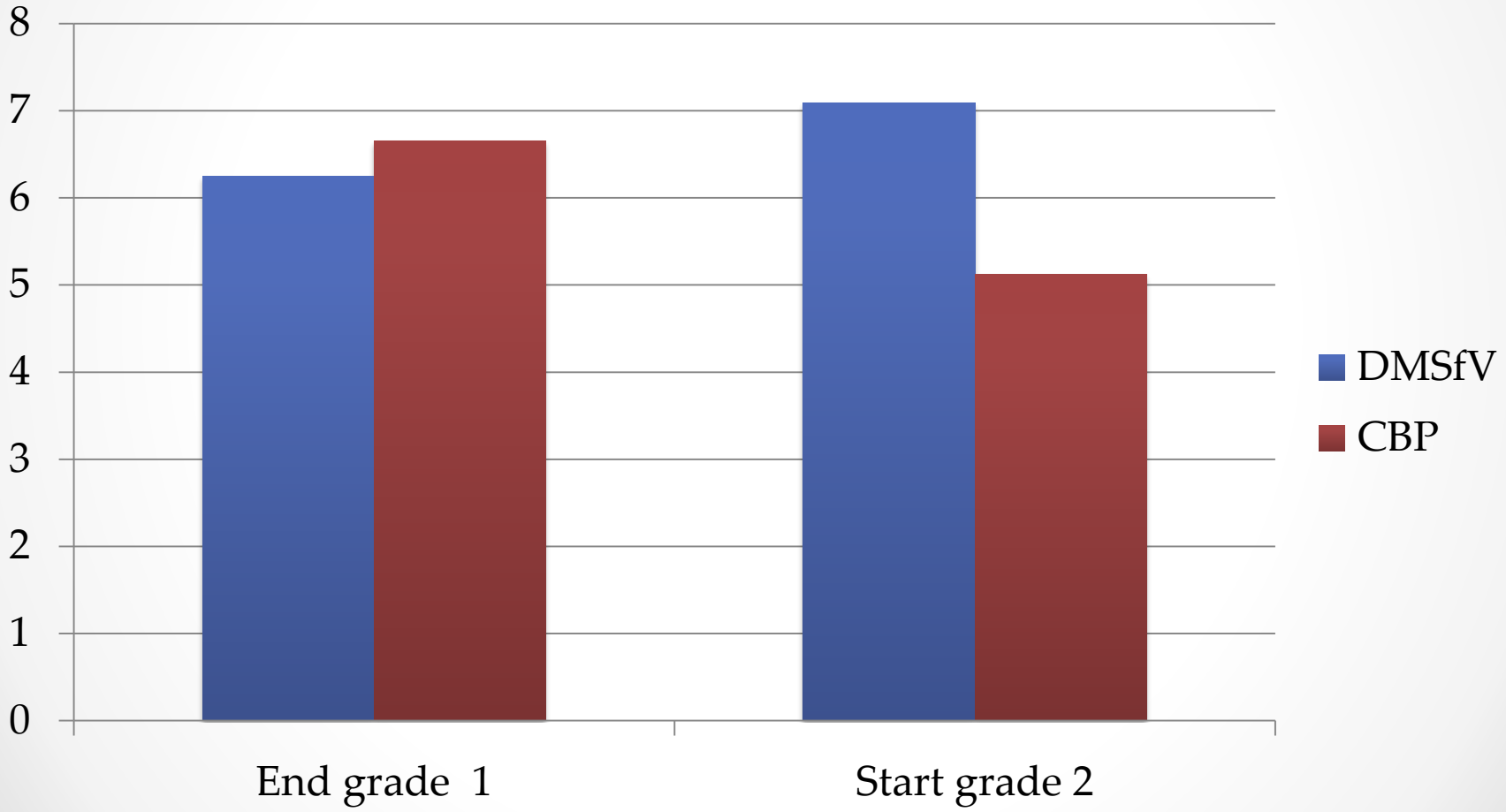
Results: WRAT Word Reading



Results: WJ Pseudoword decoding



Results: GRADE Sentence Comprehension (stanine)



Conclusions: Grade 1 study

- The 'tier 2' reading interventions did show effects even after documented good regular tier 1 teaching
- BUT The DMSfV approach was far the more successful of the two for word reading and phonological awareness
- **CBP is no guarantee of success**
- **Medium** effect sizes for interventions evident at delayed post-test for DMSfV intervention
- Other data suggest it transfers into French

Intervening in Grade 2 why phonic skills? (Again)

Phonics is based on 2 skills:

- Letter-sound knowledge **and** phonemic awareness
- Both need to be supported and in-place for children to be able to 'sound out' or 'decode' or use 'phonics'

The effects of the spelling system: Seymour et al.

- Scottish and other European children do not differ on basic letter sounds > 90% accuracy

- Scottish children know 1/3 of the matched content and function words of most European counterparts (except Denmark)

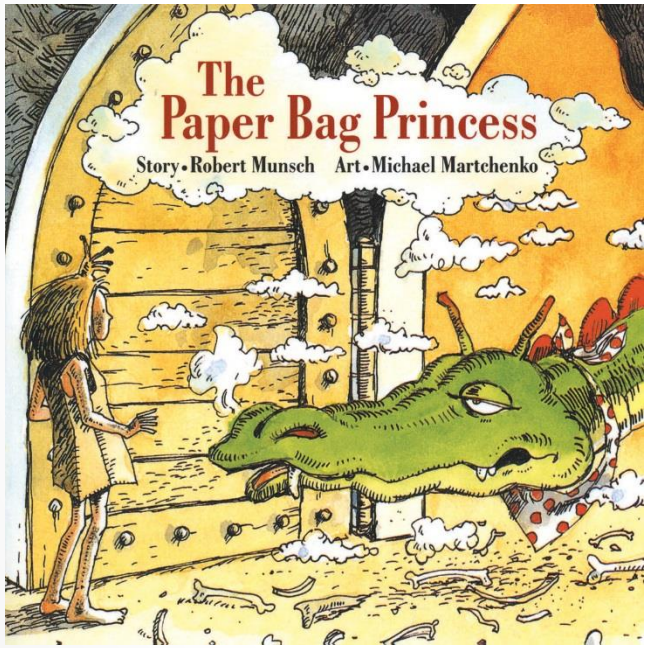
- Europe and Scandinavia: 90% accuracy (by P1)
- Denmark: P1 72 % P2 : 92%
- Scotland: P1 34 % P2 : 76%

Phonics programs for Grade 1

Jolly phonics:

1. s, a, t, i, p, n
2. c k, e, h, r, m, d
3. g, o, u, l, f, b
4. ai, j, oa, ie, ee, or
5. z, w, ng, v, oo, oo
6. y, x, ch, sh, th, th
7. qu, ou, oi, ue, er, ar

Robert Munsch



Example (The paper bag princess)

Elizabeth gra**** the **ocker and b***** on *** d*** ag**n.

*** dragon stuck hi* n*** out o* *** d*** and s**d, "Go aw**, I l*v* to **t prin*ess*s, but I h*** alr**d* **t** a **ole cas**e tod**. I am a ver* b*s* dragon. C*m* back t*mor***."

"Wait," shout** Elizabeth. "Is it tr** that *** *r* ** smartest and f**r*est dragon in *** *h*l w**ld?"

"Yes," s**d *** dragon.

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"Yes," s**d the dragon.

Example

Elizabeth grabbed the knocker and banged on the door again.

The dragon stuck his nose out of the door and said, "Go away, I love to eat princesses, but I have already eaten a whole castle today. I am a very busy dragon. Come back tomorrow."

"Wait," shouted Elizabeth. "Is it true that you are the smartest and fiercest dragon in the whole world?"

"Yes," said the dragon.

The Simplicity Principle

Background

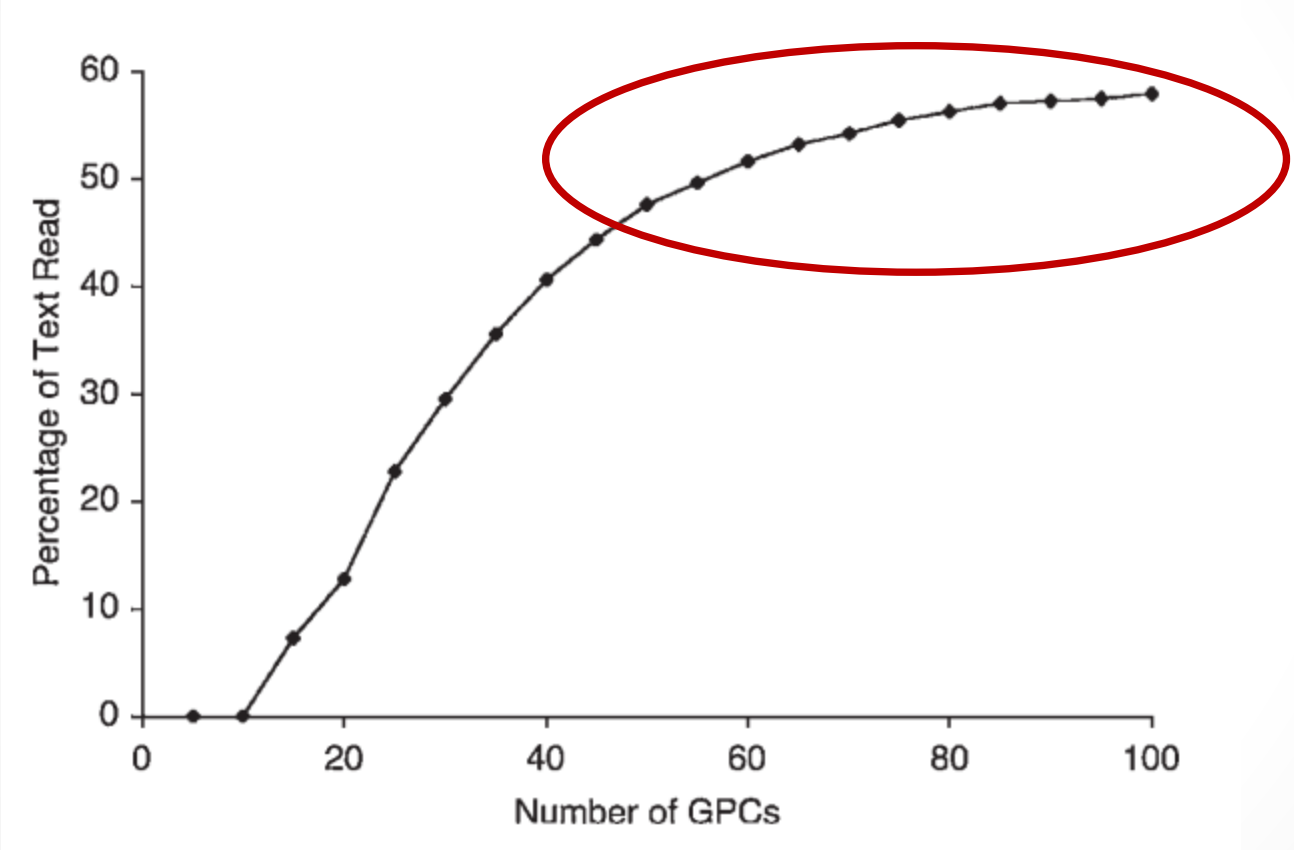
- "The theory of optimal instruction states that there is an optimal amount of information to teach that will lead to maximum generalisation" (Solity & Vousden, 2009, p.9)

- What is the optimal amount of information to teach in reading?

Background

- Analysis of 685 contemporary children's books:
  - **100 most frequent English words account for approximately 50% of all word**
    - the next 50 most frequent words account for a significantly lower proportion of word tokens in children's books
  - **64 most frequent GPCs (out of 461 in English) would enable children to read more than 60% of all word types** in children's books

Most frequently occuring GPCs



Proportion of monosyllabic word tokens that can be read as a function of the most frequent grapheme-phoneme mappings (Vousden, 2008, p.262)

Vousden and Solity (2011)

Ranked List of Grapheme-Phoneme Mappings			
"s" = /zz/	ed	oa	ow
sh	ss	dg	ur
ee = /eeee/	th	ou	kn
a_e	o_e	wh	gg
ch	ai	ed	oi
pp	aw	ay	i
ng	ir	or	air
ck	tch	oo	eer
ll	ff	th	ore
i_e	ar	ow	ear
ea = /ee/	igh	qu	**etc…**

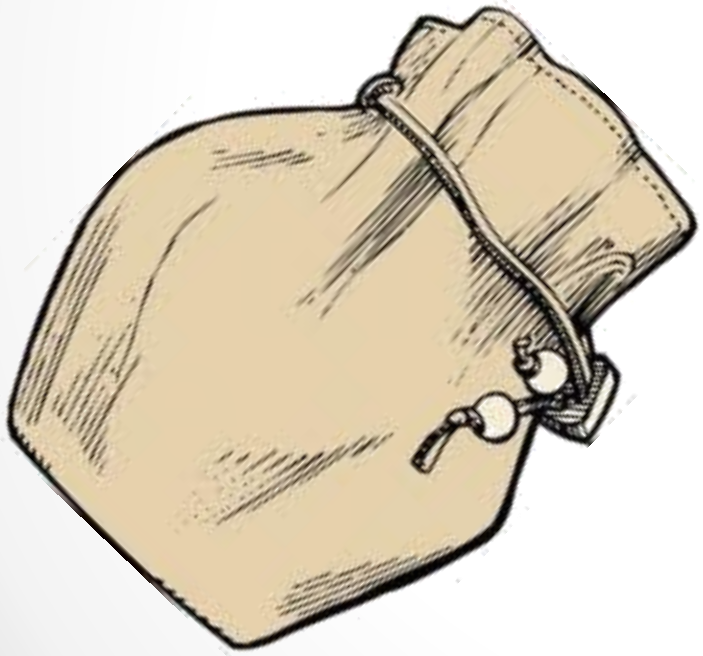
A new Canadian analysis

- We obtained the 500 most frequently borrowed young children's books from all of Toronto district public libraries – summer 2014!
- My team typed them all into a database and Dr Solity's team in the UK analyzed this list to provide a specifically Canadian list of most frequent GPCs, most common words, and their links to the most popular Canadian real books
- We shared these maximally useful units with teachers to aid their teaching and we used them in the small group winter interventions too!

A pilot study (Chen & Savage, 2014)

- We randomly allocated 38 grade 2 students to a 9-week 30 supplemental small group session programme.
- We taught intervention and taught control conditions.
- Intervention reading programme taught children complex GPCs ordered by their frequency of occurrence in children's texts (a 'simplicity principle').
- The other reading programme taught children word usage.

Part 1 : Build the word



Example: Shared reading and identifying GPCs

Elizabeth grabbed the knocker and banged on the door again.

The dragon stuck his nose out of the door and said, "Go away, I love to eat princesses, but I have already eaten a whole castle today. I am a very busy dragon. Come back tomorrow."

"Wait," shouted Elizabeth. "Is it true that you are the smartest and fiercest dragon in the whole world?"

"Yes," said the dragon.

Example

Elizabeth grabbed the knocker and banged on the door again.

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"Yes," said the dragon.

A pilot study (Chen & Savage, 2014)

- Participants in the complex GPC group performed significantly better at post tests
- Generally large *value-added* effect sizes (Cohen's d) at both by-participant and by-item for :
  - spelling, $d = 1.85$, $d = 1.16$
  - word recognition with words containing taught GPCs, $d = 0.96$, $d = 0.95$
  - word recognition, $d = 0.79$, $d = 0.61$
  - reading motivation, $d = 0.34$, $d = 0.56$

Pan–Canadian replication study

- 2 Provinces in East and West of Canada with around 150 at-risk students screened from 500.
- Well-matched quasi-experimental design with
- School level randomization
- Controls for demographics, regular teaching quality
- Language background, parent reports of difficulty
- Quality of training and delivery of interventions
- Early literacy and language abilities
- School literacy experiences
- Nested analysis of 50 classrooms

Replication study

- We find a significant **interaction**:
- **Word, pseudoword, sentence reading, spelling**
- **Simplicity was effective for those with higher phoneme blending skills**
- 30+ years of research shows that *both* GPC and phoneme awareness training is essential for improvements.

Some important caveats

- 2 of 3 in this sample remained below average on phonological awareness at post-test (mean more than 2 SDs below average)
- Average comprehension composite was SS = 85 at post-test
- Clear impact on word-level skills but not a 'magic bullet' for comprehension or fluency

Grade 3 struggling readers

- Here struggling readers have unique needs
- They may have had several years of ongoing support for phonics
- Do we give more of the same? (as in RtI?)
- They often have greater challenges in facing reading and understanding meaningful text
- Should we thus support wider language needs?
- We thus contrast Simplicity (with phonic blending) and:
- Structured Word Inquiry

Structured Word Inquiry

- Assumes that English is morpho-phonemic:
- Venezky (1967) "***the simple fact is that the present orthography is not merely a letter-to-sound system riddled with imperfections, but, instead, a more complex and more regular relationship wherein phoneme and morpheme share leading roles***" (p. 77).
- The key phrase here is that "phoneme and morpheme share leading roles."(Bowers & Bowers, 2018). Morpheme = smallest unit of meaning
- Consider e.g. 'bomb'-'bombardment', 'nation'-'national', 'sign'- 'signal'

The SWI approach

- Focus on GPCs within a frame of morphology and etymology
- A morpheme is the smallest unit of meaning
- Roots (e.g. 'happy' and bound morphemes (essentially prefix and suffix units '-un', '-ness' etc
- Etymology is the study of the historical origins (and thus of connectedness) of words
- e.g. consider ' react': Morphology clarifies the phonology.
- The morphological structure = < re + act>,
- This rules out <ea> as a digraph because graphemes never cross morphemic boundaries.
- More generally it explains why the word 'action' includes the <t> rather than the <sh> grapheme to represent the /ʃ/ of action).

The SWI approach

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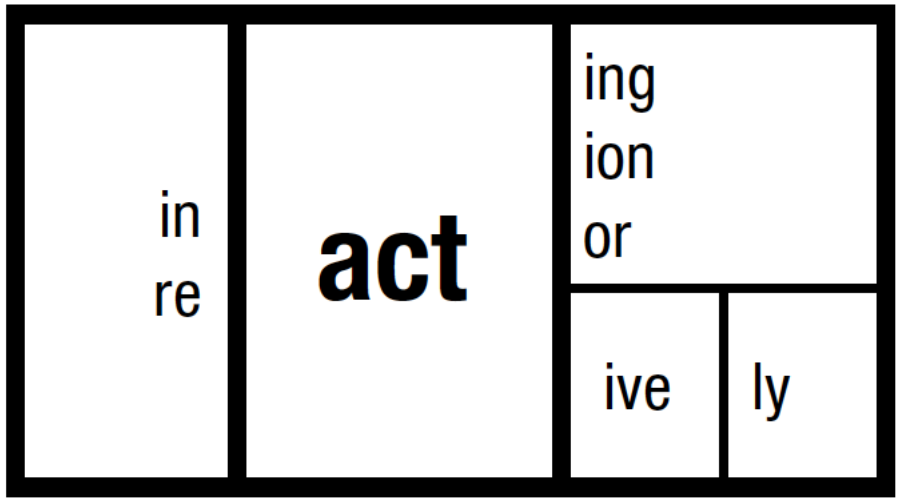

Grapheme	Phoneme	Example Words From "act" and Other Word Families
<t>	/t/	*actor, acting, take, bite*
<t> + i/u	/ʃ/	*action, option, structure*
<t> + i/u	/tʃ/	*structure, texture*

SWI and Simplicity contrasts

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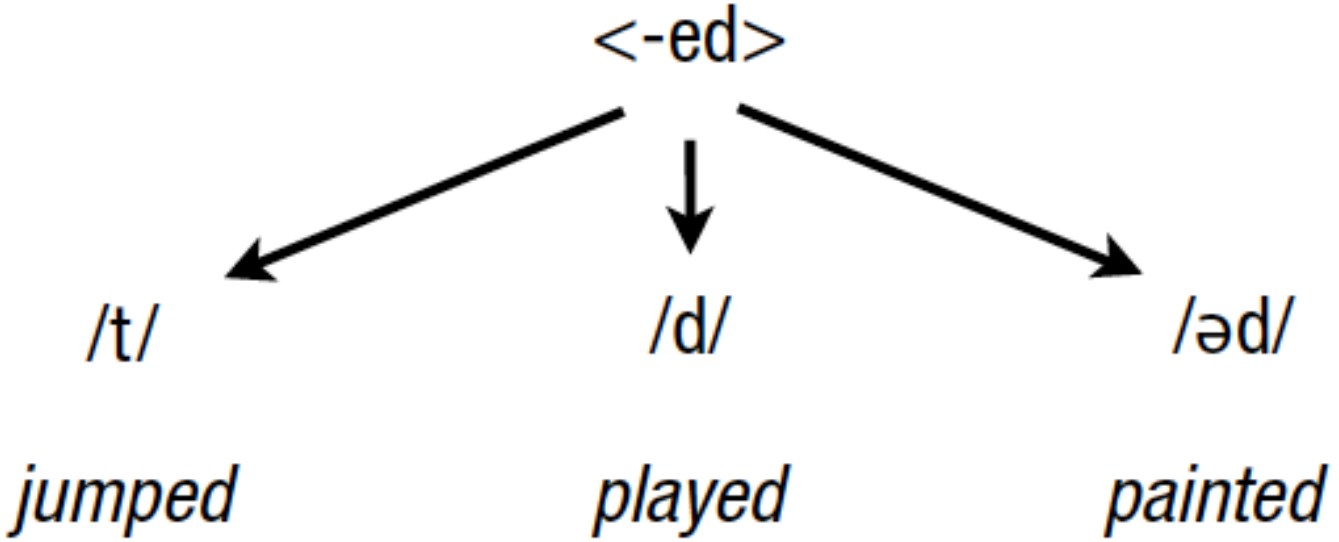


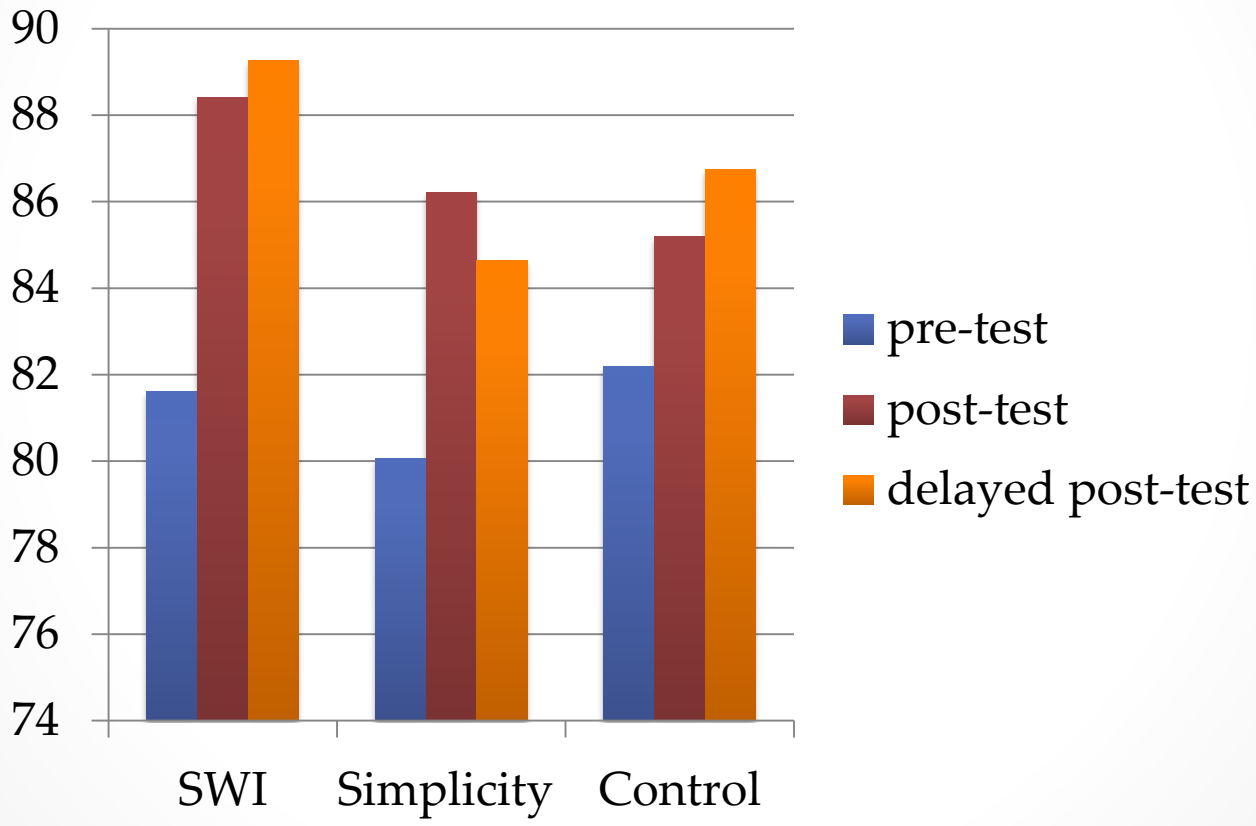
Georgiou, Savage, Dunn, Bowers, & Parrila (2019)

- Contrasted SWI and Simplicity intervention models
- 48 English-speaking children with reading difficulties randomly assigned to one of:
- Simplicity Principle (SP),
- Structure Word Inquiry (SWI),
- No Intervention (Control).

Georgiou, Savage, Dunn, Bowers, & Parrila (2019)

- Interventions: 10 weeks, 3 times a week for 30 minutes by trained psychology graduate students.
- Pre-test, post-test, and delayed post-test on: phonological awareness, morphological awareness, reading (word reading, word attack, morphological relatedness), and spelling.
- Groups well matched at pre-test: attainment, home language, parent–reported developmental history, age and gender

Results: WRAT word reading



Other results

- Similar significant effects on a morphological reading task
- BUT no main effects on the other 'secondary' outcome measures
- Across these other measures there was an interaction effect
- i.e. the interventions all worked best for children who started with high pre-test morphological ability
- Small sample suggests need for caution here (i.e. more work is needed)
- Can trained teachers produce the same effects?

Summary

- We have shown using sustained cross year interventions that a range of theory- and data –driven practices can improve reading in at-risk samples at scale across regions in grades 1, 2, & 3.
- Effects are evident in overlapping samples across years and in grade 2 despite Grade 1 effects
- Effects suggest we learn to map complex GPCs best where we map them to texts and with conceptually-driven SfV strategies for making sense of such *heuristics across all words*.
- In English the complexity of the system in English necessitates extra 'word level' work with optimal GPCs in grade 2
- In Grade 3: preliminary data suggest that SWI helps best.