

■ **A**  
**P**  
**D** **C**  
**C** : **B**  
**E P E**

M<sup>1</sup>, C<sup>1</sup>, J<sup>1</sup>,  
<sub>1,2,\*</sub>

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B (E P)  
C  
E 1, 102  
C  
32%  
I E 2,  
(MMN)  
C  
T  
MMN  
C B MMN

\*C : D P P B  
100871, C F : +86-10-6276-1081; - : 104@ ; C / :  
C N P P ; F / : 95- / -09; C / :  
: N N N F C : M E ;  
/ : 01002, 02170, 01JA L 015

... C  
... T ... C  
... C © 2005 J ... & ... , L .

Keywords: ... ; ... ; ... (MMN)

INT. OD CTION

**P** ... ( ... , T ... ,  
& ... , 1994). L ...  
(B ... & B ... , 1978, 1983; B ...  
& B ... , 1985; L ... , F ... , & P ... , 1988). P ...  
... D ... F ...  
(B ... & B ... , 1978; M ... , C ... , & ... , 1993; ... & ... ,  
1995; ... & ... , 1994), ... ( ... , 1981), ...  
... (K ... , 1986), ... ( ... & ... ,  
1988; ... , 1985), ... (B ... & ... , 1993;  
D ... & ... , 1976), ... ( ... &  
G ... , 1997; B ... , 1997). I ...  
... ( ... , ... )

(M C & K , 1980). A (M , M A , & , 1999) ( et al., 1998) et al. (1998).

32 10- . T et al. (2000)

M (2000) 50% . A , P ,

. T

2001; T et al., 2003; M et al., 1996; T et al., 1998), A et al. (2004)

B , E P

I (B , , F , & G , 1999), (MMN) ( ( ) -K , D , B , (1999)

D MMN 225 600 , per se, MMN . H , E P ( -K et al., 1999).

T C , B 1300, 5000, M C . A . A

C ( . . . . . ) .

C ( , C , A , & , 2003; & F , 2001; M B -C & H , 2000; H & B , 1997). B C

I , C

E , 1 C

102 C

E , 2, E P , C

EXPERIMENT 1

F , ? I

T

? F ,

Method

Participants

O - C (52 50 , = 129 ) B

A M C

Design and procedure

T I C

P M ( & , 1985)

. I  
 . T  
 T DMD (F & F , 2003)  
 A B  
 C 2000 A  
 60 B.

*Linguistic Tests*

T vocabulary test ( & T , 1996) 210  
 10  
 P T  
 ( )  
 P  
 T Reading fluency test 95  
 5 P  
 C  
 10-  
 T phonological awareness test (B & B ,  
 1978)  
 T 20  
 I

... T 50 ... 50 ...  
 ... (109/ ... ) ...  
 ... (20/ ... ) ...

*Auditory and temporal tests*

I *tone frequency discrimination task*, ... 300  
 ... (700 H), ... I I 500 ... O  
 ... 5 120 H, 7 ...

C ...

I *tone temporal order judgment*, ... 800 H  
 ... 2000 H ... E ... 50 ...

C ... T I I  
 50, ... 5 ... E ... 10 ... 10 ... T 75% ... 5

I *temporal interval discrimination*, ... 15 ... T I I  
 ... (1000 H) ... 500 ... T

... 100 ... 50 100 ...  
 10 (5 ... ) C

T 75% ...

T *composite tone pattern discrimination task*  
 2000 H ... 800 H ... T

... T ... 50 ... 150 ;  
 ... 150 ... 50 ... C

... I ... 75% ... 25% ... C  
 ... T

**Results**

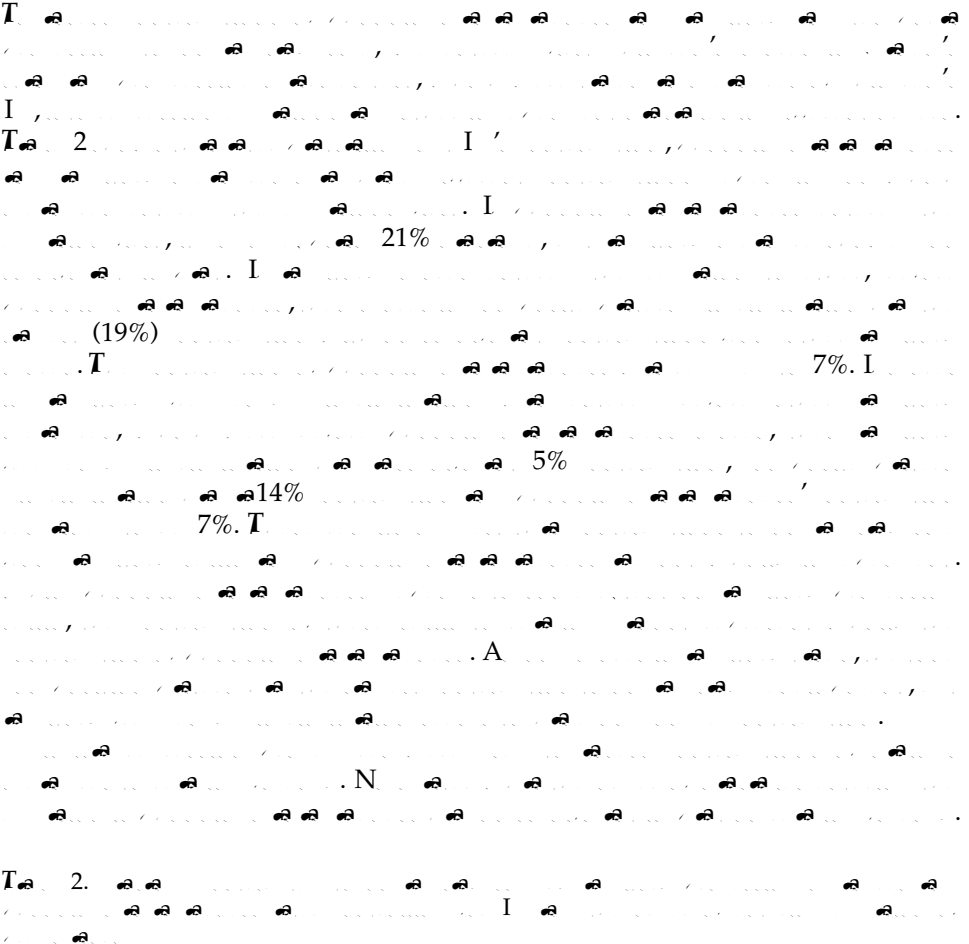
I ...

Table 1. Mean values of variables

	1	2	3	4	5	6	7	8	9	10
1. <i>M</i>										
2. <i>T</i>	0.24*									
3. <i>P</i>	0.16	0.33**								
4. <i>P</i>	0.35**	0.50**	0.22*							
5. <i>O</i>	0.10	-0.18	-0.27**	-0.20*						
6. <i>C</i>	0.02	-0.34**	-0.37**	-0.18	0.38**					
7. <i>C</i>	-0.20*	-0.35**	-0.14	-0.30**	0.01	0.06				
8. <i>T</i>	-0.28**	-0.25**	-0.26**	-0.30**	0.18	0.10	0.06			
9. <i>T</i>	-0.01	-0.22*	-0.31**	-0.26**	0.18	0.25**	0.02	0.34**		
10. <i>T</i>	-0.27**	-0.23*	-0.28**	-0.46**	0.07	-0.01	0.14	0.21*	0.55**	
11. <i>C</i>	-0.17	-0.43**	-0.22*	-0.56**	0.08	0.31**	0.22*	0.26**	0.26**	0.35**

N : \* <0.05; \*\* <0.01, \*\*\* <0.001.

Multiple regressions



D	P	R <sup>2</sup>	R <sup>2</sup>	t
1.	1.	0.05	0.05*	2.29*
	2. C	0.24	0.19***	-3.55***
	3. P	0.31	0.07**	2.86**
2.	1.	0.05	0.05*	2.29*
	2. T	0.10	0.05*	-2.22*
	3. C	0.24	0.14**	-3.55***
	4. P	0.31	0.07**	2.86**
3.	1.	0.05	0.05*	2.29*
	2. P	0.26	0.21***	5.02***
	3. A	0.31	0.05	

N.B.: \* < 0.05; \*\* < 0.01; \*\*\* < 0.001.



Table 3. (continued)

Table 4. (continued)

Table 5. (continued)

Table 3. (continued)

Dependent variable	Independent variable	R <sup>2</sup>	R <sup>2</sup> (adj.)	t
Firm performance	1. Intercept	0.03	0.03	
	2. T	0.17	0.14*	-2.01*
	3. P	0.172	0.002	
	1. Intercept	0.03	0.03	
	2. T	0.09	0.06*	-2.30*
	3. T	0.17	0.08*	-2.01*
	4. P	0.172	0.002	
	1. Intercept	0.03	0.03	
	2. P	0.06	0.03	
3. A	0.172	0.11*		

Note: \* < 0.05.

Table 4. (continued)

Dependent variable	Independent variable	R <sup>2</sup>	R <sup>2</sup> (adj.)	t
P	1. Intercept	0.12	0.12**	2.46**
	2. T			-2.63**
	C	0.44	0.32**	-4.9***
	1. Intercept	0.12	0.12**	2.46**
	2. T	0.16	0.04*	-2.14*
	3. T			-2.63**
C	0.44	0.28**	-4.9***	

Note: \* < 0.05; \*\* < 0.01; \*\*\* < 0.001.

Table 5. Hierarchical regression analysis of the relationship between phonological awareness and reading development in Chinese.

Dependent Variable	Predictor	$R^2$	$R^2$ Change	$P$
Chinese Reading	1. Age (I)	0.00	0.00	0.84
	2. A	0.16	0.16	0.00**
	3. P	0.17	0.007	0.66
Chinese Spelling	2. P	0.04	0.04	0.05*
	3. A	0.17	0.13	0.01**

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

... I, ...

### Discussion

The present study examined the relationship between phonological awareness and reading development in Chinese. The results showed that phonological awareness, particularly segmental awareness, was a significant predictor of reading development. This finding is consistent with previous research (Torgesen et al., 2000; ... et al., 1998). I ... per se ... C ...

... 7% ... T ... C ... C ... T ... T ... 2 ... H ... C ... T ...

C  
 . B  
 . T  
 . H

EXPERIMENT 1

E 1 C  
 C  
 E 2 T  
 ? M ?

Method

Participants

P 23 : 11 (2  
 9 ) 12 (2 10 ). T  
 I C  
 P M ( & , 1985). T  
 8 13 ( 11 1 , S.D.=1.34 ).

T A N A

T H K T L -D  
 (HKT-LD) (H , C , T , & L , 2000)

: C  
 P 7  
 T ( T 6).

Stimuli

T P  
 C M

Table 6. Mean scores and standard deviations for each condition.

	A (S.D.)	I (S.D.)	C	D	
C	10.91 (0.34)	75.84 (4.24)	9.56	9.97	10.02
D	11.18 (0.48)	81.81 (2.36)	5.7	7	5.875

† Tukey's post-hoc test ( $p < 0.01$ ).

The study used a 2 (Condition) × 2 (Group) × 2 (Age) × 2 (Gender) × 2 (Reading Level) factorial design. The dependent variable was the number of correct responses. The independent variables were Condition (A: simple tone, I: composite tone pattern), Group (C: control, D: experimental), Age (110, 120, 130, 140, 150), Gender (male, female), and Reading Level (1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10000). The dependent variable was the number of correct responses. The independent variables were Condition (A: simple tone, I: composite tone pattern), Group (C: control, D: experimental), Age (110, 120, 130, 140, 150), Gender (male, female), and Reading Level (1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10000). The dependent variable was the number of correct responses. The independent variables were Condition (A: simple tone, I: composite tone pattern), Group (C: control, D: experimental), Age (110, 120, 130, 140, 150), Gender (male, female), and Reading Level (1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10000).

Procedure

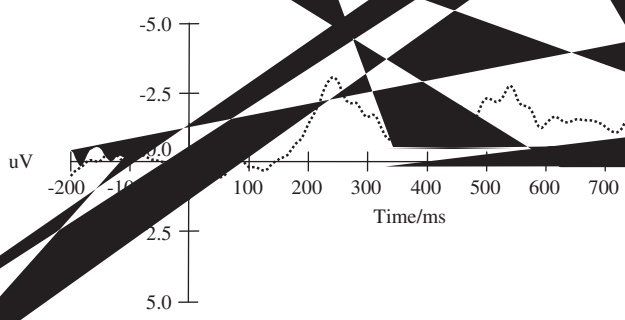
Participants were randomly assigned to either the control group (C) or the experimental group (D). The control group (C) received a simple tone (A) and the experimental group (D) received a composite tone pattern (I). The dependent variable was the number of correct responses. The independent variables were Condition (A: simple tone, I: composite tone pattern), Group (C: control, D: experimental), Age (110, 120, 130, 140, 150), Gender (male, female), and Reading Level (1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10000).

5  $\Omega$ .T  
 . E  
 1.5  
 T EEG ( .  
 250 H .T E P  
 200  
 750  
 composite tone pattern  
 T  
 150  $\mu$  ( .

**Results**

B ) 11  
 )  
 )  
 C ) 7  
 ) 10  
 E P  
 B 20- 30 -K  
 et al., 1999; 2001) F

MMN  
 F MMN  
 (p > 0.05, F 1) M  
 MMN



( $0.05 < p < 0.1$ ,  $F(2, C)$ )

MMN

150 500 T

D

MMN

I

F

3

0

100

( $p < 0.05$ ).

MMN

380

700

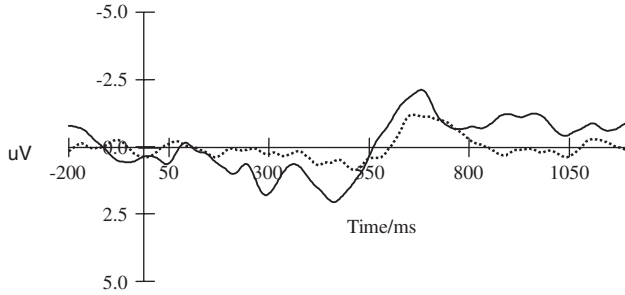
( $0.05 < p < 0.1$ ,  $F(4, F)$ )

4.

MMN

(F

5).



F

2.

G

MMN

(

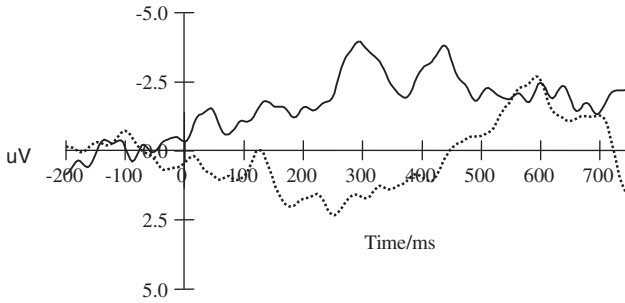
)

F

(

-

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F

3.

G

MMN

(

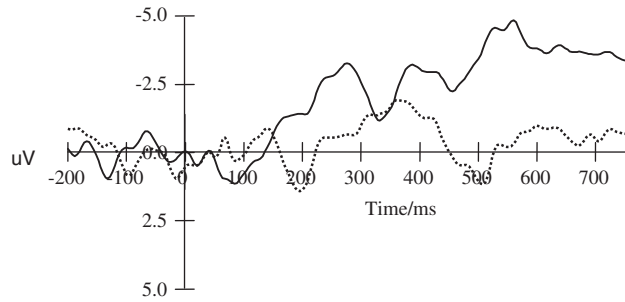
)

F

(

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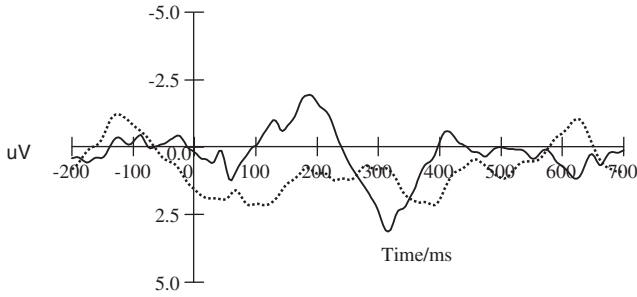
F

4.

G

MMN

C



F 5. G MMN C F

Discussion

O C MMN T

C F T

T C (M et al., 1996; -K et al., 1999).

M C

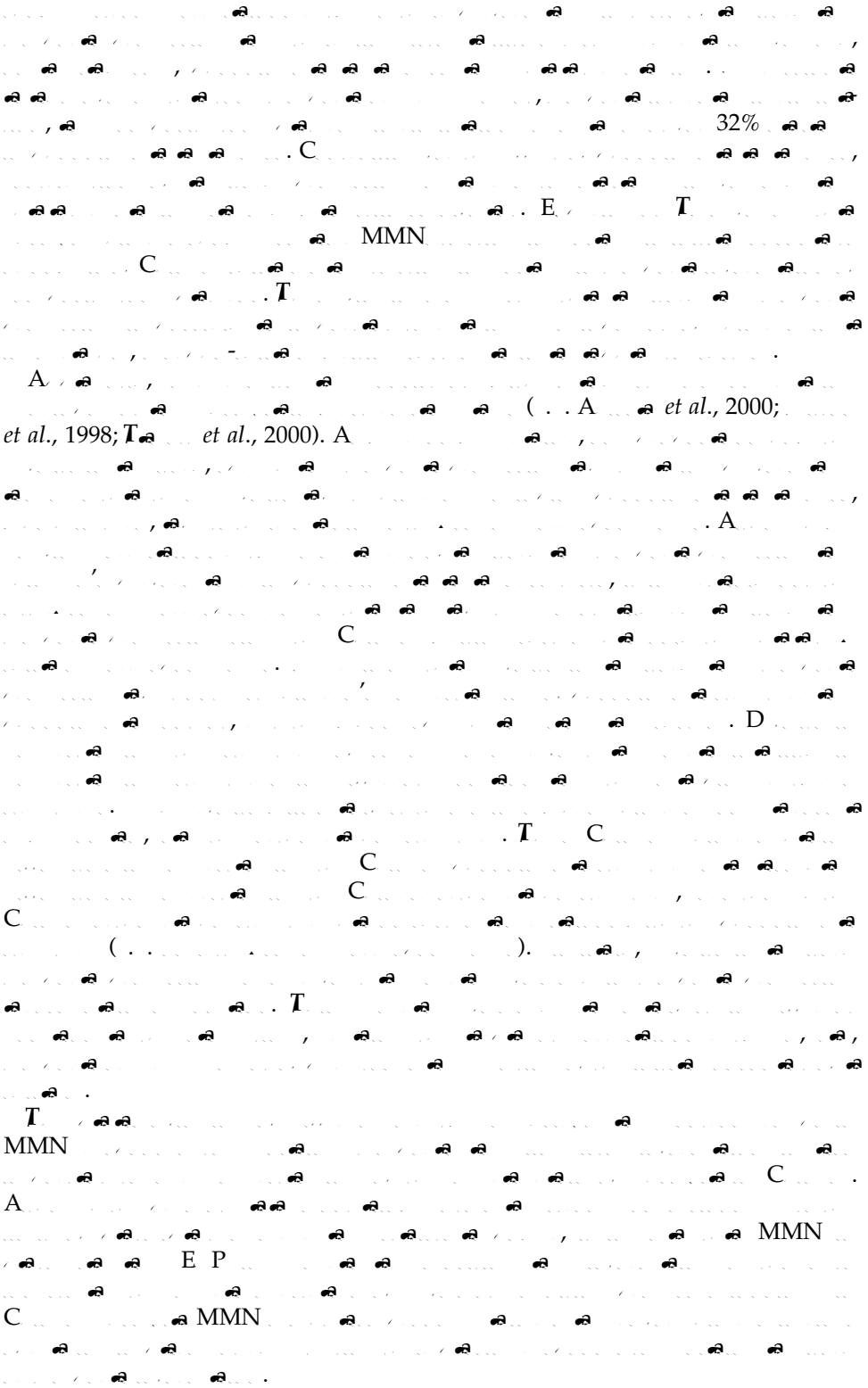
(M B -C , 1995; , A , & , 2000). F C (A et al., 2000; K et al., 2001).

C -K et al. (1998)

B et al. (1999). C P

GENERAL DISCUSSION

F I







ACKNOWLEDGEMENT

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