Materials and methods

Subjects

, .
fi (., 2009).
D , ▮
, 0 , 30 , 60 , 90
-
(0 , 30 , 60 , 90). fi
. E ( )
.
. D 10
.
(*pre-training threshold — post-training threshold*) /
pre-training threshold 100%.
A , -
B D 16
▮ ( ). E
10 12 , fi
( ). 12
fi . E fi .▮ ,
D 200 .

, 32
▮. F ,
( ) fi (. . . . / /)
▮
- - - . ,
- - fi (. ., 30 . 90) 30
-
▮ 16- -
. fi -
fi (,
2005; ., 2008; ., 2009; ., 2010).
- fi 0.25.
▮ B D , fi ▮
Acc (*trained direction post-training*) — *Acc* (*trained direction pre-training*) — *Acc* (*untrained directions post-training*) — *Acc* (*untrained directions pre-training*) , *Acc* .
30 , 60 ,
90 .

Multivariate analysis — forward model

, fl .

. fi . 30 , 60 , 90 .
B (F , 2006), -
, A A (, 1, 2) (0 , 30 , 60 ,
. ., 90) - . fi
(F(2,32) = 16.73, < 0.01) fi
.▮ , (F(6,96) = 16.78, < 0.01) (F .2B).
1 2, ,
.▮ ▮ , B .
- A A 1 2 41%
. 33%, , fi
(<15%) ((16) > 3.4, < 0.01) (F .2C).

Results

fi
, fi
Psychophysical results .

(1000 *Univariate analysis of fMRI data*
) - fi ,
(A , B D
0).▮ , - (D) 16 ▮
. , .
- - (2-AFC) E fi .
D fi (
-) (F .1A). E
D .
75% . 75%
, ,
6 (F . 2A). fi ▮ -
7 8 fi 6 0 , 30 , 60 , 90 (: 78 2%, 72 2%,
((16) < 1.39, > 0.05). , 75 2%, 78 2%; 1: 79 2%, 75 2%, 77 2%, 79 1%; 2:
▮ , B - 78 2%, 73 2%, 74 2%, 77 2%).
A A . fi
▮ ((16) < 1.31, > 0.05).
( ), (1), ▮ B D ▮ ,
(2) (F .1B). fi 1, 2, 3, 3A, 4, +, ▮ . E
, ▮.

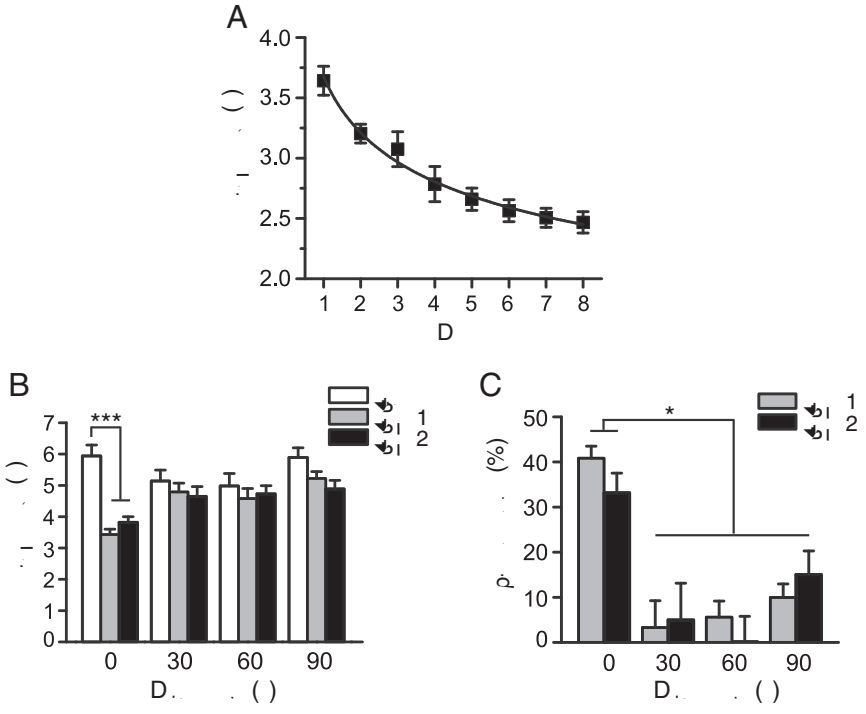


Fig. 2. . (A) . . (B)
(0) (30 , 60 , 90) , 1, 2. A fi 1, 2 (*** < 0.001).
(C) 1 2, . fi
(* < 0.05). E 1 E .

(*untrained directions pre-training*) .

1 2.

A fi /

/ B D .

( ) B D 3A

.F (fi A A .A 1, ,

, , DC), , fi ((16) = 4.35,

< 0.01). H , 1,

, 2 ((16) = 2.35, < 0.05), fi

. (F .3B).

, 3A -

, , .

, fi B D

B D -

.F , B D .

(. .,)

(G). B

- A A (, 1, *Decoding analysis of fMRI data*

2) ( ) - .

A fi - -

3A (F(2,32) = 6.57, < 0.05), ,

B D

(F .3A).

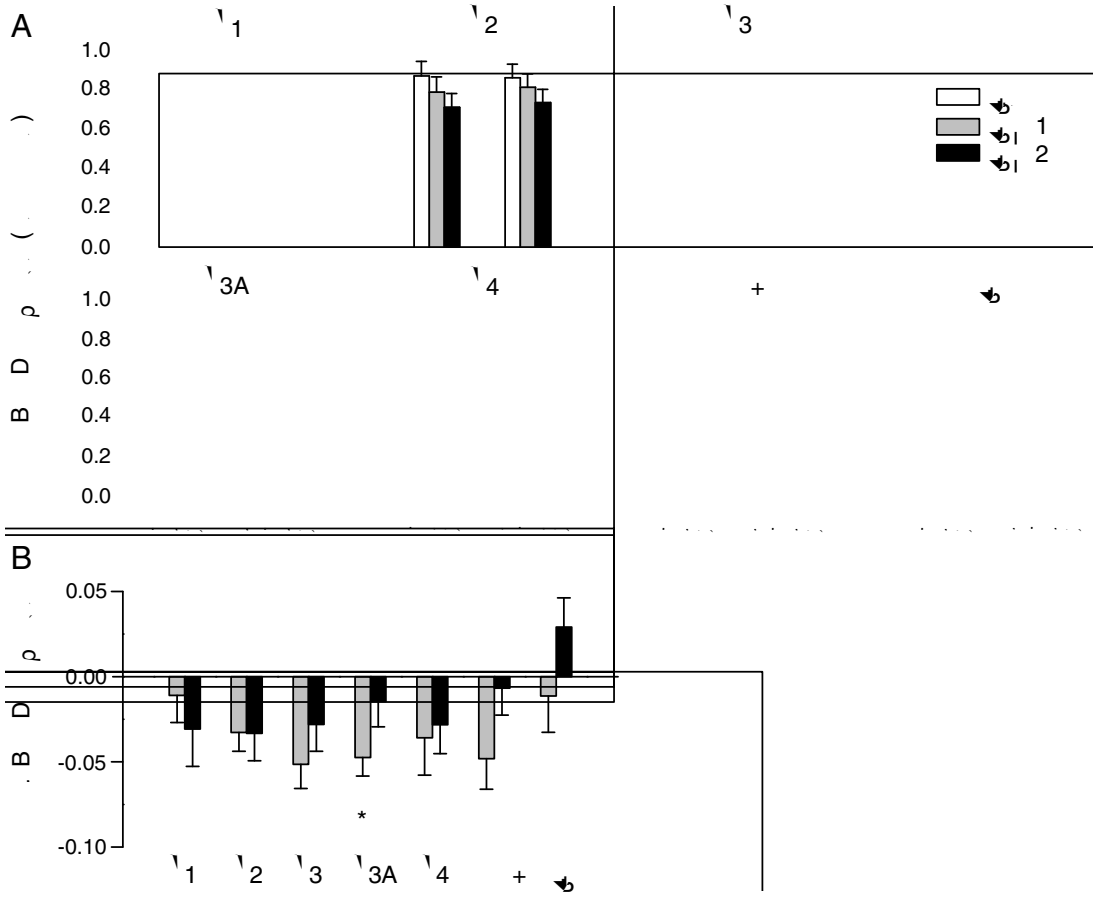
B D fi

. fi ,

, fi ( )

B D *Amp* (*trained direction post-training*) — *Amp* (*trained direction pre-training*) — *Amp* (*untrained directions post-training*) — *Amp* . F ,

fi B D



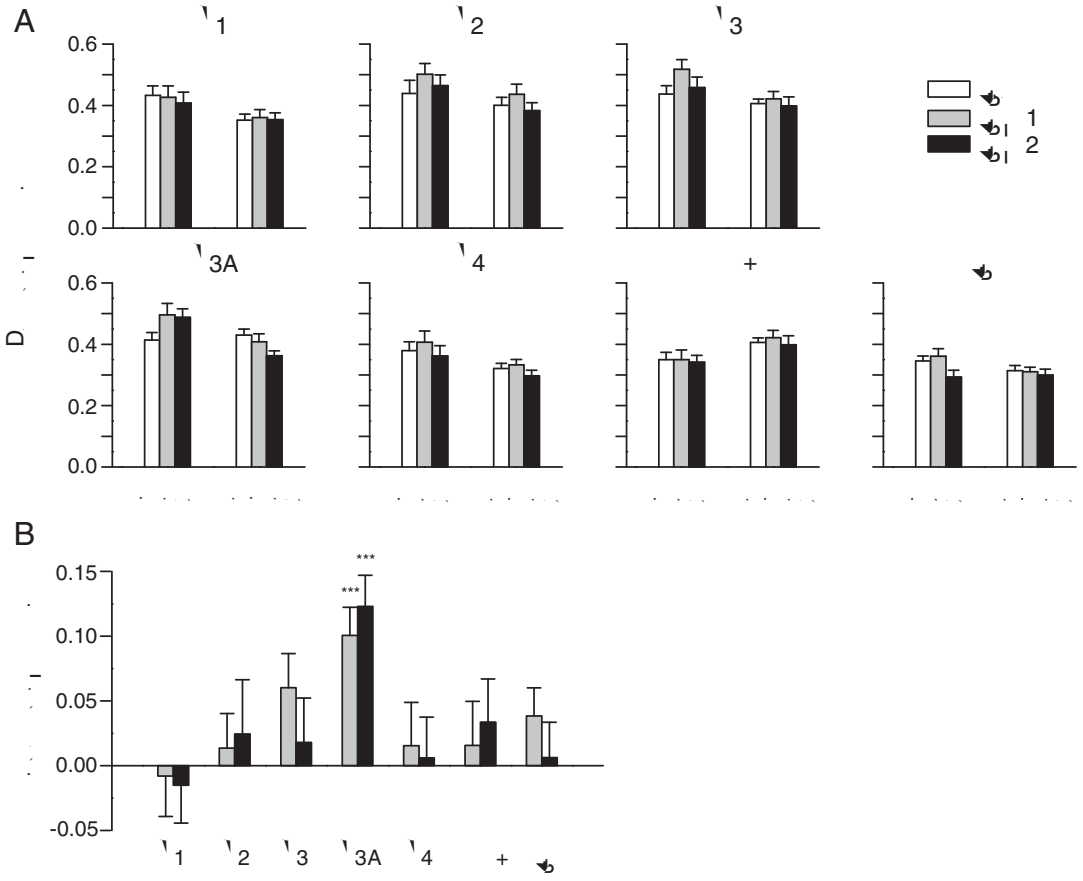


Fig. 4. . (A) D . (B) . A fi (*** < 0.001). E 1 E .

- - -) - . A fi
3A (F(2,32) = 19.07, < 0.001),
D -
A A (, 1, 2) (

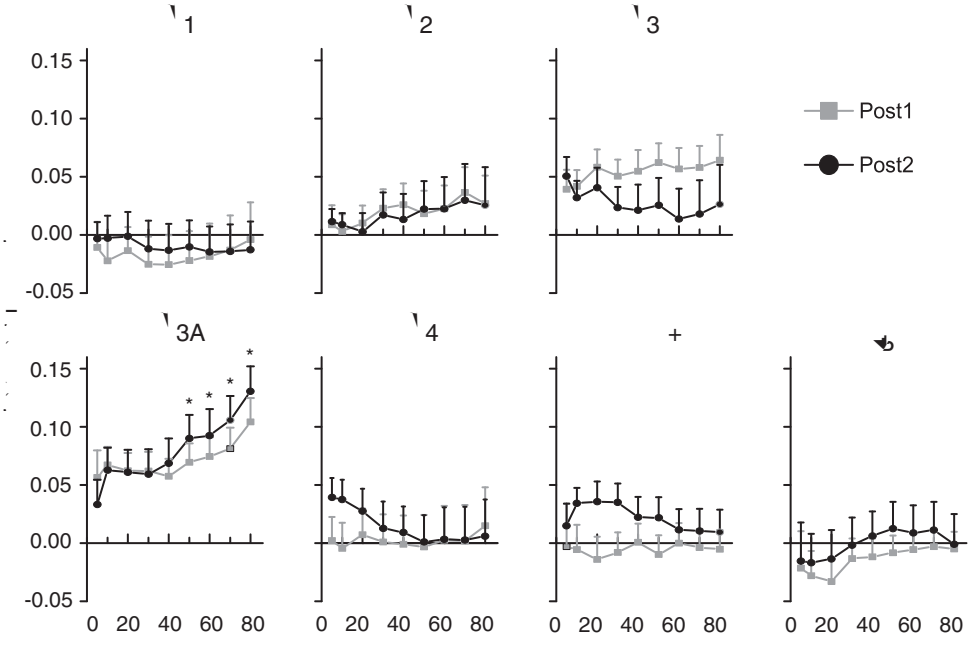
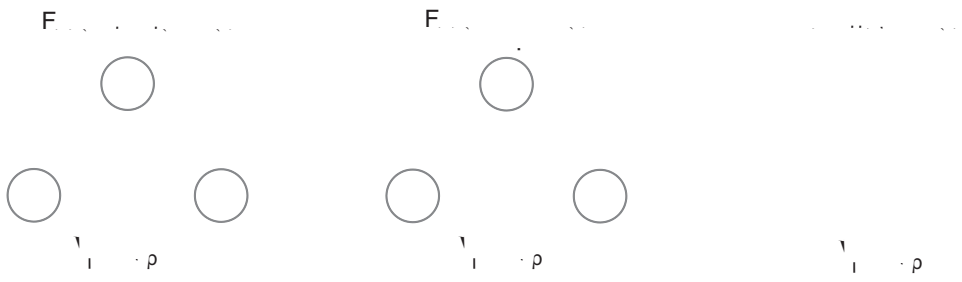


Fig. 5. . A fi (* < 0.05). E 1 E .

(F . 4A). ▮ B D , fi ▮
Acc (*trained direction post-training*) — *Acc* (*trained direction pre-training*) — *Acc* (*untrained directions post--training*) — *Acc* (*untrained directions pre-training*) . 3A
fi ▮
1 2 ((16) > 4.64, < 0.001) (F . 4B), 3A
.
fi
. F ▮, 5–80
.
50 , ▮ 3A -
fi 1 2 ((16) > 4.05, < 0.05)
(F . 5). ▮ fi
. 3A fi
.
, ,
, 1, 2.▮ , D
0 Δθ . Δθ
. A 0 D
, Δθ .
▮ ▮
. , 1 2,
B D .



(C)

= 0.51,
0.01).

05;


0
0.2
0.4
0.6

Acknowledgments

F C (31230029, 31421003, 91132302 90820307) C (2015CB351800 2012CB825500). F (BC 0617628) C FC (31228009).

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