107 (2006) 131–142

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BRAIN RESEARCH

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

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ARTICLE INFO

Article history:

A88 6 Ja a 2006

A aa 9 Mac8 2006

Keywords:

A

W

E - a a

ABSTRACT

W a88 a a a , a a c8 a , c8 c8 c8 (H. Ga aa . S a a . M . C . 26 (1998) 263–276). H , c8 a c8 c8 c8 c8 a c8 c8a . W a c8a a c8 a , a a a c8a c8 a - c8 c8 . F , 64-8 a - a a (ERP) c8 , ERPc8 a (a 280 a 388) a a - c8 c8 . S c8 c8a a a , a c8 a a8 a a a–c88 a a ac8 . T c88 a– a a c8 a – ac8 -a8 a . W c8 ERP a MRI a a a ac8 a c8a a a , . 2006 E B.V. A .

1. Introduction

A a c8a c8 , c8 a c8 - a a8 (G , 1992; S , , a a c8a 1966). (Ha a J , 2001). B a A a a c8a a c8a a a (, R . c8 , a c8a a a c8a Ca a K 8 , 1999; E a Ya , 1997), a a “ ac8 ” a , Ga a a - a a c8 a a , a (1998). T a a c8 a c8 a a a c8 a88 a c8c8 a a c8 , a a a a a a . a , . T a8 (RT) F a , c8a c8S a a a a c8a a c8 a

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E- a a : a @ c8. c8 (D. Z a).

0006-8993/$ – a 2006 E B.V. A .
:10.1016/j. a .2006.01.032

c8 . I , a a a ERP aa c8 a -c8a a .

I a c8a , a a ERPc8 aa8 c8 a c8 . c8 a a . A , a MRI (Ga a a a ., 2000; K a ., 2003; L a ., 2004; S a ., 2003), a a (c8 c88 a a a a, a a c8 , c8 a , a a a ac8) a c8 . I a c8 a, MRI , (L a ., 2004), a a c8 a a a a a ac8 a a aa - c8 c8 jc8 . I a , a a a a ac8 a “ ” a “ c8 . T aa8 c8 a a a a a a a a a . H , MRI a ac8 aa8 a a ac8 a , aa8 a a a a c8 . F a , c8 a a aa aa c8 a aa8 a a c8c8 a c8 a c8a c8 a a c8 c8 . A a a a “ c8 aa8 a c88 ”? W a c8 a , ERP c8 a a a a a a c8 a .

I c8 a ERP MRI aa8 (L a ., 2004), a a “ c-8 ” a a a MRI . Na , a c8 . I Ga a a ’ “ ac-8 ” a (Ga a a , 1998), a c8a RT c8 a “A → B” a a “B → A” c8 . I c8 a , a , a - c8a c8 a , a “ c-8 ” a a a a a a a a a c8 (. ., ac8 a a A–B–C, a c8 “A → B” a a “B → A”; “A → C” a a “C → A”; “B → C” a a “C → B”). T c8 a c8 c8 a a aa8 a . W c8 c8a a a a ERP c8c8 a c8 .

2. Results

I “ c-8 ” a , a c8 aa8 aa8 a 24 jc8 a 91.2% (SD = 7.4%). M c8 a , a c8 a c8 c8 a . I a a a jc8 a a . T c8 aa8 aa8 97.1% (SD = 4.0%) c8 . T RT “NS” (1232.5)c8 a c8a a a “S” (1851.4)c8 (a t , $N = 24$, $t = 18.1$, $P < 0.001$). I a , “DS” RT (1795.5) a a c8a a a “US” (1907.4)c8 (a t , $N = 24$, $t = 2.1$, $P = 0.046$).

I “ c8a ” a , a jc8 - aa8 a (a aa8 aa8 : 98.5%, SD: 1.1%). A a c8a c8 , a c8a RT c8 “NS” (563.4) a “S” (633.5) c8 (a t , $N = 12$, $t = 9.1$, $P < 0.001$). H , c8 a “ c-8 ” a , c8a c8 a , a a c8a RT c8 “DS” a “US” c8 (DS: 625.5 . US: 640.1 , a t , $N = 12$, $t = 1.3$, $P = 0.26$). T “NS” a “S” RT “ c-8 ” a “ c8a ” a a F . 1. T a a

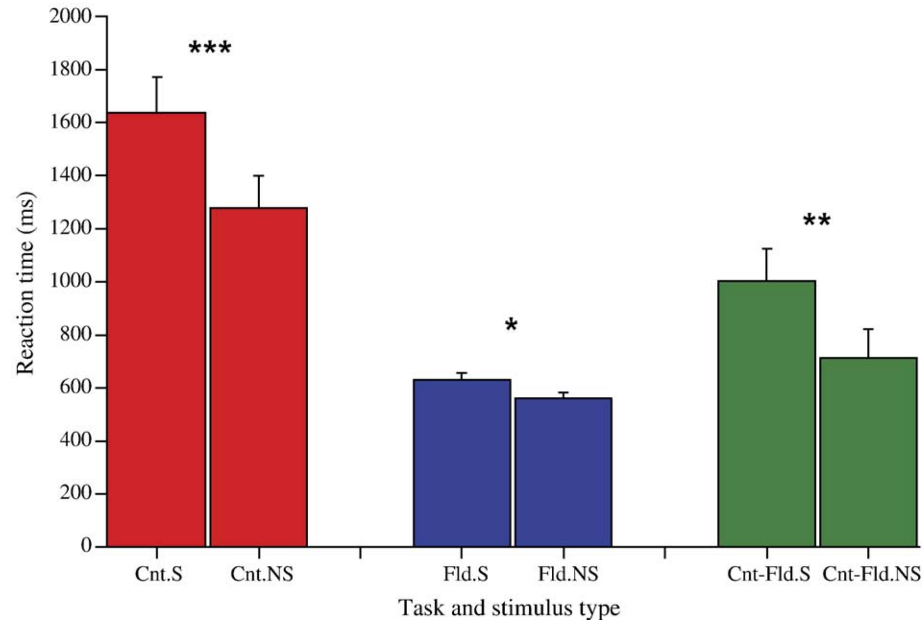

Fig. 1 – The "NS" (no-switch) vs. "S" (Switch) reaction time comparison in both the "count" (Cnt, the red bars) and the "figure identification" (FId, the blue bars) task. The data shown here were from the 12 subjects who performed both tasks. The figure identification priming contribution could be subtracted (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 "*" (*$P < 10^{-5}$, **$P < 10^{-7}$, ***$P < 10^{-8}$).

3. Discussion

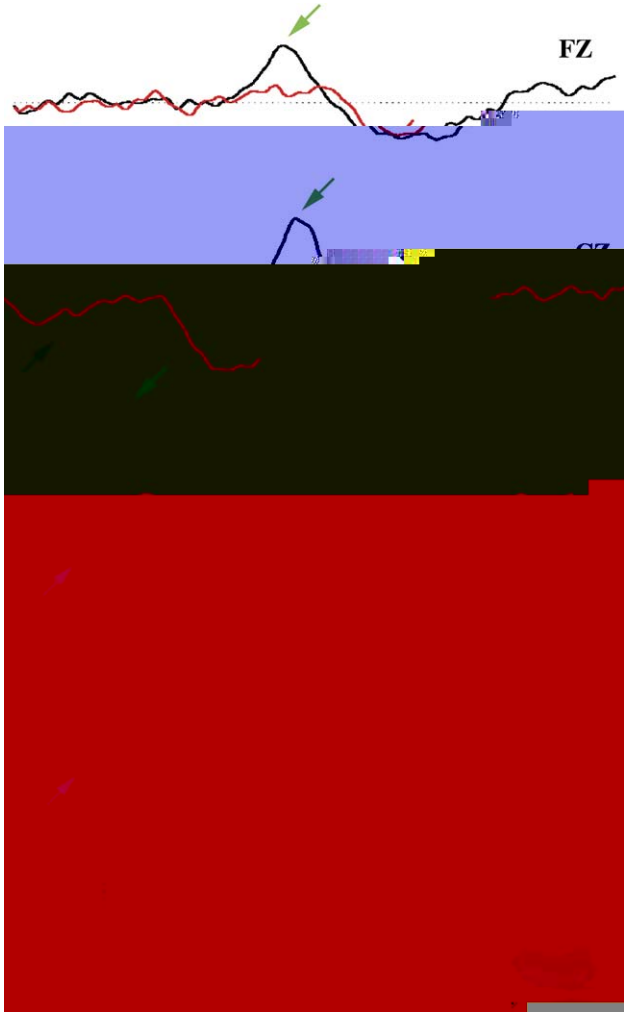

Fig. 3 – The midline (FZ, CZ, PZ and OZ) difference wave generated by a "switch – no - switch" subtraction in both the "tri-count" (black line) and the "figure identification" (red line) task. The data shown here were from the 12 subjects who performed both tasks. The blue and green arrows respectively 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 c8a c8a c8. S jc8 a a a a a a c8 .H , ea8 a a a a ea8 (a 1/5c8 a "NS" – "S" RT c8 c8 a . I ERP a a, c8a "NS" – "S" c8 " c8a " a a a 500 a , c8 a a a c8a a (280 , 388) "NS" – "S" c8 a " c8 " a .C , a a a ERP a a - c8 c8 c8a a c8a . I a , , a c8a a c8 c8 a, c8 a c8 . T c8 c8 c8 c8 a .F a , c8a a c8 a a a , c8 a , c8 c8a a . G a . (2003) a c8 a , a / a a .

B , a ac8 a a - - a (c8), G a . (2003) a ERPc8 a c8a ac8 (c8 ac8 c8) c8 a a 288 a . T c8a a a a ea8 a a a a .I c8 a , a a a c8a "S" – "NS" ERP c8 a a a a (280) a a a a a a . A c8 c8 , c8 c8 c8a ERP a a c8 a . I a - - a , a c8 a c8 a a a a c8 a c8 , a - - a . O a c8 , a c8 c8 a c8 a a , c8 c8 - - a c8 . H , a c8 , jc8 c8 c8 a a c8 a c8 . E c8a a a c8 , a a c8 a c8 . A c8 a c8 a c8 a a (Ma a ., 2002; R a ., 2004), 288 ERPc8 a c8a ac8 G a . (2003)c8 a ea8 . H , G a c8 a c8 ERP ea8 a ac8 a a a ac8 c8 c8a ac8 c8 c8 . O . T c8a ac8 a "S" c8 , c8a c8 "NS" a "S" a 500 " c8a " a .

O a a a "NS"c8 a c8 a a , c8a c8 a (a) a a - - a , a c8 - a c8 a . T , , c8a c8a c8 a c8 a a c8 . T c8a a c8 a a c8a a (a a , ea8 a , ac8, a .), a c8 a c8 / a a c8 , c8a c8 a . I a - - a , a c8 a a a - c8a a c8 a (. ., a c8 a ac8) a c8 . T ea8 a a "CHANGE" c8 , "CHANGE TO WHAT" a . H , - - a , a c8a "CHANGE TO WHAT" a . Bc8a c8a a

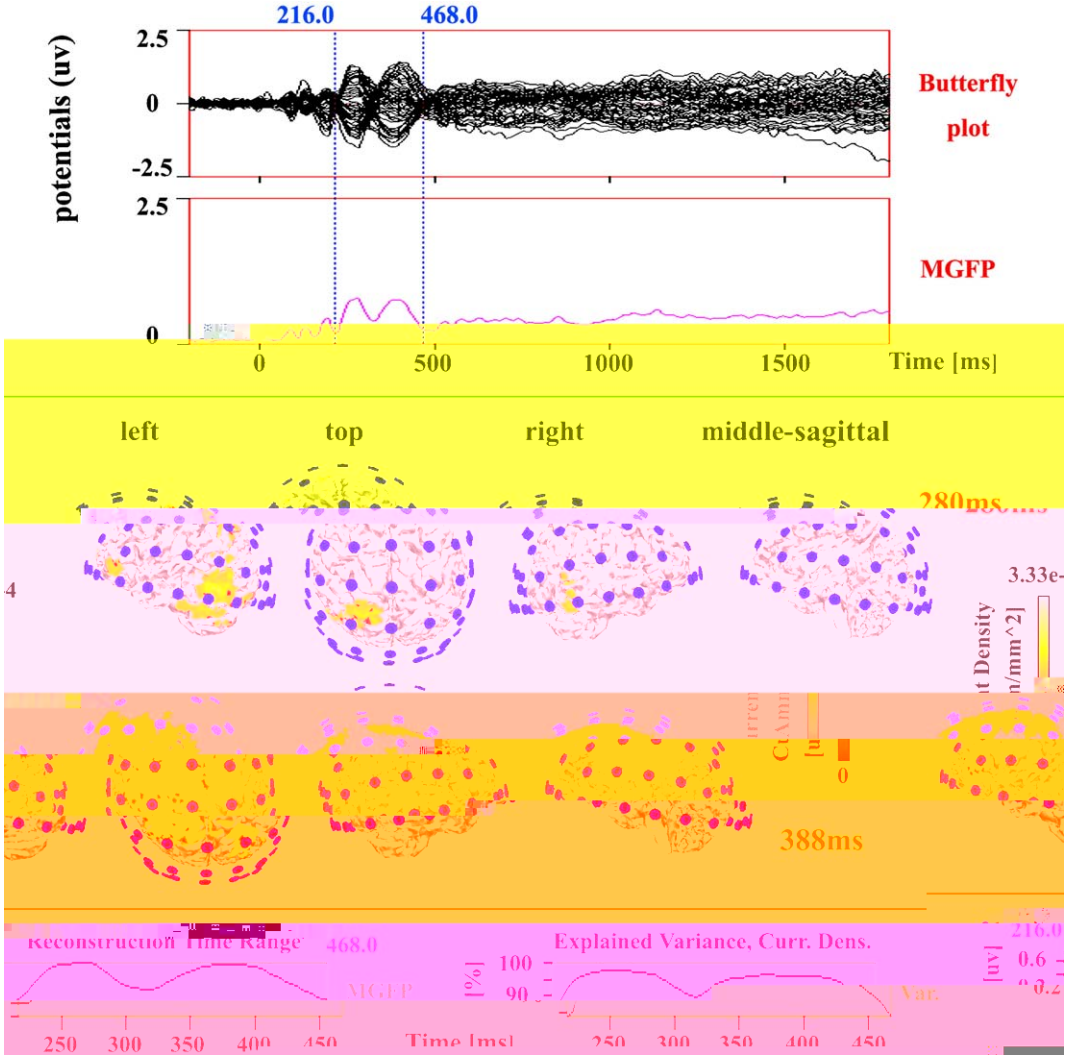

Fig. 4 – The "current-density" source analysis of the attention switching ERP activity. The upper part of the graph is the butterfly plot and the corresponding Mean Global Field Power (MGFP) of the "switch – no-switch" difference wave (average of 24 subjects). The two broken, blue lines indicate the 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.

c8 a a (. ., a a /ac88a c8 a c8a / a), c8 - a c8 c8 a - - a . I ERP , c8a 280- ca8 a a "c-8 " " c8a " a , a ERPca8 a c8 - a . T c8a c8 ERP c8 (a a a-cc88 a a a, a ac8 , a ac8) a c8 MRI , (L a ., 2004) a a a - c8 a BOLD ( ) ca8 a a a aa aa ac8 . A8 a a a a a a a a - a a c8 (Ga a a a ., 2000; K a ., 2003; S a ., 2003), a c8 c8 a . B a c8a (Z a a ., 2003) a c8 MRI , (L a ., 2004) a c8 a a a' a a - c8 a a a c8a a a a a a (C a ., 1998; K a ., 2000). A MRI , (L a ., 2004), a c8 a ca8 ac8 a a a aa a c8 " -a - " a " -a - ". O aaa c8 , ac8 - ca8 a a a a a a c8 . Ba Ba ' (Ba , 1997) c8 a a a

c8 c8 c8 a c8a ($P = 0.49$) ANOVA a a , a - , - ERP 8 a c8a "DS" . "US" c8 a PZ a CZ c8 . W c8 c8a a a a ERP c8a SNR. S c8 a - a a c88 a MRI 8 a c8 - c8 c8, a c8 c8 ERP 8 a c8 a a c8a " c8 " (Wa a Fc8 , 2001). T c8 a c8 ERP c8 , "DS"/"US" a ac8 a a. A a a , a c8 a- c8 c8 c8 a a a , MRI, ERP, a / a a ca8 .

I a , a a c8 a a c8 ac8 a a a ERP . R a a c8a a a a c8a c8 a c8 c8 . W a ERPc8 a a a 280 a 388 a . T c8 c8a a ERPc8 a c8 MRI a a , a c8 c8 a ca8 . W c8 a ac8 BOLD ca8 a a , a a–c88 a a c8 a a a ca8 a c8c8 . T - ac8 c8 a a a a a a a a a c8 c8 .

4. Experimental procedures

4.1. *Participants*

T - a a (12 a a 12 a , a a 19–25, a a a c8 c8 - - a) a U 8 c8 a Tc8 C a (USTC) a c8 a . T a c8 a 12 ca8 . T (7 a a 5 a), c8 a a c8 , " c8 " a . T c8 (5 a a 7 a) " - c8 " a " c8a " a . A jc8 a c8 a c8 a a - c8 c8 ca8 .

4.2. *Stimuli*

T 3 c8 (a (T), (E), a c8 a (R)) a a 21- VGA c8 (a : 2.4 4.8 c8 a a , 4.4 4.4 a). F " c8 " a " c8a " a , a c8 a ca8 a . Ic8 55 c8 a , 5 c8 ca8c8 . Ec8 ca8c8 c8 , a 50 c8 c8 a 110 c8 ca8 a c88 a (RR, RE, RT, ER, EE, ET, TR, TE, a TT).

I " c8 " a , ca88 a

F a , a a aa a a a χ^2 c8 , a a aa a aa(C U G a). T aa a a a ea8 a 200 .

Acknowledgments

W a S LaC a . T ac8 Na a Na S8 c8 F a C a (30370478, 30328017, 30470572, 30225026, 30328016), M S8 c8 a Tc8 C a (2006CB500705), a NIH (a RO1 EB002009).

Appendix A. Supplementary data

S a aaa c8a a c8 c8a a :10.1016/j. a .2006.01.032.

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