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Attention shift in human verbal working memory: Priming contribution and dynamic brain activation

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ABSTRACT

W a a a a , a a a , (H. Ga a a . S a a . . M . C . 26 (1998) 263–276). H , a a . W a a a a , a a a a a - . F , 64- a - a a (ERP) , ERP a (a 280 a 388) a a - . S a a a a - a a a a a a . T a – a a a – a -a a . W ERP a MRI a a a a a a a a . -.

2006 E B.V. A .

1. Introduction

A a a , a - , a a a (Ha a J , 2001). B a a a a a (, R . Ca a B , 1999; E a Ya , 1997), a a - a a a - a a a a a a a a a a . F a , a S a a a

a a a a a . - . I a , a a a a a (G , 1992; S , 1966).

A - a a - , a a a a - a " a " a - Ga a a (1998). T a a a a a - , a a a - . T a (RT) a a a a

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E- a a : a @ . . (D. Z a).

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. . I - ,
a a a ERP a a a -
a a .
I a a ,
a a ERP a a a
a a . A -
a MRI (Ga a a a ., 2000; K a ., 2003; L
a ., 2004; S. a ., 2003), a - a
(a a a, a a
, a - , a a a a)
a . I a a ,
MRI - (L a ., 2004), a a
a a a a a a a
a a a a a - .
ʃ .I a , a a a a
a a a “ ” a “
” . T a a a
a a a a - a a a
. H , MRI - a a
a a a a a , a a
a a - a . F a , a
a a aa a - a a a
a a a a
- a a . .
. A a a a
“ a a ”? W a a
, ERP a a a a a a
a .
I a ERP .
MRI a - (L a ., 2004), a a “ - ”
a a a a MRI . Na - ,
a - .
I Ga a a “ a - ” a (Ga a a , 1998), a
a RT a “A → B” a a “B → A”
. I a , a - , a -
a a - a “ - ”
a a a a a a a a a
(. ., a
a a A–B–C, a “A → B”
a a “B → A”; “A → C” a a “C → A”; “B → C”
a a “C → B”). T a a
a a a . . W
- a a a .
a ERP a
- .

2. Results

I “ - ” a , a a a - a
24 ʃ a 91.2% (SD = 7.4%). M
- a - a a a
- - - . I a a a ʃ
a a - . T
a a - 97.1% (SD = 4.0%)
- . . T RT “NS” (1232.5) a
a - a a “S” (1851.4)
(a t , $N = 24$, $t = 18.1$, $P < 0.001$). I a , “DS” RT
(1795.5) a a a - a a “US”
(1907.4) (a t , $N = 24$, $t = 2.1$, $P = 0.046$).
I “ a ” a , a ʃ -
- a a (a a a : 98.5%, SD: 1.1%). A a
a , a a RT
“NS” (563.4) a “S” (633.5)
(a t , $N = 12$, $t = 9.1$, $P < 0.001$). H ,
a “ - ” a , a
a , a a a RT
“DS” a “US” (DS: 625.5
. US: 640.1 , a t , $N = 12$, $t = 1.3$, $P = 0.26$).
T “NS” a “S” RT “ - ” a “
a ” a a F . 1. T a a
12 ʃ 22010 -209.8(5.2().7( )-36571T 7.51)- 54.7 7( )-

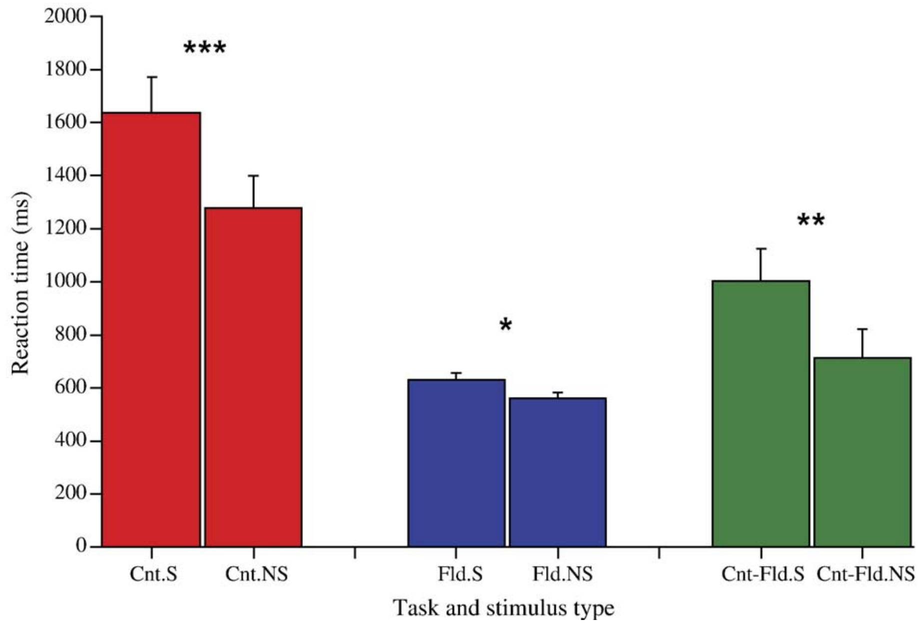

Fig. 1 – The "NS" (no-switch) vs. "S" (Switch) reaction time comparison in both the "count" (Cnt, the red bars) and the "figure identification" (FId, the blue bars) task. The data shown here were from the 12 subjects who performed both tasks. The figure identification priming contribution could be subtracted (Cnt-FId, the green bars) out from the stimuli switching cost without affecting the significance of the RT difference from a mental attention shift. The error bars represent the standard error. The significant levels of each paired comparison (paired *t* test) were indicated by the "*" (*$P < 10^{-5}$, **$P < 10^{-7}$, ***$P < 10^{-8}$).

a a a a a a (280 a 388). T a a a a a a F 3. T a (280) a a a a a a . F a (388), a a a, a , a a a a . T a a a a a a a a a ERP a , 216 –468 . O M a G a F P (MGFP) a , a (280 a 388) a (F 4). W SNR (a a) =6.4, a a a a a a a a a a a a a – a a a, a a a a ("G " : _ . , _ . , _ . , _ a- a _ .). T a a a a MGFP a a F . 4. A 280 (SNR = 6.4, a a a = 97.6%), a a a a , a a a a a a a a a . A 388 (SNR = 6.2, a a a = 97.4%), a a a a a a a a a a a a , a a, a , a a a a. N a a a -a a a – a a a a a a a a a . I a , a a a a , a

a a a a a a a a a , a a a a a a a .

3. Discussion

T a a a ERP a a a a a a a a a a a a a . I a , a a a a a . O a a "S" . "NS" ERP a a a a . H , a a (280 a 388) "S" – "NS" a , a a N2- a a a a "NS" a a a a "S" a , a a a a P300 "NS" . O a a a "NS" , a a a a . T a a a "S" a "NS" . B a "S" a , "US" a "DS", a a "NS" a , ERP a a - a . T a a a a a , 3 a a a a a a , a a a "S" a "NS" a a

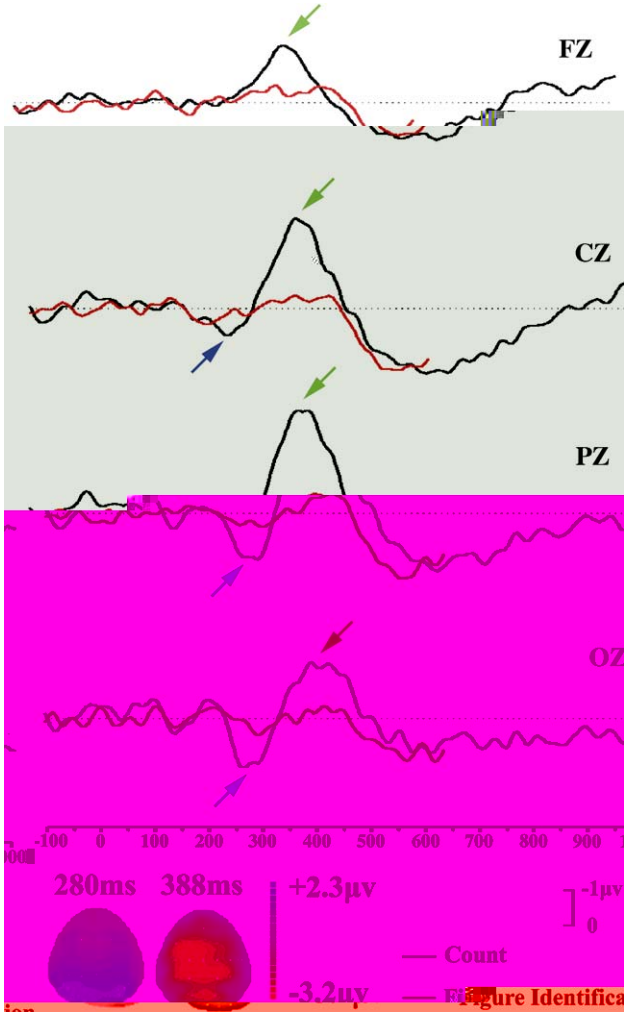

Fig. 3 – The midline (FZ, CZ, PZ and OZ) difference wave generated by a "switch – no - switch" subtraction in both the "tri-count" (black line) and the "figure identification" (red line) task. The data shown here were from the 12 subjects who performed both tasks. The blue and green arrows respectively marked the two peaks (280 ms and 388 ms) on the counting difference wave. The potential scalp topographies of these two peaks are shown at the bottom of the graph.

F a a RT a a, a a a . S ʃ a a a a a a a .H , a a a a a a a (a 1/5) a "NS" – "S" RT a . I ERP a a, a "NS" – "S" " a " a a a 500 a , a a a a a (280 , 388) "NS" – "S" a " - " a .C - , a a a ERP a a - a - a . I a , , a a - .

a - a . T a . F a , a a a - a a - a , a . G a . (2003) a a , a / a a . B a a a a - - a ( ), G a . (2003) a ERP a - a a (a) a a 288 a . T a a - a a a a . I - a , a a a a "S" – "NS" ERP a a a - a (280) a a a a a a . A , - a ERP a a - a . I a - - a , a a a a a a , a - - a . O - a , a - a a - - a . H , a ʃ a a a a . E a a a , a a - a a . A a - a a (Ma a ., 2002; R a ., 2004), 288 ERP a - a a - G a . (2003) a a - . H , G a a ERP a - a a a a - a a a . O - . T - a a a "S" , a "NS" a "S" a 500 " - a " a .

O a a a "NS" a a a - a a (a) a a - - a , a - a a . T , , a - a a a - a . T - a a - a a a (a a , a a , a , a .), a a - / a a - a a . I a - - a , a a - a a - a a a (. ., a a a) a . T a - a a "CHANGE" , "CHANGE TO WHAT" a . H , - - a , a a "CHANGE TO WHAT" a . B a a a

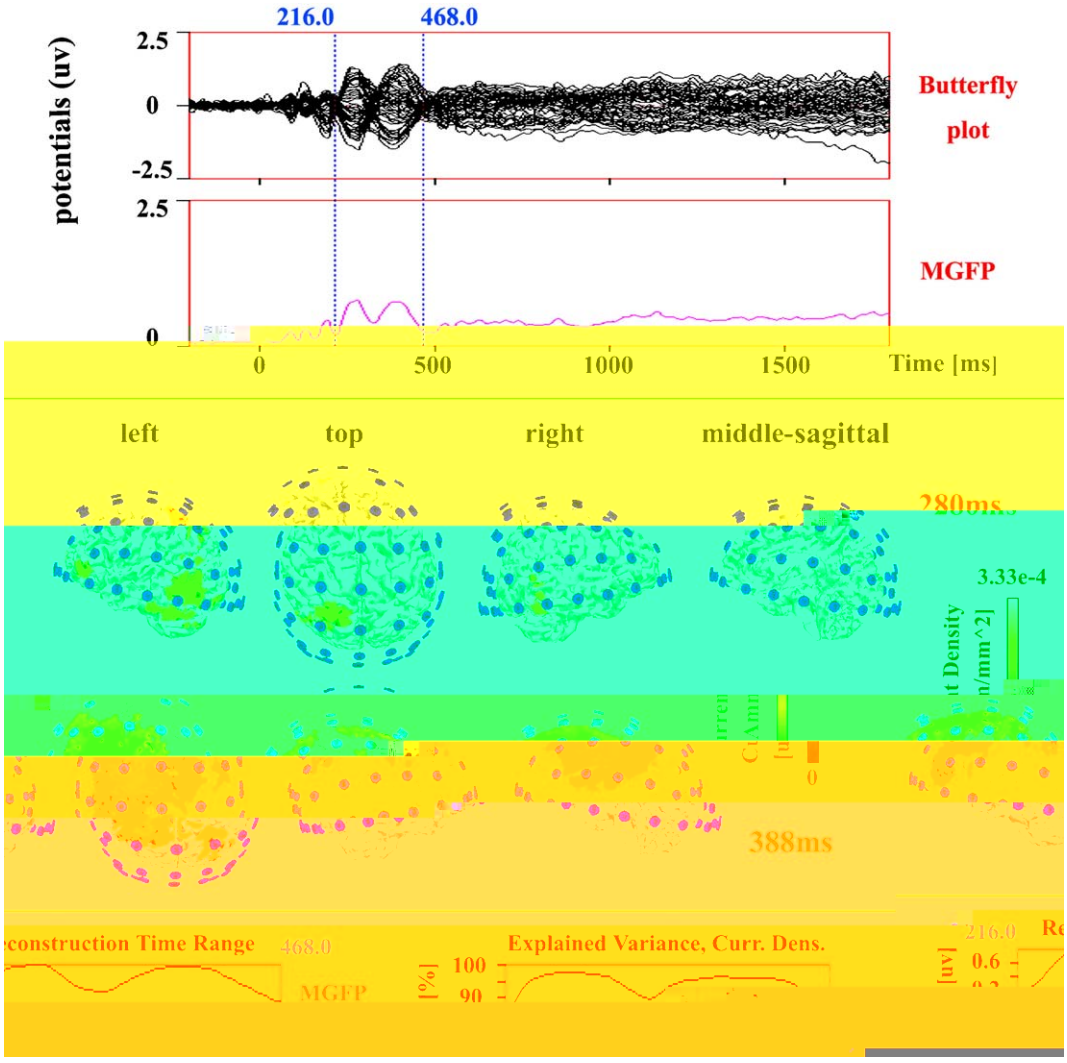

Fig. 4 – The "current-density" source analysis of the attention switching ERP activity. The upper part of the graph is the butterfly plot and the corresponding Mean Global Field Power (MGFP) of the "switch – no-switch" difference wave (average of 24 subjects). The two broken, blue lines indicate the time window used in the source reconstruction. From the left, top, right and middle-sagittal view, the middle part of the graph shows the result of the source analysis at 280 ms (upper row) and 388 ms (lower row). The blue points around the brain mark the positions of the EEG electrodes. The curves of the reconstruction time range and the explained variance are shown at the bottom of the graph.

a a (. ., a a /a a a / a), - a a - - a . I ERP , a 280- a a " - " " a " a , a ERP a - a - a . T a ERP (a a a– a a a, a , a a) a MRI - (L a ., 2004) a a a - a BOLD (-) a a a aa aa a . A a a a a a a - - a - a

(Ga a a a ., 2000; K a ., 2003; S. a ., 2003), a a . B a - a (Z a a ., 2003) a MRI - (L a ., 2004) a a a a a - a a a - a a a a (C a ., 1998; K a ., 2000). A MRI - (L a ., 2004), a a a a a a a a a a a a " -a - " a " -a - ". O a a a , a - a a a a a a a a . Ba Ba - - (Ba - , 1997) a - a a

a a (P = 0.49) ANOVA a a- , a - - - ERP a - a “DS” . “US” a PZ a CZ . W a a a a- ERP a SNR. S a - - a a a MRI a - , a ERP a a a - a “ ” (Wa a F , 2001). T a ERP , “DS”/“US” a a a a. A a - a a- a a a , MRI, ERP, a / a a a . I a - , a a a - a a a a ERP . R a a a a a a a . W a ERP a a a a 280 a 388 a . T a a ERP a MRI a a - a a a - . W - a a BOLD a a a , a – a a a a a a a . T - a a a a a a a a a a . a (RR, RE, RT, ER, EE, ET, TR, TE, a TT). I “ - ” a , a a

4. Experimental procedures

4.1. *Participants*

T - a a (12 a a 12 a , a a 19–25, a a a - - a) a U - S a T - C a (USTC) a a - . T - a - a 12 a . T (7 a a 5 a), a a - , - “ - ” a . T (5 a a 7 a) “ - ” a “ a ” a . A ſ a a a a - a .

4.2. *Stimuli*

T 3 - (a (T), (E), a a (R)) a - a 21- VGA (a : 2.4 4.8 a a , 4.4 4.4 a). F “ - ” a “ a ” a , a a a - a . I 55 a - , 5 a . E a , a 50 a 110 a

F a , a a aa a aa - χ^2 , - a a aa a aa(C - U G a). T aa a a a - a 200 .

Acknowledgments

W a S LaC a . T a - Na a Na S F a C a (30370478, 30328017, 30470572, 30225026, 30328016), M - S a T - C a (2006CB500705), a NIH (a RO1 EB002009).

Appendix A. Supplementary data

S a - aaa a a a a :10.1016/ J a .2006.01.032.

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