







An fMRI study of normal and impaired reading







- generated from fusiform gyrus
- lateralized to the left hemisphere fusiform gyrus (the visual word form area; Cohen et al., 2000)
- orthographic word-form detection

When & how does the sensitivity of brain to print emerges?

- 32 nonreading kindergarten children
- Behavioral + fMRI + ERP

























Chinese orthography

- · Metalinguistic knowledge of Chinese orthography
 - Legal combination of strokes (to form a radical)
 - Radical position (Hsiao et al., 2009; Su et al., 2012,)
 - Radical function
 - Consistency/regularity of phonetic radical (Lee et al., 2004; 2005; 2007; 2009)
 - Semantic transparency of semantic radical (Cheng et al., in preparation)
 - Radical combinability (orthographic neighborhood size) (Hsu et al., 2009; 2011)











Collective Teaching Method	
•寚 yao2: 摇、瑶、遥、謠、傜、徭	
•胡 hu2: 瑚、蝴、湖、鬍、餬、醐	
•荒 liu2: 流、琉、硫 shu1: 疏、梳 yu4: 毓	26-

A computer assisted interactive game for learning Chinese

- Design principle
 - Repetitive and collective exposure to a set of phonograms that share a specific phonetic radical

P I	honetic adical		Ta	arget c	haract	ers			distra	ctors	
	巠	勁	徑	莖	經	輕	經	腦	淄	婦	椅
		jing4	jing4	jing1	jing1	qing1	jing1				

- · Objectives: implicit learning of
 - Radicals and their most likely positions
 - To acquire the radical-sound association
 - Homophone disambiguation





Hit the Carrot if the character contains the target radical...



Hit the Carrot if the character contains the target radical...



Do not Hit the carrot (it is a orthographic similar distractor)









Extra credits from making compound words from the target character



The Hall of Fame Improvement on naming speed Control group Experimental group ID 公素 99753004 $3740 \\ 1680 \\ 1440 \\ 1180$ Con RAN reading time Exp_RAN reading time una 123 21 ightlin santoun cylee 30. 25) 20) 1130 15.0 15.0 san2 10.0 10.) 8 TammyLiu 80 liuagain hothero 1st~2nd 3rd~4ti 5th~6th Experimental group showed a significant improvement on rapid naming time of 返回 characters, across all grades

Lexicality effect

- The lexicality effect refers to how readers react to real word, pseudoword, and nonword.
- This effect reflects whether readers acquire the orthographic rules in a writing system.









- Colleague students, N=17
- Normal developing children (3rd to 6th grades), subdivided into three reading levels
 - High 🗋
 - Medium Chinese character recognition task (CCRT)score
- Dyslexic children and their age-matched control (Poster No:3-43)

















Behavioral and ERP measures for pre- and post- tests



Two groups of players (play less versus play more)

Play more	Grade	Garde score of CCRT	Time(mins)	Score
Case 1	5 th	2.5	1281	115685
Case 2	5 th	2.9	1796	139805
Case 3	6 th	3.8	3485	190440
Play ess	Grade	Garde score of CCRT	Time(mins)	Score
Play less Case 1	Grade 5 th	Garde score of CCRT 1.2	Time(mins) 45	Score 29720
Play less Case 1 Case 2	Grade 5 th 6 th	Garde score of CCRT 1.2 3.2	Time(mins) 45 56	Score 29720 34490

Improvement on Chinese character recognition (CCRT) 120 100 CCRT Raw score 80 60 pre-test post-test 40 20 0 (mins) 1281 1796 3485 45 56 10 play less play more







Conclusions



to index the development of orthographic processing for children in learning to read.

Foundations for a New Science of Learning



Future direction

· Collaborations among cognitive neuroscience, machine learning, and education

- Evidence-based CAI program
- Effectiveness evaluation on behavioral and neural levels
- · Possible applications for early intervention in clinical and educational settings.



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