

# Development of right inferior fronto-parietal cortices associated with self-face recognition

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E-Poster

Introduction:

One's own face is very special to humans and recognizing the face as their own is fundamental for the formation of self-identity. In our previous study, we showed using self-face recognition task in adults that inferior fronto-parietal network mediated by the inferior branch of the superior longitudinal fasciculus fiber tract (SLF III) in the right hemisphere dominantly involves self-face recognition (Morita et al. 2015). Here, we provide developmental evidence that the right-side dominance of inferior fronto-parietal activity for self-face recognition emerges after junior high school age but not at elementary school age, and that the degree of right-sided dominance well correlates with individual self-consciousness score.

Methods:

We scanned brain activity with functional magnetic resonance imaging while 20 elementary school children (younger children; aged from 8 to 11 years), 20 junior high-school students (older children; aged from 12 to 15 years) and 20 young adults (aged from 18 to 23 years) were required to view either their own face or others' faces and to judge if a presented face image was one's own or not. All of them were right-handed healthy participants. First, we depicted brain regions where the activity increased when viewing self-face as compared with other's face (self-face related activity). Next, we performed flip analysis to evaluate the right hemisphere dominance of inferior fronto-parietal activity for self-face recognition. To depict significant brain regions in each analysis, we used voxel-wise threshold of  $p < 0.001$  and evaluated significance of brain activations in terms of spatial extent of the activations in the entire brain (cluster-wise threshold  $p < 0.05$  corrected). All the participants also completed a questionnaire for the public and private self-consciousness scales (For adults Sugawara, 1984, for children Sakurai, 1992). The public scale is designed to evaluate one's tendency to be concern about one's own appearance and behaviors, while the private scale may measure one's tendency to be aware of one's own inner states. Then, we also examined the relationship between the degree of right-side dominance of inferior fronto-parietal activity and the individual self-consciousness scores in the younger and older children.

Results:

In adults, we found the self-face related activity in the inferior frontal cortices (anterior insula, areas 44 and 45) and in the inferior parietal cortices (areas PF and PGa) of the right hemisphere, in addition to the bilateral inferior occipital cortex (IOC) and inferior temporal gyrus (ITG) (yellow sections in Fig. 1 right column). The right inferior fronto-parietal activities were also observed in older children but not in younger children (Fig. 1 middle and left column), even though younger children could successfully discriminate their own faces behaviorally. The flip analysis revealed the right-side dominance of the inferior fronto-parietal activity only in adults and older children (blue sections in Fig. 1 right and middle column). Finally, we found that the degree of right-side dominance of the inferior parietal activity correlated with the public self-consciousness score in younger and older children.

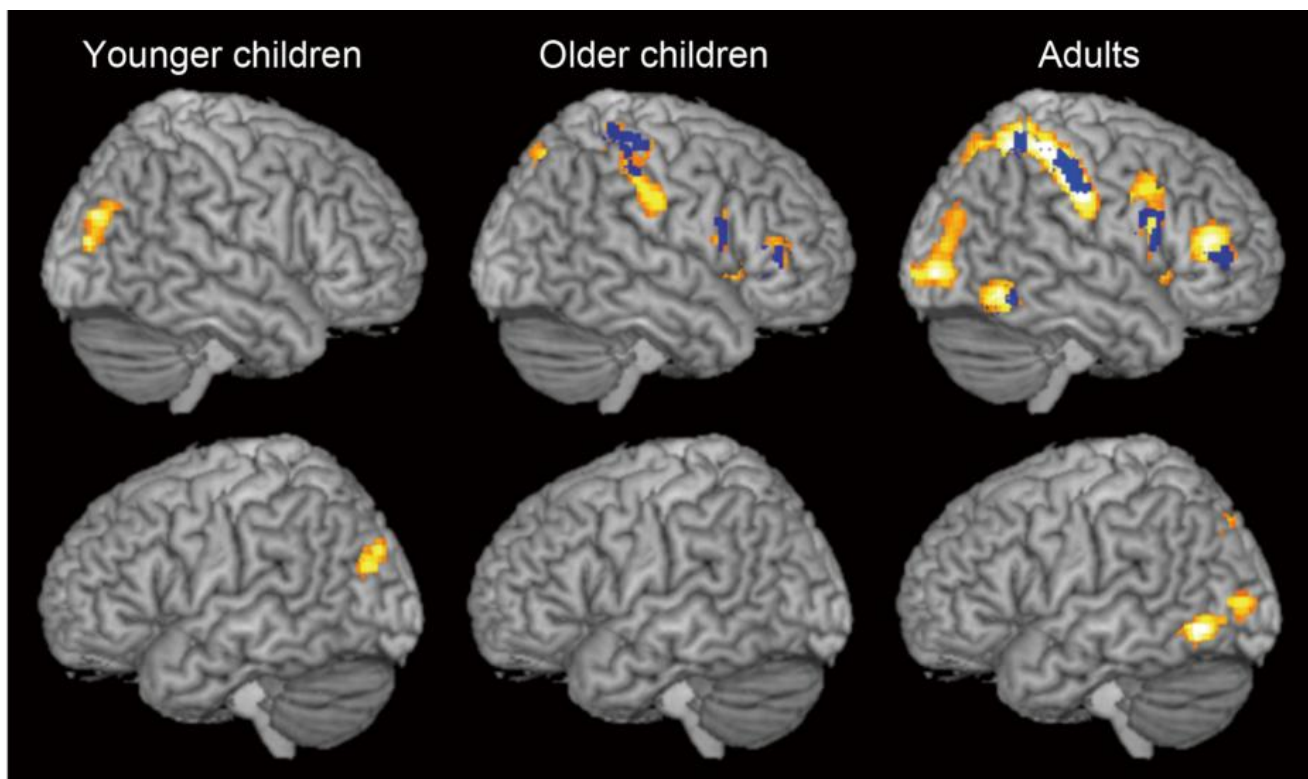


Figure 1 Brain regions showing self-face related activity (self-face > other's face; yellow sections) and those showing right-side dominant activity (right hemisphere > left hemisphere; blue sections). Images in the left column represent the data obtained from younger children, those in the middle for older children, and those in the right for adults.

#### Conclusions:

In the present study, we showed that the right-side dominance of the inferior fronto-parietal activity associated with self-face recognition emerges after junior high school age but not at elementary school age. We further showed the possibility that the right-lateralized inferior parietal activity develops (matures) in association with the development of one's public self-consciousness through elementary and junior high-school ages. These results indicate that the development of one's public self-consciousness leading to self-identity is somehow associated with the emergence of the right-lateralized activity in the inferior fronto-parietal network mediated by the SLF III.

#### Imaging Methods:

BOLD fMRI

#### Lifespan Development:

Normal Brain Development: Fetus to Adolescence <sup>2</sup>

#### Social Neuroscience:

Self Processes <sup>1</sup>

#### Poster Session:

Poster Session – Wednesday

#### Keywords:

Development  
FUNCTIONAL MRI  
Other – fronto-parietal network; self-face

<sup>1</sup><sup>2</sup>Indicates the priority used for review

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Please indicate which methods were used in your research:

Functional MRI

For human MRI, what field strength scanner do you use?

3.0T

Which processing packages did you use for your study?

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Provide references in author date format

Morita, T. (2015), 'Shared right inferior fronto-parietal substrates for corporeal awareness and self-identification', 21th Meeting of the Organization for Human Brain Mapping, Honolulu, poster no. 4195.  
Sakurai, S. (1992), 'The investigation of self-consciousness in the 5th- and 6th-grade children', Jikken-Shakai-Shinrigaku-Kenkyu (Hiroshima), vol. 32, pp. 85-94.  
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