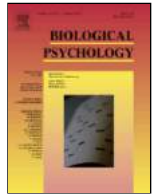




CDCI: CIH A>HIH 6K6>A67A: 6I -8>: C8: D>G: 8I

B>DAD<>86A +HN8=DAD<N

?DJGC6A =DB: E6<: : L.L.L.: AH: K>: G.8DB



(: CI6A >B6<: GN D; ;68: : C=6C8: H ;68: -H: CH>I>K: : K: CI-G: A6I: 9 EDI: CI>6AH ID 6B7><JDJH K>HJ6A HI>BJA>

'>C<M>' J⁶U⁷, C=6C<M>C 3=6C<⁸, '>6C<' >⁶U⁷U⁸

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A, . \$C' \$) ! *

AB - . , AC .

Keywords:

O>HJ6A B: CI6A >B6<: GN
. DE-9DLC BD9JA6I>DC
! 68:
O: GI: M EDH>I>K: EDI: CI>6A
+2
) 170
K: CI-G: A6I: 9 EDI: CI>6AH

O>HJ6A B: CI6A >B6<: GN ;DGBH B: CI6A G: EG: H: CI6I>DCH D; K>HJ6A D7?: 8IH L=: C 8DGG: HEDC9: CI HI>BJA> 6G: 67H: CI 6C9
H=6G: H HDB: 8=6G68I: GH L>I= K>HJ6A E: G8: E I>DC. BDI= I=: K: GI: M-EDH>I>K: -EDI: CI>6A (O++) 6C9) 170 8DBEDC: CIH D:
: K: CI-G: A6I: 9 EDI: CI>6AH (, +H) ID K>HJ6A HI>BJA>=6K: 6 G: B6G@67A: EG: ;: C8: ID ;68: H. . =>H HIJ9N >CK: HI><6I: 9
L=: I=: G K>HJ6A B: CI6A >B6<: GN BD9JA6I: H I=: ;68: -H: CH>I>K: O++ 6C9/DG) 170 8DBEDC: CIH. . =: G: HJAIH H=DL: 9
I=6I L>I= H><C>;86CIAN A6G<: G 6BEA>IJ9: H JC9: G I=: ;68: ->B6<: GN 8DC9>I>DC I=6C I=: =DJH: ->B6<: GN 8DC9>I>DC,
I=: O++ 6C9 +2 G: HEDCH: H, 7JI CDI I=:) 170 8DBEDC: CI, L: G: : A>8I: 9 7N E=6H: -66C9DB>0: 9 6B7><JDJH HI>BJA>.
. =JH, I=: 7G6>C HJ7HIG6I: H JC9: GAN>C< O++ 6G: CDI 8DBEA: I: AN >9: CI>86A ID I=DH: JC9: GAN>C<) 170, 6C9 I=: O++/
+2 B6C>; HI6I>DC D; I=: 86I><DGN H: A: 8I>K>IN >C>B6<: GN EGD767AN G: S: 8IH 6C >CI: <66I>DC D;

UNCORRECTED PROOF

=DJH: H L: G: EA68: 9 >CID 6 ;68: -H=6E: 8DCIDJG ID G: 9J8: I=: E=NH>86A >C-
 I: GH>BJAJH K6G>6C8: . . =: H: DG><C6A E>8IJG: H L: G: IG6CH: ;GG: 9 ID 8DB-
 EA: I: AN 6B7><JDJH R<JG: H JH>C< I=: E=6H: G6C9DB>06I>DC B: I=D9H D;
 (A. ' AB 7.0, A: 69>C< ID I=6I 6A I=: E=M: AH D; 6 E>8IJG: L: G: H: A: 8I: 9
 6C9 I=: >G E=6H: H L: G: G6C9DBAN G: 9>HIG>7J1: 9 ID ;DGB 6 C: L R<JG: . . D
 6KD>9 EDI: CI>6A ; ; ; 8IH D; 8DCI: CI D; DG><C6A E>8IJG: H, I=: H: 6B7><JDJH
 R<JG: H L: G: 8A6HH>R: 9 >CID ILD 86I: <DG>: H 688DG9>C< ID I=: >G DG><C6A
 8DCI: CI: I=: 6B7><JDJH R<JG: H ;GDB ;68: E>8IJG: H 6C9 I=DH: ;GDB =DJH:
 E>8IJG: H. 68= DG><C6A E>8IJG: L6H EGD8: HH: 9 ;DG 15 I>B: H. . =JH, >C ID-
 I6A 150 8DBEA: I: AN 6B7><JDJH R<JG: H L: G: B69: ;GDB ;68: E>8IJG: H 6C9
 150 8DBEA: I: AN 6B7><JDJH R<JG: H L: G: B69: ;GDB =DJH: E>8IJG: H. A-
 I: G I=: E=6H: -G6C9DB>06I>DC B6C>EJA6I>DC, I=: H: 6B7><JDJH R<JG: H =69
 C: >I=: G G: 8D<C>067A: ;68: D7?: 8IH CDG G: 8D<C>067A: =DJH: D7?: 8IH. . =:
 I=>G9 86I: <DGN D; HI>BJA> L: G: 150 " 6JHH>6C CD>H: HI>BJA>, L=DH: 7G<=I-
 C: HH L6H B618=: 9 ID I=6I D; 8DBEA: I: AN 6B7><JDJH R<JG: H.

\$C 699>I>DC ID I=: 8DBEA: I: AN 6B7><JDJH R<JG: H, E>8IJG: H 8DCI6>C-
 >C< :>I=: G 6 G: 6A ;68: DG 6 G: 6A =DJH: L: G: 6AHD JH: 9. (DG: HE: 8;>86AN,
 50 ;68: E>8IJG: H 6C9 50 =DJH: E>8IJG: H (10 DG><C6A ;68: E>8IJG: H 6C9
 10 DG><C6A =DJH: E>8IJG: H :68= HJ7B>I: 9 ID I=: EGD8: HH>C< 9: H8G>7: 9
 7: ADL 5 I>B: H) L: G: EGD8: HH: 9 >CID =6A: -6B7><JDJH E>8IJG: H, >C L=>8=
 :>I=: G 6 ;68: DG 6 =DJH: 8DJA9 7: : 6H>AN D7H: GK: 9. . =: =6A: -6B7><JDJH
 E>8IJG: H L: G: EGD9J8: 9 7N G6C9DBAN H: A: 8I>C< 50% D; I=: E=M: AH D; I=:
 DG><C6A E>8IJG: H 6C9 G6C9DB>0C< I=: E=6H: H D; I=: E=M: AH. \$C I=>H L6N,
 50 =6A: -6B7><JDJH ;68: E>8IJG: H 6C9 50 =6A: -6B7><JDJH =DJH: E>8IJG: H
 L: G: D716>C: 9. \$C :68= 8DC9>I>DC L>I=: :>I=: G I=: ;68: -E>8IJG: DG><C DG
 I=: =DJH: -E>8IJG: DG><C, 50 DG><C6A (8A: 6G) E>8IJG: H 6C9 50 =6A: -6B-
 7><JDJH E>8IJG: H L: G: JH: 9 (!>. <1).

2.3. Procedures

DJG>C< I=: :ME: G>B: CI, E6GI>8>E6CIH H6I >C 6 9>BAN>I 6C9 HDJC9-6I-
 I: CJ6I: 9 GDDB ((\$ ->: A9: 9 AJ9>DB: IG>8 M6B>C6I>DC A8DJHI>8 -J>I:),
 L>I= 6 9>HI6C8: D; 75 8B 6L6N ;GDB 6 15->C. 8DBEJI: G H8G: : C (G: HDAJ-
 I>DC, 1024 × 768 E=M: AH; G: G: H= G6I: , 60 #0) I=6I EG: H: CI: 9 I=: K>HJ6A
 HI>BJA> (K>HJ6A 6C<A: , 10.5° × 7.9°). . =: G: L: G: ILD 7AD8@H (;68: ->B-
 6<: GN 7AD8@, =DJH: ->B6<: GN 7AD8@) D; 550 G6C9DBAN DG9: G: 9 IG>6AH, >C-
 8AJ9>C< >C :68= 7AD8@ 150 EG: H: CI6I>DCH D; 6B7><JDJH R<JG: H ;GDB ;68:
 E>8IJG: H, 150 EG: H: CI6I>DCH D; 6B7><JDJH R<JG: H ;GDB =DJH: E>8IJG: H,
 150 EG: H: CI6I>DCH D; " 6JHH>6C CD>H: >B6<: H, 6C9 :>I=: G 100 EG: H: CI6-
 I>DCH D; G: 6A: ;68: E>8IJG: H (50 8A: 6G 6C9 50 =6A: -6B7><JDJH DC: H, DCAN
 >C I=: ;68: ->B6<: GN 7AD8@) DG 100 EG: H: CI6I>DCH D; G: 6A:=DJH: E>8IJG: H
 (50 8A: 6G 6C9 50 =6A: -6B7><JDJH DC: H, DCAN >C I=: =DJH: ->B6<: GN 7AD8@).
 . =: DG9: G D; I=: 2 7AD8@H L6H 8DJCI: G76A6C8: 9 68GDHH E6GI>8>E6CIH. 68=
 7AD8@ L6H 9>K>9: 9 >CID 5 H: HH>DCH 6C9 E6GI>8>E6CIH =69 6 H=DGI G: HI 7: -
 IL: . : C H: HH>DCH.

\$C 6 IG>6A, 6 RM6I>DC 8GDHH L6H EG: H: CI: 9 ;DG 6 9JG6I>DC G6C9DBAN
 7: IL: . : C 800 6C9 1000 BH, ;DMDL: 9 7N 6C 800-BH EG: H: CI6I>DC D; 6
 HI>BJAJH, 6C9 I=: C E6GI>8>E6CIH G: HEDC9: 9 ID I=>H HI>BJAJH 7N EG: HH-
 >C< D; I=: ILD 7J1IDCH D; 6 ?DNHI>8@ (!>. <1). B: ;DG: :68= 7AD8@, E6G-
 I>8>E6CIH L: G: >CHIGJ8I: 9 ID >B6<C: :>I=: G 6 ;68: (>C I=: ;68: ->B6<: GN
 7AD8@) DG 6 =DJH: (>C =DJH: ->B6<: GN 7AD8@). . =: >CHIGJ8I>DC ;DG I=:
 ;68: ->B6<: GN 7AD8@ L6H I=6I " 1 : 66: <D>C< ID H=DL NDJ 6 CJB7: G
 D; ;68: E>8IJG: H. -DB: D; I=: B 6G: 8A: 6G, 7J1 HDB: 6G: 6B7><JDJH.
 2DJG 16H@ >H ID ?J9<: I=: <: C9: G 6C9 EG: HH I=: 8DGG: HEDC9>C< 7J1-
 IDCH. . =: 16H@ >C HDB: IG>6AH B6N 7: 8=6A: C>C< 6C9 NDJ B><=I RC9
 HDB: R<JG: H IDD 6B7><JDJH ID I: AM I=: <: C9: G. 2DJ ?JHI >B6<C: 6
 ;68: ;GDB 6C 6B7><JDJH R<JG: 6C9 IGN NDJG 7: HI ID 9: I: GB>C: I=:
 <: C9: G. . =: >CHIGJ8I>DC ;DG I=: =DJH: ->B6<: GN 7AD8@ L6H H>B>A6G, : M-
 8: EI I=6I I=: E6GI>8>E6CIH 16H@ L6H ID ?J9<: L=: I=: G I=: >B6<: 9

Real Face/House Pictures



Fig. 1. -I>BJA> 6C9 +GD8: 9JG: H. . =: JEE: G E6C: A (A): M6BEA: H D; I=: :ME: G>B: CI6A HI>BJA>. CDBEA: I: AN 6B7><JDJH R<JG: HI>BJA> L: G: JH: 9 >C 7DI= I=: ;68: ->B6<: GN 6C9 =DJH: ->B6<: GN 7AD8@H. CDGG: HEDC9>C< G: 6A ;68: / =DJH: E>8IJG: H L: G: JH: 9 >C I=: ;68: ->B6<: GN 7AD8@ 6C9 I=: =DJH: ->B6<: GN 7AD8@H. . =: ADL: G E6C: A (B): ME: G>B: CI6A EGD8: 9JG: H. DJG>C< HI>BJAJH EG: H: C-
 I6I>DC, E6GI>8>E6CIH L: G: >CHIGJ8I: 9 ID >B6<C: :>I=: G 6 ;68: DG 6 =DJH: , 6C9 I=: C B6@: 2-6A: GC6I>K: ->DG8: 9-8>D=8: G: G: HEDC: H (B6A: /: B6A: , ILD/I=: G: SDDH).

=DJH:H =69 :>I=:G 2 DG 3 SDDGH. \$C I=H L6N, E6G1>8>E6CIH E:G;DGB:9 I=: 2-6AI:GC6I>K:~;DG8:9-8=D8: (2A!C) <:C9:G?J9<B:CI 16H@ (:DG I=: ;68:~>B6<:GN 7AD8@) DG SDDG?J9<B:CI 16H@ (:DG I=: =DJH:~>B6<:GN 7AD8@) CDI DCAN ;DG 8DBEA:I:AN 6B7<<JDJH R<JG:H, 7J1 6AHD ;DG G:6A ;68:H >C I=: ;68:~>B6<:GN 7AD8@ 6C9 ;DG G:6A =DJH:H >C I=: =DJH:~>B6<:GN 7AD8@. . D 6KD>9 >C I=:G:G:C8:H ;GDB E6G1>8>E6CIH 68I>DCH, E6G1>8>E6CIH L:G: >CHIGJ8I:9 ID EG:HH I=: 7J1IDC DCAN 6I:G I=: K>HJ6A HI>BJAJH I:GB>C6I:9.

B: ;DG: I=: ;DGB6A I:HI>C<, E6G1>8>E6CIH G:8:>K:9 6 IG6>C>C< ID :CHJG: I=6I I=:N =69 ;JMAN JC9:GHIDD9 I=: EGD8:9JG: 6C9 E:G;DGB:9 I=: 16H@ 8DGG:8IAN. . =: EJJGDH: D; I=:H HIJ9N L6H ;JMAN :MEA6>C:9 ID >C9>K>9J6A E6G1>8>E6CIH DCAN 6I I=: :C9 D; I=: :ME:G>B:CI.

2.4. EEG recordings

-86AE :A:8IGD-:C8:E=6AD<G6E=>8 68I>K>IN L6H G:8DG9:9 JH<C< 6 64-8=6CC:A) : JGD-86C -NCABEH HNHI: B (CDBEJ B:9>8H ' >B>I:9, O>8ID- G>6, AJHI66A>6) L>I= I=: G:G:C8: :A:8IGD9: EA68:9 DC I=: CDH: I>E. . LD K:GI>86A 6C9 =DG>ODCI6A * " H>I:H L:G: JH:9 ID BDC>IDG :N: BDK: B:CIH 6C9 :N: 7A>C@H, EA68:9 HJE:G>DG 6C9 >C:G>DG ID I=: A:;I :N: 6C9 6AHD 6I I=: DJI:G 86CI=>D: I=: ILD :N:H. A:8IGD9: >BE:96C8: L6H @:EI 7:- ADL 5 @ . " H>C6AH L:G: EGD8:HH:9 6I DC>A>C: 76C9-E6HH ;GDB 0.05 ID 100 #0 6C9 9>>>I>0:9 L>I= 6 H6BEA: 66I: D; 1000 #0. D6I6 6K:G6<: L6H E:G;DGB:9 6;I:G HDGI>C< 7N HI>BJAJH INE: (6B7><JDJH R<JG:H ;GDB ;68:H, 6B7><JDJH R<JG:H ;GDB =DJH:H, " 6JHH>6C CD>H:, G:6A ;68: /=DJH: E>8IJG:H) 6C9 >B6<:GN 86I:<DGN (:68: 7AD8@, =DJH: 7AD8@). " 6C9 * " L:G: :ED8=:9 ;GDB 200 BH 7:;DG: (H:GK:9 6H 76H A>C: ;DG I=: 76H A>C: 8DGG:8I>DC) 6C9 800 BH 6;I:G I=: HI>BJAJH DCH:I. ED8=H L>I= D8JA6G 6G- I>68H :M8: :9>C< < 100 uO L:G: G:?.8I:9, 6C9 I=:C I=: L6K:;DGB L6H DT>A>C: ADL-E6HH RAI:G:9 6I I=: 8JI-DT :G:FJ:C8N D; 20 #0 (12 9B/D8- I6K:). '>C:6G 9:S:8I>DCH L:G: G:BDK:9 7:;DG: 6K:G6<C<.

. =: E:6@ 6BEA>IJ9: 6C9 A6I:C8N D; I=:) 170 8DBEDC:CI L:G: EGD8:HH:9 6I I=: D88>E>ID-I: BEDG6A H>I:H >C I=: G<=>I =:B>HE=:G: (+6, +8, +*6, +*8) 6C9 A:;I =:B>HE=:G: (+5, +7, +*5, +*7) 9JG>C< I=: I>B: L>C- 9DL D; 140-220 BH 6;I:G I=: HI>BJAJH DCH:I. . =: O++ L6H EGD8:HH:9 6I I=: ;GDCID-8:CI6A H>I:H D; !C0 6C9 C0 140-220 BH 6;I:G I=: HI>BJAJH DC- H:I; I=: D88>E>ID-I: BEDG6A +2 8DBEDC:CI L6H EGD8:HH:9 6I I=: H>I:H >C I=: G<=>I =:B>HE=:G: (+6, +8, +*6, +*8) 6C9 A:;I =:B>HE=:G: (+5, +7, +*5, +*7) 9JG>C< I=: I>B: L>C9DL D; 200-260 BH 6;I:G I=: HI>BJAJH DCH:I. \$C I=: E:6@>ID-E:6@ B:6HJG: B:CI D; O++ ;GDCI6A) 1 (I=: C:<6I>K: E:6@ 6GDJC9 100-120 BH 6;I:G I=: HI>BJAJH DCH:I) L6H EGD8:HH:9 6I I=: :A:8IGD9: H>I:H D; !C0 6C9 C0 9JG>C< I=: I>B: L>C9DL D; 70-150 BH 6;- I:G I=: HI>BJAJH DCH:I, 6C9 I=:) 1-O++ E:6@>ID-E:6@ 6BEA>IJ9: L6H D7- I6>C:9 7N HJ7IG68I>C< I=: 76H A>C:>ID-E:6@ 6BEA>IJ9: D; ;GDCI6A) 1 ;GDB I=: 76H A>C:>ID-E:6@ 6BEA>IJ9: D; O++.

3. Results

3.1. Behavioral testing

. =: G:HJAIH D; I=: 7: =6K>DG6A I:HI>C< H=DL:9 I=6I I=: B:6C 688J- G68N G6I: D; I=: 2A!C 16H@ ;DG G:8D<C>O>C< G:6A ;68: E>8IJG:H 6C9 G:6A =DJH: E>8IJG:H L:G: 67DK: 0.85 (:68:, 0.94 ± 0.01; =DJH:, 0.88 ± 0.02), >C9>86I>C< I=6I E6G1>8>E6CIH L:G: 67A: ID 8DC8:CI6I: I=:>G 6II:CI>DC DC I=: HI>BJAJH,

E:G;DGB I=: 16H@, 6C9 9>H8G>B>C6I: :: 6IJG:H D; I=: G:6A D7?:8IH (:68: H DG =DJH:H).

! DG I=: 8DBEA:I:AN 6B7><JDJH R<JG:H, >C I=: ;68:~>B6<:GN 16H@ 6C9 >C I=: >C I=: =DJH:~>B6<:GN 16H@ E6G1>8>E6CIH ?J9<:9 I=: R<JG:H 6H :>I=:G B6A: DG :: B6A: DG 6H ILD DG I=:G: SDDGH DCAN 6I G6C9DB. -I6I>HI>86AMN, >C I=: ;68:~>B6<:GN 16H@, CD H>C>:>86CI 9>;:G:C8:H L:G: ;DJC9 7:IL::C I=: EGD767>A>IN D; ?J9><C< I=: 6B7><JDJH E>8IJG:H 6H :>I=:G B6A: ;68:H (0.56 ± 0.03) DG :: B6A: ;68:H (0.44 ± 0.03). \$C I=: =DJH:~>B6<:GN 16H@, CD H>C>:>86CI 9>;:G:C8: L6H ;DJC9 7:IL::C I=: EGD767>A>IN D; ?J9>< >C< I=: 6B7><JDJH E>8IJG:H 6H :>I=:G ILD-SDDG =DJH:H (0.46 ± 0.03) DG I=:G: -SDDG =DJH:H (0.54 ± 0.03).

3.2. ERP recordings

3.2.1. Amplitudes and latencies of ERPs to completely ambiguous figures

I><. 2 H=DLH I=: <GDJE <G6C9 6K:G6<: , + L6K:;DGBH >C9J8:9 7N :68: D; I=: 3 INE:H D; 6B7><JDJH HI>BJAJ>C :>I=:G I=: ;68:~>B6<:GN 8DC- 9>I>DC DG I=: =DJH:~>B6<:GN 8DC9>I>DC L>I= G:8DG9>C<H ;GDB I=: :A:8- IGD9: H>I:H D; C0 6C9 +8. CA:6GAN, I=: 6B7><JDJH HI>BJAJ>G:A>67AN :A>8>I:9 7DI= I=: O++ 8DBEDC:CI (6I H>I: C0) 6C9 I=: +2 8DBEDC:CI (6I H>I: +8), 7JI CDI I=:) 170 8DBEDC:CI (6AHD H: :7:ADL). . =: G:HJAIH D; G:8DG9>C<H 6I H>I: C0 H=DL:9 I=6I I=: 6BEA>IJ9: D; O++ L6H A6G<:G JC9:G I=: ;68:~>B6<:GN 8DC9>I>DC I=6C JC9:G I=: =DJH:~>B6<:GN 8DC9>I>DC. . =: 6BEA>IJ9: 6C9 A6I:C8N D; O++ L:G: HI6I>HI>86AMN 6C- 6ANO:9 JH<C< 6 G:E:6I:9-B:6HJG:H 6C6ANH:H D; K6G>6C8: (A) *OA) L>I= I=: ;DMADL>C< 3 K6G>67A:H (1) >B6<:GN 86I:<DGN (:68: >B6<:GN, =DJH: >B6<:GN), (2) HI>BJAJH INE: (6B7><JDJH R<JG:H ;GDB ;68: E>8IJG:H, 6B- 7><JDJH R<JG:H ;GDB =DJH: E>8IJG:H, " 6JHH>6C CD>H:), 6C9 (3) :A:8- IGD9: H>I: (!C0, C0). A I=G:~K6G>67A: L>I=>C>HJ7?:8I A) *OA H=DL:9 6 H>C>:>86CI B6>C :;;8I D; >B6<:GN 86I:<DGN 4!(1,15) = 18.27, p = 0.001, $\eta^p = 0.555$, H>C>:>86CI B6>C :;;8I D; HI>BJAJH INE: 4!(2,30) = 6.58, p = 0.004, $\eta^p = 0.315$, 6C9 H>C>:>86CI B6>C :;;8I D; :A:8IGD9: H>I: 4!(1,15) = 4.87, p = 0.043, $\eta^p = 0.255$.) D H>C>:>86CI >C I:G68I>DCH L:G: D7H:GK:9 (6AA p > 0.05). '-D +DHI =D8 6C6AN- H:H H=DL:9 I=6I I=: 6BEA>IJ9: D; O++ L6H H>C>:>86CIAN A6G<:G JC9:G I=: ;68:~>B6<:GN 8DC9>I>DC (2.95 ± 0.63 uO) I=6C JC9:G I=: =DJH:~>B6<:GN 8DC9>I>DC (1.80 ± 0.52 uO) 4!(15) = 4.28, p < 0.001, CD- =:C'H d = 0.505. . =JH, 6AI=DJ<=>9:CI>86A 6B7><JDJH HI>BJAJ>L:G: JH:9, >CIGD9J8>C< B:CI6A >B6<:GN D; ;68: A:9 ID HI6DCC:G O++ I=6C >CIGD9J8- >C< B:CI6A >B6<:GN D; =DJH:.

(DG:DK:G, I=: B:6C O++ 6BEA>IJ9: ID I=: 6B7><JDJH HI>BJAJ>;GDB ;68: E>8IJG:H (2.87 ± 0.64 uO) L6H A6G<:G I=6C B:6C O++ 6BEA>IJ9: ID " 6JHH>6C CD>H: (1.74 ± 0.50 uO) 4!(15) = 3.42, p = 0.004, CD- =:C'H d = 0.495, 6C9 I=: B:6C O++ 6BEA>IJ9: ID I=: 6B7><JDJH HI>B- JAJ>;GDB =DJH: E>8IJG:H (2.51 ± 0.62 uO) L6H A6G<:G I=6C B:6C O++ 6B- EA>IJ9: ID " 6JHH>6C CD>H: 4!(15) = 2.49, p = 0.025, CD- =:C'H d = 0.345. AMHD, CD H>C>:>86CI 9>;:G:C8: L6H ;DJC9 7:IL::C O++ :A>8>I:9 7N 6B- 7><JDJH HI>BJAJ>;GDB ;68: E>8IJG:H 6C9 I=6I :A>8>I:9 7N 6B7><JDJH HI>B- JAJ>;GDB =DJH: E>8IJG:H (p = 0.27). . =JH, I=: :;;8I D; DG><C6A E>8- IJG: 8DCI:CI 7:;DG: E=6H: G6C9DB>O6I>DC L6H CDI H>C>:>86CI. . =: G:- HJAIH 6AHD H=DL:9 I=6I O++ 6I I=: H>I: C0 (2.68 ± 0.65 uO) L6H A6G<:G I=6C I=6I 6I I=: H>I: !C0 (2.07 ± 0.49 uO)

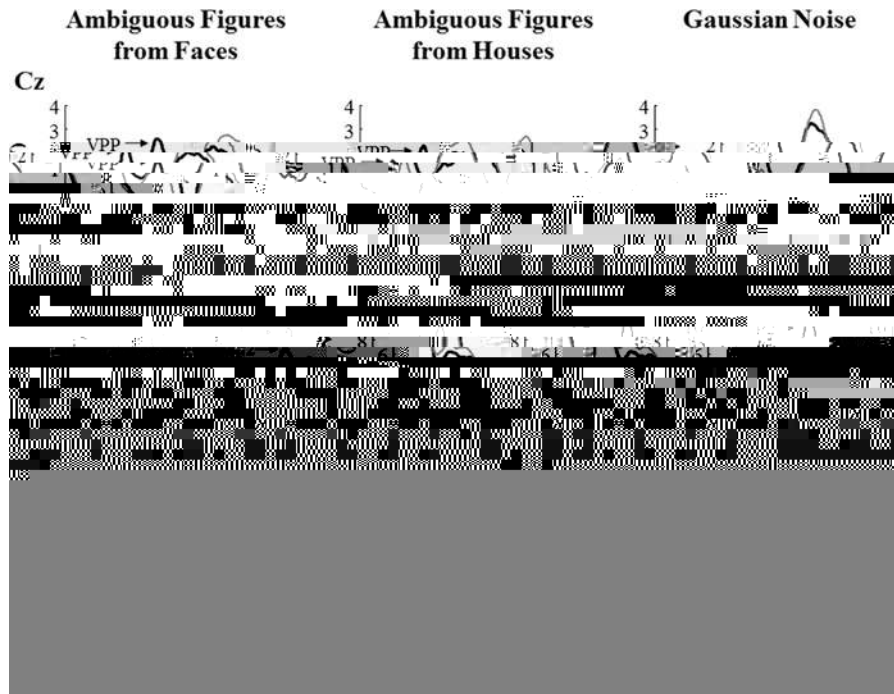


Fig. 2. 1 K: ;DGBH D; O++ 6C9 +2. "GDJE <G6C9 6K:G6<: L6K:;DGBH 6I :A:8IGD9: H>I: CO (I=: JEE:G E6C:A) 6C9 +8 (I=: ADL:G E6C:A) JC9:G :>I=:G I=: ;68: ->B6<:GN 8DC9>I>DC DG I=: =DJH: ->B6<:GN 8DC9>I>DC. O++ (I>B: L>C9DL: 140-220 BH) 6C9 +2 (I>B: L>C9DL: 200-260 BH) L:G :C=6C8: 9 JC9:G I=: ;68: ->B6<:GN 8DC9>I>DC (96@A A:C:) 8DBE6G: 9 ID I=: =DJH: ->B6<:GN 8DC9>I>DC (<G: N A:C:).

4I(15) = 2.27, $p = 0.043$, $CD = C'H d = 0.275$. . =: 8DBE6G:HDCH >C O++ 6BEA>IJ9: H 6G: H=DLC >C I=: JEE: G E6C: A D; !>. 3.
 ! DG I=: A6I: C8N D; O++, C>I=: G I=: B6>C :;; 8I :DG :68= D; I=: 3 K6G-67A: H CDG I=: >C I: G68I>DCH 7: IL: C I=: K6G-67A: H L: G: H<C>;86CI. . =: B: 6C A6I: C8N D; O++ L6H 191.4 ± 8.5 BH 6C9 191.4 ± 7.3 BH JC9: G I=: ;68: ->B6<:GN 8DC9>I>DC 6C9 I=: =DJH: ->B6<:GN 8DC9>I>DC, G: HE: 8I>K: AN.
 . =: 6BEA>IJ9: 6C9 A6I: C8N D; +2 L: G: 6C6ANO: 9 6AHD JH<C < 6 G: -E: 6I: 9-B: 6HJG: H A) *OA L>I=: I=: ;DMDL>C< 3 K6G-67A: H (1) >B6<:GN 86I: <DGN (:68: >B6<:GN, =DJH: >B6<:GN), (2) HI>BJAJH INE: (6B7><J-DJH HI>BJA> ;GDB :68: E>8IJG: H, 6B7><JDJH HI>BJA> ;GDB =DJH: E>8IJG: H, " 6JHH>6C CD:H:), 6C9 (3) =: B>HE=: G: (A: ;I, G<=I). " G: :C=DJH: -": >HH: G A9?JHIB: CI L6H JH: 9 ;DG K>DA6I>DC D; -E=: G>8-IN AHUJBEI>DC.
 . =: ADL: G E6C: A D; !>. 2 H=DLH I=: 8DBE6G:HDCH D; <G6C9 6K: G-6<: , + L6K: ;DGBH JC9: G I=: ;68: ->B6<:GN 8DC9>I>DC 6C9 I= DH: JC9: G I=: =DJH: ->B6<:GN 8DC9>I>DC L>I=: I=: G: 8DG9>C<H 6I I=: :A: 8IGD9: H>I: D; +8. ! DG I=: +2 6BEA>IJ9: , 6 I=G: : -K6G-67A: L>I=>C-HJ7?: 8I A) *OA G: -K: 6A: 9 6 H<C>;86CI B6>C :;; 8I D; >B6<:GN 86I: <DGN 4! (1,15) = 4.58, $p = 0.049$, $\eta^2 = 0.235$, H<C>;86CI B6>C :;; 8I D; HI>BJAJH INE: 4! (2.30) = 35.19, $p < 0.001$, $\eta^2 = 0.705$, 6C9 H<C>;86CI B6>C :;; 8I D; =: B>HE=: G: 4! (1,15) = 5.58, $p = 0.032$, $\eta^2 = 0.275$. ! DG >C I: G68- I>DCH 6BDC< I=: 3 K6G-67A: H, DCAN I=: >C I: G68I>DC 7: IL: :C HI>BJAJH INE: 6C9 =: B>HE=: G: L6H H<C>;86CI 4! (1.32, 19.79) = 10.55, $p = 0.002$, $\eta^2 = 0.415$. ' -D +DHI #D8 8DBE6G:HDCH H=DL: 9 I=6I I=: 6B-EA>IJ9: D; +2 L6H A6G<:G JC9: G I=: ;68: ->B6<:GN 8DC9>I>DC (10.38 ± 0.85 μO) I=6C JC9: G I=: =DJH: ->B6<:GN 8DC9>I>DC (9.44 ± 0.98 μO) 4I(15) = 2.14, $p = 0.049$, $CD = C'H d = 0.275$.

(DG: DK: G, I=: H>BEA: :;; 8I D; I=: ILD-L6N (HI>BJAJH INE: 7N =: B>HE=: G:)>C I: G68I>DC L6H 6C6ANO: 9. . =: 6BEA>IJ9: D; +2 >C I=: G<=I =: B>HE=: G: L6H A6G<:G I=6C I=6I >C I=: A: ;I=: B>HE=: G: L=: C I=: HI>BJA> L: G: :>I=: G 6B7><JDJH DC: H ;GDB :68: E>8IJG: H 4I(15) = 2.36, $p = 0.032$, $CD = C'H d = 0.425$ DG 6B7><JDJH DC: H ;GDB =DJH: E>8IJG: H 4I(15) = 2.94, $p = 0.010$, $CD = C'H d = 0.465$, 7JI CDI L=: C I=: HI>BJA> L: G: " 6JHH->6C-CD:H: DC: H ($p = 0.179$). . =: 8DBE6G:HDCH D; +2 6BEA>IJ9: H 6G: H=DLC >C I=: ADL: G E6C: A D; !>. 3.
 ! DG I=: A6I: C8N D; +2, 6 I=G: : -K6G-67A: L>I=>C-HJ7?: 8I A) *OA DCAN G: K: 6A: 9 6 H<C>;86CI B6>C :;; 8I D; HI>BJAJH INE: 4! (1.28, 19.25) = 4.25, $p = 0.034$, $\eta^2 = 0.225$. ' -D +DHI #D8 8DBE6G:HDCH H=DL: 9 I=6I +2 >C9J8: 9 7N 6B7><JDJH HI>BJA> ;GDB :68: E>8IJG: H (229.0 ± 3.5 BH) D88JG: 9 :6G: G I=6C +2 >C9J8: 9 7N " 6JHH>6C CD:H: (235.2 ± 3.4 BH) 4I(15) = 2.22, $p = 0.043$, $CD = C'H d = 0.455$. . =: 9>;:G: C8: 7: IL: :C +2 A6I: C8N ID 6B7><JDJH HI>BJA> ;GDB =DJH: E>8-IJG: H (229.0 ± 3.3 BH) 6C9 I=6I ID " 6JHH>6C CD:H: L6H B6G<C6A 4I(15) = 2.10, $p = 0.053$, $CD = C'H d = 0.475$. . =: B: 6C A6I: C8N D; +2 L6H 229.1 ± 3.3 BH 6C9 223.1 ± 3.3 BH JC9: G I=: ;68: ->B6<:GN 8DC9>I>DC 6C9 I=: =DJH: ->B6<:GN 8DC9>I>DC, G: HE: 8I>K: AN.
 , + L6K: ;DGBH >C 5 E6G>8-E6CIH : M=>7>I: 9 6C D7H: GK67A:) 170 8DB-EDC: CI JC9: G :>I=: G I=: ;68: ->B6<:GN 8DC9>I>DC DG I=: =DJH: ->B6<:GN 8DC9>I>DC.) D) 170 8DBEDC: CI L6H D7H: GK67A: ;GDB I=: <G6C9 6K: G6<: , + L6K: ;DGB 68GDH 16 E6G>8-E6CIH.
 . =: <G6C9 6K: G6<: , + L6K: ;DGBH D; 6A I=: 6C6ANO: 9 :A: 8IGD9: H>I: H (!CO, CO, +5, +6, +7, +8, +*5, +*6, +*7, +*8) JC9: G ;68: ->B6<:GN 6C9 =DJH: ->B6<:GN 8DC9>I>DCH ;DG I=: 4 HI>BJAJH INE: H (8DB-EA: I: AN 6B7><JDJH R<JG: H ;GDB



Fig. 3. -161>H1>86A 8DBE6G>HDCH D; O++ 6C9 +2 6BEA1J9: H. . =: JEE: G E6C: A: +DHI #D8 8DBE6G>HDCH D; E: 6@ 6BEA1J9: H D; O++ 61 : A: 8IGD9: H1: H C0 6C9 ! C0. . =: 6BEA1J9: D; O++ JC9: G I=: ;68: >B6<: GN 8DC9>1>DC L6H H<C>:>86CIAN A6G<: G I=6C I=61 JC9: G I=: =DJH: >B6<: GN 8DC9>1>DC, 6C9 O++ : A>8>1: 9 7N 6B7><JDJH E>8IJG: H L6H H<C>:>86CIAN A6G<: G I=6C I=61 : A>8>1: 9 7N " 6JHH>6C CD>H: . . =: ADL: G E6C: A: +DHI #D8 8DBE6G>HDCH D; E: 6@ 6BEA1J9: H D; +2>C I=: A: ; I=: B>HE=: G: (+5, +7, +*5, +*7) 6C9 I=: G<<I =: B>HE=: G: (+6, +8, +*6, +*8) . . =: 6BEA1J9: D; +2 JC9: G I=: ;68: >B6<: GN 8DC9>1>DC L6H H<C>:>86CIAN A6G<: G I=6C I=61 JC9: G I=: =DJH: >B6<: GN 8DC9>1>DC, 6C9 +2 : A>8>1: 9 7N 6B7><JDJH R<JG: H L6H H<C>:>86CIAN A6G<: G I=6C I=61 : A>8>1: 9 7N " 6JHH>6C CD>H: . . GGDG B6GH G: EG: H: CI I=: H16C96G9 : GGDG D; I=: B: 6C (-). * $p < 0.05$, ** $p < 0.01$.

;68: H, 8DBEA: I: AN 6B7><JDJH R<JG: H ;DGB =DJH: H, " 6JHH>6C CD>H: 6C9 G: 6A E>8IJG: H) 6G: H=DLC >C !>. 4.

3.2.2. Comparisons of ERPs under the face-imagery condition and ERPs to real face-picture stimulation

B6H: 9 DC I=: G: HJAIH 9: H8G>7: 9 67DK: , I=: >CSJ: C8: D; DG<>C6A E>8-IJG: 8DC1: CI 86C 7: : M8AJ9: 9. . D 8DBE6G: , +H ID 6B7><JDJH HI>BJA> JC9: G I=: ;68: >B6<: GN 8DC9>1>DC 6C9 , +H ID G: 6A ;68: -E>8IJG: HI>BJA> A61>DC (>C8AJ9>< 7DI= =6A; -6B7><JDJH ;68: E>8IJG: H 6C9 8A: 6C ;68: E>8-IJG: H), L: B: G<: 9 6B7><JDJH R<JG: H ;GDB ;68: E>8IJG: H 6C9 I=DH: ;GDB =DJH: E>8IJG: H ID ;DGB 6 H<C>A: 6B7><JDJH R<JG: 8DC9>1>DC, 6C9 I=: C 8DBE6G: 9 , +H ID I=: H: 6B7><JDJH R<JG: H JC9: G I=: ;68: >B6<: GN 8DC-9>1>DC L>I= , +H ID G: 6A ;68: E>8IJG: H.

AH H=DLC >C !>. 5, 7DI= 6B7><JDJH R<JG: H JC9: G I=: ;68: >B6<: GN 8DC9>1>DC 6C9 G: 6A ;68: E>8IJG: H : A>8>1: 9 I=: O++ 8DBEDC: CI 6I I=: H1: C0 6C9 I=: +2 8DBEDC: CI 6I I=: H1: +8. AAMD, I=: ;68: -HE: 8>R8) 170 8DBEDC: CI L6H G: A>67AN : A>8>1: 9 DCAN 7N I=: G: 6A ;68: E>8IJG: H (CDI 7N I=: 6B7><JDJH R<JG: H).

!DG I=: 6BEA1J9: D; O++ 8DBEDC: CI, 6 2 (HI>BJAJH INE.: 6B7><J-DJH E>8IJG: H L>I= ;68: >B6<: GN, ;68: -E>8IJG: HI>BJA6-

I>DC) 7N 2 (: A: 8IGD9: H1: : C0, ! C0) G: E: 6I: 9-B: 6HJG: H A) *OA H=DL: 9 6 H<C>:>86CI ILD-L6N >CI: 6681>DC 4!(1, 15) = 63.98, $p < 0.001$, $\eta^2 = 0.815$. . =: 9>;: G: C8: D; O++ 6BEA1J9: 7: IL.: C I=: ILD HI>BJAJH INE: H (;68: -E>8IJG: HI>BJA61>DC B>CJH 6B7><JDJH E>8IJG: L>I= ;68: >B6<: GN) L6H A6G<: G 6I H1: ! C0 (1.93 ± 0.93 µV) 8DBE6G: 9 ID I=6I 6I H1: C0 (0.16 ± 0.91 µV) 4!(15) = 8.00, $p < 0.001$, $CD- =: C' H d = 0.485$. AAMD, I=: A6I: C8N D; O++ L6H 6C6AN0: 9 6C9 I=: G: HJAIH H=DL: 9 I=6I CD H<C>:>86CI 9>;: G: C8: H L: G: ;DJC9 7: IL.: C 2 HI>BJAJH INE: H (186.0 ± 9.2 BH ;DG 8DBEA: I: AN 6B7><JDJH HI>BJA> JC9: G I=: ;68: >B6<: GN 8DC9>1>DC; 185.3 ± 4.6 BH ;DG G: 6A; 68: -E>8IJG: HI>BJA6-1>DC).

AI I=: D88>E>ID-I: BEDG6A H1: H, 6H I=: EDH1>K: EDI: CI>6A +2 E6GI>6AN DK: GA6EE: 9 L>I= I=: C: <6I>K: EDI: CI>6A) 170, I=: 6BEA1J9: D; +2 : A>8>1: 9 7N ;68: -E>8IJG: HI>BJA> L6H CDI67AN G: 9J8: 9, HB6AM: G I=6C I=61 >C9J8: 9 7N 6B7><JDJH HI>BJA> JC9: G I=: ;68: >B6<: GN 8DC9>1>DC. . =: G: L6H CD H<C>:>86CI 9>;: G: C8: >C E: 6@ A6I: C8N D; +2 7: IL.: C I=: 2 HI>BJAJH INE: H (227.6 ± 3.5 BH ;DG 8DBEA: I: AN 6B7><JDJH HI>BJA> JC9: G I=: ;68: >B6<: GN 8DC9>1>DC; 232.2 ± 3.1 BH ;DG ;68: -E>8IJG: HI>BJA61>DC).

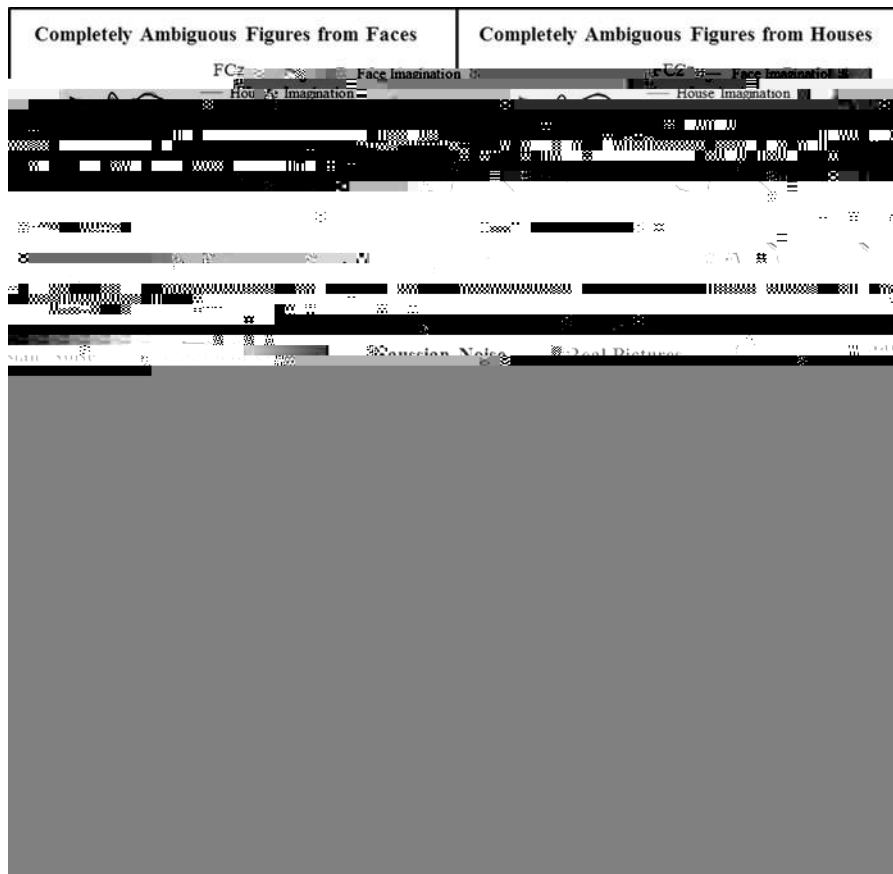


Fig. 4. " GDJE <G6C9 6K: G6<: L6K: :DGBH 6I 6M 6C6ANO: 9 :A: 8IGD9: H: I: H ! DG I=: HI>BJAJH INE: D: 8DBEA: I: AN 6B7><JDJH R<JG: H :GDB :68: H, 8DBEA: I: AN 6B7><JDJH R<JG: H :GDB =DJH: H, 6C9 " 6JHb6C CD>H: , I=: 966@ A:C: H G: EG: H: CI I=: :68: ->B6<: GN 8DC9>I-DC 6C9 I=: <G: N A:C: H G: EG: H: CI =DJH: ->B6<: GN 8DC9>I-DC. ! DG I=: HI>BJAJH INE: D: G: 6A E>8IJG: H, I=: 966@ A:C: H G: EG: H: CI G: 6A :68: -E>8IJG: 8DC9>I-DC 6C9 I=: <G: N A:C: H G: EG: H: CI G: 6A =DJH: -E>8IJG: 8DC9>I-DC. .=: :A: 8IGD9: H: I: H>C8AJ9: 9 ! CO, CO, +5, +6, +7, +8, +*5, +*6, +*7, +*8.

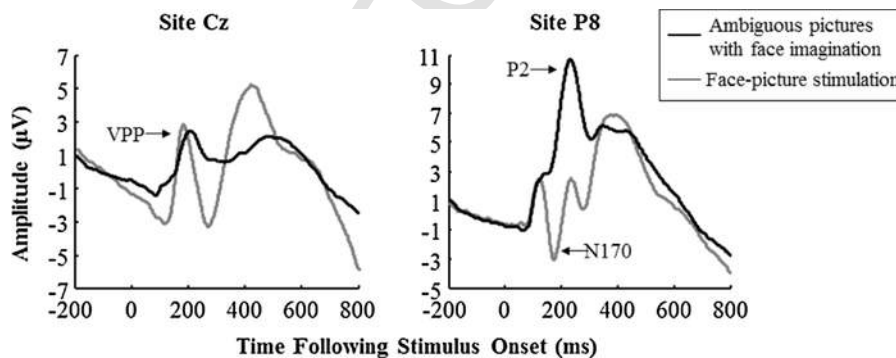


Fig. 5. " GDJE <G6C9 6K: G6<: L6K: :DGBH 6I :A: 8IGD9: H: I: H CO 6C9 +8. D66@ A:C: H G: EG: H: CI G: HEDCH: H : A>8: I: 9 7N 6B7><JDJH R<JG: H L>I=: :68: >B6<: GN, 6C9 <G: N A:C: H G: EG: H: CI G: HEDCH: H >C9J8: 9 7N G: 6A :68: E>8IJG: H. O++ 6C9 +2 D88JG6: 9 >C 7DI I=: :68: ->B6<: GN 8DC9>I-DC 6C9 :68: -E: G8: EI>DC 8DC9>I-DC, 7JI) 170 L6H :DJC9 DCAN >C I=: :68: -E: G8: EI>DC 8DC9>I-DC.

3.2.3. Comparisons of preference of VPP to face between the ambiguous-figure condition and the

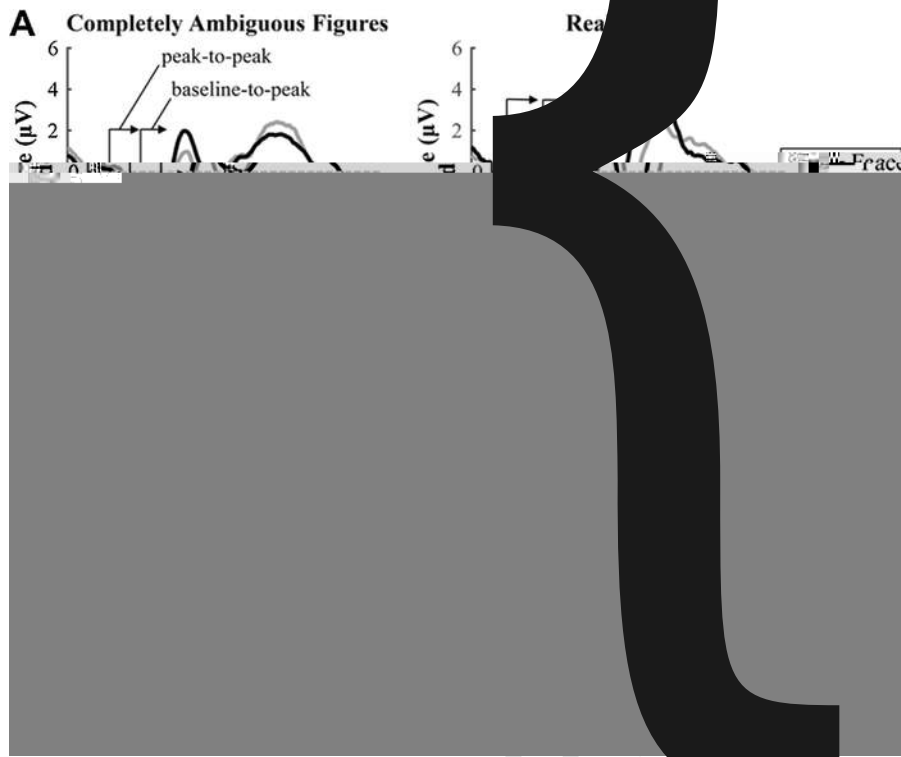


Fig. 6. . =: JEE:G E6C:AH (A): "GDJE <66C9 6K:G6<: D; , + L6K:;DGBH 6I ;GDCID-8: CIG6A H>I: H (6K:G6<: 9 68GDHH I=: ! CO 6C9 C... =: G 7N 8DBEA: I: AN 6B7><JDJH R<JG: H (A:;I E6C: A) L>I=: >I=: G ;B6<: GN (966@ A<C:) DG =DJH: >B6<: GN (<G: N A<C:), DG 7N G: 6A:;68: E>8IJG: H (966@ A<C:)>C G<=<I E6C: A) DG G: 6A=DJH: E>8IJG: H (<G: N A<C:)>C G<=<I E6C: A) . . =: ADL: G E6C: AH (B): +DHI =D8 8DBE6G+HDCH D: 76H: A<C: -ID-E: 6@ 6BEA>IJ9: H D: O++ (A: ;I E6C: A) 6C9 E: 6@-ID-E: 6@ 6BEA>IJ9: H D:) 1-O++ (G<=<I E6C: A) 68GDHH HI>BJAJH INE: H 6C9 8DC9>I>DCH. BDI= 76H: A<C: -ID-E: 6@ 6C9 E: 6@-ID-E: 6@ B: 6HJG: B: CIH H=DL: 9 HIGDC<: G O++ JC9: G ;68: 8DC9>I>DCH (966@ 76G) I=6C =DJH: 8DC9>I>DCH (<G: N 76G) . . =: E: 6@-ID-E: 6@ B: 6HJG: B: CI 6AHD G: K: 6AH 6 HIGDC<: G ;68: -69K6C16<: . . . ;8I ;DG G: 6A E>8IJG: H I=6C 8DBEA: I: AN 6B7><JDJH R<JG: H. GGDG B6GH G: EG: H: CI I=: HI6C9669 :GGDG D: I=: B: 6C (- (). * *p* < 0.05, ** *p* < 0.01, *m.s.* B66<=>C6ANN H<C>:>86CI.

E: 6I: 9-B: 6HJG: H A) *OA D; I=: 76H: A<C: -ID-E: 6@ O++ 6BEA>IJ9: G: - K: 6A: 9 6 B6G<=>C6ANN H<C>:>86CI B6>C . . . ;8I D; HI>BJAJH INE: 4I (1, 15) = 4.40, *p* = 0.053, η^2 = 0.235 6C9 6 H<C>:>86CI B6>C . . . ;8I D; HI>BJAJH-D7?: 8I 8DC9>I>DC 4I (1, 15) = 4.93, *p* = 0.042, η^2 = 0.255. . =: ILD-L6N >CI: G68I>DC L6H CDI H<C>:>86CI (*p* = 0.63). A' -D +DHI =D8 6C6ANNH>H 6AHD H=DL: 9 I=6I O++ JC9: G I=: ;68: 8DC9>I>DC (3.91 ± 0.71 μO) L6H H<C>:>86CIAN A6G<: G I=6C I=6I JC9: G I=: =DJH: 8DC9>I>DC (2.73 ± 0.51 μO) 4I(15) = 2.22, *p* = 0.042, *CD*=: C'H *d* = 0.475. #DL- :K: G, I=: 9>;: G: C8: 7: IL: : C O++ ID G: 6A E>8IJG: H (3.95 ± 0.67 μO) 6C9 I=6I ID 8DBEA: I: AN 6B7><JDJH R<JG: H (2.69 ± 0.61 μO) L6H DCAN B6G<=>C6ANN H<C>:>86CI 4I(15) = 2.10, *p* = 0.053, *CD*=: C'H *d* = 0.495. . =: G: HJAIH H=DL: 9 I=6I I=: EG: ;: G: C8: D; O++ ID ;68: >B6<: GN JC9: G I=: 6B- 7><JDJH-R<JG: 8DC9>I>DC L6H H>B>A6G ID I=: EG: ;: G: C8: D; O++ ID G: 6A-R< JG: HI>B>JA> JC9: G I=: G: 6A-E>8IJG: 8DC9>I>DC. !DG I=: O++ 6BEA>IJ9: H H=DL C >C I=: G<=<I E6C: A D; !>. 6B, 6 2 (HI>BJAJH INE: : 8DBEA: I: AN 6B7><JDJH R<JG: H, G: 6A E>8IJG: H) 7N 2 (HI>BJAJH-D7?: 8I 8DC9>I>DC: ;68: , =DJH:) G: E: 6I: 9-B: 6HJG: H A) *OA D; E: 6@-ID-E: 6@ 6BEA>IJ9: G: K: 6A: 9 6 H<C>:>86CI B6>C . . . ;8I D; HI>BJAJH INE: 4I (1, 15) = 22.57, *p* < 0.001, η^2 = 0.605, 6 H<C>:>86CI B6>C . . . ;8I D; HI>BJAJH-D7?: 8I 8DC9>I>DC 4I (1, 15) = 11.89, *p* = 0.004, η^2 = 0.445, 6C9 6 H<C>:>86CI ILD-L6N >CI: G68I>DC 7: IL: : C I=: ILD ;68IDGH 4I (1, 15) = 5.52, *p* = 0.033, η^2 = 0.275. !DG 8DBEA: I: AN 6B7><JDJH R<JG: H, I=: E: 6@-ID-E: 6@ 6BEA>IJ9: D; O++ JC9: G ;68: >B6<: GN (5.47 ± 0.62 μO) L6H H<C>:>86CIAN

A6G<: G I=6C I=6I JC9: G =DJH: >B6<: GN (4.83 ± 0.50 μO) 4I(15) = 2.28, *p* = 0.037, *CD*=: C'H *d* = 0.295. !DG G: 6A E>8IJG: H, I=: G: 6A:;68: E>8IJG: 6AHD :A>8>I: 9 HIGDC<: G O++ (8.17 ± 0.78 μO) I=6C G: 6A=DJH: E>8IJG: 9>9 (5.96 ± 0.56 μO) 4I(15) = 3.17, *p* = 0.006, *CD*=: C'H *d* = 0.815. AAHD, I=: ;68: /=DJH: 9>;: G: C8: ;DG G: 6A E>8IJG: H (2.21 ± 0.70 μO) L6H H<C>:>86CIAN A6G<: G I=6C I=6I ;DG 8DBEA: I: AN 6B7><JDJH R<JG: H (0.64 ± 0.28 μO) 4I(14) = 2.35, *p* = 0.033, *CD*=: C'H *d* = 0.745. . =: G: -HJAIH D; E: 6@-ID-E: 6@-6BEA>IJ9: 9616 H=DL: 9 I=6I ;DG B: CI6A >B6<: GN, I=: ;68: -EG: ;: G: CI>6A . . . ;8I 8DJA9 6AHD 7: EG: H: CI: 9 7N I=:) 1-O++ 6B-EA>IJ9: .

4. Discussion

AH B: CI>DC: 9 >C I=: \$CIGD9J8I>DC, EG: K>DJH HIJ9: H =6K: H=DL C I=6I 6 EG: ;: G: C8: ID ;68: HI>BJA6I>DC: M>HIH >C I=: ILD , + 8DBEDC: CIH,) 170 6C9 O++ . . =: 6>B D; I=: EG: H: CI HIJ9N L6H ID :M6B>C: L=: I=: G 6 EG: ;: G: C8: D;) 170 6C97 200. 854 Tα(. . 1 671 . 48 322. 484 T9OEAOEOEOE08> Tj2<

6<:GN 8DC9>I>DC, EG:H:C1>C< 8DBEA:I:AN 6B7><JDJH E>8IJG:H DCAN G:A-
67AN :A>8>I:9 I=: O++ 6C9 +2 8DBEDC:CIH, 7JI CDI I=:) 170 8DBEDC:CI
(L=>8= L6H CDI 9:I:8I67A: >C I=: B6?DG>IN D; I=: E6GI>8>E6CIH). *7K>
DJHAN, I=: G:HJAH D; I=>H HIJ9N 9>9 CDI ;JAN HJEEEDGI I=: CDI>DC I=6I O++
6C9) 170 B6C>;HI I=: >9:C1>86A 7G6>C EGD8:HH:H (%:B:A :I 6A., 2003;
%DN8: & , DHH>DC, 2005).

\$I =6H 7: : C @CDLC I=6I) 170 B6>CAN G: S: 8IH I=: : 6GAN 6C9 6JIDB6I>8
HIGJ8IJG6A : C8D9>C< HI6<:H >C ;68: EGD8:HH>C< (B: C1>C & D: DJ: A, 2000;
B: C1>C : I 6A., 1996; C6JFJ>A : I 6A., 2000; >B: G, 2000).) 170 86C 7: G: A-
67AN :A>8>I:9 7N CD>H: >B6<:H DCAN L=: C 7DIIDB-JE ;68: H<C6AH DG D7?: 8I
H<C6AH 6G: 6K6>A67A: , HJ8= 6H L=: C LDG@>C< B: BDGN D; 6 G: 6A ;68: >B-
6<: >H L: A B6>C16>C: 9 (-G: :C>K6H6C : I 6A., 2007) DG

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CDH: ;

766>C 681>K>IN G:A6I:9 ID ;6B>A66 6C9 JC;6B>A66 ;68: EGD8:HH>C<: AC , + HIJ9N. CA>C>86A) : JGDE=NH>DAD<N 110 (3), 4490462.
 , DHH>DC, B, D:AK:CC:, %, D: 761>HH:, D., " D;;6JM, O., BGJN:G, , , C6DBB: A>C8@, (, : I 6A, 1999. -E61>D-I: BEDG6A AD86A>061>DC D; I=: ;68: >CK: GH>DC :;; 8I: AC :K: CI-G:A6I:9 ED-I: CI>6AH HIJ9N. B>DAD<>86A +HN8=DAD<N 50 (3), 1730189.
 -66K: 9G6, C., *A>K6G: H, .\$, \$<A: H>6H, %, 2012. CD<C>I>K: 9: 8A>C: :;; 8IH 6I 6C : 6GAN HI6<.: K>9: C8: ;GDB) 170 6C9 O++ .) : JGDH8>: C8: ' : II: GH 518 (2), 1490153.
 -B>I=, (.', " DHH: A>C, I., -8=NCH, +." , 2012. (: 6HJG<C< >CI: GC6A G: EG: H: CI6I>DCH ;GDB 7:- =6K>DG6A 6C9 7G6>C 96I6. CJGG: CI B>DAD<N 22 (3), 1910196.
 -G: : C>K6H6C, &. &, &6I0, %, %=6, A.+., 2007. . : BEDG6A 8=6G68I: G>HI>8H D; IDE>9DLC BD9J- A6I>DCH 9JG<C< LDG@>C< B: BDGN B6>CI: C6C8: : AC :K: CI-G:A6I:9 EDI: CI>6A HIJ9N D; I=:

) 170 8DBEDC: CI. %DJG6A D; CD<C>I>K:) : JGDH8>: C8: 19 (11), 183601844.
 -I6=A, %, 1>: H:, #., -8=L:>C7: G<: G, -, , 2008. ME: GI>H: 6C9 DLC-668: 7>6H >C ;68: EGD- 8: HH>C<: AC :K: CI-G:A6I:9 EDI: CI>6A HIJ9N.) : JGDG: EDGI 19 (5), 5830587.
 . 6NADG, (%, (8C6GI=N, " , -6A>76, , D: <>DK6CC>, , 1999. , + : K>9: C8: D; 9: K: ADEB: C- I6A 8=6C<: H>C EGD8: HH>C< D; ;68: H: CA>C>86A) : JGDE=NH>DAD<N 110 (5), 4490462. 30
 1 >9, #.A., BJH: N, .A., 2004. - : >C< ;68: H>C I=: CD>H: -ID8=6HI>8 68I>K>IN >C E: C8: EIJ6A G: <>DCH D; I=: 766>C B6N >CSJ: C8: I=: E: G8: EI>DC D; 6B7>< JDJH HI>BJA. +HN8=DCDB>8 BJM: I>C & , : K>: L 11 (3), 4750481



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DUJ TJET.BT.342. 6041 666. 586 Td>OF> TJET.BT.33352546666. 586 Td>O.

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