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Neural Representations of the Self and the Mother for Chinese Individuals

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Abstract

An important question in social neuroscience is the similarities and differences in the neural representations between the self and close others. Most studies examining this topic have identified the medial prefrontal cortex (MPFC) region as the primary area involved in this process. However, several studies have reported conflicting data, making further investigation of this topic very important. In this functional magnetic resonance imaging (fMRI) study, we investigated the brain activity in the anterior cingulate cortex (ACC) when Chinese participants passively listened to their self-name (SN), their mother's name (MN), and unknown names (UN). The results showed that compared with UN recognition, SN perception was associated with a robust activation in a widely distributed bilateral network, including the cortical midline structure (the MPFC and ACC), the inferior frontal gyrus, and the middle temporal gyrus. The SN invoked the bilateral superior temporal gyrus in contrast to the MN; the MN recognition provoked a stronger activation in the central and posterior brain regions in contrast to the SN recognition. The SN and MN caused an activation of overlapping areas, namely, the ACC, MPFC, and superior frontal gyrus. These results suggest that Chinese individuals utilize certain common brain region in processing both the SN and the MN. The present findings provide evidence for the neural basis of the self and close others for Chinese individuals.

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Introduction

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FC

ACC . C

ACC

Methods

Ethics statement

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Participants

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Stimuli and procedure

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1 F(1, 22) = 10.41, P<0.01 .

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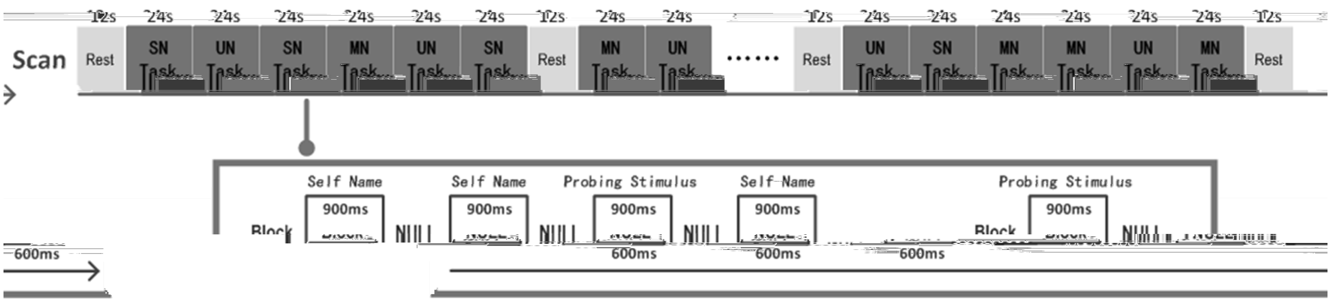

Figure 1. Schema of the design of one scan of the current study.
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2. - 3.5 ×3.5 ×3.5 24 . G 4 .

fMRI data acquisition and analysis

B I C B 3- (= 2000 , E = 30 , = 90°, = 3 , F = 240 , = 64 × 64 , = 3.75 ×3.75 ×3.75). A 3D 1- (= 2530 , E = 3.37 , = 1.3 , F = 256 , = 256 ×256 , = 1.0 ×1.0). A F I (AFNI) 23 .

. A - A A, (. .,) - . 3 C AFNI, C $p<0.05$ (:// . . .- / / / / /3 C .). 108 . A D ( ) 25 . F E .

Table 1. Brain activations shown in various contrasts (p< 0.05, two-tail).

	Volume	BA	X	Y	Z	t value	Region
SN>UN							
	300	8,9,24,32	−5.2	48	27.5	4.68*	MPFC and ACC
	212	45	−43.8	16.5	17	4.25*	Left IFG
	115	22	−54.2	−39.5	3	3.93*	Left MTG and TPJ
MN>UN							
	827	6,8,9,24,32	−22.8	44.5	34.5	4.74*	MPFC, ACC
	201	5,6,7	8.8	−32.5	52	4.45*	Left paracentral lobe
	94	7	−15.8	−43	27.5	4.517	Left PCC
	63	40	−47.2	−46.5	34.5	4.36	Left TPJ

Note: *X*, *Y*, and *Z* are Talairach coordinates; MPFC = medial prefrontal cortex; ACC = anterior cingulate cortex; IFG = inferior frontal gyrus; MTG = middle temporal gyrus; TPJ = temporoparietal junction. * corrected for multiple comparisons.
doi:10.1371/journal.pone.0091556.t001

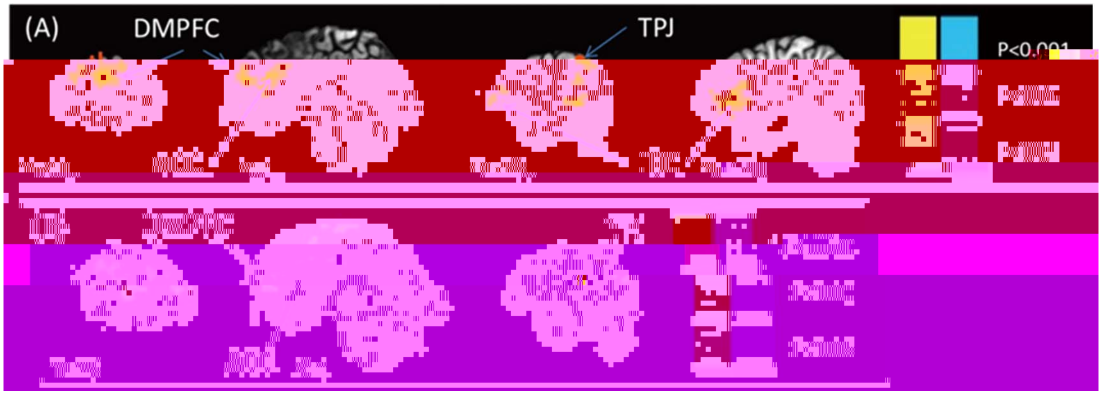

Figure 2. Contrasting brain activation patterns elicited by different name types. (A) SN>UN; (B) MN>UN.
doi:10.1371/journal.pone.0091556.g002

Results

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FC ($_{25}$ = 4.68, p<0.001), ACC ($_{25}$ = 3.93, p< 0.001), (IFG) ($_{25}$ = 4.25, p<0.001), ($_{25}$ = 3.93, p<0.001), - (J) ($_{25}$ = 3.85, p<0.001) (1). C

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FC ($_{25}$ = 4.74, p<0.001), ACC ($_{25}$ = 2.42, p<0.05), ($_{25}$ = 4.45, p<0.001), CC ($_{25}$ = 2.65, p< 0.05), J ($_{25}$ = 4.36, p<0.001) (1). ,

(: $_{25}$ = 4.46, p<0.001; : $_{25}$ = 5.26, p<0.001); ($_{25}$ = 5.24, p<0.001), (: $_{25}$ = 3.91, p<0.001; : $_{25}$ = 4.72, p<0.001), ($_{25}$ = 4.80, p<0.001), ($_{25}$ = 4.33, p<0.001), CC ($_{25}$ = 4.57, p<0.001), - (: $_{25}$ = 4.69, p<0.001; : $_{25}$ = 6.28, p< 0.001), ($_{25}$ = 5.07, p<0.001).

A - , C (. ., FC ACC) (F 2).

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FC, ACC, FG (2, F 3).

Discussion

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, C (. ., FC ACC), IFG, (. .,).

FC, ACC, , CC, J.

ACC, FC, FG. F ,

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Differential neural representations of the self and mother

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B -

Table 2. Brain activations shown in the conjunction analysis (cluster level).

Volume	X	Y	Z	Region
93	−5.7	43.6	30.9	MPFC
38	0.1	19	30.3	ACC
34	−23	47.8	27.9	left SFG
16	12.7	49.1	31	right SFG

Note: *X*, *Y*, and *Z* are Talairach coordinates; MPFC = medial prefrontal cortex; ACC = anterior cingulate cortex; SFG = superior frontal gyrus.
doi:10.1371/journal.pone.0091556.t002

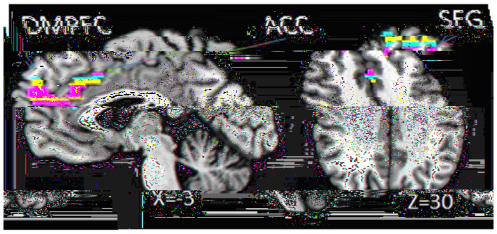

Figure 3. Conjunction analysis of the brain activation patterns of SN and MN compared with those of UN reveals that the MPFC, ACC, and SFG are activated both in SN and MN conditions.
doi:10.1371/journal.pone.0091556.g003

29 , 30 . (. ., , , , CC, , A,). , , 31,32 . . A CC 4 ; 33,34 . , , , . I , , . A - , A, 35,36 37 . I , . , - - ,

Common neural representations of the self and the mother

FC 4,12,13 , . FC - - , 4,5,12,13 . (FG). 38,39 . FG , FG . , ACC , I ACC . C 4,40,41 , ACC - . H , ACC . (2012), ACC

- . H , . . F , - , 20 . , , 18,42 . ACC . C - 18,19 , C . F , C C 5,8 . I - C , , . . . I . A , . A ACC , 4 . ; , 8 . F . . . D . I . A 5,11,43,44,45 , C . - - 18,19 . I , - , . C , . , C .

Conclusion

. C , C . I ,

FC ACC,

Acknowledgments

Z

Author Contributions

C :
: H . Z H . A : ZC .
C / / : G H .
: G ZC . Z .

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