

Stronger brain activation for own baby but similar activation toward babies of own and different ethnicities in parents living in a multicultural environment

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INTRODUCTION

The **Baby Schema Effect** is a phenomenon where specific infant facial cues automatically trigger a distinct set of brain responses that promotes adaptive caregiving, affection and nurturing in adults. There is also an innate tendency to categorise people into **In-group (IG)** and **Out-group (OG)** members based on salient visual features such as **ethnicity**.

This study aims to examine if **ethnicity** plays a role in the **baby schema effect** in a **multicultural** society. As previous work has mostly not considered the effect of psychosocial factors such as ethnicity in a multicultural setting, this adds ecological validity and contributes further understanding to the dynamics of the baby schema effect in an increasingly socially and culturally complex and interconnected world.

METHODS

27 Singaporean Chinese parents took part in the study. Participants were presented images under 3 categories: **8 ethnic in-groups (IG)**, **8 ethnic out-groups (OG)**, **1 Own Infant (OI)**.

MRI scanning and functional scans of brain activity were obtained. General linear modelling was conducted for each subject to assess the effect of ethnicity and kinship on the baby schema effect. **IG, OG, OI conditions** were modelled as separate regressors of interest.

In the second-level mixed-effect analysis, 4 hypotheses were tested: neural differences in viewing non-own IG versus OG infant faces (**IG>OG**); own infant versus non-own IG infant faces (**OI>IG**); non-own OG infant faces (**OI>OG**); commonalities of neural activation towards non-own IG versus OG infant faces (**IGNOG**). A **one-sample t-test** was performed in second-level random-effect analysis for group effects.

Only clusters that survived voxel-level correction, at a statistical threshold of **p < 0.05** (k=10 voxels), for multiple comparisons across the whole brain (family-wise error, FWE), were reported.

RESULTS

Effect of Ethnicity on the Baby Schema Effect

IG>OG contrast: No significant difference was found in brain responses to non-own ethnic IG and OG infant faces.

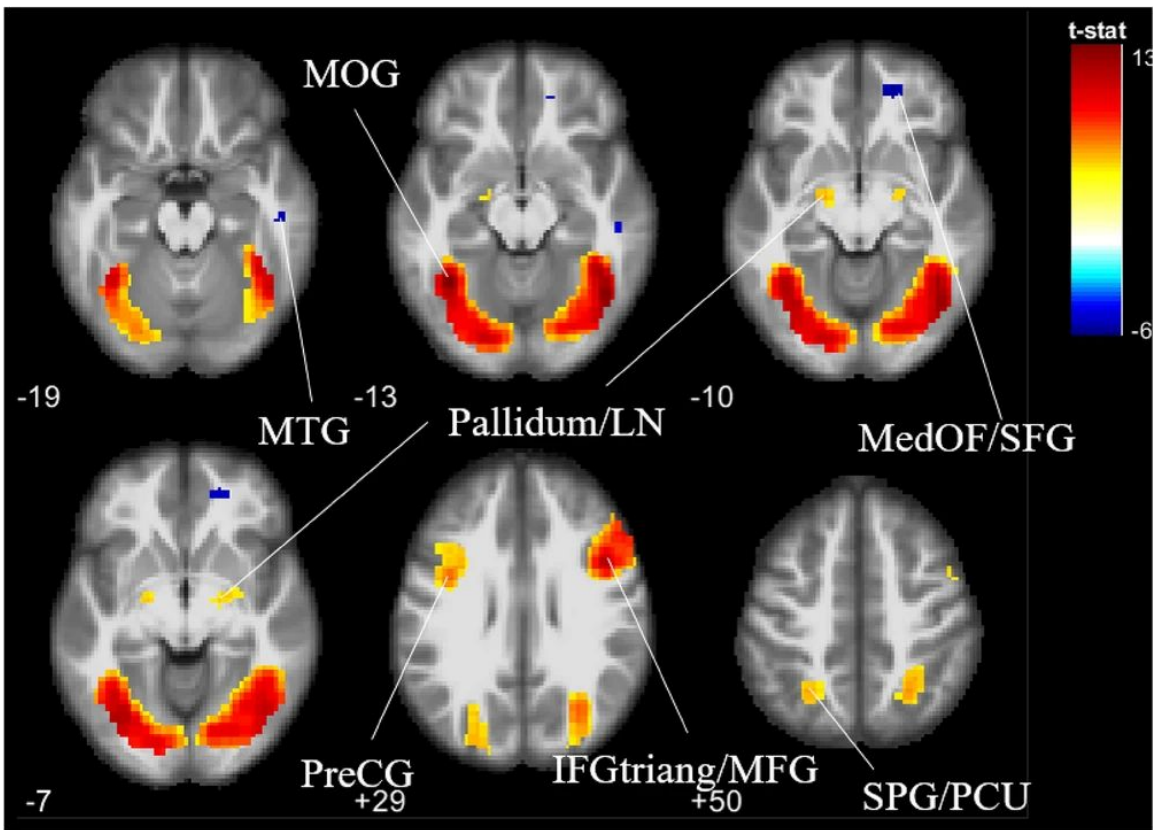


Fig 2.

IGNOG contrast (Fig 2): For both non-own ethnic IG and OG faces, the significantly active regions were the middle occipital gyrus (MOG), precentral gyrus (PreCG), superior parietal gyrus (SPG) comprising of the precuneus (PCU) in the left hemisphere; pars triangularis (IFGtriang) extending to the middle frontal gyrus (MFG) in the right hemisphere; and bilateral pallidum comprising of the lentiform nucleus (LN). Similarity in deactivation was found in the medial orbitofrontal gyrus (MedOF) extending to superior frontal gyrus (SFG) and in the middle temporal gyrus (MTG) in the right hemisphere.

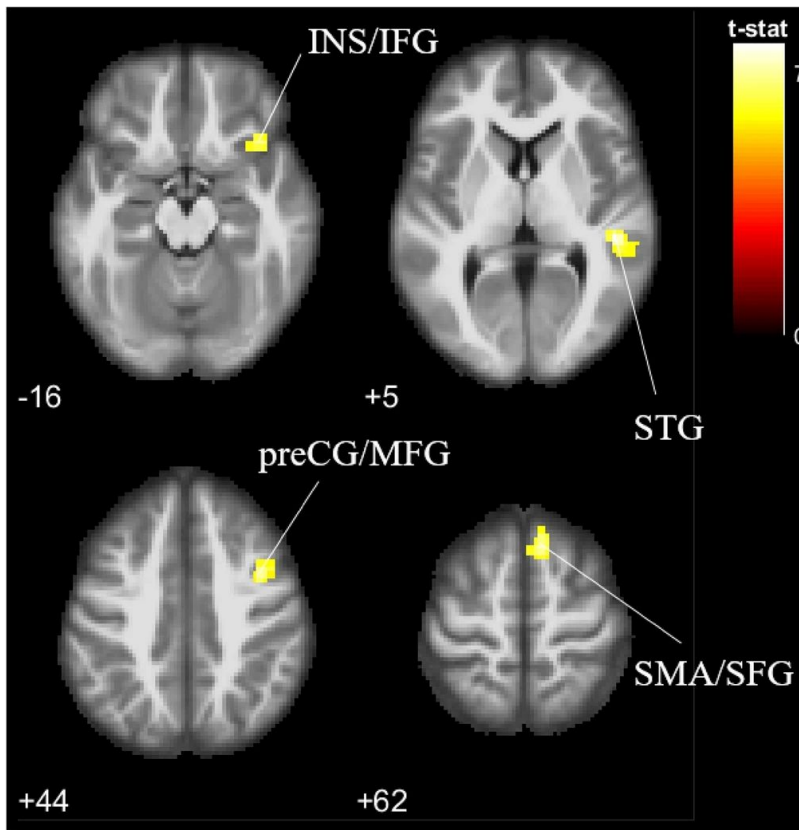


Fig 3.

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RESULTS

Effect of Kinship on the Baby Schema Effect

OI>IG contrast (Fig 3): Chinese parents showed higher activation in the superior temporal gyrus (STG); supplementary motor area (SMA) located in the superior frontal gyrus (SFG); precentral gyrus (preCG) extending to the middle frontal gyrus (MFG); and insula (INS) extending to the inferior frontal gyrus (IFG). All activations were limited to the right hemisphere. Deactivation was found in the right parietal sub-gyral and precentral gyrus at uncorrected p<0.001 (not shown here).

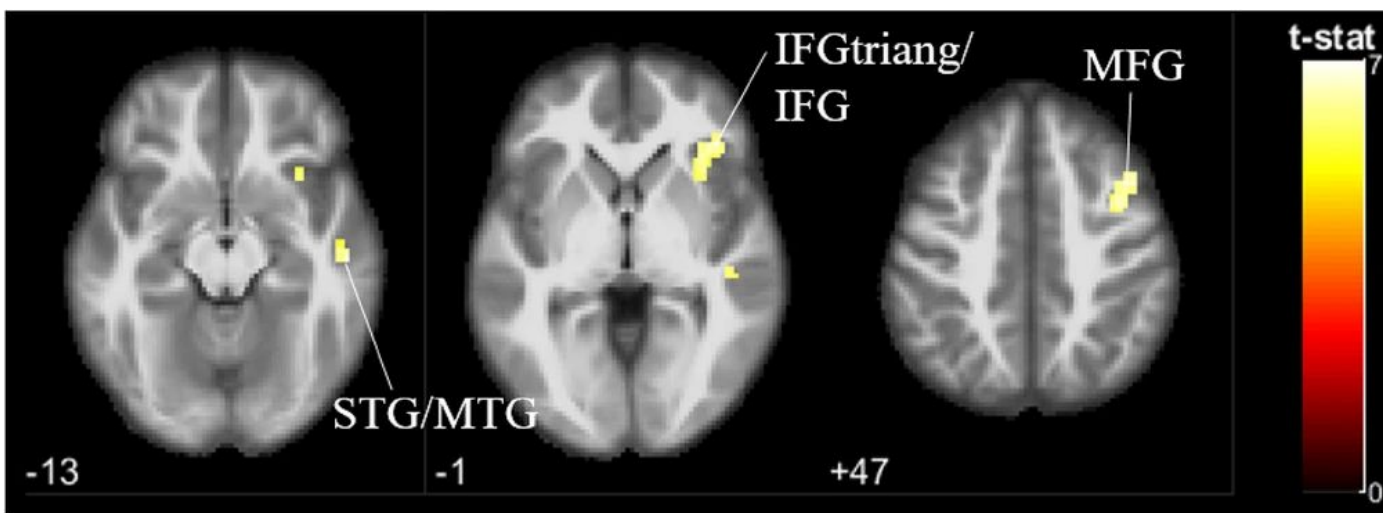


Fig 4.

OI>OG contrast (Fig 4): Chinese parents showed higher activation in the middle frontal gyrus (MFG); pars triangularis (IFGtriang) in the inferior frontal gyrus (IFG); and superior temporal gyrus (STG) extending to the middle temporal gyrus (MTG). Similarly to the OI>IG contrast, activations were all restricted to the right hemisphere. Deactivation was found in the bilateral postcentral gyrus, and left precuneus (not shown here) only at the less stringent uncorrected p<0.001.

DISCUSSION

In summary:

- 1) The baby schema effect showed robustness in the context of ethnicity, such that there was no difference in brain activations between viewing a non-own ethnic in-group infant and a non-own ethnic out-group infant
- 2) Own infant faces were found to induce stronger brain activation patterns in these networks.

Activations observed in the brain and their influence on findings of the study:

- **Bilateral pallidum and left middle occipital gyrus:** reward and motivation processing, and racial perception. Demonstrates the effect of baby schema and absence of race bias.
- **Superior parietal lobule (which comprises of the precuneus):** attention, empathy and episodic memory retrieval. Participants, who are Singaporean parents hailing from a multicultural background, may have a “parental instinct” that motivates caregiving of babies of other ethnicities and an unconscious categorization of ethnic out-group infant faces into an “enlarged in-group”. Possible neural links to similar levels of memory and cognition towards babies regardless of their ethnicity is also suggested.
- **Pars triangularis:** imagination of performing goal-directed movement sequences. Both groups of infants may demand equally high levels of orienting and processing from adult caregivers.
- **Right insula and right superior temporal gyrus:** emotional empathy.
- **Right insula, right middle temporal gyrus and right inferior frontal gyrus:** greater reward and motivation processing.
- **Insula and inferior frontal gyrus:** parental caretaking motivation.
- **Right supplementary motor area:** visually guided motor intentions and empathy network.
 - Involved in development of 3 main parental networks: emotional scaffolding, ability and motivation to focus attention on infants’ emotional cues and respond, as well as sensitivity to infants’ attachment behaviour.
- **Middle frontal gyrus:** theory of mind area - ability to understand others’ mental state.

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Author contributions

G.E. conceptualized the study. B.L.R. collected the data. B.L.R. and K.H.L.S. analysed the data. B.L.R. and K.H.L.S. wrote the original draft. All the authors reviewed and edited the submitted version of the article.