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26 2000; 19 J ỳ 2001; 19 J ỳ 2001

Abstract

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N2 . - w -
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ỳ . 2001 E S B. . A .

Keywords: A ; E - (E); G ; H ; -

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E-mail address: @ . (S. H).

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II: S 0301-0511(01)00073-4

1. Introduction

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(N , 1977). H w , y w w
(K /V , 1979), y (M , 1979),
(z, 1983), y
(B ., 1990; H ., 1990; L ,
1993, 1996), (H H y , 1999; H
., 1999) .
w N - y
S - (E). F ,
H z M_ (1993) E
( ).
y / N2 x
w w
. H . (1997) y
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w -w y . E w
1 N2 .
/ N2 w
w y y y w
. 3 , w
-w y . S 1 N2
y w
(H C , 1996; H ., 1999)
- (H ., 2000).
L - y (3) y
y
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(D , 1977; M C y D , 1981).
- y E (. . 1)
y .
w y (E)
y (F ., 1996; H z ., 1998), w w
w (CBF)
. H w , / N2
. (H H y , 1999; H ., 1999)
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w ẋ N2
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L . (L ., 1993; L H ẏ , 1994 , ; G L , 1997)

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ẇ , 1993). A ,

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(H z M_ , 1993; H C ,
1996; H ., 1997, 1999 ; H z , ., 1998)
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ẋ . C ẏ, - ẇ
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/ ẇ2 ẏ - ẇ
(L H -
ẏ , 1994), ẇ ẇ ẋ / ẇ2
- ẇ .

2. Methods

2.1. Subjects

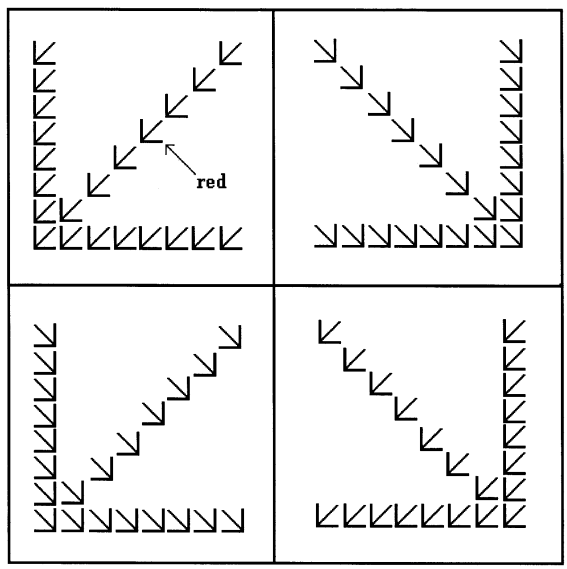
F ẏ (; ẇ 19 24 ẏ)
ẇ ẇ . ẇ ẏ ẏ (15
,

2.2. Stimuli

C w - 60
' ẏ , F . 1. E w w
w
w w. w w 8 × 8
ẋ . w 4.1 × 4.8__ 0.38 ×
0.48_, ẏ. w w .
ẑ - w
ẋ w . 0.02 / 2.
E -
0.68 / 2 (w CIE 0.237/0.285) 0.66 / 2
(w CIE 0.228/0.219), ẏ.

2.3. Procedure

w ẏ w ẋ , w
0.2 × 0.2__ , w ẏ ẏ, w w
400 . ẋ w
, w ẏ w 600 1000 . N
ẋ , w
w ẏ



F . 1. I ẋ . H
(w) w -
w ẋ .

w ẏ w . I
ẏ. A 40 , 800 10
w , ẏ, .
w w 400 , w
400 . w w -
. ẏ w w w
w
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w w .

2.4. ERP recording and analysis

EEG ẏ w I 10/20 ẏ F≥1, F≥2, F3, F4, F7, F8, 3, 4, C3, C4, 5, 6, ≥3, ≥4, 1, 2, Fz, Cz, ≥z, 10 x 10/20 ẏ . w FC1/2 w ẏ w Cz F3/4, C≥1/2 w ẏ w ≥z C3/4. A w 1 w ẏ w 1 w ≥3 5, 2 ; (IN3)

1
E ⇒ w w

	⇒ ẏ w w ( )	M w w ( )	M
⇒1	80 140	90 130	5, 6, ⇒3, ⇒4, 1, 2, 1, 2, I◣3, I◣4
◣1	130 210	150 200	5, 6, ⇒3, ⇒4, 1, 2, 1, 2, I◣3, I◣4
⇒2	160 220	170 210	F3, F4, FC1, FC2, C3, C4
F / ◣2	220 360	240 340	F3, F4, FC1, FC2, C3, C4
/ ◣2			5, 6, ⇒3, ⇒4, 1, 2, 1, 2, I◣3, I◣4
H	200 350	250 320	
⇒ -	200 350	230 300	
⇒3			C3, C4, ⇒3, ⇒4, 5, 6, 1, 2
Homogeneous stimuli			
G	300 700	310 430	
L	300 700	380 500	
Pop-out stimuli			
G	300 700	310 430	
L	300 700	370 490	

2
( ) (%)

	G		L	
	C	I	C	I
Homogeneous stimuli (n = 14)				
	377	379	425	459
E	6.5	6.3	8.9	16.8
Pop-out stimuli (n = 20)				
	375	384	440	465
E	1.2	1.8	1.5	2.6

3. Results

3.1. Behavioral performance

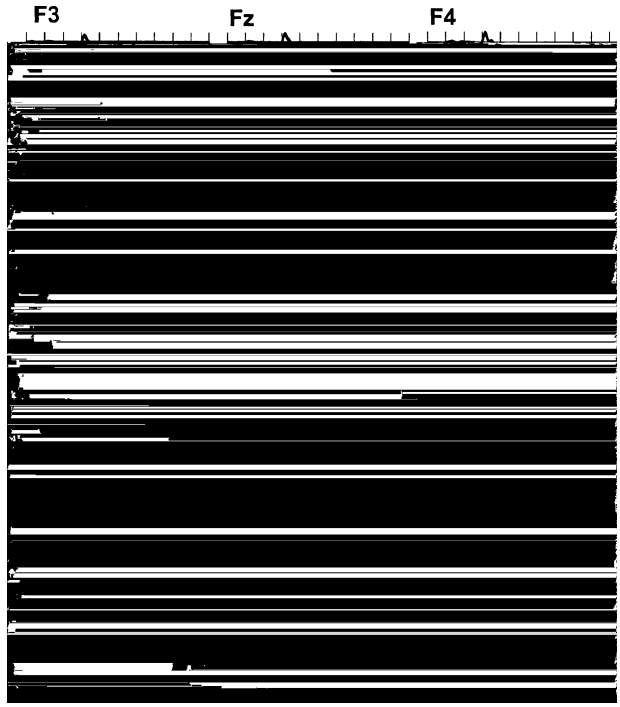
w 2. w
$F(1,32) = 123.7,\ P < 0.0005$. I ẏ -
w w w $F(1,32) = 140.9,\ P <$
0.0005 , w
$F(1,32) = 32.0,\ P < 0.0005$.
$F < 1$. H w , G S ẏ × C S ẏ × S S
w $F(1,32) = 3.93,\ P < 0.05$,
w - . ÷
, , w
$F(1,13) = 70.4,\ P < 0.0005$
$F(1,13) = 1.25,\ P > 0.2$. F - , w ,
w $F(1,19) = 5.73,\ P < 0.0005,$
$(F(1,19) = 3.72,\ P < 0.002,$ ẏ .
E w (6.5%) (3.5%)
$F(1,32) = 141.0,\ P < 0.0005$, w
ẏ $F(1,32) = 35.2,\ P < 0.0005$. w
- $F(1,32) = 126.7,\ P < 0.0005$. G ẏ ×
C ẏ w $F(1,32) = 12.3,\ P < 0.002$, -
w . w
× G ẏ $F(1,32) = 13.6,\ P < 0.001$,
S S w - ẏ .
G ẏ × C ẏ × S w
$F(1,32) = 8.96,\ P < 0.005$. S AN A
w , , w
$F(1,13) = 20.4,\ P < 0.0005$. F - , w ,
ẏ w $F < 1$.

3.2. Electrophysiological data

E ÷ w w ẏ , -
, , .
E ÷ F . 2 3. F
, E ÷ ÷1 w 80 140
, N1 w 130 200 , N2 w 200
350 . A / , E ÷ w z ẏ ẏ ÷2 w
160 260 , N2 w 220 360. A ÷3 w
300 700 w w x .

3.2.1. P1 and N1

G ẏ w , ,
5 6: $F(1,32) = 15.40,\ P < 0.0005;$ 1 2: $F(1,32) = 15.28,\ P <$



F . 2. G E .
GC, ; GI, , LC, , LI, .

0.0005; I 3 I 4: $F(1,32) = 19.25$, $P < 0.0005$; 3 4 ($F(1,32) = 10.56$, $P < 0.003$.
1 [1].

C ,
$P > 0.05$. A A ,
1 .

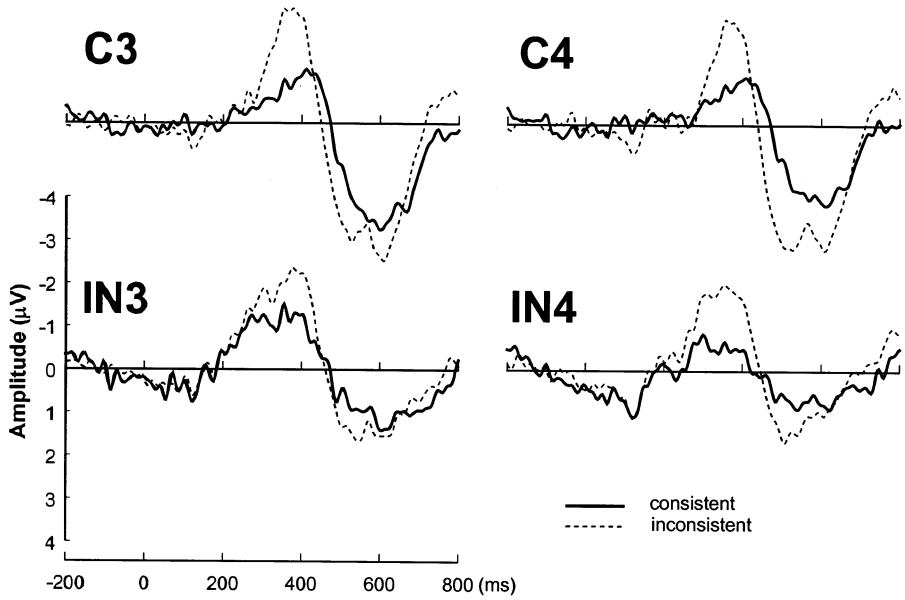
3.2.2. Frontal/central N2

/ 2
F3 F4: $F(1,32) = 18.16$, $P < 0.001$; FC1 FC2: $F(1,32) = 32.13$, $P < 0.001$; C3 C4: $F(1,32) = 36.68$, $P < 0.001$. I , × G (F3 F4: $F(1,32) = 8.13$, $P < 0.007$; FC1 FC2: $F(1,32) = 8.66$, $P < 0.006$; C3 C4: $F(1,32) = 8.77$, $P < 0.006$, / 2 - . /

[1] 1 / ($P < 0.03$) - ($P > 0.1$), . H , 1 , .

N2 w
$P > 0.1$, w
- F3 F4: $F(1,19) = 27.92$, $P < 0.001$; FC1 FC2: $F(1,19) = 43.76$, $P < 0.001$; C3 C4: $F(1,19) = 41.12$, $P < 0.001$. ẏ w
(N2
)
, G ẏ × C ẏ F3 F4: $F(1,32) = 8.43$, $P < 0.007$; FC1 FC2: $F(1,32) = 10.75$, $P < 0.003$; C3 C4: $F(1,32) = 9.96$, $P < 0.004$. ẏ w
N2 F3 F4: $F(1,32) = 8.15$, $P < 0.007$; FC1 FC2: $F(1,32) = 4.58$, $P < 0.04$; C3 C4: $F(1,32) = 7.69$, $P < 0.009$.
w ,
G ẏ × C ẏ FC1 FC2: $F(1,32) = 4.19$, $P < 0.05$; C3 C4: $F(1,32) = 4.70$, $P < 0.05$. N2 w
- ,
× G ẏ F3 F4: $F(1,32) = 6.06$, $P < 0.02$. -
S S × G ẏ × C ẏ w F3 F4
$F(1,32) \geq 7.24$, $P \leq 0.01$, w
- .

F . 3. G E - . GC, ; GI, , LC, , LI, .



F . 4. D w y E E
w w w
y.

3.2.3. Temporal/occipital N2

/ N2 w
5 6: $F(1,32) = 17.05$, $P < 0.001$; 1 2: $F(1,32) = 7.43$, $P < 0.01$; IN3 IN4: $F(1,32) = 5.08$, $P < 0.03$. / N2
w 5 6: $F(1,32) = 12.63$, $P < 0.002$; 1 2: $F(1,32) = 4.64$, $P < 0.04$. y
w / N2
5 6: $F(1,32) = 26.63$, $P < 0.001$; 1 2: $F(1,32) = 28.45$, $P < 0.001$; 1 2: $F(1,32) = 31.46$, $P < 0.001$; IN3 IN4: $F(1,32) = 48.89$, $P < 0.001$. -
w ,
G y × C y 5 6: $F(1,32) = 4.94$, $P < 0.03$; 1 2: $F(1,32) = 5.07$, $P < 0.03$. I y, w
S S × G y IN3 IN4 $F(1,32) = 4.39$, $P < 0.04$; , / N2
w - w .
/ N2 w -
5 6: $F(1,32) = 11.64$, $P < 0.002$; IN3 IN4: $F(1,32) = 6.42$, $P < 0.02$.
/ N2 /
N2 y - ,
w w y E

E (F . 4 5). F . 6
ẏ w N2 w w. N ,
, w N2 w w
/ (ẏ ,
). F - , w ,
w N2 w w w /
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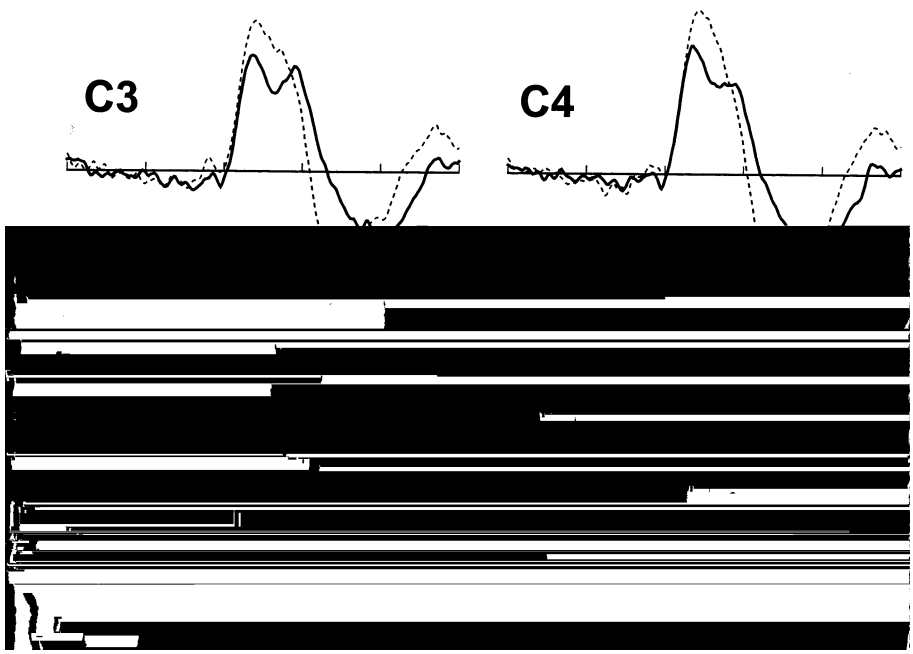
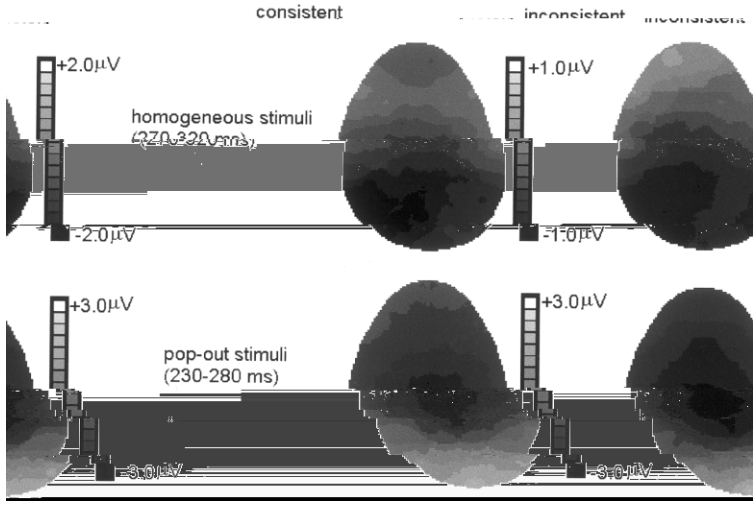
3.2.4. P2 and P3

2
F3 F4: $F(1,32) = 8.02$, $P < 0.008$; FC1 FC2: $F(1,32) = 4.57$,
$P < 0.04$. AN A 3
3. 3 w .
w ,
G ẏ × C ẏ. 3 w
w w ẏ ẏ w w
. G ẏ × C ẏ w -
, 3 w
. w
S S
w .



F . 5. D w ẏ E E
- . w
w w ẏ.



F . 6. ẏ w w x w
/ / 2 w w.

4. Discussion

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ẏ A A ÷3 / -
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	G	C	G×C
P3 amplitudes			
C3 C4	0.002	. .	0.003
÷3 ÷4	0.001	. .	0.003
5 6	0.001	. .	0.017
1 2	0.001	. .	0.002
P3 latencies			
C3 C4	0.001	0.001	0.001
÷3 ÷4	0.001	0.002	0.001
5 6	0.001	0.001	0.001
1 2	0.001	0.001	0.001

G, G ẏ; C, C ẏ; G×C, G ẏ×C ẏ.

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I ý S , 1999). I ý
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N I N D (N -32893), A
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