Task dynamics of body category and emotion representation in high-level visual, prefrontal and parietal cortex.

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There is an increasingly detailed understanding of how a familiar visual object category like the human body is processed [1].
However, the brain encodes information in high-dimensional representational space (Dynamic, task sensitive and at the service of the behavioral goal) [2].

Questions:

- How is the emotional expression represented in the body selective areas: extrastriate body area (EBA) and fusiform body area (FBA).
- Is body and expression representation in EBA and FBA influenced by whether or not the task requires explicit emotion recognition or are task effects limited to frontoparietal areas?

[1] Downing et al. 2001; Peelen et al. 2007; Peelen and Downing 2007;
[2] Averbeck, Latham, and Pouget 2006; Haxby, Connolly, and Guntupalli 2014; Kriegeskorte et al. 2008; Hebart et al. 2018.

- 20 participants (8 males, age =22 ± 3.51 years) using 3T fMRI [1]:
    - T2*-weighted gradient echo EPI (2 x 2 x 2 mm^3 resolution), TR = 2000 ms.
- Images of angry and happy body postures
  (5 identities x 2 emotion x 2 skin color).

- 2 categorization tasks (4 separate runs, mixed block/event related design):
    - Explicit (Emotion) task: name the emotion expressed.
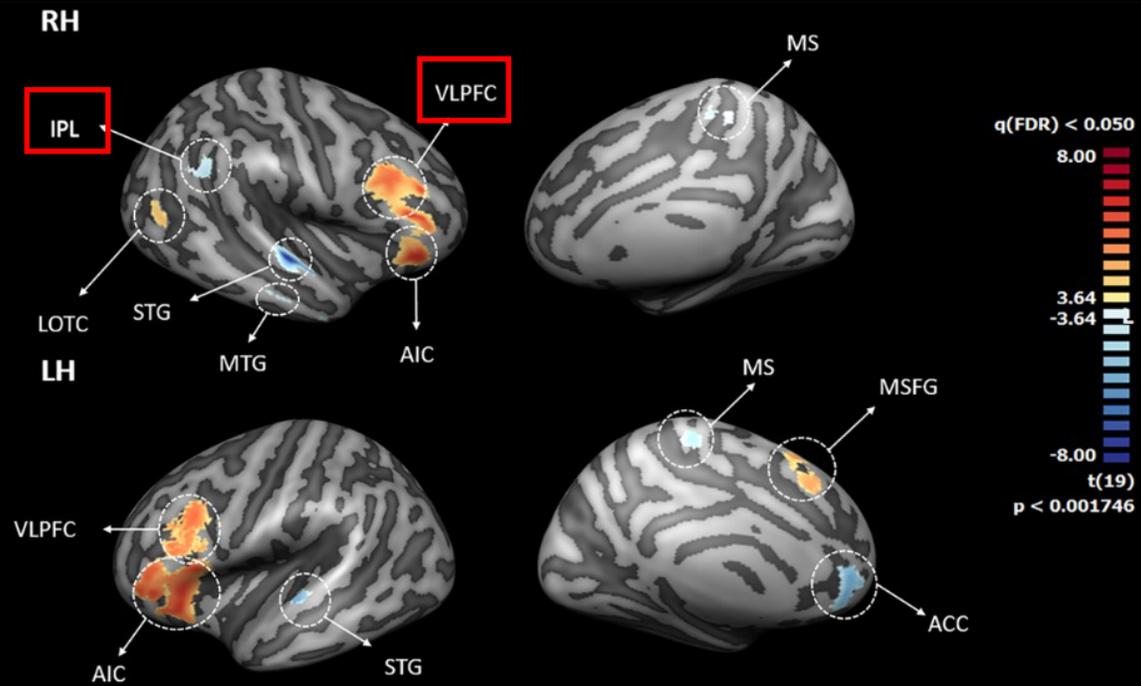   - Implicit (Shape) task: name the shape superimposed.

Analysis:
- BrainVoyager (Preprocessing, Univariate GLM, Results display)
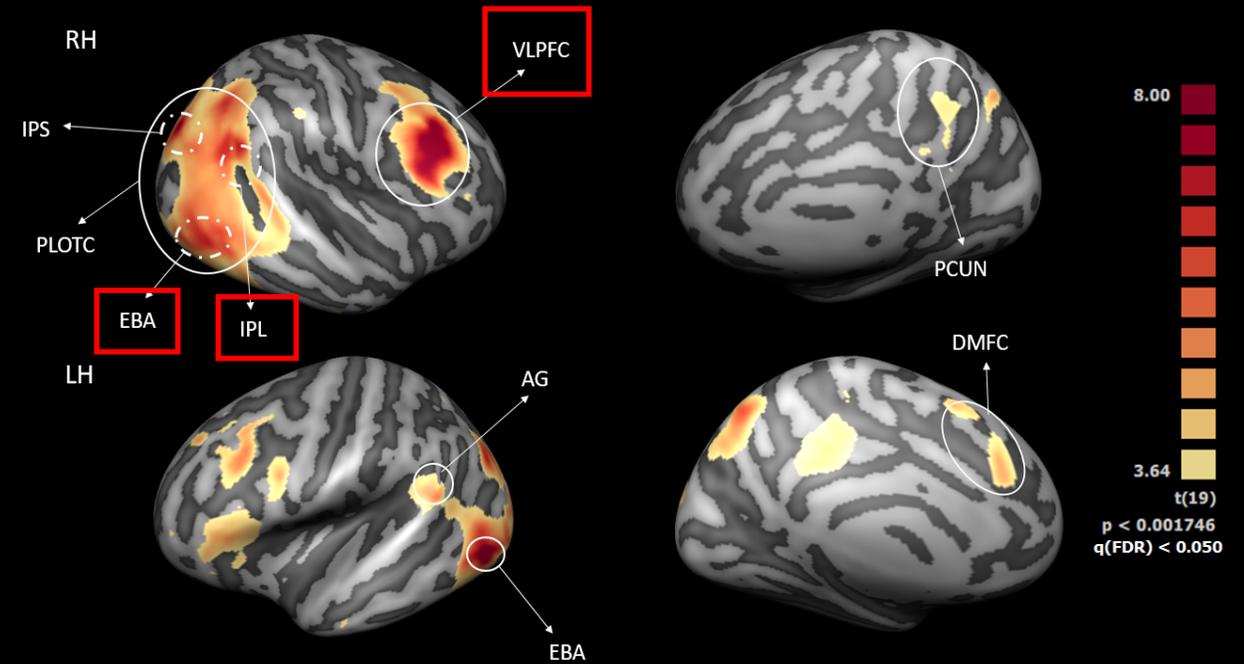- Matlab (Searchlight MVPA , Gaussian naive Bayes classifier (leave one run out), RSA) [2].
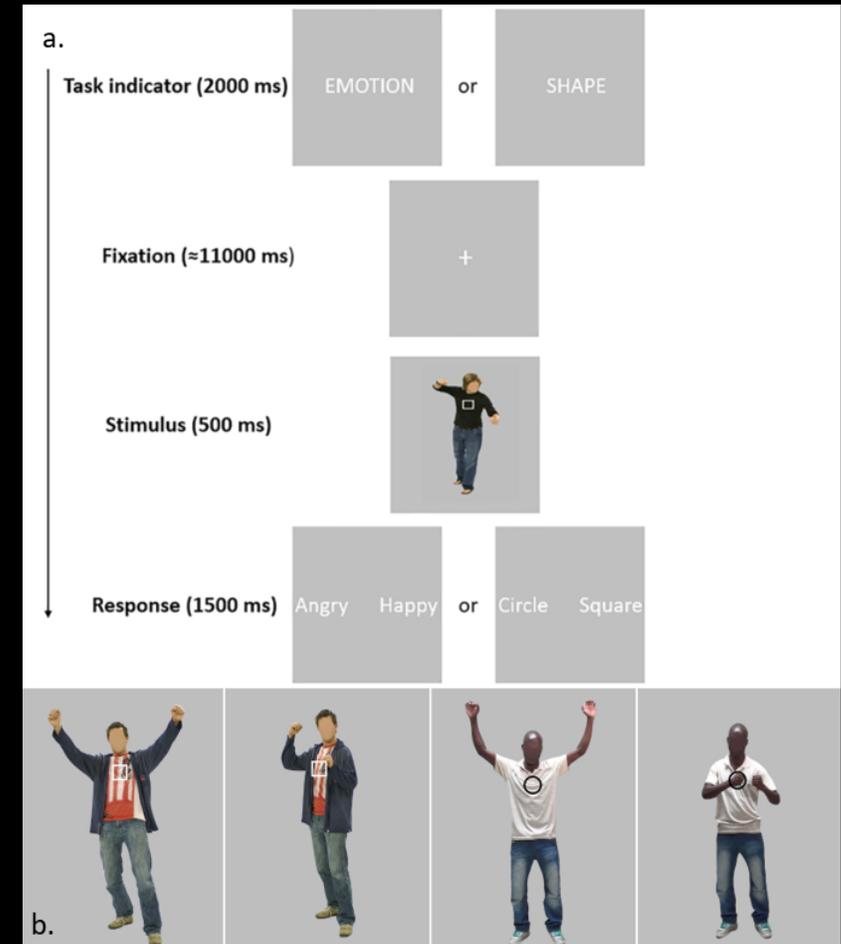
[1] Watson and de Gelder 2017.
[2] Kriegeskorte, Goebel, and Bandettini 2006; Ontivero-Ortega et al. 2017; Kriegeskorte et al. 2008

Whole Brain Analysis: Univariate group results for Explicit vs. Implicit expression recognition task (q(FDR) < .05).
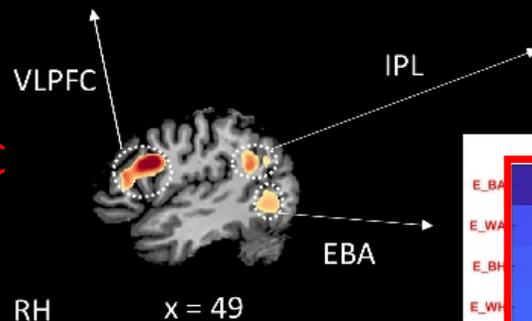
Whole Brain MVPA Analysis: group results of the GNB classifier for Explicit vs. Implicit task. (q(FDR) < .05).
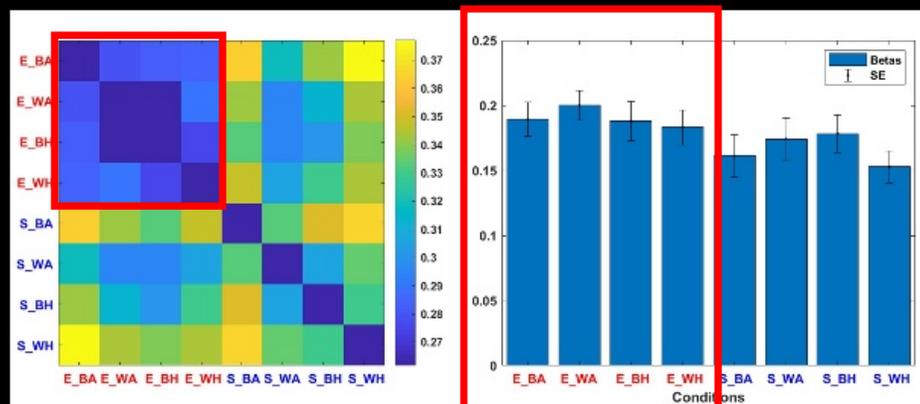
VLPFC, IPL, and EBA are among the areas where is max the difference between the 2 tasks, and also these first 2 areas are more active in the in the explicit and the implicit task respectively.

Higher activation in implicit task for IPL

Higher activation in explicit task for VLPFC and EBA
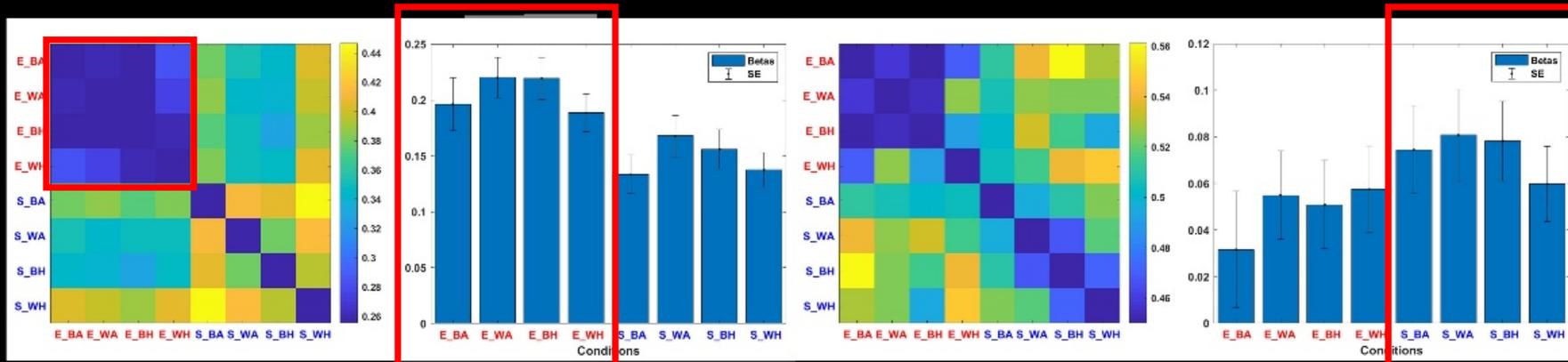
Task can be decoded in VLPFC and EBA

Details of the responses from the ROIs identified by the task based decoding, RDM and beta plots at the category level of each ROIs are shown (q(FDR) = 0.01).

Our results indicate:

- the difference between the two tasks can be decoded in EBA, VLPFC and IPL and that task sensitivity is clearly seen both in category selective areas in the higher visual cortex and in the VLPFC.
- VLPFC may be involved in explicit body attribute recognition and/or emotion regulation [1].

Take home:
- The combination of higher activation in EBA and VLPFC and lower activation in IPL indicates connections between them with VLPFC possibly influencing EBA positively and IPL negatively [2].
- To understand the function of an area, it is important to take into account the task of the participants.
- Depending on whether the emotion recognition is explicit or implicit, different brain areas play a role.

[1] Wager 2008; Bugatus, Weiner, and Grill-Spector 2017; Bracci, Daniels, and Op de Beeck 2017;
[2] Ongur and Price 2000; Goldman-Rakic 1996; Ong, Stohler, and Herr 2019; Craig 2009; Tamietto et al. 2015

Thank you!

For details have a look at:

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