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# Learning to read Chinese characters: Evidence from the phonological loop

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## Abstract

Chinese characters are learned by reading. This study investigated whether the phonological loop, a mechanism proposed by Baddeley (1986) to explain the phonological short-term memory system, is involved in the early stage of Chinese character learning. Two experiments were conducted. In Experiment 1, Chinese characters were presented for a short duration (100 ms) and then followed by a mask. Participants were asked to repeat the characters aloud. In Experiment 2, Chinese characters were presented for a longer duration (200 ms) and then followed by a mask. Participants were asked to repeat the characters aloud. Results showed that the phonological loop is involved in the early stage of Chinese character learning. The phonological loop is used to store the phonological information of Chinese characters in short-term memory, which is then used to learn the Chinese characters.

**Keywords:** Chinese characters; Phonological loop; Memory; Reading; Learning

## 1. Introduction

Chinese characters are learned by reading. This study investigated whether the phonological loop, a mechanism proposed by Baddeley (1986) to explain the phonological short-term memory system, is involved in the early stage of Chinese character learning. Two experiments were conducted. In Experiment 1, Chinese characters were presented for a short duration (100 ms) and then followed by a mask. Participants were asked to repeat the characters aloud. In Experiment 2, Chinese characters were presented for a longer duration (200 ms) and then followed by a mask. Participants were asked to repeat the characters aloud. Results showed that the phonological loop is involved in the early stage of Chinese character learning. The phonological loop is used to store the phonological information of Chinese characters in short-term memory, which is then used to learn the Chinese characters.

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## 2. Method

### 2.1. Participants

E1, f 66, f, i b 18 27. f  
 f C, b i B  
 F, H f, f, i b 1 b  
 b i 2 2b i i f 1b  
 40 b i 1b ff  
 1 f i b 2b  
 2 b i  
 1b i

### 2.2. Stimuli

A b b C, f b C  
 ci2 b ta1 xie3 ... zhe4 ge4  
 !! 1 2 ( i .., bo1 " bo2 !! )  
 b b " b i b ( i .., du3  
 bo2 !! b " duan3 bo1 !! ) A b 1  
 b 160. b b  
 3 4, i 1 2b b  
 b b f b f  
 1 2 b b 1b  
 b 2b b z - b b 25 f  
 b b f b i AA (B, 2001). 1 2 -  
 b ( 10 )b  
 11 (100% 1-0% 2, 90% 1-10%  
 2, ..., 0% 1-100% 2). Fi . 1 f f  
 b qin. i - b ( LA) b b  
 11 f0 i b b  
 f f 25 f b i b b . F  
 ( A b 2 Fi 2) b b b i -  
 f b , i b ff . N



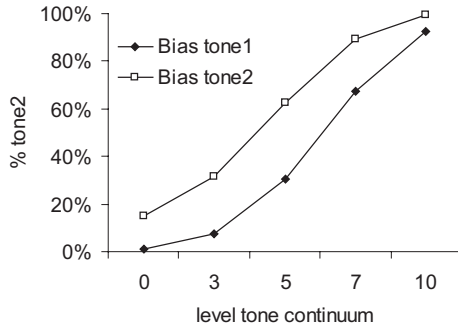


Figure 2. M... f... 2... b...  
 ... b...  
 ... f... f... 1... 2...  
 ... J... f... 11-...  
 ... b... f... f... 80%... 1... 20%... 2...  
 ... 60%... 1... 40%... 2... 50%... 1... 50%... 2... 40%... 1... 60%... 2... 20%... 1... 80%...  
 ... 2...  
 ... b... f... A...  
 ... N... 2003, f...  
 ... F... 2AFC  
 ... 50 x 50... C... f 189 x 113...

### 2.3. Apparatus and procedure

MA LAB... C... b... (2.54) (B... 1997).  
 ... 200...  
 ... 600... f... 1.5...  
 ... 400-... b...  
 ... b... 1... 45... 1... 2... 55... 3... 4...  
 ... F... 90... 1... 2... 40...  
 ... H... 1... b...

L	G <sub>1</sub> (1B)		G <sub>2</sub> (2B)	
	N	A b	N	A b
1	25	20	20	25
2	20	25		20
3	30	25	30	25
4	30	25	30	25
	80	100	80	100

Note.

1 2 b b 1 1 f f 2  
 b 1 110 3- 4b -  
 60 b b f !!  
 200 f 10  
 ( ta1 xie3/shuo1 ... zhe4ge4ci2” /  
 1 2 b  
 bo bo1 bo2  
 0.2  
 5 C  
 D 40 b (20  
 20 ) f0  
 ( 3, 5, 6, 7, 9 f 1 2 ; )  
 A ff

2.4. Design and analysis

F b b b b E  
 1 2 b - b b  
 F b 2 b ) C ( ff )  
 b b ( )  
 6) 1 2. b b 1  
 b b

1.

..., E... G... × C... (..., E... G... b... N... b... 4 (B..., D..., & B..., 2008). F... ( /...), b... (J..., 2008).

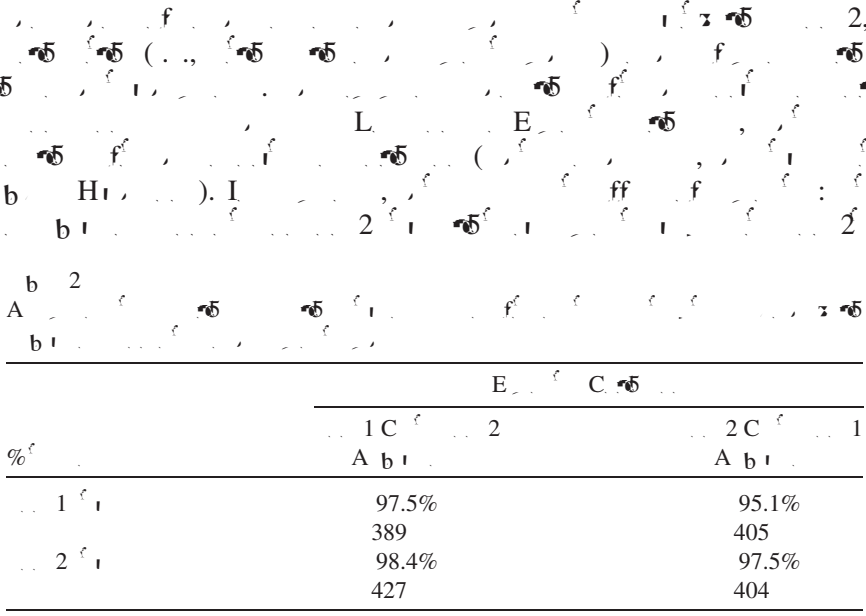
### 3. Results

#### 3.1. Exposure

I..., 99% (b 2)b 2, b 2 ( ) f, 78 b f, ff. A f, f E C b (b b = -39, p < .05; b f (b = -0.66, p < .001). N ff

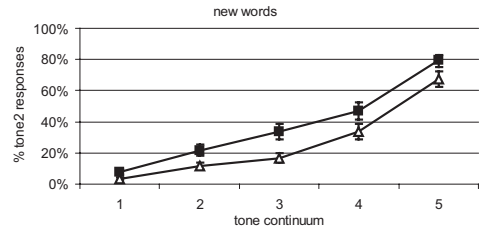
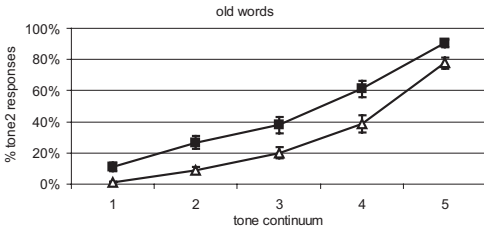
#### 3.2. Test

Fig. 3





Same tone context in Exposure and Test



Different tone context in Exposure and Test

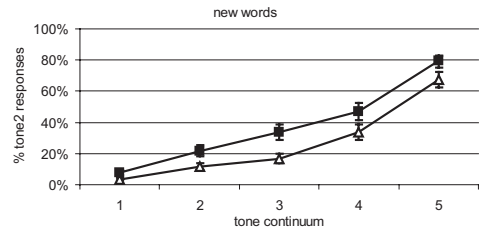
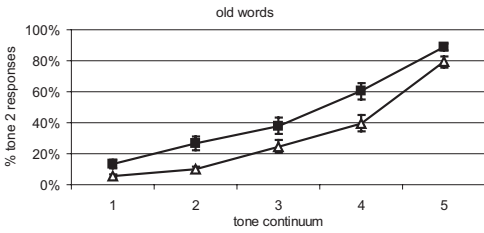
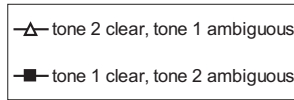
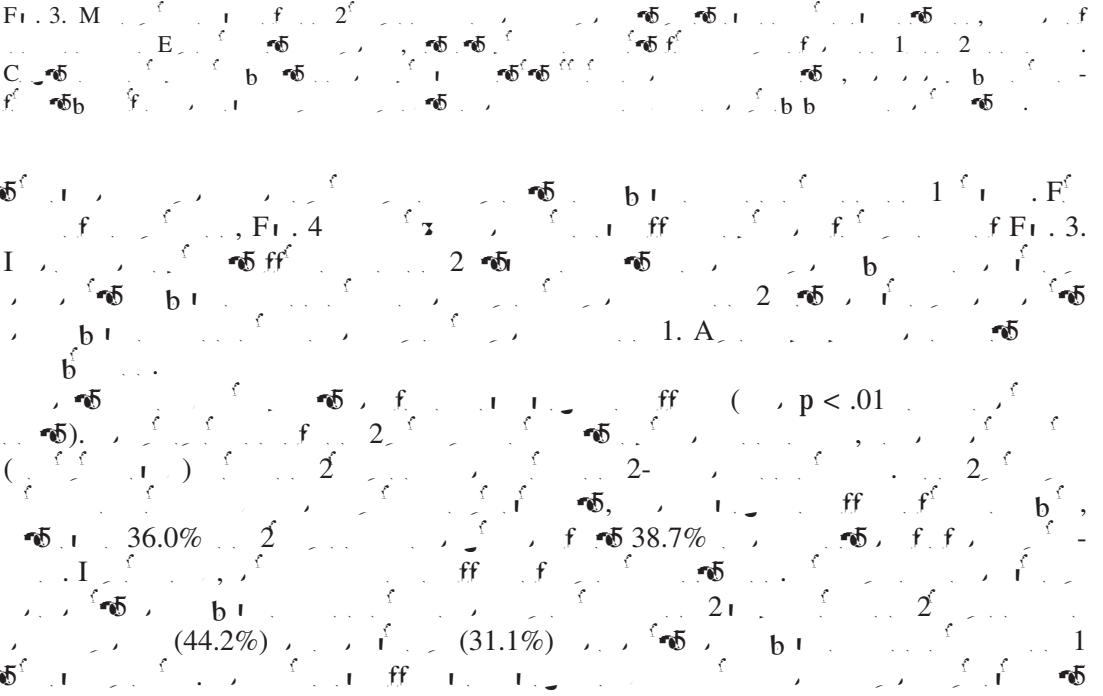


Fig. 3. M



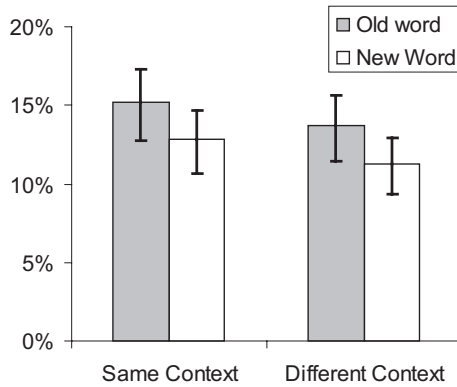


Figure 4. Left: Percentage of correct responses for old words (15.0%) and new words (10.8%) in the same context. Right: Percentage of correct responses for old words (14.4%) and new words (11.8%) in a different context. Error bars represent standard error.  $p < .05$ .  $p > .2$ .

4. Discussion

The present study investigated the effects of context on word recognition. Results showed that old words were recognized more accurately than new words, both in the same and different context conditions. This finding is consistent with previous research on word recognition (e.g., Eysenck & M... 2005, 2006; K... & ... 2005, 2006; L... & L... 2007; M... 2006; N... 2003), which has shown that word frequency and context play important roles in word recognition. The present study also found that the effect of context was more pronounced for old words than for new words. This may be due to the fact that old words have been encountered more frequently and are therefore more likely to be associated with a specific context. In contrast, new words are less familiar and may not be as strongly associated with a specific context. The present study has important implications for understanding word recognition and for designing educational materials. For example, it suggests that new words should be presented in a variety of contexts to facilitate learning and retention. Additionally, the present study highlights the importance of word frequency in word recognition, suggesting that high-frequency words should be prioritized in educational materials.

b  
H  
(N<sup>ff</sup>, 1994),  
1998),  
b  
b  
F  
? B  
b  
M  
(G  
ff

I (G... , 1996);

(f... )

B...

### Acknowledgments

L... N... (N... LIDI 016084338) E... C... (E C-... I... G... 206198)

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**Supporting Information**

**A55** I f b f Lb

**Appendix S1:** E

**Appendix S2:** -B b f A ( ) b b b b