

The Benefits of Copying

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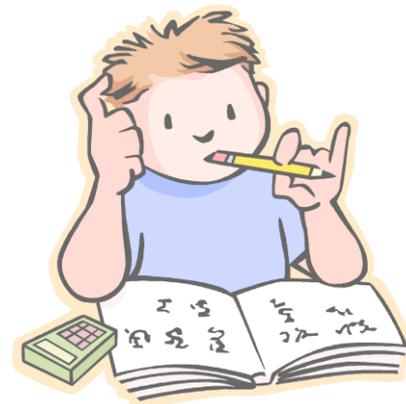


Outline

- ▷ Copying as a window: “Pure” copying and delayed copying
- ▷ Benefits of pure copying
- ▷ Benefits of delayed copying
- ▷ Teach copying

Copying as a window into early writing?

- ▷ “Pure” copying
- ▷ Delayed copying (with various names, e.g., orthographic working memory, visual-orthographic copying)



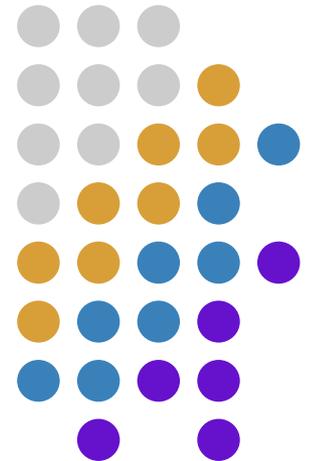
Copying in Chinese

- ▷ Children with dyslexia are often exceptionally poor in character-writing (e.g., Tan et al., 2005)
- ▷ Rote copying remains the primary method of Chinese character learning (e.g., Wu et al., 1999)
- ▷ Chan et al. (2006) found $r = .50$ of word writing and reading among 1235 students; with RAN, memory, and orthographic skill statistically controlled, $r = .42$
- ▷ Law et al. (1998): Numerous stroke ordering difficulties in Chinese children
- ▷ Tseng & Chow (2000): Slow writers of Chinese have specific difficulties in fine-motor tasks and copying of figures

What about Copying Itself?

- ▷ Beyond orthographic knowledge?
- ▷ Sequential/spatial difficulties in spelling (Seymour & Porpodas, 1980)?
- ▷ Reliance on partial cues only (Frith, 1980)?
- ▷ Writing helps adults and children learn new stimuli better than looking or typing alone (e.g., Richards et al., 2011)
- ▷ Compared to good readers, poor writers use more of the brain to write a new grapheme—fMRI (Richards et al., 2011)
- ▷ Care must be taken to include stimuli that are equally unfamiliar to both good and poor readers

Pure Copying and its benefits for literacy learning



“Pure” copying

- ▷ Copying tasks in Korean, Vietnamese, Hebrew
- ▷ Following some of the logic of Vellutino (1979; 1987)

Korean

--	--	--	--

From a dyslexic child

--	--	--	--

From a typically developing child

Hebrew

--	--	--	--

From a dyslexic child

--	--	--	--

From a typically developing child

Vietnamese

<p>Mặt trời mọc ở phía Đông.</p> <p>Correct Sentence</p>

From a dyslexic child

<p>Mặt trời mọc ở phía Đông.</p> <p>From a typically developing child</p>
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Pure copying and dyslexia



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Copying skills in relation to word reading and writing in Chinese children with and without dyslexia

Catherine McBride-Chang^a, Kevin K.H. Chung^b, Xiuhong Tong^a

Because Chinese character learning typically relies heavily on rote character copying, we tested independent copying skill in third- and fourth-grade Chinese children with and without dyslexia. In total, 21 Chinese third and fourth graders with dyslexia and 33 without dyslexia (matched on age, nonverbal IQ, and mother's education level) were given tasks of copying unfamiliar print in Vietnamese, Korean, and Hebrew as well as tests of word reading and writing, morphological awareness, rapid automatized naming (RAN), and **orthographic processing**. All three copying tasks distinguished dyslexic children from nondyslexic children with moderate effect sizes (.67–.80). Zero-order correlations of the three copying tasks with dictation and reading ranged from .37 to .58. With age, Raven's, group status, RAN, morphological awareness, and orthographic measures statistically controlled, the copying tasks uniquely explained 6% and 3% variance in word reading and dictation, respectively. Results suggest that copying skill itself may be useful in understanding the development and impairment of literacy skills in Chinese.

▷ Participants: 21 HK Chinese 3rd/4th graders with dyslexia; 33 without dyslexia (matched on age, nonverbal IQ, and mother's education level)

▷ All three copying tasks (Vietnamese, Korean, and Hebrew) distinguished children with and without dyslexia with moderate effect sizes (.67–.80).

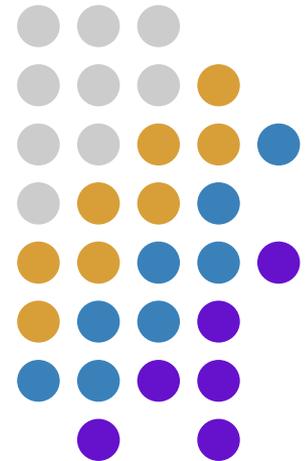
Pure copying as a marker of dyslexia in Chinese

▷ **Kalindi et al. (2015)** tested four groups of HK 2nd graders who were dyslexic in Chinese (N = 14), poor in English reading (N = 16), poor in both (N = 17), or good readers (N = 17).

▷ Children were tested on pure copying of unfamiliar stimuli, rapid automatized naming (RAN), phoneme deletion, syllable deletion, and morphological awareness.

▷ Children with dyslexia and poor in both groups showed significantly poorer performances on the copying task

What about development and pure copying?



Handwriting in Chinese spelling

Table. Hierarchical regression explaining spelling

Block/Variables	R^2	ΔR^2	$\Delta F (df1, df2)$	Final β
Block1				
Age	.14	.14	7.44(3,137)***	-.06
Nonverbal IQ				-.02
Vocabulary knowledge				.11
Block 2				
Morphological awareness	.46	.32	20.05(4,133)***	.07
Phonological awareness				.10
Character decision				.23***
Semantic radical awareness				.25***
Block 3				
Stroke order	.57	.10	7.59(4,129)***	.12
Hebrew copying				.08
Vietnamese copying				.17***
Handwriting fluency				.19***

▷ Lam & McBride (2018)

▷ Participants: 141 HK kindergartners

▷ Assessed on which measures associated with spelling

Pure copying in reading and writing in different scripts

Table. Hierarchical regression explaining spelling Chinese and English word reading and spelling from pure copying

▷ Ye, Yan, Ruan, McBride, & Yeung (2021)

▷ Participants: 188 HK kindergartners followed up at grades 1 and 2

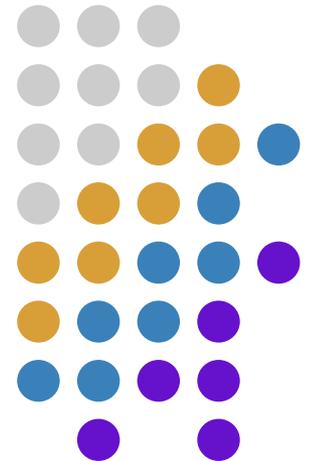
Step	Variable	Chinese Word Reading				Chinese Word Spelling			
		P1		P2		P1		P2	
		ΔR^2	R ²	ΔR^2	R ²	ΔR^2	R ²	ΔR^2	R ²
1	Age, IQ	.18***	.18	.14***	.28	.22***	.22	.11***	.11
2	RAN, PA, MA	.23***	.41	.21***	.40	.16***	.38	.16***	.26
3	Pure copying	.03***	.45	.04**	.45	.05***	.43	.05**	.31

Step	Variable	English Word Reading				English Word Spelling			
		P1		P2		P1		P2	
		ΔR^2	R ²	ΔR^2	R ²	ΔR^2	R ²	ΔR^2	R ²
1	Age, IQ	.18***	.18	.23***	.23	.17***	.17	.22***	.22
2	RAN, PA, MA	.25***	.44	.32***	.55	.20***	.37	.29***	.51
3	Pure copying	.00	.44	.00	.55	.00	.37	.00	.51

Conclusions: “Pure” copying

- ▷ Can explain variability in spelling for the inexperienced in Chinese
- ▷ Less clear for English
- ▷ In similar work by S. Suggate et al. (2016; 2019), “pure” copying was inconsistently associated with spelling in German
- ▷ What about delayed copying?

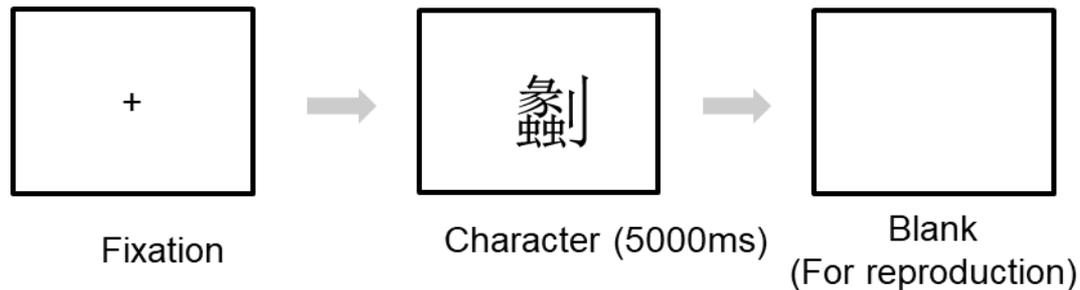
Delayed copying and its benefits to literacy learning



History of delayed copying:

▷ Hua SHU, Richard ANDERSON, Alice LAI, and others previously used it with upper primary school level Chinese students

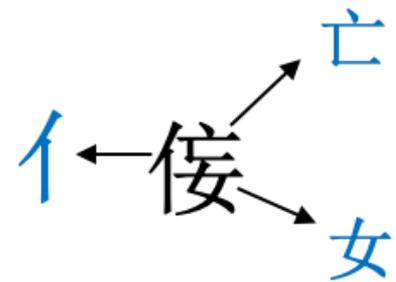
Delayed copying procedure



Partial Scoring

▷ Performance in a delayed copying task is scored by (sub)components instead of the correctness of a whole character.

▷ Clearly reflecting the “break down” character process by spellers



Unique correlates

▷ Wang, McBride, & Chan (2014)

▷ Participants: 94 Mainland Chinese kindergartners.

Longitudinal predictors

▷ Wang, Yin, & McBride (2015)

▷ Participants: 73 Mainland Chinese kindergartners

Table. Hierarchical regression explaining spelling

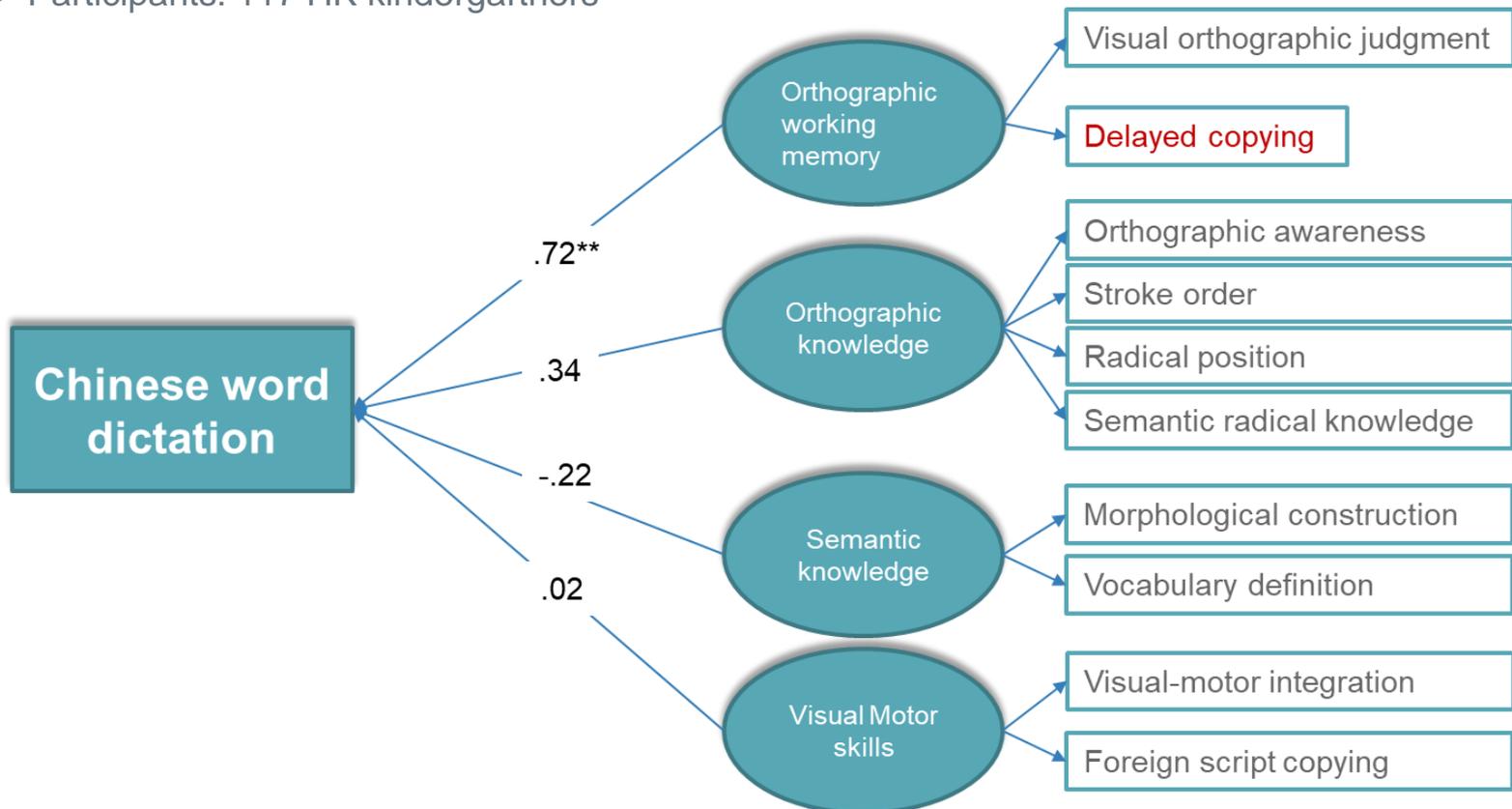
Blocks/Variables	R^2	ΔR^2	Final β
Block1			
Age	.26	.26	-.06
Level			.24
Nonverbal IQ			-.12
Block 2			
Pure copying	.37	.11**	.47***
Block 3			
Delayed copying	.42	.05**	.25**

Blocks/Variables	R^2	ΔR^2	Final β
Block1			
Age	.39	.39**	.29**
Nonverbal IQ			-.07
T1 reading skill			.08
Block 2			
Delayed copying	.59	.20**	.58**

Delayed copying is a distinctive correlate of Chinese spelling

▷ Mo, McBride, & Yip (2018)

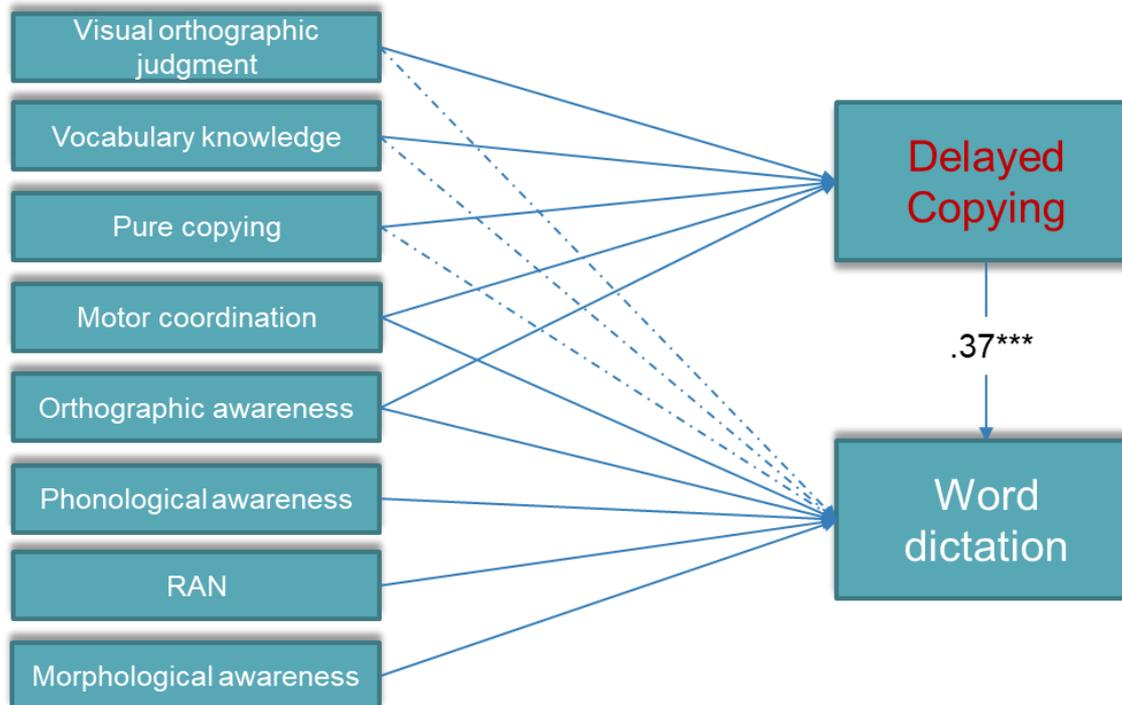
▷ Participants: 117 HK kindergartners



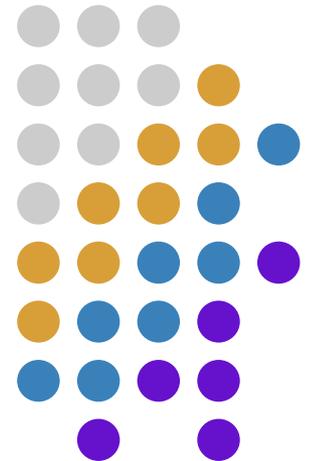
Delayed copying is a unique window into Chinese spelling acquisition

▷ Ye, McBride, Yin, Cheang, & Tse (2020)

▷ Participants: 294 typically developing HK kindergarteners



Delayed copying in other scripts

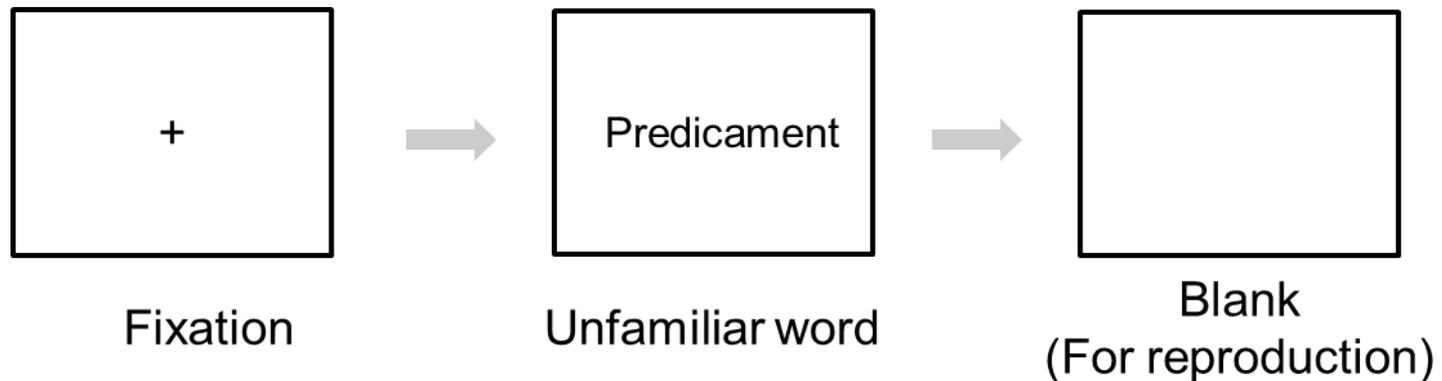


Delayed copying in reading and writing in different scripts

▷ Lo, Ye, Tong, McBride, Ho, & Waye (2018)

▷ Participants: 134 HK Chinese-English bilingual children at Grades 1 to 4 (Mean age = 7.6 years)

▷ Results: The variable that was most strongly associated with Chinese dictation was Chinese delayed copying; the variable most strongly associated with English dictation was English delayed copying.



Delayed copying in Korean



▷ Cho & McBride (2020)

▷ Participants: 94 five-year-old first language (L1) Korean kindergartners AND 41 foreign language (FL) learners (HK Chinese university students)

▷ Results: Among Korean 5-year-olds, delayed copying explained unique variances to both spelling of phonologically consistent syllables and spelling of inconsistent syllables in Korean Hangul.

▷ For university students learning Korean as L2, only delayed copying significantly explained spelling of consistent syllables

Outcomes

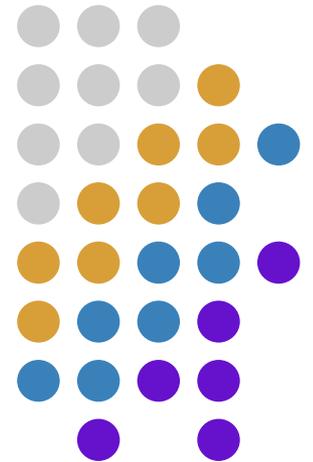
Standardized Beta Weights for Regression Equation With Spelling of Phonologically Consistent and Inconsistent Syllables as the Dependent Measures for [5-Year-Old Children](#).

Variables	Spelling of consistent syllables			Spelling of inconsistent syllables		
	B	t	p	B	t	p
Age	.10	1.47	.144	.04	0.62	.534
Syllable awareness	.07	0.74	.462	.20	2.01	.048
Phoneme coda awareness	.23	2.80	.006	.28	3.22	.002
Phonological working memory	.11	1.32	.192	-.02	-.20	.844
Morphological awareness	.01	0.09	.926	-.06	-.59	.554
Vocabulary	.08	1.00	.321	.18	2.13	.036
Delayed copying	.45	5.62	<.001	.32	3.75	<.001
Orthographic knowledge	.13	1.84	.070	.19	2.40	.019
Total R ²	.59	--		.55	--	---

Standardized Beta Weights for Regression Equation With Spelling of Phonologically Consistent and Inconsistent Syllables as the Dependent Measures for [HK University Students](#)

Variables	Spelling of consistent syllables			Spelling of inconsistent syllables		
	<i>B</i>	<i>t</i>	<i>p</i>	<i>B</i>	<i>t</i>	<i>p</i>
<i>Without reading</i>						
Delayed copying	.41	2.44	.040	.15	1.15	.259
Vocabulary	.37	1.95	.059	.62	4.26	<.001
Orthographic awareness	-.07	-.45	.657	.15	1.30	.202
Total R ²	.47	--	--	.70	---	--
<i>With reading</i>						
Delayed copying	.42	2.39	.022	.10	.78	.438
Vocabulary	.40	1.80	.08	.50	3.12	.004
Orthographic awareness	-.07	-.42	.674	.14	1.20	.237
Reading fluency	-.04	-.22	.827	.21	1.55	.131
Total R ²	.47	--	---	.72	---	---

Teach Copying

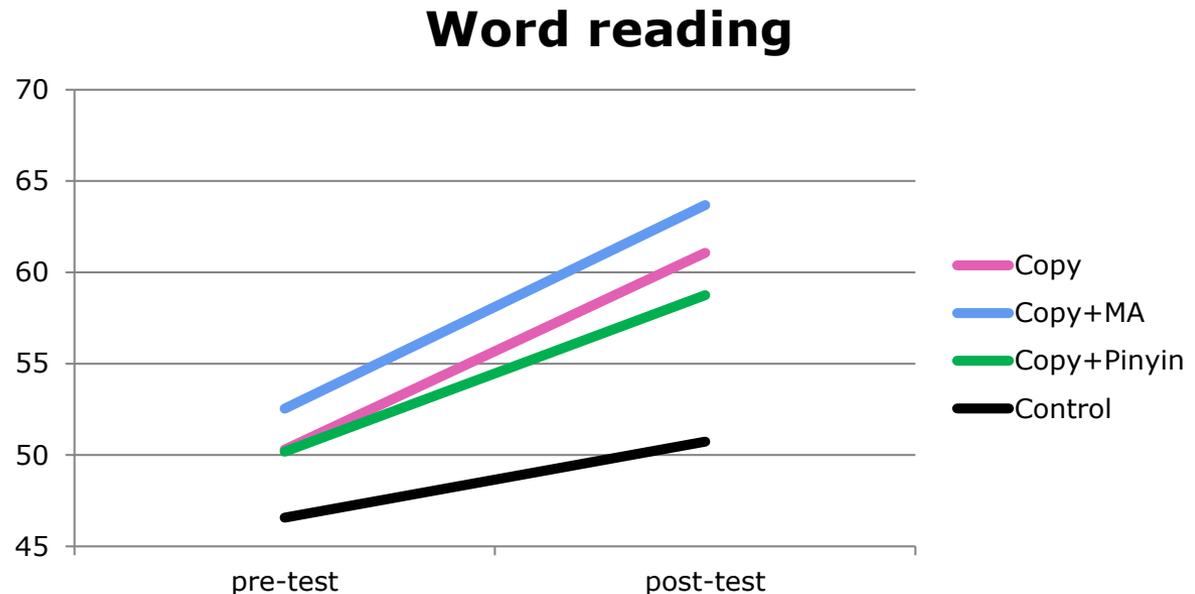


Copying Training Program

▷ Outcomes (1)

▷ Wang & McBride (2017)

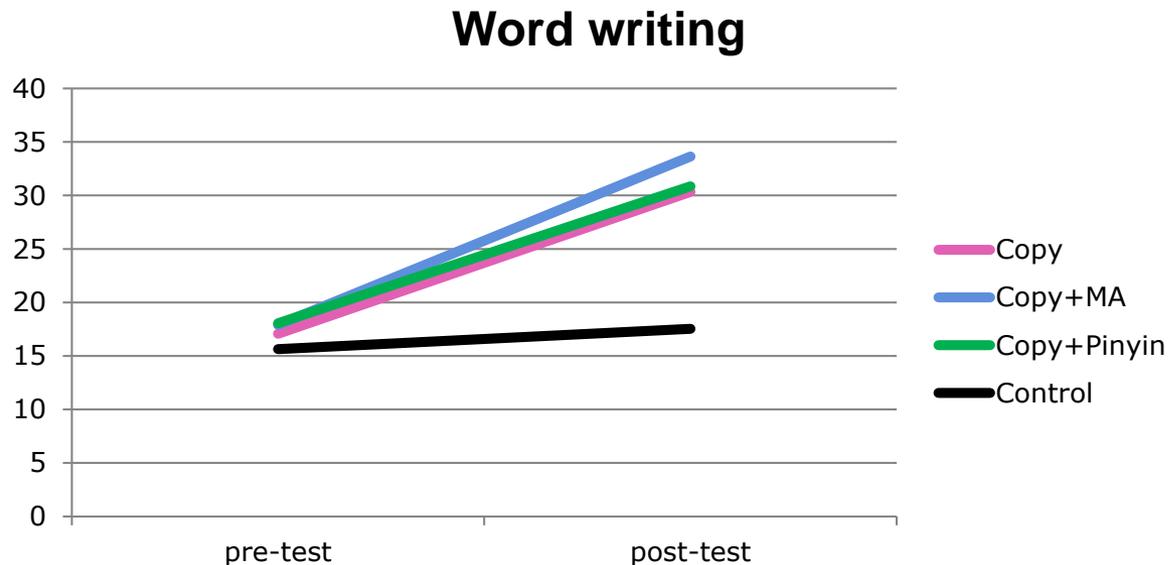
▷ Participants: 97 kindergarteners aged 5-7 years in mainland China (30 in Copy, 32 in Copy + Pinyin, 35 in Copy + Morphological awareness training groups)



For word reading, all three intervention groups progressed more than control group. $F(3,123) = 5.17, p < .01$ (Wang & McBride, 2017).

Copying Training Program

▷ Outcomes (2)



For word writing, all the three intervention groups progressed more than control group. $F(3,123) = 23.60, p < .01$. Moreover, the combined program of Copy+MA also outperformed Copy+ Pinyin (contrast estimates were 3.46).

Parent-child joint writing in Chinese kindergarteners

▷ Lam & McBride (2013)

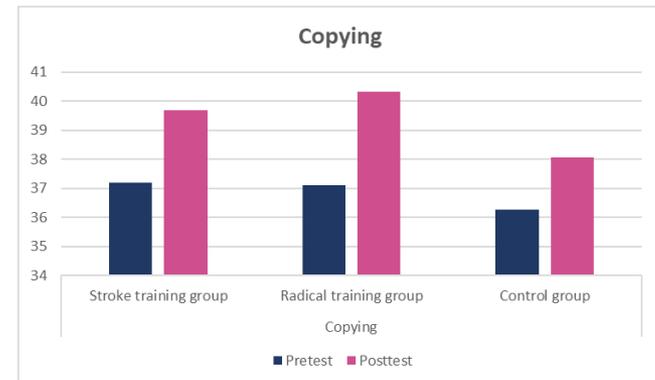
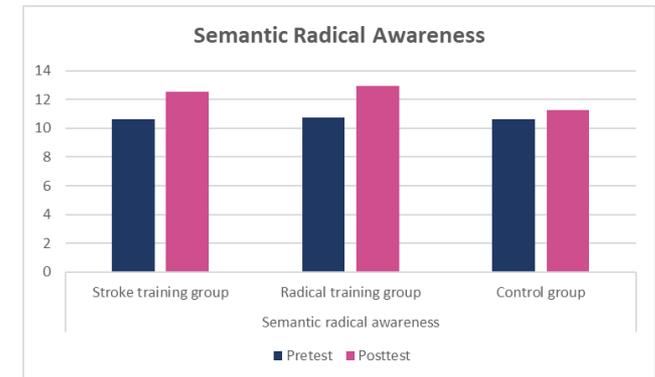
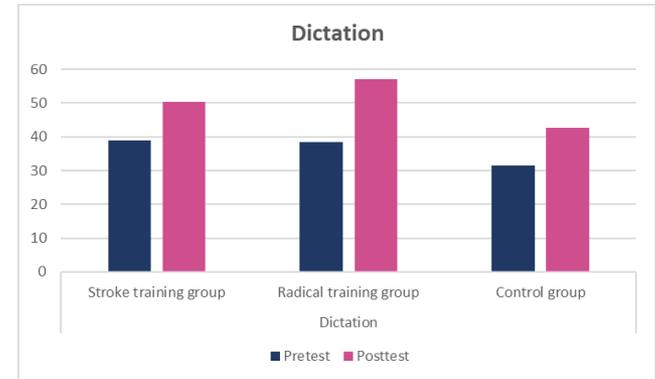
▷ Participants: 80 Hong Kong kindergarteners

▷ Eight weeks of training

▷ Stroke training group, radical training group, control group



Figure 1. General strokes of Chinese characters, every stroke is provided with a name, for example [、] is called 點 which means dot.



The transferability of handwriting skills

▷ Asselborn et al., (2021)

- ▷ Participants: 190 children from grades 1-4 in the capital of Kazakhstan. Without experience in writing in Latin
- ▷ Copy a short test using both the Cyrillic and Latin alphabets on a digital tablet

Table 3. Summary statistics for the participants involved in this study.

	Grade 1	Grade 2	Grade 3	Grade 4
Male/female	13/16	33/38	21/20	23/26
Age (std.) [years]	6.94 (0.4)	7.94 (0.4)	8.88 (0.4)	10.16 (0.6)
Right handed/left handed	27/2	68/3	37/4	46/3
Cyrillic average learning time [months]	6	18	30	42
Latin average learning time [months]	0	0	0	0

Learning pace was 6 hours per week for handwriting classes in Cyrillic alphabet and 2 hours per week for English classes (English as a foreign language).

- ▷ Results: the quality of Cyrillic writing increased from grades 1–4, due to increased practice; the quality of the Latin writing increased as well, despite the fact that all of the pupils had the same absence of experience in writing in Latin.
- ▷ This improvement in Latin script as an indicator of the transfer of fine motor control skills from Cyrillic to Latin

Copying training facilitated writing of Chinese characters

▷ Wang et al., (2018)

▷ Participant: 29 Chinese speaking and 34 non-Chinese speaking second and third graders

▷ Participants were taught 16 new Chinese characters in one of four conditions: copy, radical, phonological and look–say

▷ Results: Copying condition best facilitated writing of Chinese characters for both groups.

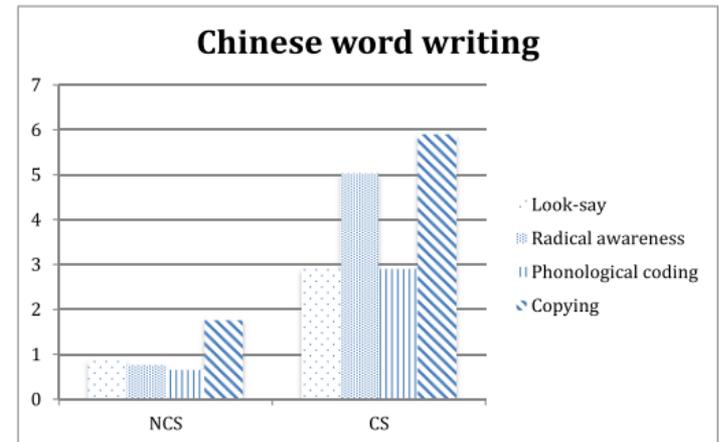


Figure 1. Mean score of Chinese word writing of four learning conditions for each group. NCS, non-Chinese-speaking children; CS, Chinese-speaking children. [Colour figure can be viewed at wileyonlinelibrary.com]

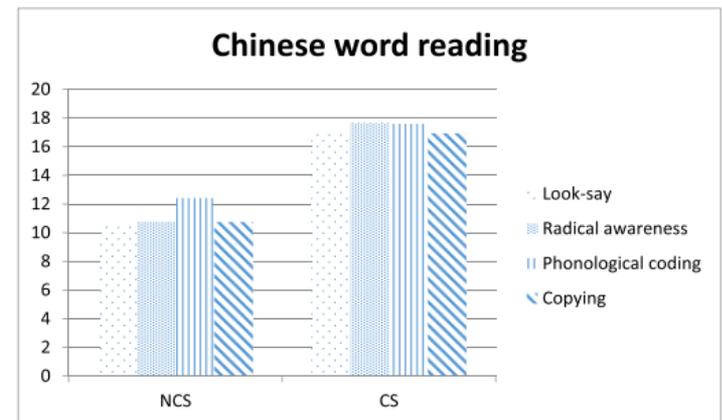


Figure 2. Mean score of Chinese word reading of four learning conditions for each group. NCS, non-Chinese-speaking children; CS, Chinese-speaking children. [Colour figure can be viewed at wileyonlinelibrary.com]

Copying training in Korean

- ▷ Cho, McBride, & Kim (2020)
- ▷ Participants: 45 Korean kindergartners
- ▷ Taught 6 new Korean Guljas in each of four conditions: whole Gulja, alphabet letter, Consonant+Vowel and coda subsyllabic units, and Copying
- ▷ Result: Copying instruction facilitated Gulja learning in novice readers.

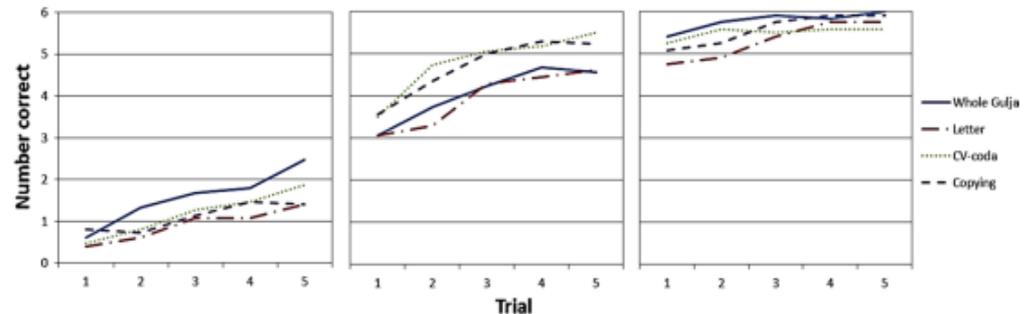


Fig. 1 Number of correct responses in the Hangeul Gulja learning task as a function of reading level, trial and condition in emergent readers (left panel), novice readers (middle panel), and good readers (right panel)

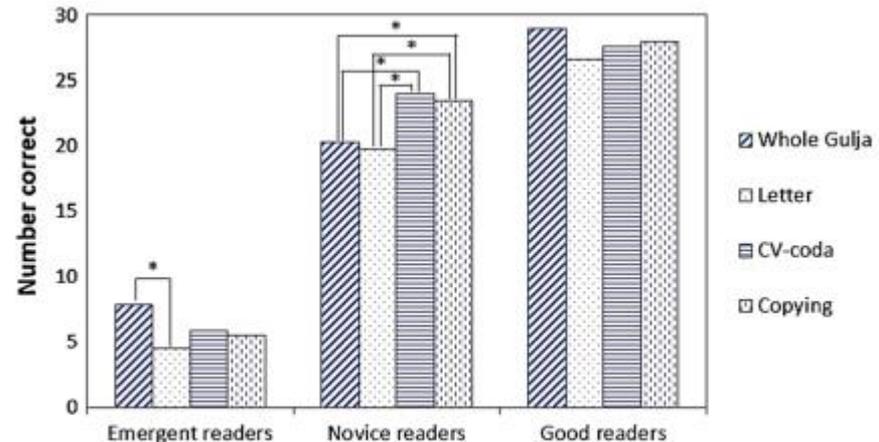


Fig. 2 Number of correct responses in the Hangeul Gulja-learning task as a function of reading level and condition. A star (*) indicates a significant difference between two conditions in multiple comparisons

Copying training in both children and their parents

▷ Lau et al., 2020

- ▷ Participants: 44 preschoolers in the intervention group and 29 preschoolers as the control group, all from Hong Kong.
- ▷ Children in the intervention group and eight of their mothers participated in Chinese literacy interventions that consisted of two approaches – Copying and Morphological Awareness Training (CMAT) and Integrative Perceptual Approach (IPA).

Outcomes

- ▷ Results: the intervention group did significantly better than the control group at posttest in morphological awareness, word reading and writing when taught using CMAT
- ▷ Mothers made gains on most Chinese literacy measures and children whose mothers participated in the intervention had higher gains in mean scores relative to their pretest scores on most measures than those whose mothers did not, suggesting the effectiveness of combined child and parent interventions.

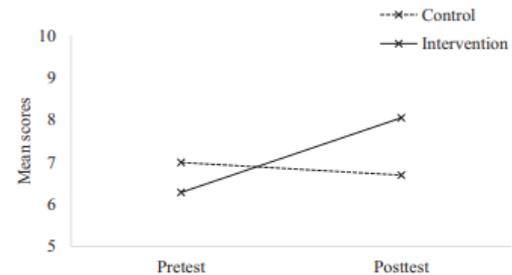


Figure 1. Estimated marginal means of pretest and posttest scores of intervention and control groups for morphological awareness.

Covariates appearing in the model are evaluated at non-verbal intelligence = 15.47.

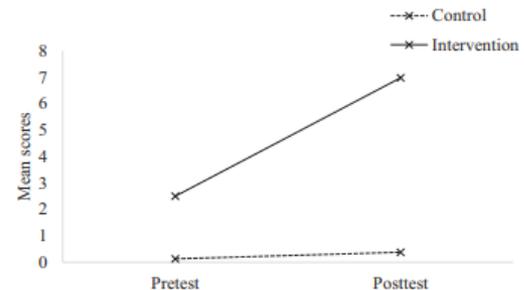


Figure 2. Estimated marginal means of pretest and posttest scores of intervention and control groups for CMAT word writing.

Covariates appearing in the model are evaluated at non-verbal intelligence = 15.47.

Conclusion

- ▷ Copying seems to be helpful in learning to spell Chinese even at the beginning.
- ▷ Pure copying seems important for initial writing of Chinese, less important later.
- ▷ Delayed copying is consistently useful across scripts and likely represents complex skills, e.g., orthographic, memory, visuo-motor, and other skills.

A book on handwriting and visual motor skills

- ▷ Coming soon...
- ▷ Late 2022 or early 2023



Routledge International Handbook of Visual-motor skills, Handwriting, and Spelling: Theory, Research, and Practice

Edited by Yanyan YE, Tomohiro Inoue, Urs Maurer, and Catherine McBride

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Grazie Danke Ευχαριστίες Dalu

Thank You Köszönöm

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Спасибо Dank Gracias

谢谢 Merci Seé
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Obrigado