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Brain changes that accompany infant care: decoding pain in babies' cries

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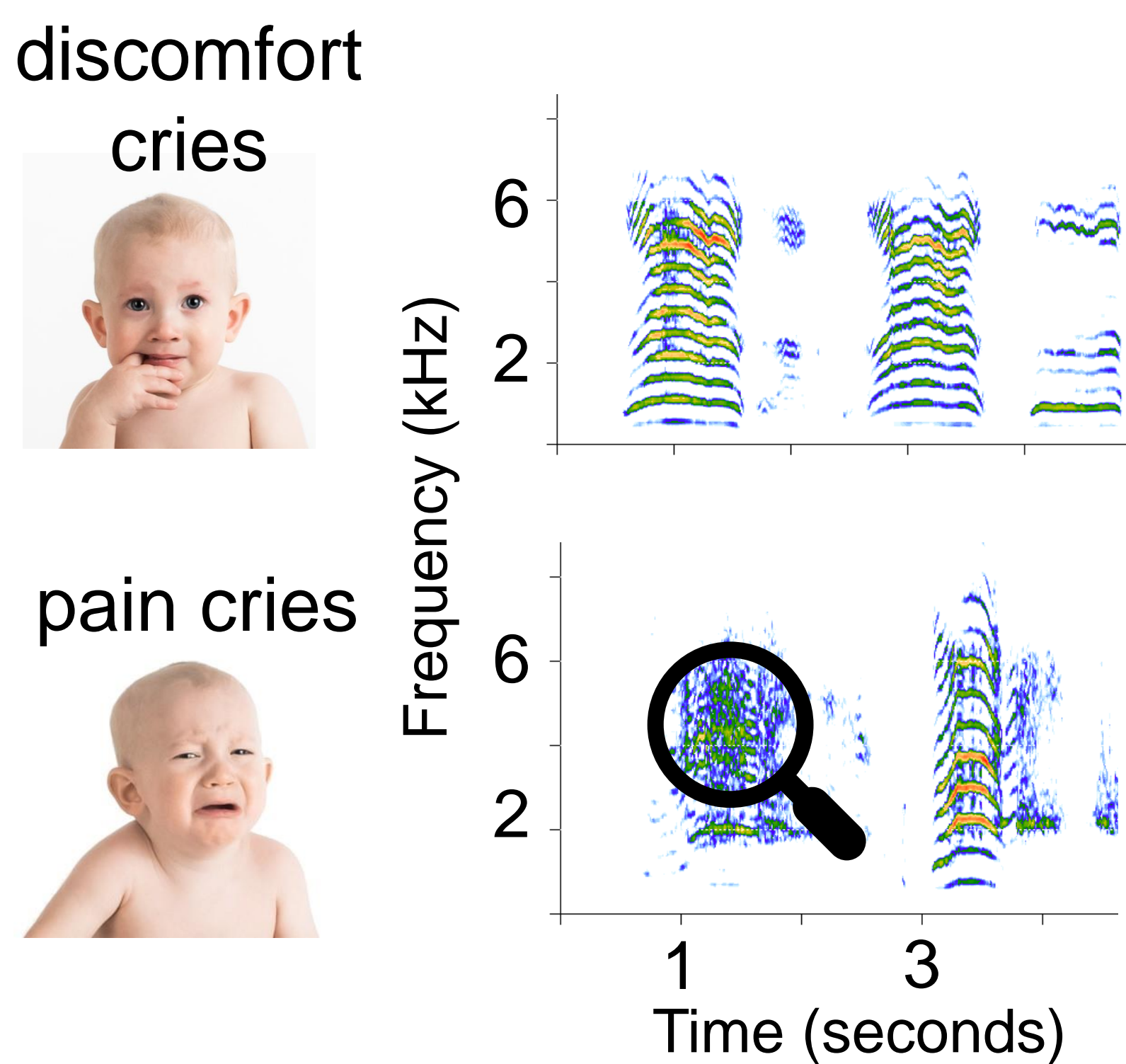
Contact: Siloé Corvin, siloe.corvin@inserm.fr; Camille Fauchon, camille.fauchon@univ-st-etienne.fr



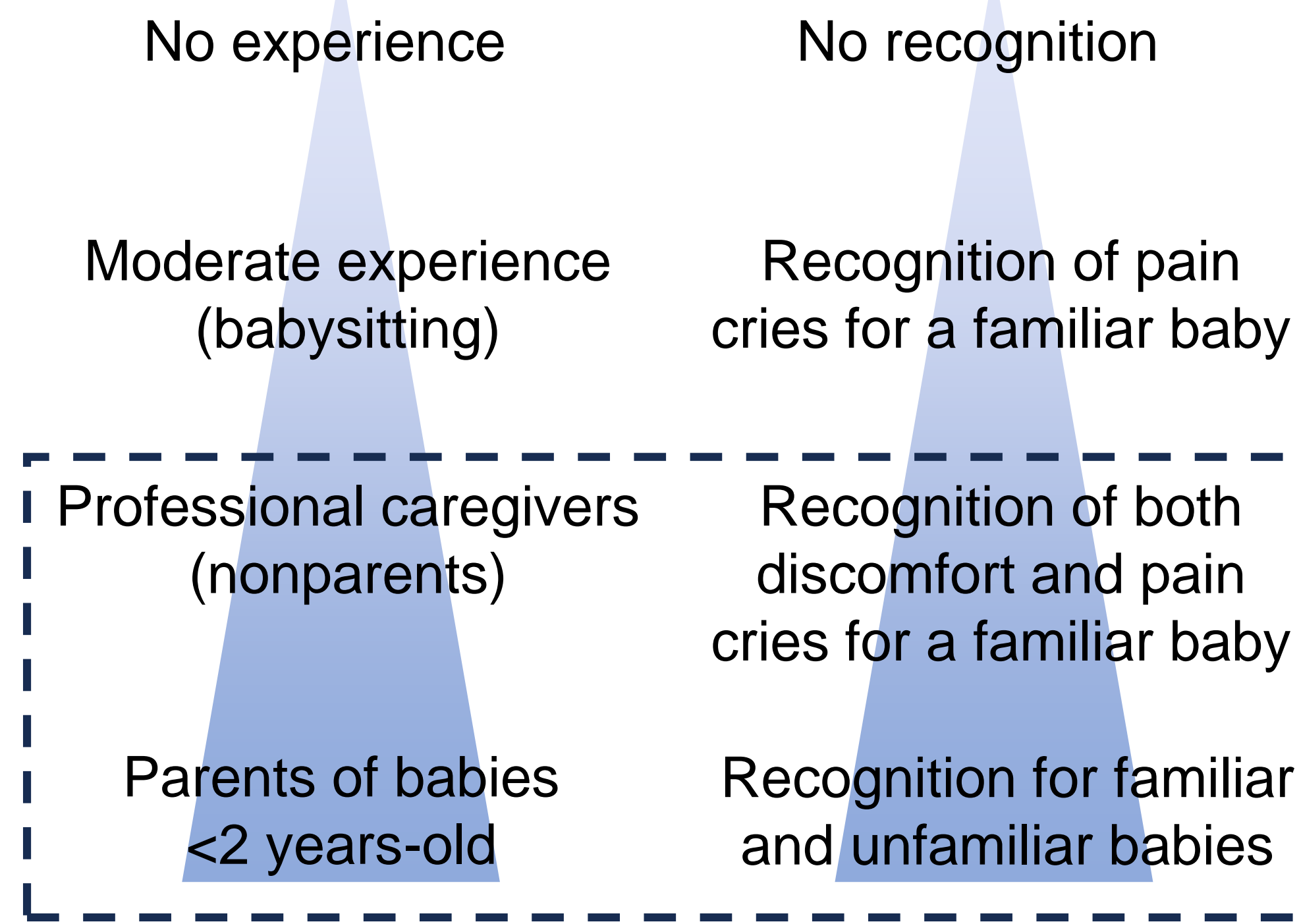
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Background: adults learn to identify pain in babies cries

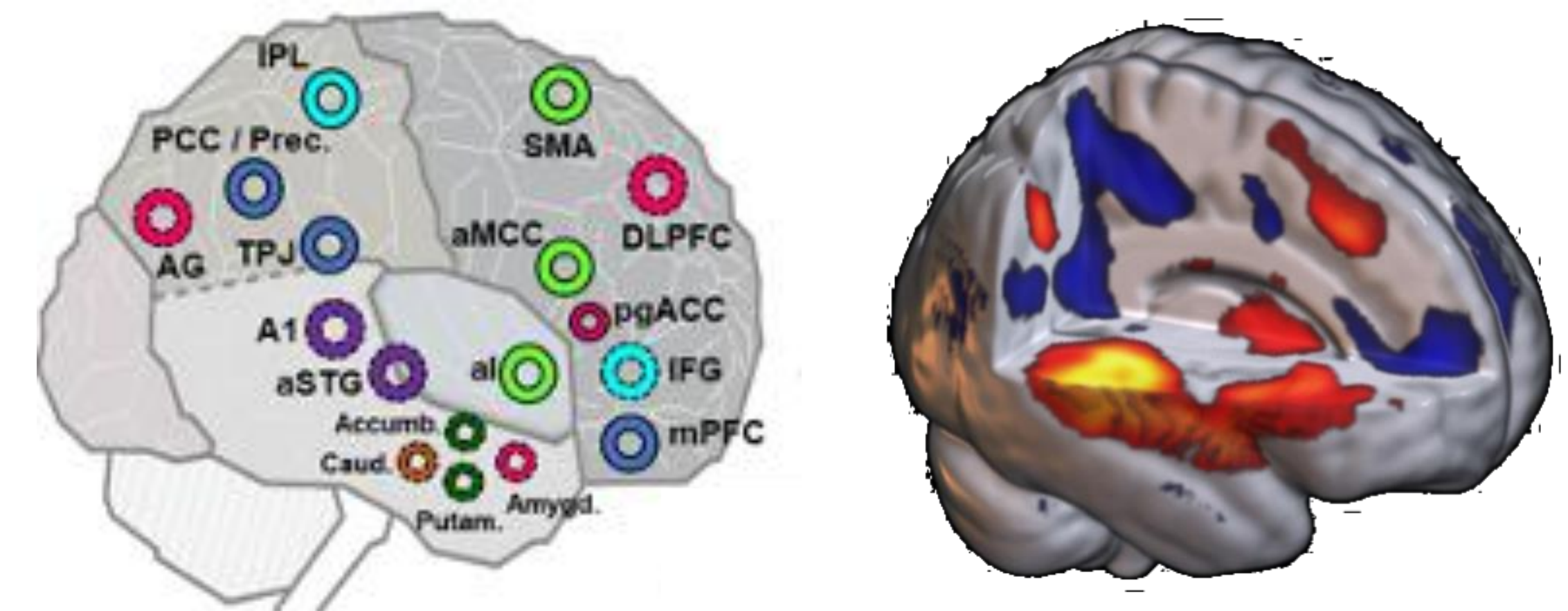


1. Spectrograms of cries. Pain cries are longer, louder, harsher and rougher¹



2. Effective recognition of both discomfort and pain cries increase with experience in babies care²

3. Cries listening involve activation in a large-scale brain networks (auditory, cognitive, attention, emotion and mirroring networks)³



Aim: What are the brain correlates of pain identification for familiar and unfamiliar babies in experts?

We hypothesized that familiar cries would recruit brain networks involved in memory and associative processing.

Methods

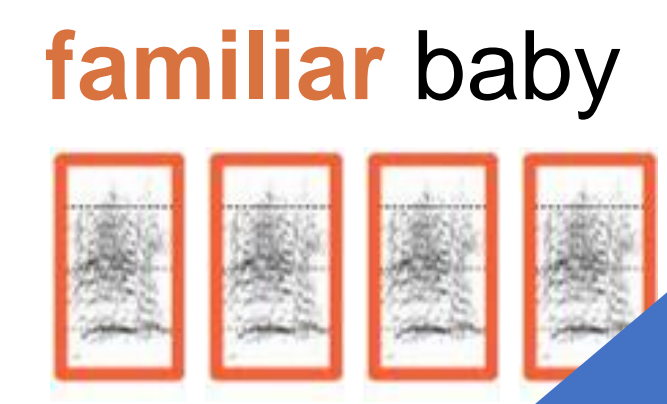


Day 2: Test with 64 cries, 4 conditions

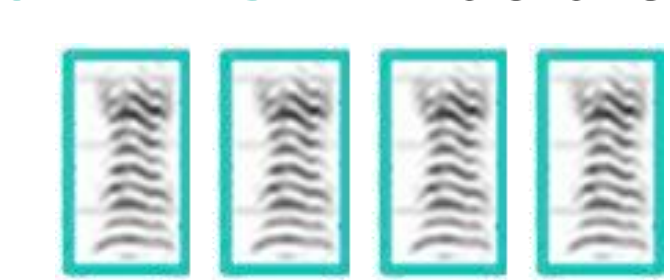
Discomfort cries familiar baby



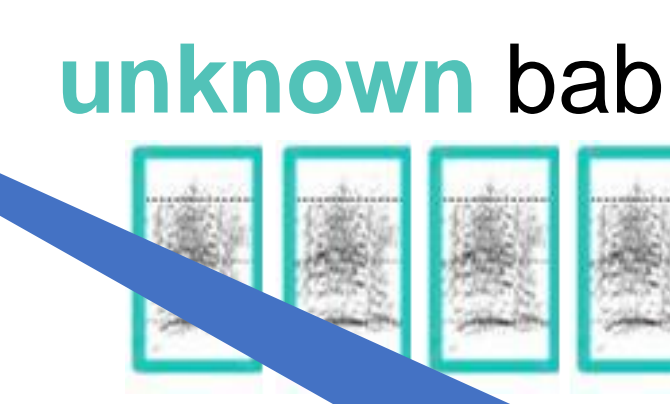
Pain cries familiar baby



Discomfort cries unknown babies



Pain cries unknown babies



20 mothers
20 fathers



20 childless women working in pediatric care

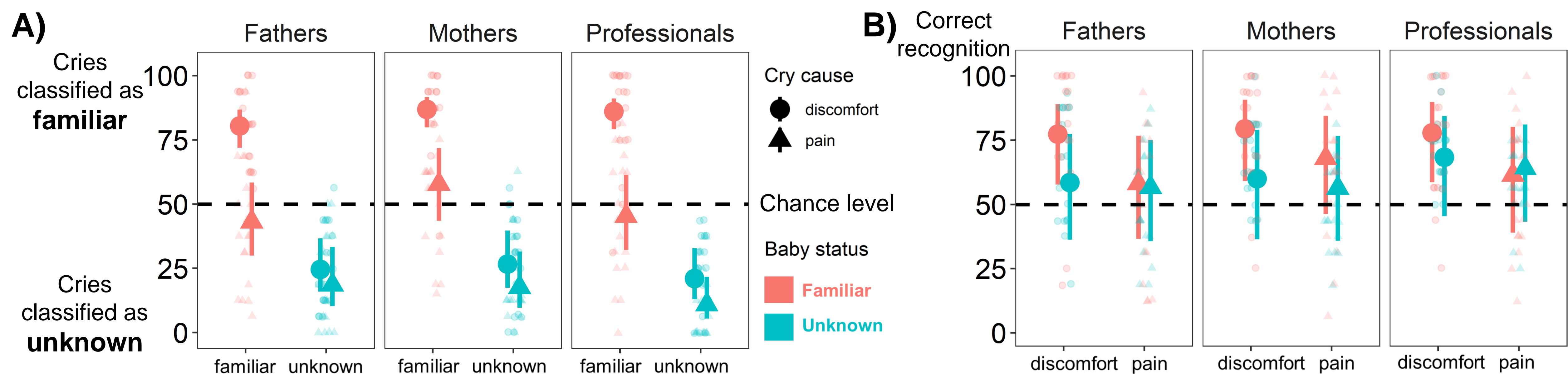
Bayesian mixed models and BOLD contrasts

YOUR baby? Yes/No

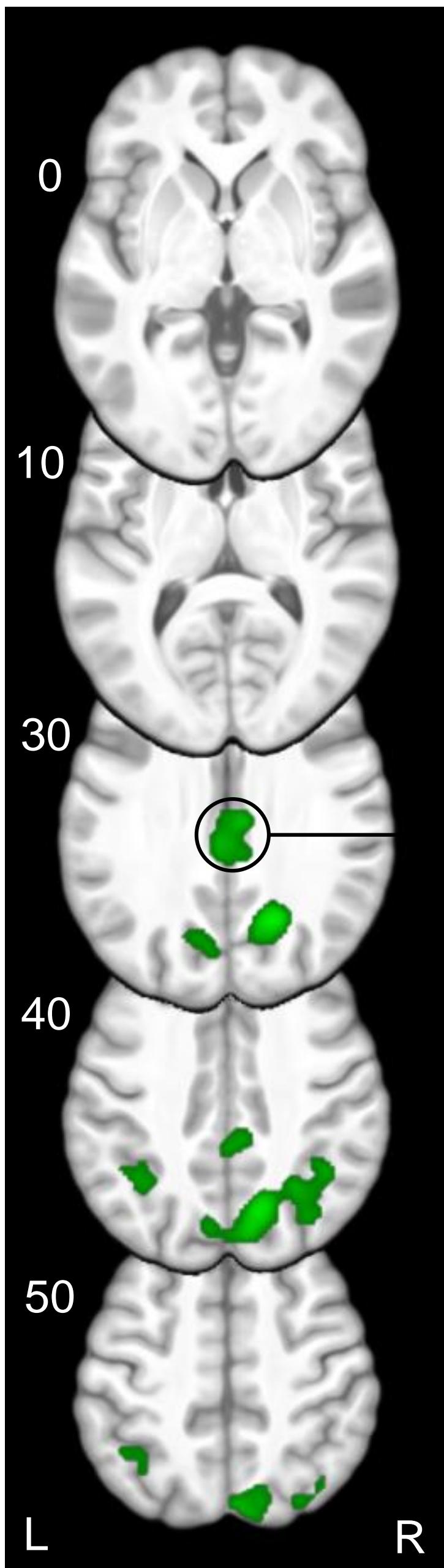
Pain? Yes/No

Results

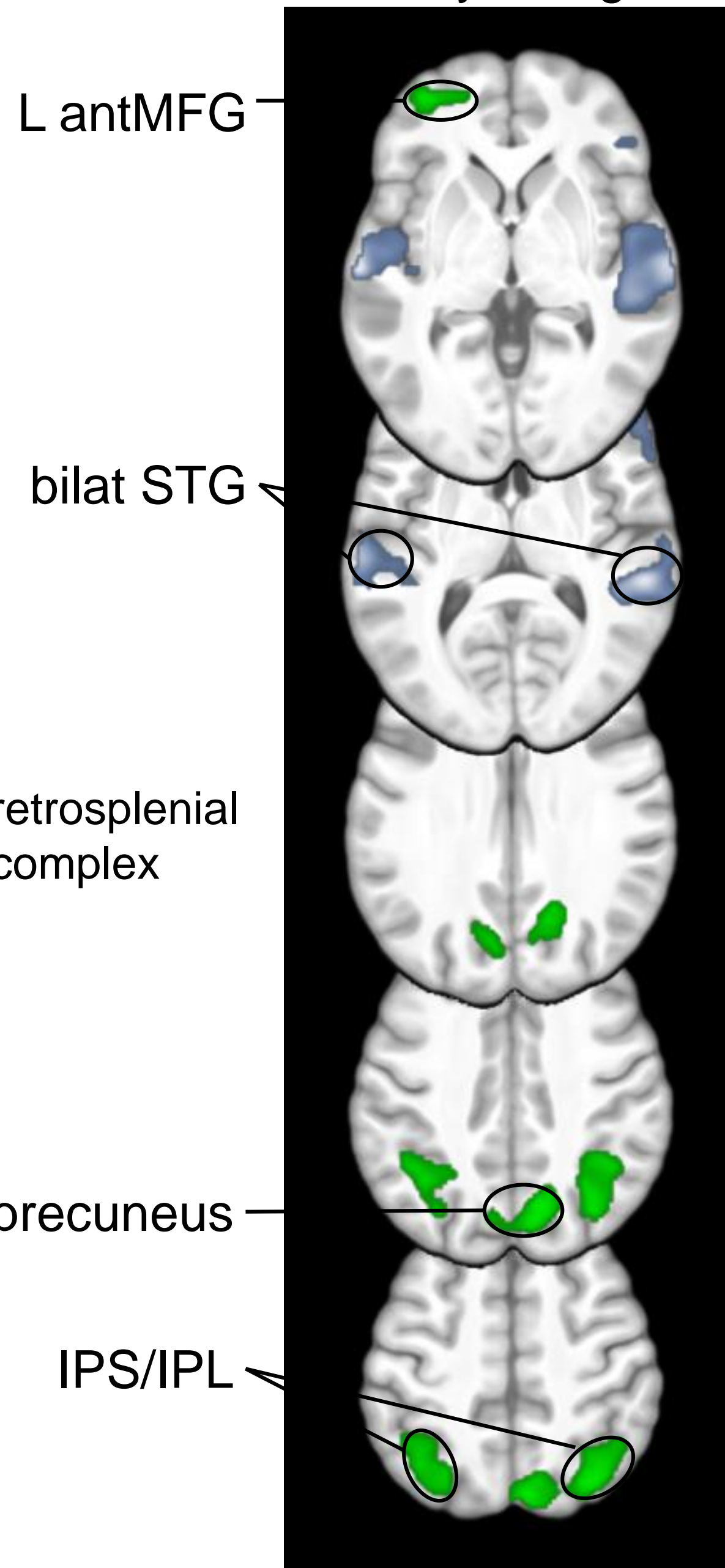
4. A) Listeners recognized well their familiar baby based on discomfort cries, but not based on pain cries. They correctly rejected cries of unknown babies; B) Only discomfort cries from the familiar baby were correctly recognized above chance.



Perceiving cries as familiar



Familiar cries correctly recognized



Conclusion

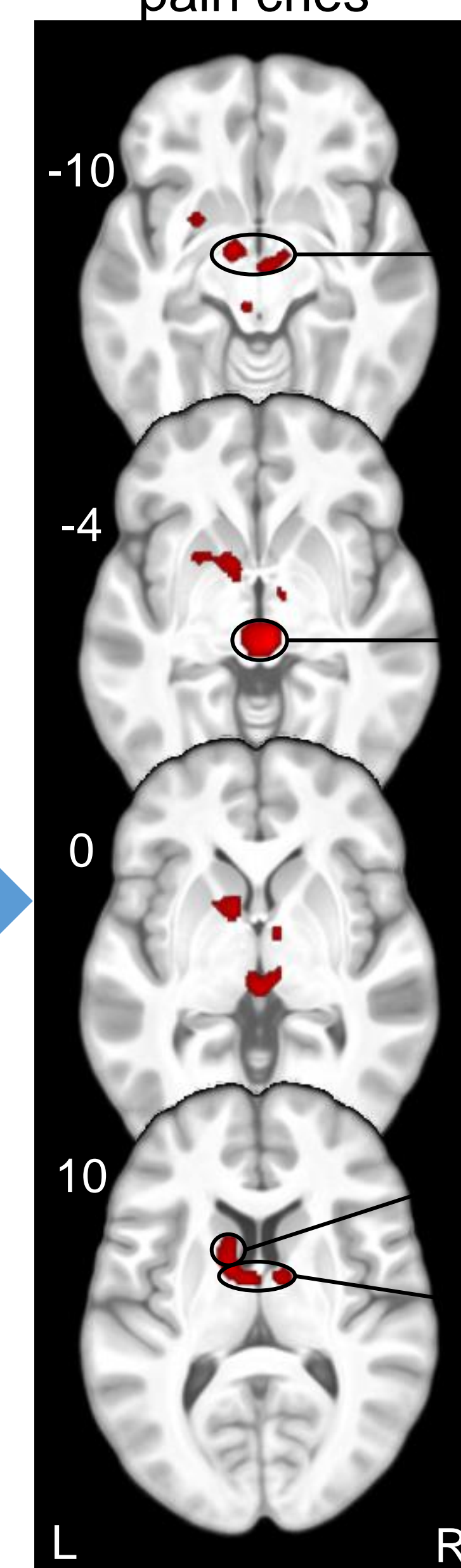
Cries contain strong information on baby's identity, allowing expert listeners to recognize one given baby, but pain disrupts this recognition (Fig 4A). Familiarity with a baby engages brain areas known to be involved in familiar voice recognition (precuneus, IPL; decreased in STG; Fig 5).

Despite acoustic specificity, identifying pain in cries, compared with non-painful distress, is difficult for experts in babies care (Fig 4B), both parents of young babies and professional caregivers. It leads to an increase in BOLD activity in associative areas (IFG) and decreased in primary auditory areas (Heschl's gyri; Fig 6).

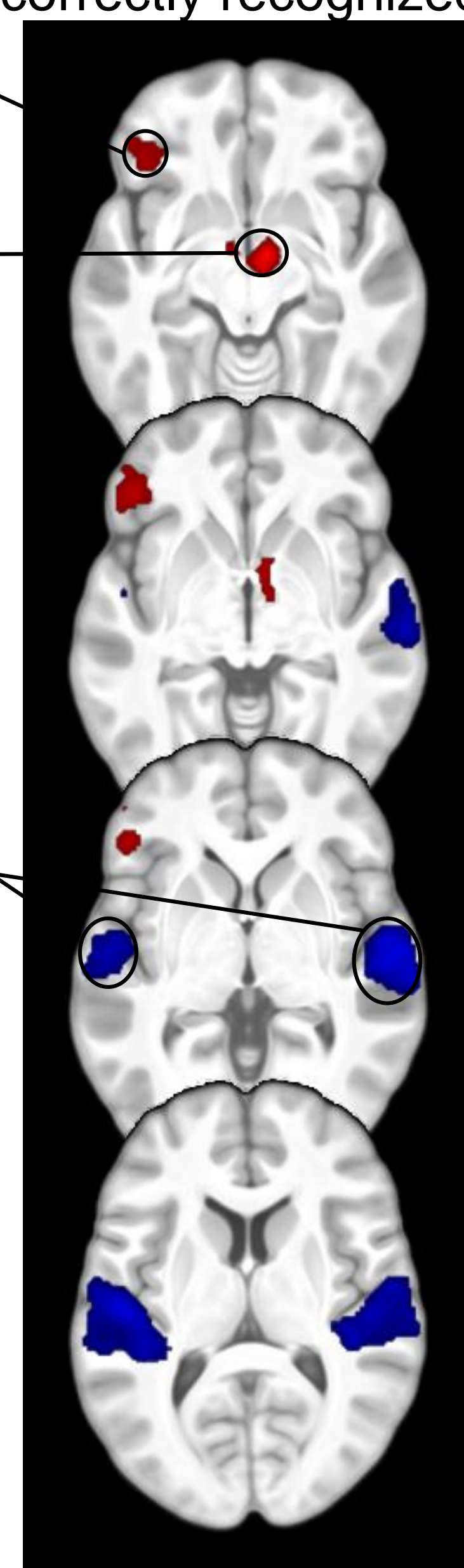
Performances and general brain processing of information were similar in all groups, both between mothers and fathers, and between mothers and professionals.

IPS: inferior parietal sulcus; IPL: inferior parietal lobule; IFG: inferior frontal gyrus; MFG: middle frontal gyrus; PAG: periaqueductal grey matter; STG: superior temporal gyrus

Perceiving pain cries



Pain cries correctly recognized



Pain > Discomfort

Pain < Discomfort

5. Correct recognition of the familiar baby activated brain areas involved in perspective-taking, emotion regulation and familiar voice recognition (all subjects).

6. Pain recognition involved high-level processing (all subjects).

References
1. Koutseff, A. et al. The acoustic space of pain: cries as indicators of distress recovering dynamics in pre-verbal infants. *Bioacoustics* (2017).
2. Corvin, S et al. Adults learn to identify pain in babies' cries. *Current Biology* (2022).
3. Wittman, J. et al. Towards a neural model of infant cry perception. *Neuroscience & Biobehavioral Reviews* (2019).



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