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Introduction to ARA

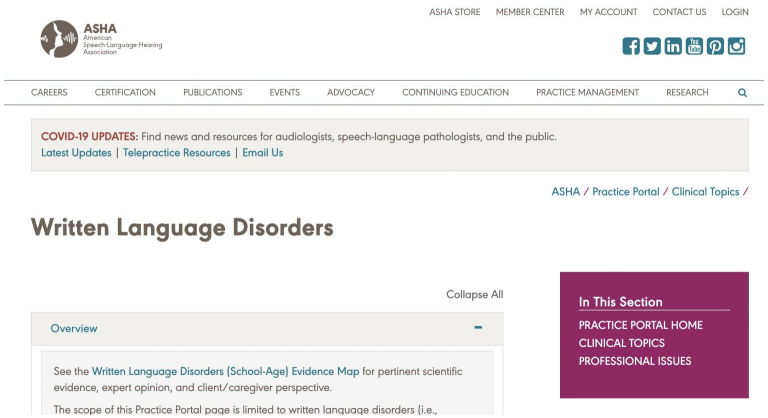
Dustin Lau

Department of Chinese and Bilingual Studies

The Hong Kong Polytechnic University

Written language disorders

- ASHA webpage…



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Written Language Disorders

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Reading difficulties as a “language” problem

THE JOURNAL OF CHILD PSYCHOLOGY AND PSYCHIATRY
ACAMH
Journal of Child Psychology and Psychiatry 53:5 (2012), pp 593–607
doi:10.1111/j.1469-7610.2011.02495.x

Annual Research Review: The nature and classification of reading disorders – a commentary on proposals for DSM-5

Margaret J. Snowling,[1] and Charles Hulme[2]

[1]Department of Psychology, University of York, York, UK; [2]Division of Psychology and Language Sciences, University College, London, UK

This article reviews our understanding of reading disorders in children and relates it to current proposals for their classification in DSM-5. There are two different, commonly occurring, forms of reading disorder in children which arise from different underlying language difficulties. Dyslexia (as defined in DSM-5), or decoding difficulty, refers to children who have difficulty in mastering the relationships between the spelling patterns of words and their pronunciations. These children typically read aloud inaccurately and slowly, and experience additional problems with spelling. Dyslexia appears to arise principally from a weakness in phonological (speech sound) skills, and there is good evidence that it can be ameliorated by systematic phonic teaching combined with phonological awareness training. The other major form of reading difficulty is reading comprehension impairment. These children read aloud accurately and fluently, but have difficulty understanding what they have read. Reading comprehension impairment appears to arise from weaknesses in a range of oral language skills including poor vocabulary knowledge, weak grammatical skills and difficulties in oral language comprehension. We suggest that the omission of reading comprehension impairment from DSM-5 is a serious one that should be remedied. Both dyslexia and reading comprehension impairment are dimensional in nature, and show strong continuities with other disorders of language. We argue that recognizing the continuities between reading and language disorders has important implications for assessment and treatment, and we note that the high rates of comorbidity between reading disorders and other seemingly disparate disorders (including ADHD and motor disorders) raises important challenges for understanding these disorders. **Keywords:** Reading disorders, language disorders, dyslexia, reading comprehension impairment, intervention.

Implications

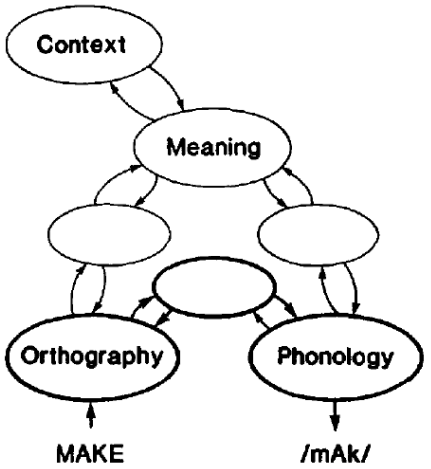
- Speech therapists play significant role in the management of children with written language disorders
- Similar training goals as typical oral language intervention
  - Learning the items
  - Acquiring the rules behind

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Theories

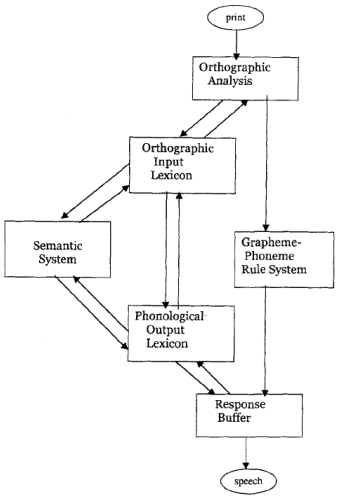
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"Triangle" model (Seidenberg & McClelland, 1989)



Dual-route (cascaded) model (Colheart et al., 2001)

- Regular words
  - E.g. hat
- Irregular (exception) words
  - E.g. pint
- Pseudowords
  - E.g. *smat*



Dual-route model of reading/writing Chinese (Weekes et al., 2006)

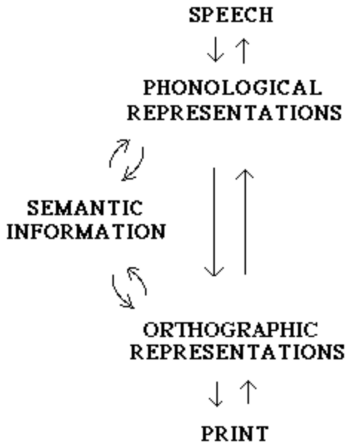


Figure 1: Functional model of reading and writing in Chinese

Metalinguistic awareness

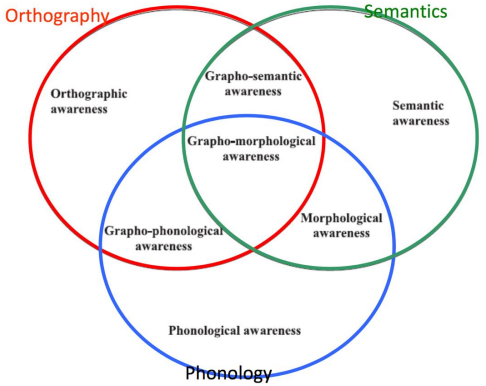


FIGURE 1 Interrelation between different aspects of metalinguistic awareness.

Kuo & Anderson (2006)

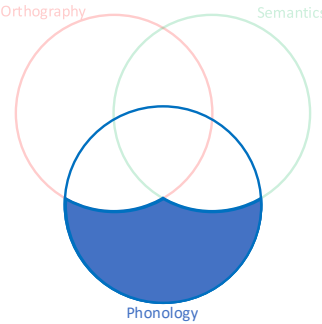
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Knowing the rules

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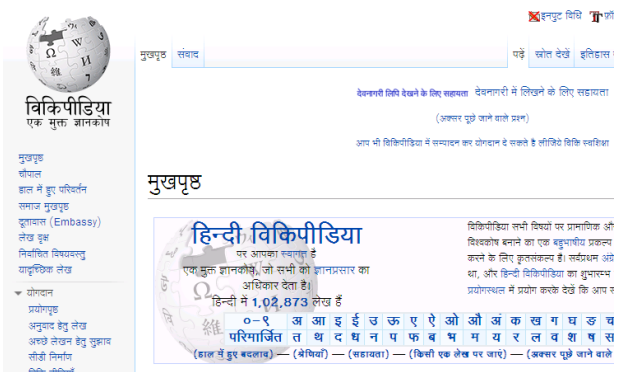
Metalinguistic awareness

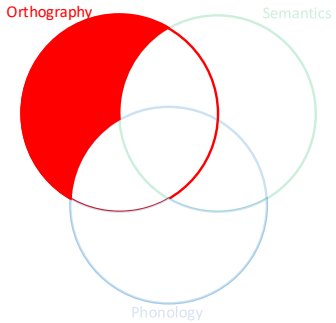
- Phonological awareness
  - "… ability to reflect on and manipulate basic phonological units of a language…" (Kuo & Anderson, 2006)
  - E.g. say the word "clear" without the /k/



Orthographic awareness

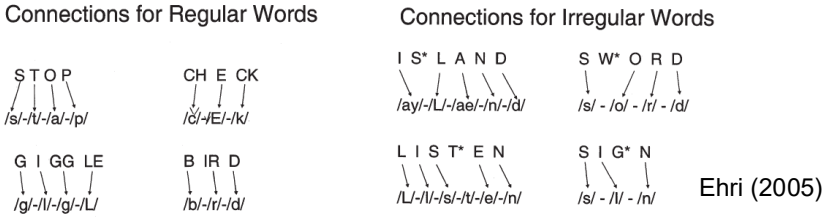
- Basic orthographic units of a language
- Rules: E.g. What's "legal", what's "illegal"…





Con't

- Not that simple actually…



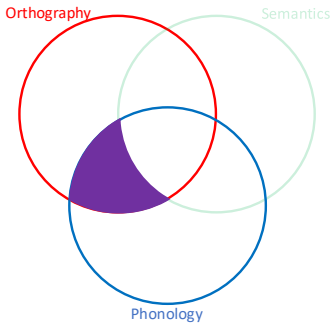
Ehri (2005)

- Orthographic "patterns"
  - E.g. "-ake" in "bake", "cake", "take", "wake"

Grapheme-phoneme correspondence (Ortho – Phono)

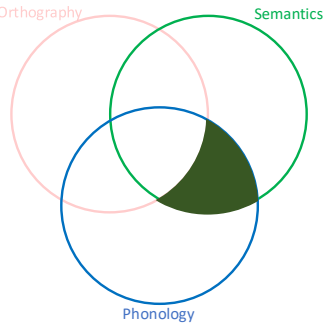
- E.g. hat

/ h æ t /



Morphological awareness (Phono – Semantics)

- Basic meaningful units of a language (oral)
  - dogs = dog (plural)
  - teacher = teach + -er
- Knowledge about word combinations
  - cat vs cats
  - top vs stop



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Applications in Chinese

Empirical data

- McBride et al. (2003) JEP

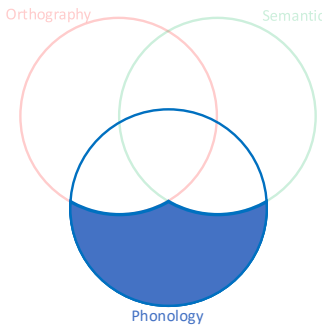
Table 3
Hierarchical Regression Equation Predicting Chinese Character Recognition for Kindergarten (K3), Second-Grade (P2), and Combined Sample

	K3		P2		Combined sample	
Step and variable	ΔR^2	R^2	ΔR^2	R^2	ΔR^2	R^2
1. Age	.022	.022	.002	.002	.540***	.540
2. Visual matching, cross out	.054	.076	.174***	.175	.092***	.631
3. Vocabulary elaboration	.188***	.263	.072**	.247	.050***	.681
4. Syllable deletion, onset phoneme deletion	.042	.306	.045	.292	.018**	.699
5. Rapid number naming, rapid object naming	.065*	.371	.036*	.347	.023***	.724
6. Morpheme identification, morphological construction	.087**	.457	.034	.381	.031***	.756

* $p < .05$. ** $p < .01$. *** $p < .001$.

Phonological awareness (Ho et al., 2007; McBride et al., 2003)

- Syllable deletion
  - 「電單車」唔講個「車」字係咩?
- Onset-Rhyme awareness
  - /si/ - /sa/ - /ce/ 邊個唔一樣呀？
  - /baa/ - /saa/ - /di/ 邊個唔一樣呀？



Empirical data

- Lau et al. (2015) CLP

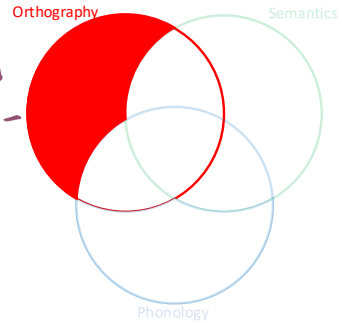
Table 3. Standardised coefficient (β) and ΔR^2 at the two steps of HRA using accuracy scores in different reading tasks as dependent variables.

	β	T	ΔR^2
Dependent variable: non-phonetic compounds naming			
Step 1			0.11***
Raven	0.01	0.24	
Step 2			0.28***
Phonological awareness – Rhyme	0.15	2.34*	0.08***
Phonological awareness – Syllable	0.16	2.74**	0.05***
RAN	−0.11	−2.11*	0.05***
Pinyin_Iso	0.14	2.29*	0.04***
Orthographic awareness	0.16	3.09**	0.03***
Pinyin_Real	0.13	2.00*	0.02*
Morphological awareness	0.14	2.33*	0.01*
Dependent variable: Irregular phonetic compounds naming			
Step 1			0.16***
Raven	0.07	1.25	
Step 2			0.30***
Phonological awareness – Rhyme	0.18	3.07**	0.10***
Pinyin_Iso	0.22	3.91***	0.07***
RAN	−0.12	−2.32*	0.03*
Phonological awareness – Syllable	0.1	1.86	0.03***
Orthographic awareness			
Morphological awareness	0.14	2.54*	0.01*
Pinyin_Real	0.1	1.76	0.01*
Dependent variable: Regular phonetic compounds naming			
Step 1			0.10***
Raven	0.02	0.29	
Step 2			0.22***
Phonological awareness – Rhyme	0.24	3.66***	0.12***
Pinyin_Iso			

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

Orthographic awareness

- Basic orthographic units of Chinese
- Word 詞語 荷花
- Characters 單字 荷 花
- Radicals 聲旁 / 形旁 艹何 艹化
- Logographemes 部件 艹亻可 艹亻匕
- Strokes 筆劃 一丨ノ丨小 一丨ノ丨匕一



Empirical data

- Lau et al. (2015) CLP

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[illegible]			
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[illegible]	0.1	1.86	0.03*
Orthographic awareness	0.18	3.75	0.03***
[illegible]			
Pinyin_Real	0.1	1.76	0.01*
Dependent variable: Regular phonetic compounds naming			
Step 1			0.10***
Raven	0.02	0.29	
Step 2			0.22***
Phonological awareness – Rhyme	0.24	3.66***	0.12***
Pinyin_Iso	0.24	3.66***	0.10***

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

Empirical data

- Yeung et al. (2011) *SSR*

TABLE 3
Standardized Betas for Regression Equations Predicting Word Reading and Word Spelling From Reading-Related Skills Measures After Controls for Differences in Age, IQ, and Oral Vocabulary

	Word Reading			*Word Spelling*		
Final Step Predictor	B	SE B	β	B	SE B	β
Age	−0.02	0.33	0.00	−0.06	0.07	−0.04
IQ	0.14	0.10	0.07	−0.01	0.02	−0.02
Oral vocabulary	−0.03	0.31	−0.01	0.03	0.06	0.02
Phonological awareness	0.04	0.60	0.00	0.22	0.12	0.10
[illegible]						
Orthographic skills	2.63	0.49	0.29***	0.25	0.10	0.15*
[illegible]						

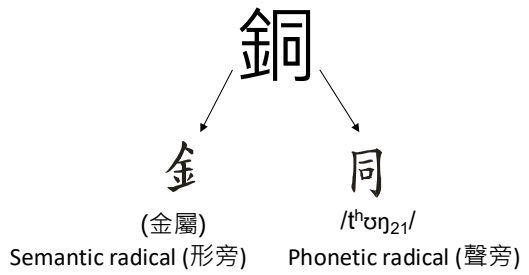
*$p < .05$. **$p < .01$. ***$p < .001$.

TABLE 4
Unique and Common Contributions of Age, IQ & Oral Vocabulary, Orthographic Skills, and Morphological Awareness to Word Reading and Word Spelling

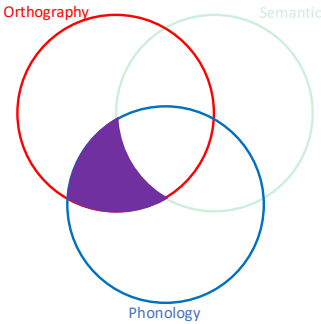
Predictor	*Word Reading*	*Word Spelling*
Unique contributions		
1. Age, IQ & oral vocabulary	0.025	0.020
2. Orthographic skills	0.097	0.027
3. Morphological awareness	0.065	0.132
Common contributions		
Common to 1 and 2	0.005	−0.001
Common to 1 and 3	0.085	0.062
Common to 2 and 3	0.023	0.001
Common to 1, 2 and 3	0.069	0.039
Sum	0.369	0.280

Grapheme-phoneme correspondence (Ortho – Phono)

- Phonetic compound characters 形聲字



- Regularity
  - Regular 清、桐
  - Irregular 倩、洞



Empirical data

Learning to Read Chinese Beyond the Logographic Phase

Connie Suk-Han Ho, Peter Bryant

First published: 09 November 2011 | https://doi.org/10.1598/RRQ.32.3.3 | Citations: 154

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ABSTRACTS

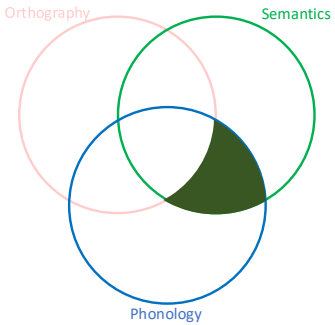
This study investigated the role of phonetics for children learning to read Chinese. Participants were 45 Chinese first graders and 45 second graders recruited in Hong Kong. The study revealed that children name phonologically regular Chinese characters more accurately than irregular ones, and phonetic-related errors were the most dominant type in reading Chinese characters and words. There were statistically significant correlations among Chinese pseudocharacter reading, Chinese real character reading, and rhyme detection for the first graders. These findings suggested that Chinese first and second graders do rely on phonetics for sound cues in naming Chinese characters, and phonological awareness seemed to be important in learning these script-sound regularities in Chinese. It therefore appeared that beyond the logographic phase, there was also a phonological phase in learning to read Chinese.

Morphemes

Smallest meaningful units of the language

- E.g. “Unchangeable”
- E.g. “月餅” /jyut6 beng2/ [mooncake]

Morphological awareness (Phono – Semantics)



Words can be classified as…

Monomorphemic words

- e.g. 手、狗

Multi-morphemic words

- e.g. 手錶、耳環、狗公園

Morphology of Chinese

- Inflectional
  - 黃色、藍色、紅色…
  - 我們、你們、他們…
  - Aspect markers
- Derivation
  - 電腦化、羅馬化…
- Compounding
  - 手錶、凍飲…

Morphosyntax

- Compare the following:
  - 「龜速」vs「速龜」
  - 「潮童」vs「童潮」

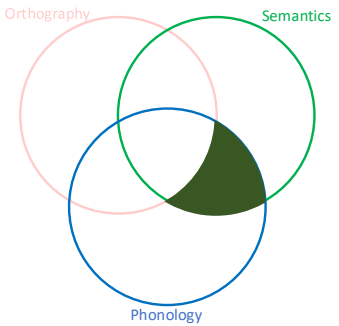
Morphological awareness (Phono – Semantics)

Manipulations of morphemes

- e.g. 龜、速、九十

Structure of words

- 龜速
- 九十後



Morphosyntactic structures

- Basically includes
  - 偏正 (e.g. 飛機、電腦)
  - 聯合 (e.g. 閱讀、朋友)
  - 述賓 (e.g. 出版、彈琴)
  - 述補 (e.g. 推廣、打開)
  - 主謂 (e.g. 民主、人為)

Empirical data

- Yeung et al. (2011) SSR

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Standardized Betas for Regression Equations Predicting Word Reading and Word Spelling From Reading-Related Skills Measures After Controls for Differences in Age, IQ, and Oral Vocabulary

	Word Reading			Word Spelling		
Final Step Predictor	B	SE B	*β*	B	SE B	*β*
Age	−0.02	0.33	0.00	−0.06	0.07	−0.04
IQ	0.14	0.10	0.07	−0.01	0.02	−0.02
Oral vocabulary	−0.03	0.31	−0.01	0.03	0.06	0.02
Phonological awareness	0.04	0.60	0.00	0.22	0.12	0.10
Rapid naming	−1.70	0.24	−0.34***	−0.15	0.05	−0.16**
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Morphological awareness	2.64	0.57	0.25***	0.70	0.12	0.36***

*$p < .05$. **$p < .01$. ***$p < .001$.

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Unique and Common Contributions of Age, IQ & Oral Vocabulary, Orthographic Skills, and Morphological Awareness to Word Reading and Word Spelling

Predictor	*Word Reading*	*Word Spelling*
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1. Age, IQ & oral vocabulary	0.025	0.020
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Common to 2 and 3	0.023	0.001
Common to 1, 2 and 3	0.069	0.039
Sum	0.369	0.280

Con't

- Tong et al. (2011) JRR

Table 4. Hierarchical regression predicting Chinese word reading across times 1–3, and time 3 Chinese word dictation from all time 1 measures, controlling for time 1 Chinese word reading.

Step and variables	T2 word reading		T3 word reading		T3 word dictation	
	ΔR^2	β	ΔR^2	β	ΔR^2	β
1. T1 controlled variables and word reading	.664***	.786***	.413***	.575***	.297***	.345***
2. T1 morphological construction	.000	−.087	.000	−.060	.001	−.052
3. T1 homophone identification	.014**	.127**	.012†	.125*	.004	.073
4. T1 visual–spatial relationships	.008*	.094†	.015*	.144*	.013†	.130†
5. T1 syllable deletion	.012**	.141**	.006	.099	.010	.130
2. T1 syllable deletion	.013**	.677	.009†	.423	.015†	.312
3. T1 visual–spatial relationships	.002	.680	.008	.430	.007	.319
4. T1 morphological construction	.003	.683	.001	.432	.001	.320
5. T1 homophone identification	.015**	.698	.014*	.446	.005	.325
2. T1 syllable deletion	.013**	.677	.009	.423	.015†	.312
3. T1 visual–spatial relationships	.002	.680	.008†	.430	.007	.319
4. T1 homophone identification	.014**	.693	.013	.444	.004	.323
5. T1 morphological construction	.004	.698	.002	.446	.002	.325
2. T1 syllable deletion	.013**	.677	.009†	.423	.015†	.312
3. T1 morphological construction	.002	.679	.000	.423	.000	.312
4. T1 homophone identification	.013**	.692	.011†	.434	.003	.315
5. T1 visual–spatial relationships	.005†	.698	.012†	.446	.010	.325
R^2	.698		.446		.325	

Note: The capitalised T and its numeral at the end of each variable represent the time in which it was measured.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

Con't

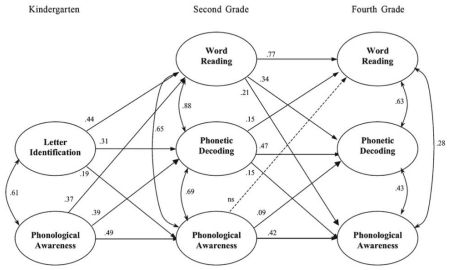
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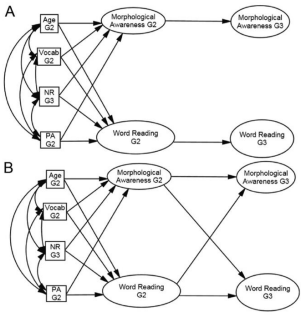
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Phonological awareness – Rhyme	0.18	3.07**	0.10***
Pinyin_Iso	0.22	3.91***	0.07***
RAN	−0.12	−2.32*	0.05***
Phonological awareness – Syllable	0.1	1.86	0.03***
[illegible]	[illegible]	[illegible]	[illegible]
Morphological awareness	0.14	2.54*	0.01*
[illegible]	[illegible]	[illegible]	[illegible]
Dependent variable: Regular phonetic compounds naming			
Step 1			0.10***
Raven	0.02	0.29	
Step 2			0.22***
Phonological awareness – Rhyme	0.24	3.66***	0.12***
Pinyin_Iso	0.24	3.66***	0.10***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Reciprocal relationship



Hogan et al. (2005) *Lang Sp Hearing Ser Sch*



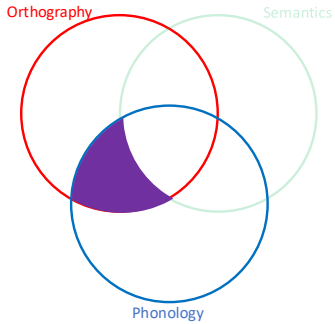
Deacon et al. (2013) *Dev Psy*

Implications

- Shall we promote the metalinguistic awareness so that the reading performance will be promoted?
- Shall we directly work on reading instead?
- More like “chicken and egg”…

Accelerating Reading Abilities (ARA)

- Orthography – Phonology



“Rule-based” treatment in Chinese

Regularity

Regularity	Character	Phonetic radical
Regular	琪/k^hei_{21}/	其/k^hei_{21}/
Irregular	組/$tsou_{35}$/	且/$ts^h\varepsilon_{35}$/

Consistency

Consistency	Phonetic	Characters
Consistent	肙	鵑 /kyn$_{55}$/ 娟 /kyn$_{55}$/ 涓 /kyn$_{55}$/ 捐 /kyn$_{55}$/
Inconsistent	艮	根 /kan$_{55}$/ 眼 /ŋan$_{23}$/ 很 /hɐn$_{35}$/ 限 /han$_{22}$/

Con't

	Regularity	Consistency
返	反 Regular	返販板 Inconsistent
鈉	内 Irregular	鈉吶納 Consistent

Regularity x Consistency

	Regularity	Consistency
蝗	皇 Regular	蝗惶煌凰 Consistent
粗	且 Irregular	粗祖咀姐 Inconsistent

ARA

- Hypothesis
  - Children failed in reading acquisition because they are not able to establish the metalinguistic awareness of reading
- Goal of treatment
  - To assist the client to establish the metalinguistic awareness of reading

Targeted metalinguistic awareness

- The awareness of regularity
- The awareness of consistency
- The character awareness (morphological awareness)

Con't

- Stage 2
  - To aware of the existence of irregularity
  - To establish the awareness of consistency
- Stimuli
  - Irregular but consistent (IRC) characters

Three treatment stages

- Stage 1
  - To establish the awareness of regularity
- Stimuli
  - Regular and consistent (RC) characters

Con't

- Stage 3
  - To aware of the existence of inconsistency
  - To flexibly use the regularity rule and the consistency rule
- Stimuli
  - Irregular but consistent (IRC) characters, regular but inconsistent (RIC) characters and irregular and inconsistent (IRIC) characters

Applying the principles of statistical learning Plante and Gómez (2018)

- Implicit instructions
- "Regularity" principle
  - High frequency of occurrence of the treatment targets with high consistency in the language input

  →One type of characters in each stage
- "Variability" principle
  - The use of varied elements in association with the treatment target in the presentation of language input

  → Twelve pairs of targets in each session

Con't

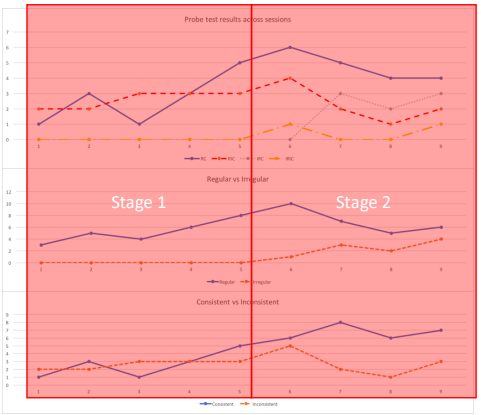
- Contains:
  - 6 low freq RC characters
  - 6 low freq RIC characters
  - 6 low freq IRC characters
  - 6 low freq IRIC characters
  - 6 phonetic radicals
  - 6 treatment targets
- The first 4 types of characters are matched for average frequencies

Probe test

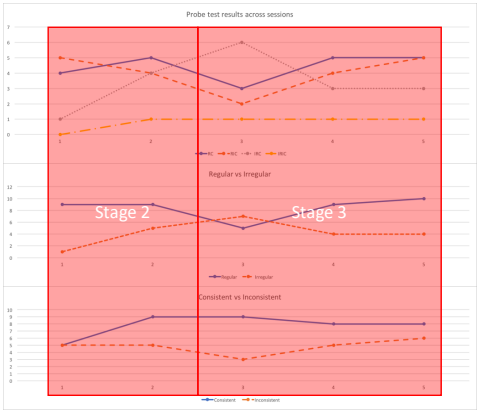
- Tailor-made to track the reading strategies used by each client
- Administered at:
  - The assessment session
  - The end of each treatment session
  - The post-Tx assessment session

Case illustration

- Case 1: CKL



Case 2: WCK



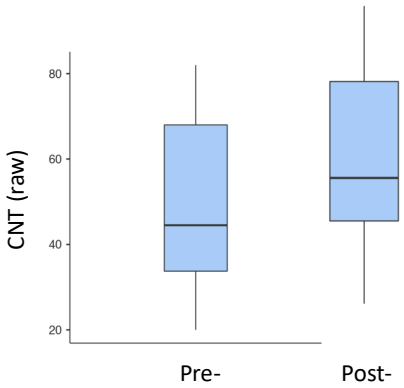
THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Summary

We Are PolyU • Together We Excel
情繫理大 • 共創非凡

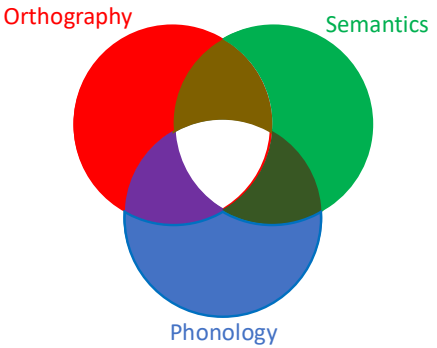
Empirical data

- Results of paired t-test: t(19) = 7.64, $p < .001$



Leung et al. (in preparation)

The triangle model as a framework to guide Ax and Tx



Written language disorders

- It’s all about language
- Any concepts applied in oral language assessment and treatment are applicable in written language disorders as well!

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