### Introduction

- Humans have the ability to generate thoughts about their own internal states, known as higher-order or metacognitive beliefs (1).
- Metacognitive sensitivity may underpin everyday awareness and sense of self (2), and is crucial for the active guidance of future behaviour (3).
- Generation of metacognitive judgments can be formalised using computational descriptions of post-decision processes (4), but the biological foundations of this ability are unknown.

- **Is variability in metacognitive ability related to brain structure?**

### Methods

- **Participants:** 32 participants (15 males, aged 19 – 37 years; mean age 26.4 years). 1 participant was excluded due to abnormal task performance (\(d' > 3.8 D\) from the group mean).

  - **Psychophysics:** temporal 2AFC task (see Task figure), 600 trials split into 6 blocks. Participants were required to decide whether the higher contrast “pop-out” Gabor had appeared in the first or the second interval; no feedback was given. Trial-by-trial ratings of decision confidence were made on a scale of 1-6.

  - **Pop-out Gabor contrast** was dynamically adjusted using a 1-up-2-down staircase procedure, leading to convergence on 71% accuracy.

- **Behavioral analysis:** Type II signal detection analysis was used to quantify metacognitive sensitivity. A “hit” is defined as a high confidence response after a correct decision and a “false alarm” as a high confidence response after an incorrect decision. Area under the ROC (AUC) was quantified using non-parametric methods (5).

- **Structural brain imaging:** A 1.5T Sonata scanner (Siemens Medical Systems, Erlangen, Germany) was used to acquire T1 images for each participant. T1-weighted anatomical whole-brain scans were acquired for voxel-based morphometry (VBM) analysis (176 slices, echo time = 3.56ms, TR = 12.24ms, voxel size 1mm isotropic). The diffusion tensor imaging (DTI) dataset comprised of 68 images with 60 slices and 2.3mm isotropic resolution (b = 1000 s/mm², echo time = 90ms, FOV = 220ms).

  - **Regression analysis:** Individual Type II ROCs

### Conclusions

- Individual differences exist in metacognitive sensitivity (\(A_{roc}\)) despite holding perceptual performance (\(d'\)) constant.

  - Both grey matter volume and white matter integrity (fractional anisotropy) in prefrontal cortex (BA10 and anterior corpus callosum) are predictive of an individual’s metacognitive ability.

  - The functional contributions of these regions to post-decision judgments remains to be examined.

  - Our findings indicate a circumscribed network including prefrontal and inferior temporal cortex may contribute to metacognitive computations in healthy individuals.