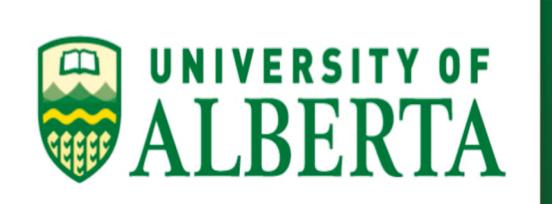# Response to Intervention: Schools Where All Children Learn to Read

George Georgiou[1], Robert Savage[2], Kristy Dunn[1], Kristina Maiorino[2], Rauno Parrila[1]

[1]University of Alberta, Department of Educational Psychology
[2]McGill University, Department of Educational and Counselling Psychology

Abstract

We evaluated two experimenter-delivered, small group word reading programs among at-risk poor readers in grade 1 classes of regular elementary schools using a two-arm dual site matched control trial intervention. Readers with word reading scores below the 30th percentile ($n = 201$) were deemed 'at-risk' and allocated to either a) a Direct Mapping and Set-for-Variability program (DMSfV); or b) Current or Best-Practices (CBP) small group reading support, typically for 10-11 hours over 10 weeks. Students were matched on baseline reading and language abilities and other parent background demographic measures. Results of hierarchical modeling of data showed advantages for the DMSfV program (for word reading and spelling at post-test and word reading and sentence comprehension at 5 month delayed post-test), with discernible valued added for the DMSfV condition across all follow-up measures. Results support the use of modified versions of standard small group preventative literacy intervention models that teach both direct mapping of taught GPCs in text and set-for-variability.

Introduction

This intervention study tests a hypothesis concerning the impact of distinct and theory-driven reading interventions. The current Direct Mapping and Set–for–Variability (DM SfV) intervention incorporates three key features: 1) linking taught grapheme-phonemes to text containing these specific items ('direct mapping'), 2) an intense focus on teaching alternate vowel digraph pronunciations, and 3) teaching 2-stage processes for reading both regular and exception words ('set-for-variability').

Our experimental hypothesis is that these features add measurable value to reading outcomes for at-risk poor readers beyond standard best practices using generic synthetic phonic strategies, rote teaching of high frequency sight words, and generic shared book reading.

Method

Participants
Readers with word reading scores below the 30th percentile ($n = 201$) were deemed 'at-risk' and allocated to either a) a Direct Mapping and Set-for-Variability program (DMSfV); or b) Current or Best-Practices (CBP) small group reading support.

Interventions
In **DMSfV**, all lessons were created to include review (2-5 minutes), teaching (5 minutes), practice activity/game (10 minutes), and shared book reading (10 minutes). The goals were to teach children letter sounds, common digraphs and what sounds they made, principles of blending grapheme-phonemes into words (first orally from phonemes then from graphemes), and common rules for decoding English (i.e.,- silent e rule or vowel digraphs rule of the first vowel being a short vowel and the vowel being silent).

In **CBP**, each lesson was programmatic and sequential, building on previous experience, and structured to contain a review, 10 minutes of phonic work focusing on a number of grapheme to phoneme correspondences each day, and 10 minutes of shared book reading. Unlike in DMSFV there was relatively less exposure to vowel and other digraphs. The CBP program also differed from DMSFV in allocating 7-10 minutes of work to recognizing 'sight words' drawn from the 100 most frequent word list. Shared book reading in the CBP program also differed from the DMSFV condition in that books were not chosen to embody specific grapheme-to-phoneme units taught on that day.

Procedure
The intervention was delivered in small groups (3-4 children) typically for 10-11 hours over 10 weeks.

Results

Students were matched on baseline reading and language abilities, and other parent background demographic measures and on the observed quality of regular classroom teaching (see Table 1).

Table 1: Matching characteristics of the Intervention sample by condition

Condition	DMSfV	CBP	Significance
Gender (% female)	58	44	3.92 *
Chronological Age in months	76.78 (4.14)	77.33 (4.47)	-0.92 n.s.
Parent-reported learning difficulties (%)	9	13	0.82 n.s.
Mother's education	4.91 (1.37)	4.69 (1.3)	0.98 n.s.
Mother-child language	1.64 (0.92)	1.65 (0.97)	-0.09 n.s.
Father-child language	1.57 (0.89)	1.62 (0.88)	-0.17 n.s.
Peabody Picture Vocabulary Test (kindergarten)	94.23 (14.41)	87.87 (16.55)	3.13 n.s.
Wide Range Achievement Test reading	74.96 (10.25)	74.14 (10.91)	0.54 n.s.
GRADE vocabulary composite	73.58 (12.39)	71.00 (11.72)	2.01 n.s.
Woodcock Johnson III Pseudo-word spelling	93.88 (15.43)	94.63 (15.67)	-0.33 n.s.
Woodcock Johnson III Spelling of sounds	92.45 (9.54)	91.69 (12.25)	0.49 n.s.
GRADE Listening comprehension	3.61 (1.74)	3.51 (1.86)	0.38 n.s.
Observer–rated grade 1 teaching	11.08 (1.47)	12.53 (3.80)	2.65 n.s.

Table 2.

Means and Standard Deviations for the Pre-Test, Post-test and Delayed Post-Test Literacy Measures by Intervention Group

Measure	DMSfV				CBP				Effect size	Effect size
	Pre-test	Mid-test	Post-test	Delay post-test	Pre-test	Mid-test	Post-test	Delay post-test	Post-test	Delayed post-test
WRAT [a]	74.89 (10.17)	80.55 (9.30)	97.32 (14.24)	93.72 (13.47)	73.34 (10.79)	79.03 (10.14)	89.15 (14.44)	87.93 (13.32)	0.41	0.21
Word attack [a]	93.81 (15.45)	100.63 (13.97)	104.67 (13.82)	100.83 (12.24)	94.57 (15.75)	99.84 (13.13)	102.23 (13.67)	96.56 (11.69)	0.08	0.18
Spell [a]	92.71 (9.51)		104.22 (11.73)	99.21 (11.08)	91.38 (12.22)		99.24 (11.87)	94.88 (10.56)	0.27	0.21
Vocab [a]	73.58 (12.39)		86.81 (15.72)	81.95 (16.01)	71.00 (11.72)		81.83 (15.17)	75.60 (15.86)	0.28	0.30
Sentence comp [b]			6.25 (3.53)	7.09 (4.03)			6.65 (4.4)	5.12 (2.41)	-0.01	0.30
Fry words [b]	2.51 (2.65)		13.59 (5.49)		2.21 (2.45)		11.99 (6.2)		0.22	
DIBELS PSF [b]	15.31 (15.51)		39.44 (16.77)		17.13 (14.81)		34.54 (17.55)		0.32	

Note: Values are represented by (a) standard scores, (b) raw scores.
Key:

WRAT	Wide Range Achievement Test III, Reading sub-test
Word attack	Woodcock-Johnson III Test of Achievement, Pseudoword reading sub-test
Spelling	Woodcock-Johnson III Test of Achievement, Spelling sub-test
Vocab	Group Reading and Diagnostic Evaluation, Vocabulary Composite score
Sentence comp	Group Reading and Diagnostic Evaluation, Reading Comprehension Composite score
Blending words	Comprehensive, Test of Phonological Processing, Blending Words sub-test
Fry words	20 words from Fry high frequency word list

Our data were first analyzed with HLM with classroom as the unit of analysis as our intervention groups within classrooms were not consistent over time. The final HLM models were built in standard 'bottom-up' fashion from preliminary analyses with steps in HLM followed sequentially in order to yield the final models.

Results of hierarchical modeling of data showed advantages for the DMSfV program ($p < .05$ for word reading and spelling at post-test and word reading and sentence comprehension at 5 month delayed post-test), with discernible valued added for the DMSfV condition across all follow-up measures (see Table 2).

Discussion

In broader theoretical terms, our findings suggest that the provision of additional strategies and opportunities to map vowels to multiple words in texts helps to phonemically underpin word representations within connectionist networks even when the grapheme to phoneme correspondences are complex.

Our results further suggest that interventions including 'lexicalized' phonic strategies for taught variable vowel rules, and where the taught units are densely represented in texts that are shared that day, are more effective than interventions containing common research-validated practices (e.g., well-delivered differentiated, preventative, thrice weekly small group synthetic phonics supports, the teaching of sight words and shared text reading).

More generally, optimal intervention theory, policy, and practice probably hinges on the demonstration of value added of optimal new models over the current 'best practices'.

Our Partners

Edmonton Public School Board

- Lymburn
- Grovenor
- Malcolm Tweedle
- Pollard Meadows
- Coronation
- Hardisty
- Nellie Carlson
- Brander Gardens
- Greenfield
- Kensington
- Lynnwood

"uplifting the whole people"
— HENRY MARSHALL TORY, FOUNDING PRESIDENT, 1908