

# Mapping Gilles de la Tourette syndrome through the distress and relief associated with tic-related behaviors: an fMRI study

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# Equal contribution

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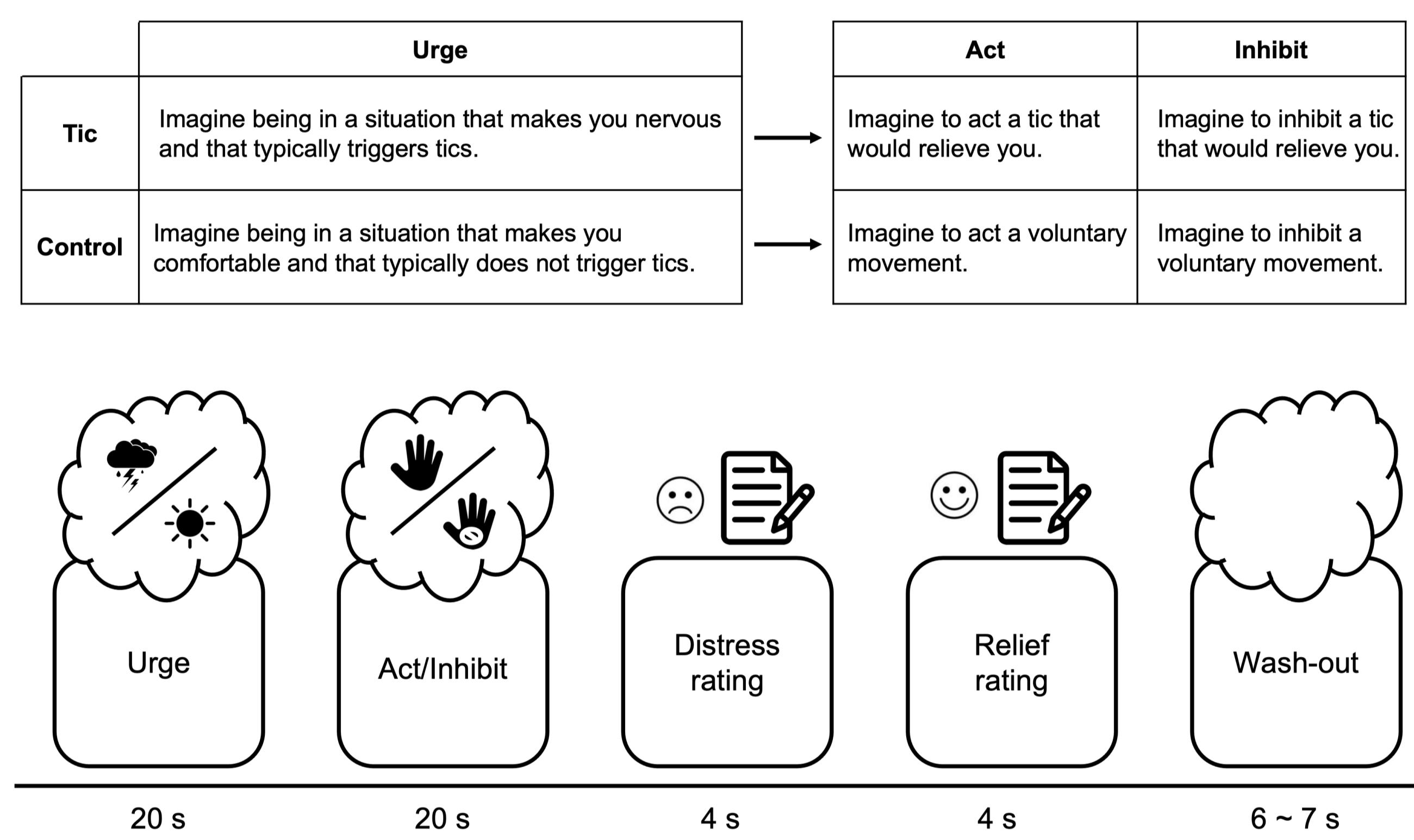
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## Background and Aim

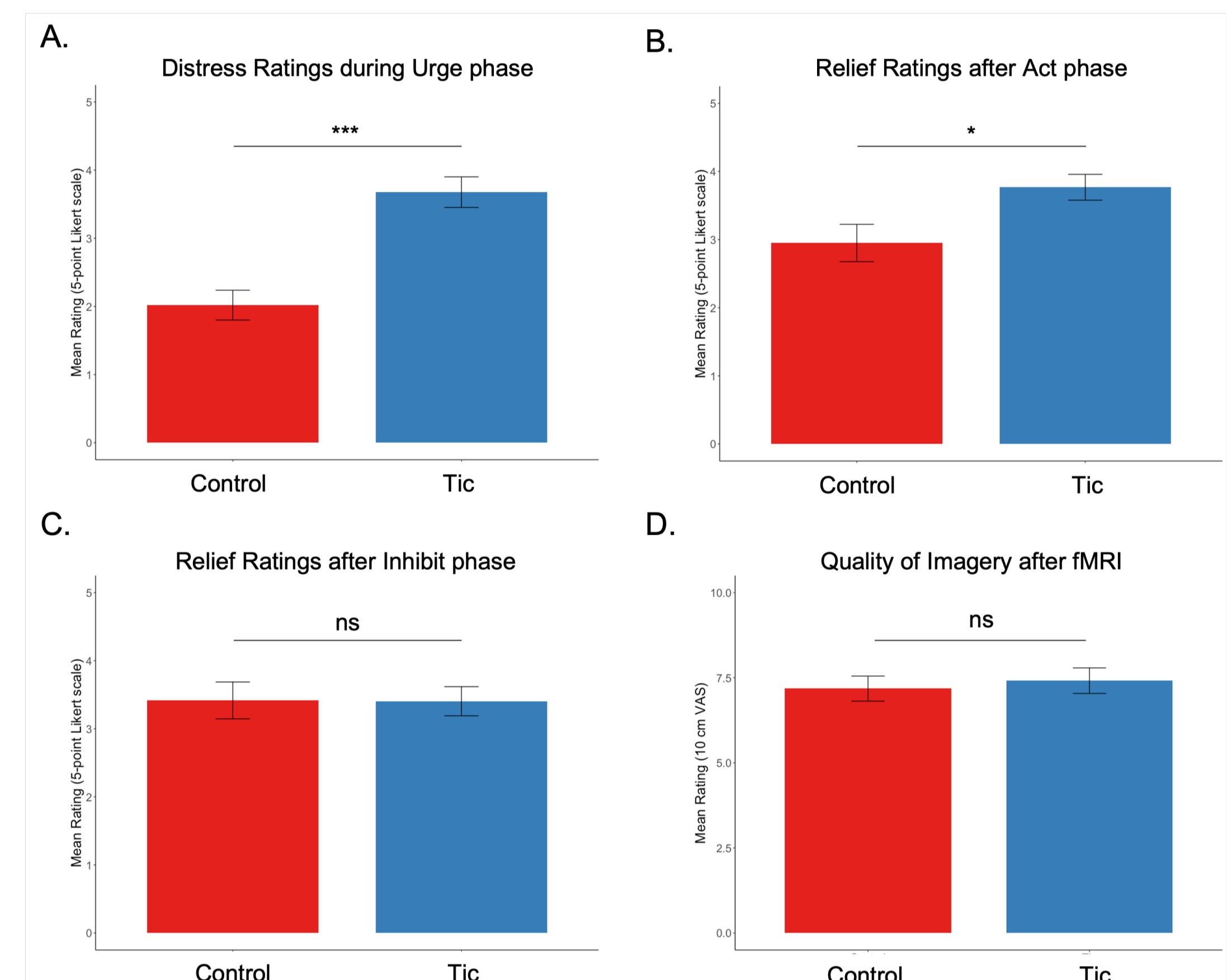
- We previously provided evidence of a different neurofunctional organization of motor control in Gilles de la Tourette Syndrome (GTS), entailing different phases of motor execution (i.e., motor planning, motor execution, and motor awareness [1-3]).
- Here, we expand such findings, considering tic-related phenomenology rather than ordinary motor acts, and we explore the brain correlates of personal distress or relief typically associated with tic manifestations.
- We used a mental imagery task of the behaviors associated with tic manifestation, inhibition, and urges.
- To make the tic imagery activity better connected to patients' actual experience, we asked them to recall typical tic-provoking situations and compared these fMRI patterns with the neural activity induced by the mental simulation of "relaxed situations" and pre-determined stereotyped motor behaviors.
- We also evaluated the distress or relief perceived during the different phases of the task, using trial-by-trial subjective reports, and we correlated these with brain activity.

## Experimental fMRI Task



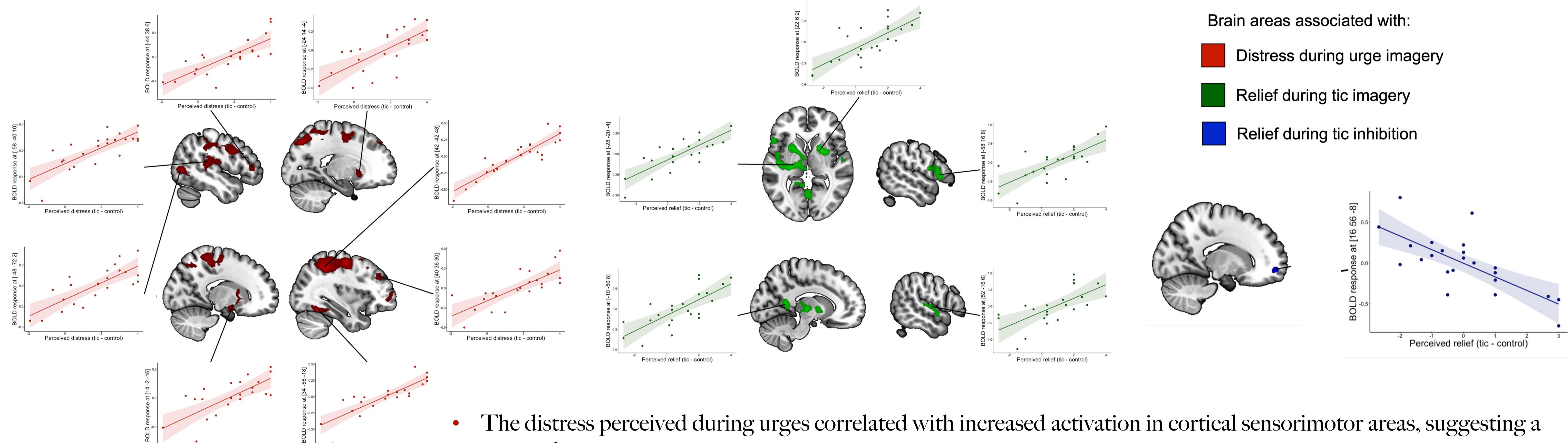
- Patients were instructed to mentally recall typical tic-triggering scenarios, followed by the simulation of tic behaviors or their inhibition.
- We compared the brain activation patterns evoked by these scenarios with the neural activity recorded during the mental simulation of "neutral situations" that were then followed by the mental execution or inhibition of pre-determined stereotyped motor behaviors.

## Behavioral Results



- Patients experienced a higher level of distress during the imagery of tic-triggering scenarios and higher relief during tic imagery.

## Neurofunctional Results



- The distress perceived during urges correlated with increased activation in cortical sensorimotor areas, suggesting a motor alarm.
- Conversely, relief during tic execution was positively associated with the activity of a subcortical network.
- A lower relief during tic inhibition was associated with greater activation of the orbitofrontal cortex (OFC).

## Discussion

- Our results emphasize the importance of exploring the relationship between the physiology of the tic-related phenomenology and personal distress or relief experienced by patients.
- We propose that the distress experienced during urges might be the causing factor of the activations seen in cortical premotor networks.
- Moreover, as the relief during tic imagery was higher the higher the subcortical structures activation, these structures may play a causal role in the affective component of tic phenomenology.
- The evidence that tic mental imagery can modulate patients' clinical manifestations and distress suggests that this non-invasive and safe behavioral technique could be used in conjunction with other treatments, such as medication and behavioral therapies.
- Patients could use tic imagery when they feel the urge to perform a tic to dissipate the distress associated with urges.

## References

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