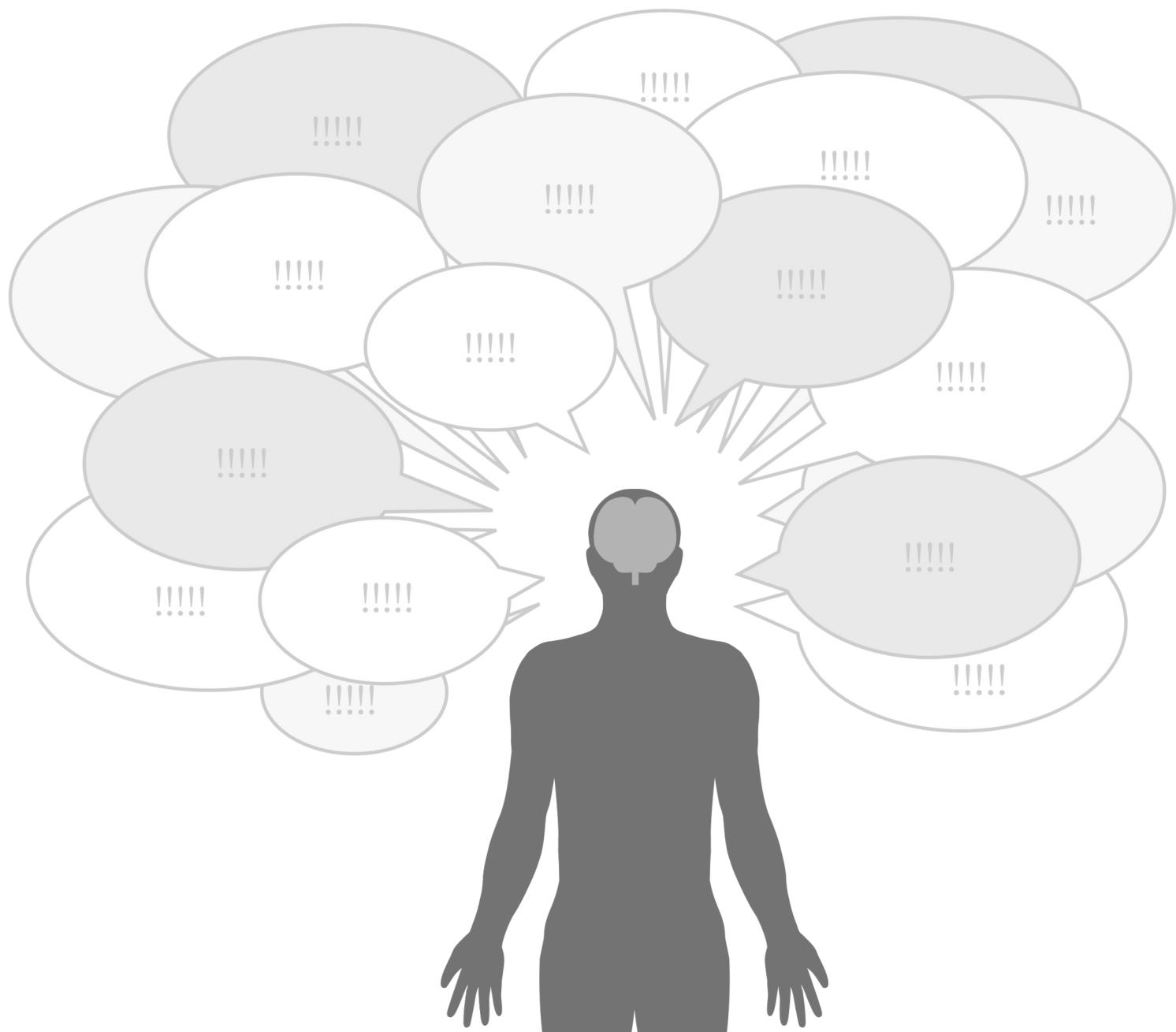


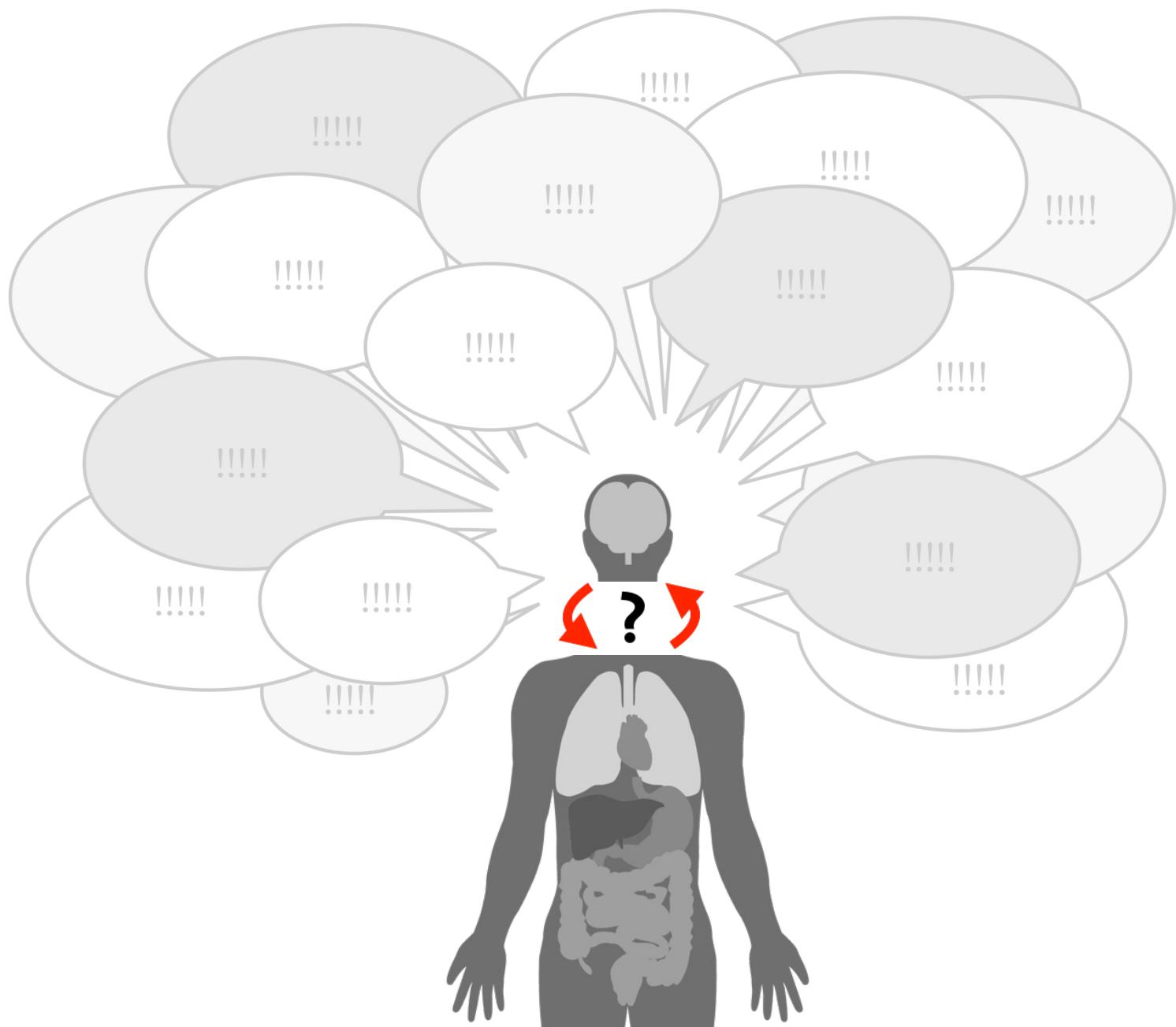
# CPC 2022

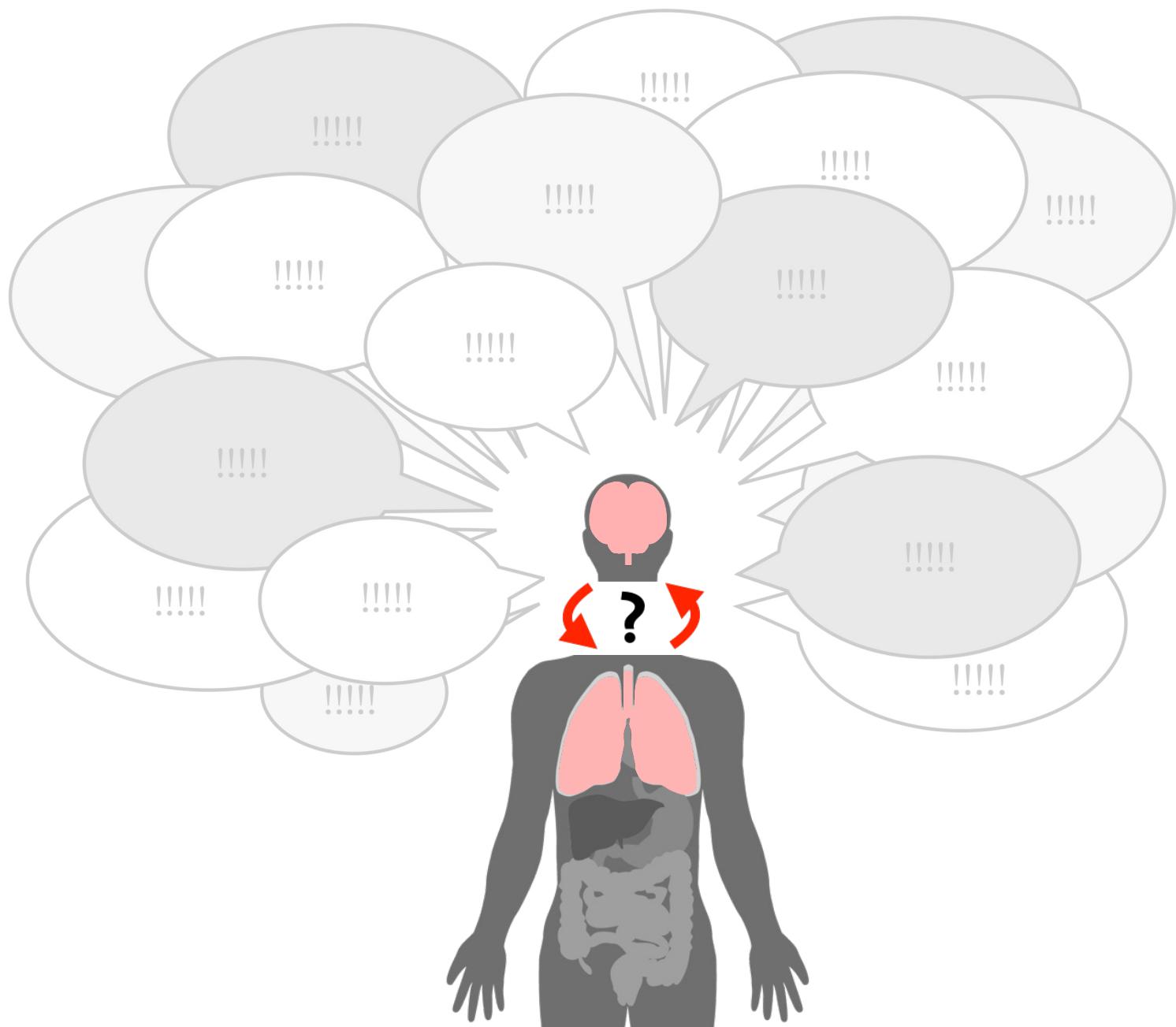
## Interoception of breathing and its relationship with anxiety

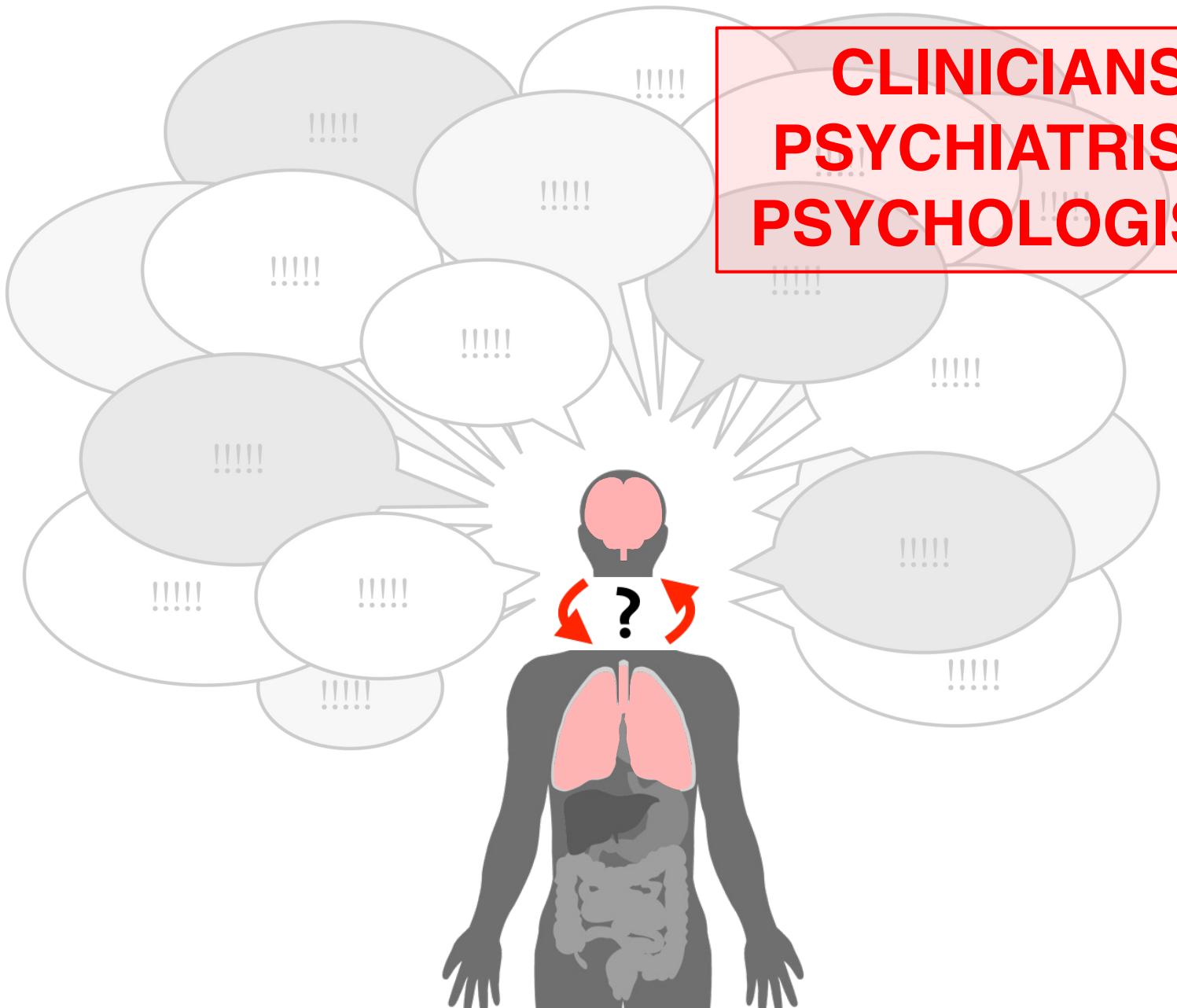
Dr Olivia Harrison

Rutherford Discovery Research Fellow and Senior Lecturer  
Department of Psychology, University of Otago







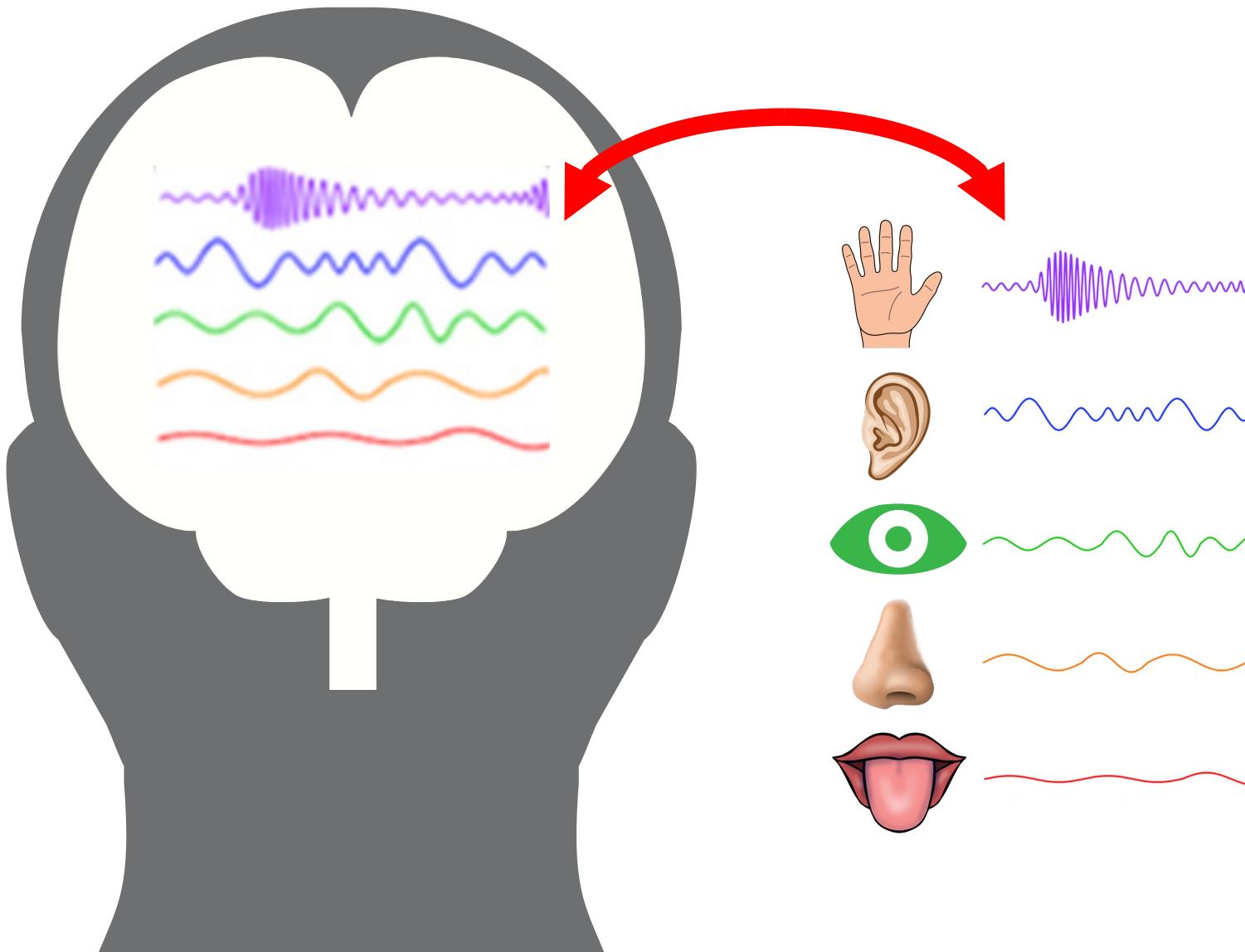


# **CLINICIANS: PSYCHIATRISTS PSYCHOLOGISTS**

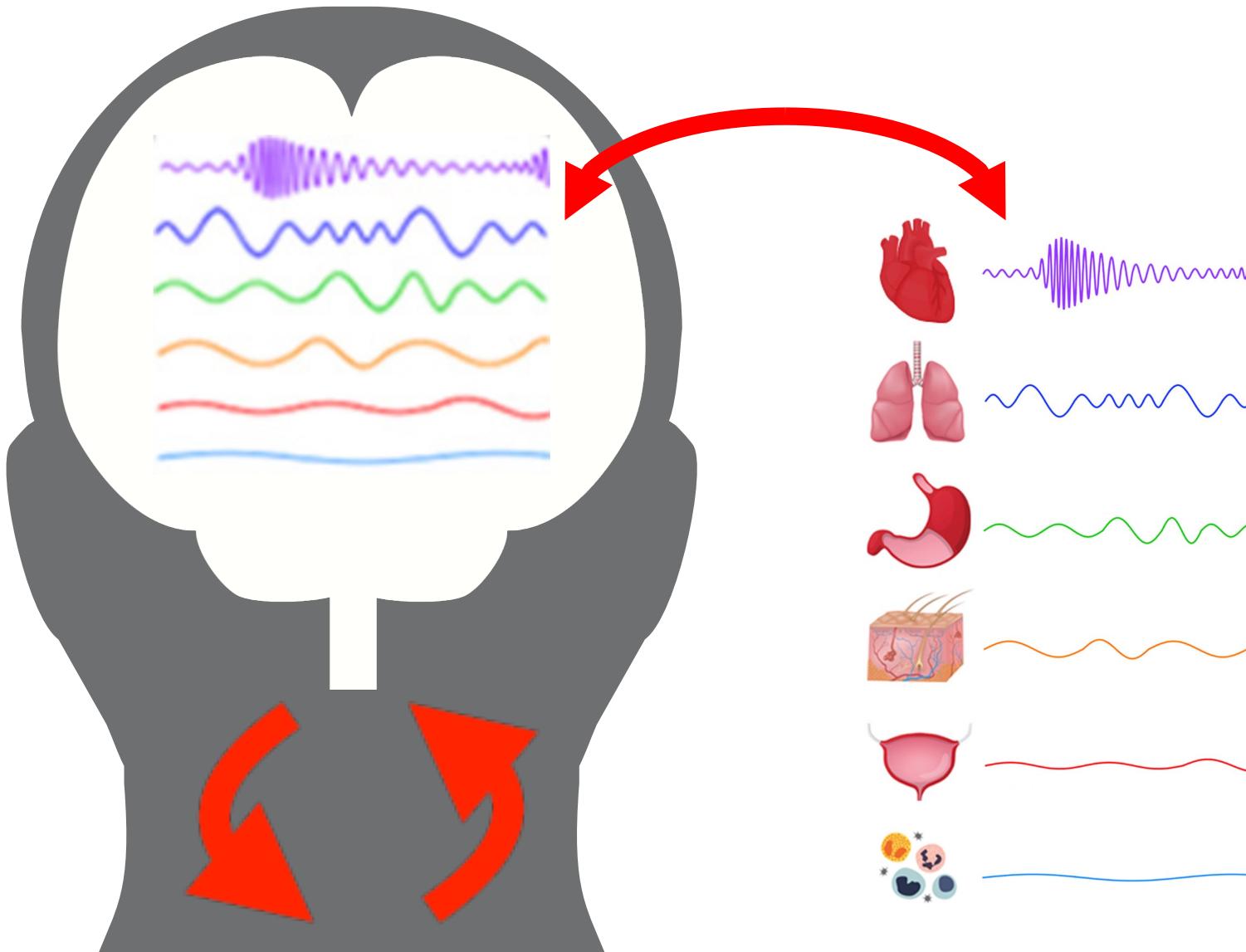
**CLINICIANS:  
PSYCHIATRISTS  
PSYCHOLOGISTS**

**OUR RESEARCH**

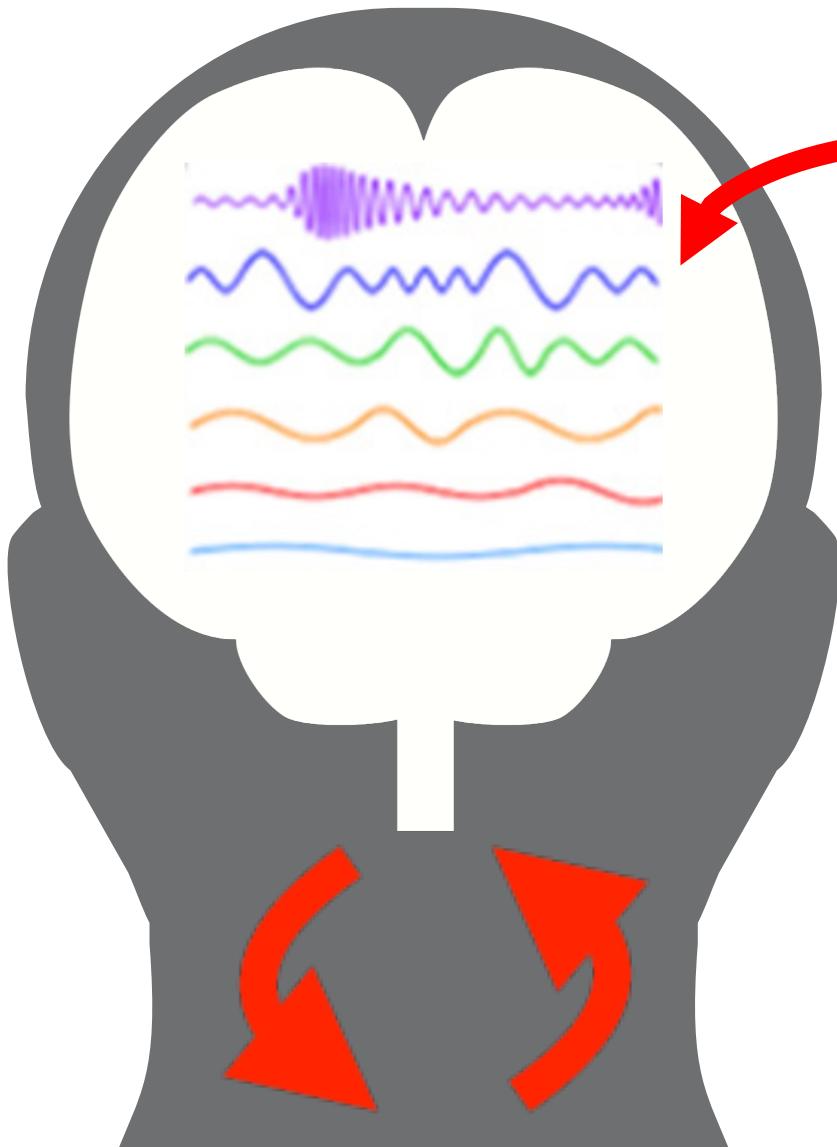
# EXTEROCEPTION



# INTEROCEPTION



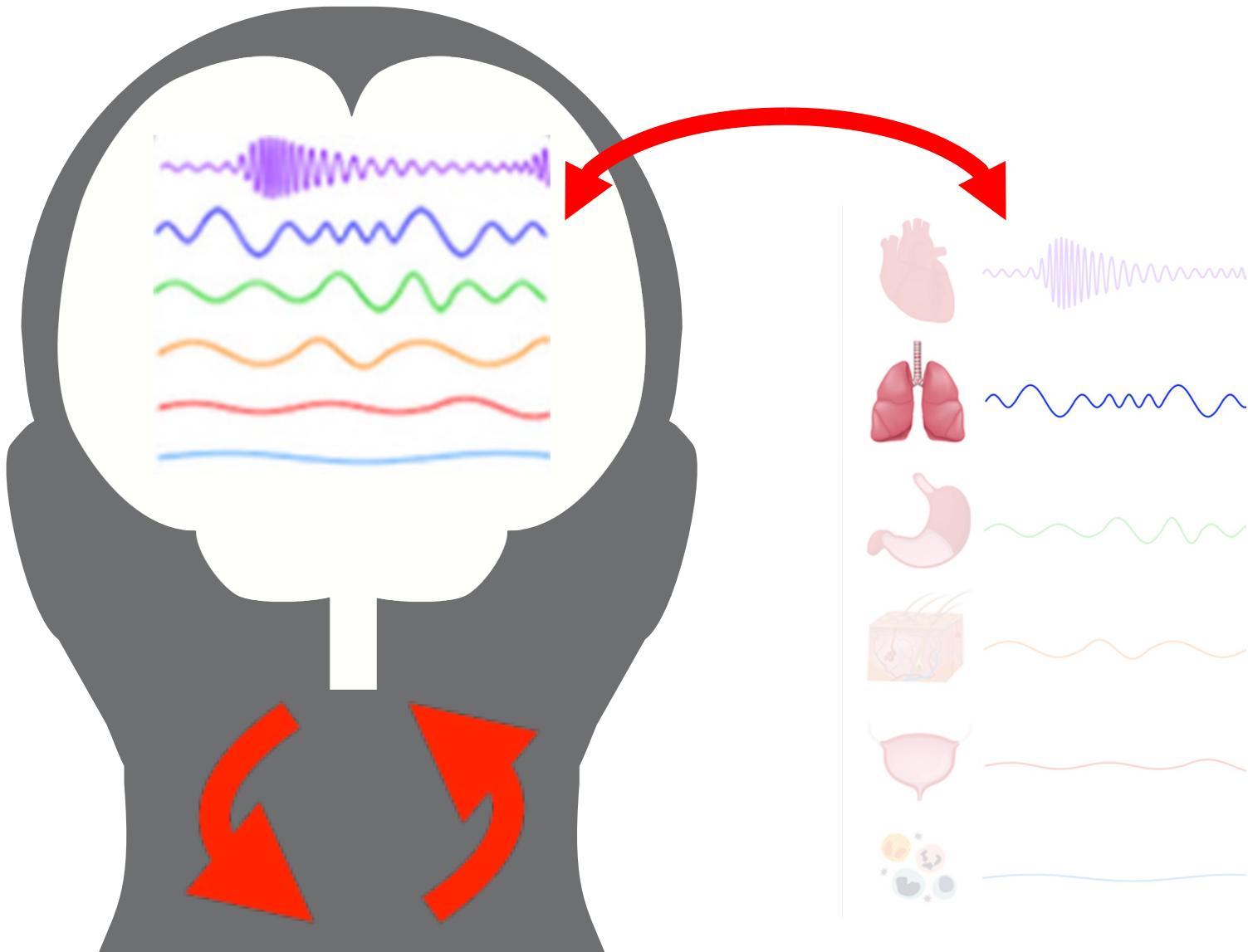
# INTEROCEPTION AND MENTAL HEALTH



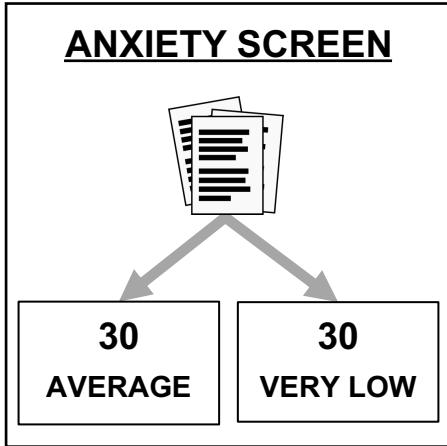
## BRAIN-BODY MAPPING

Chronic physiological disease  
Psychiatry and psychosomatics  
... Or a combination?

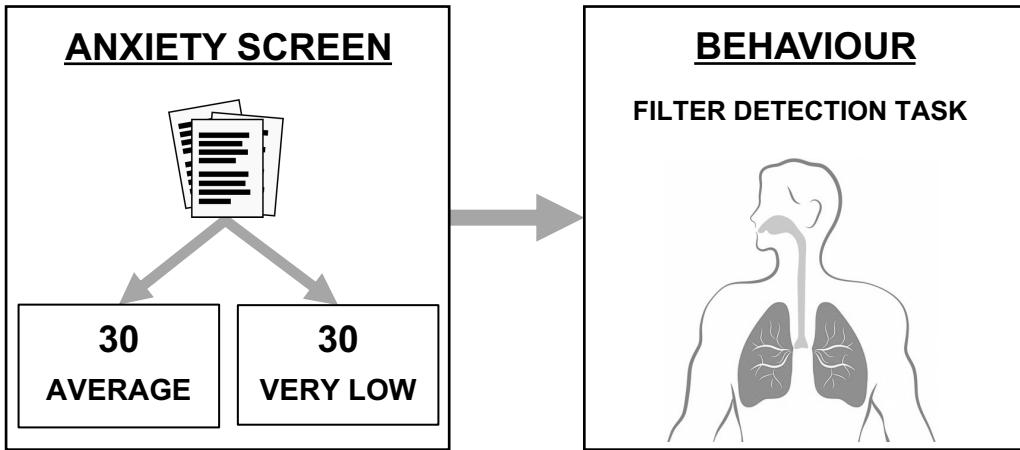
# INTEROCEPTION



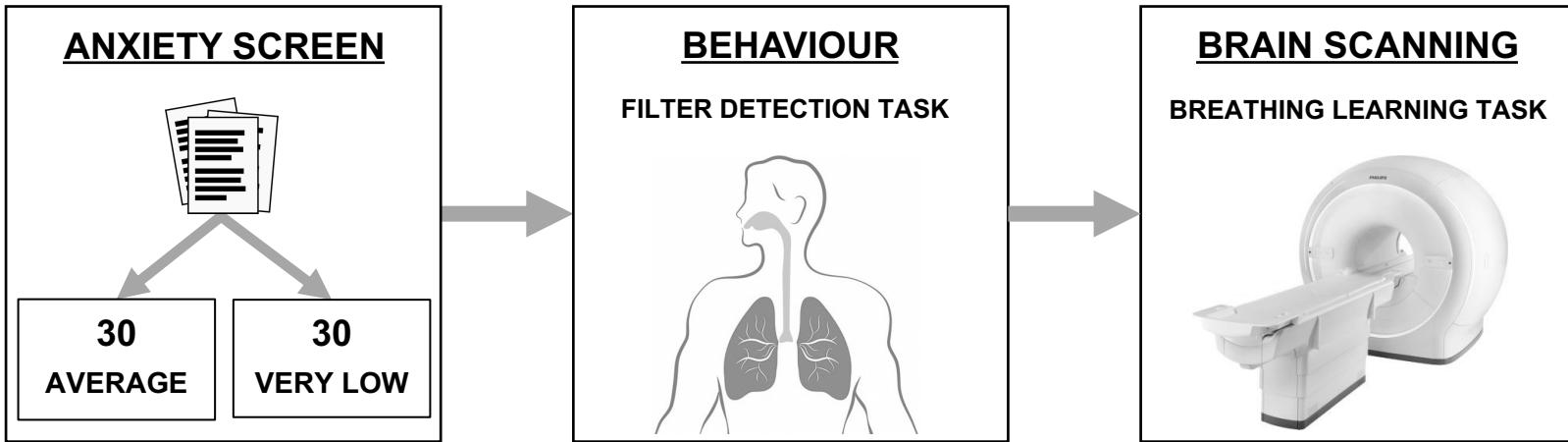
# INTEROCEPTION AND ANXIETY



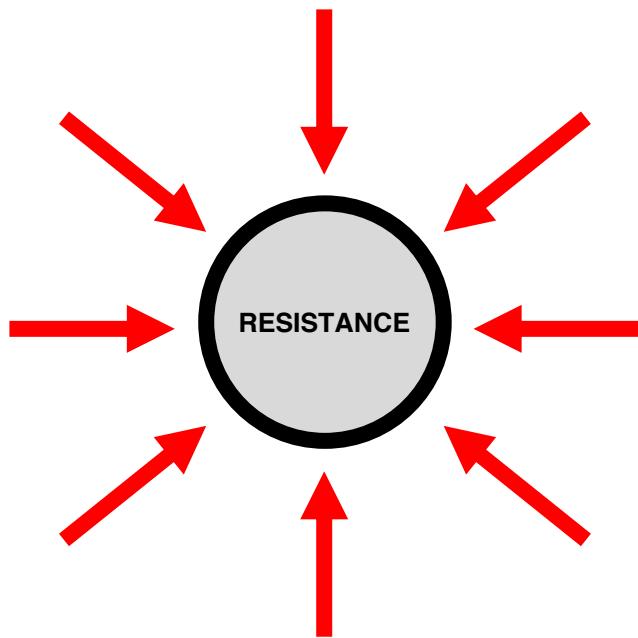
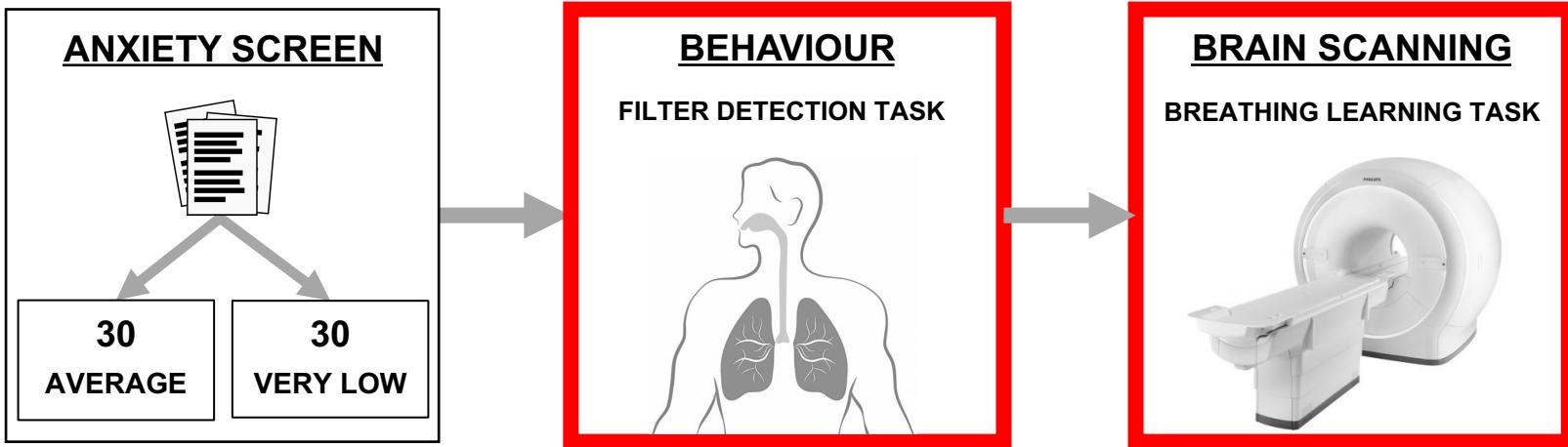
# INTEROCEPTION AND ANXIETY



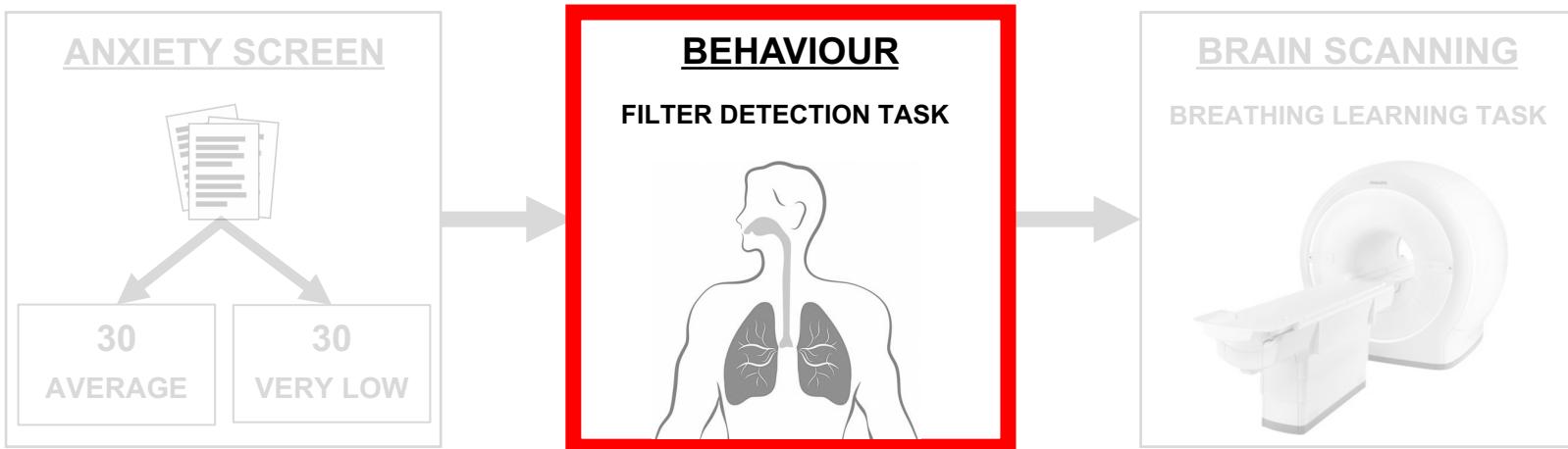
# INTEROCEPTION AND ANXIETY



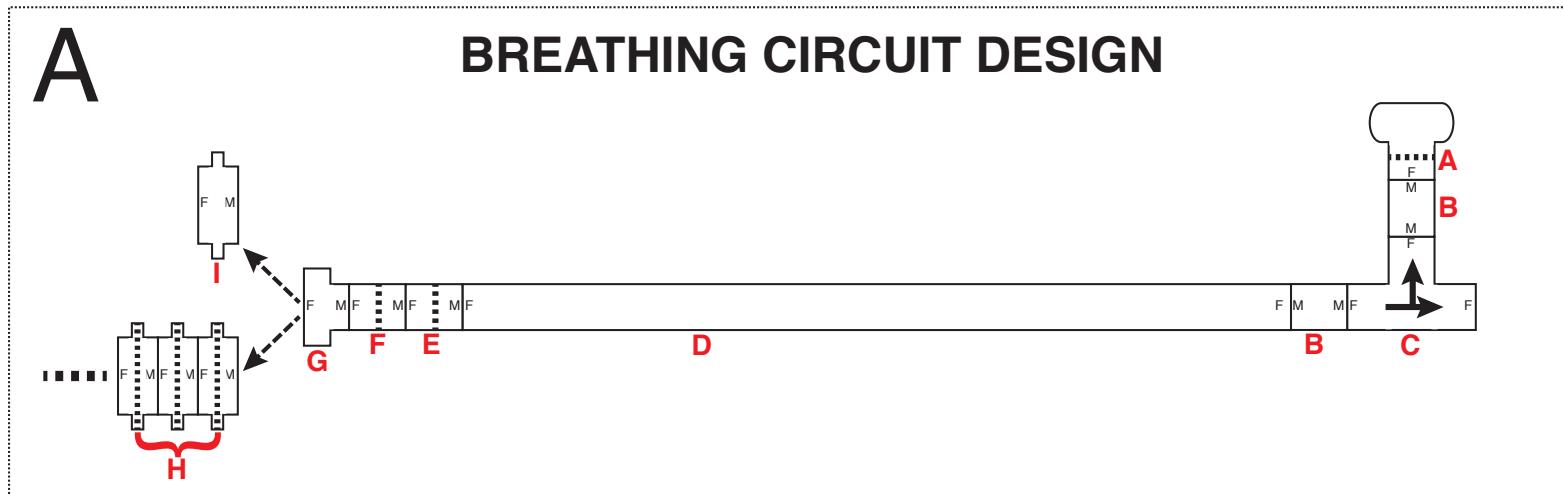
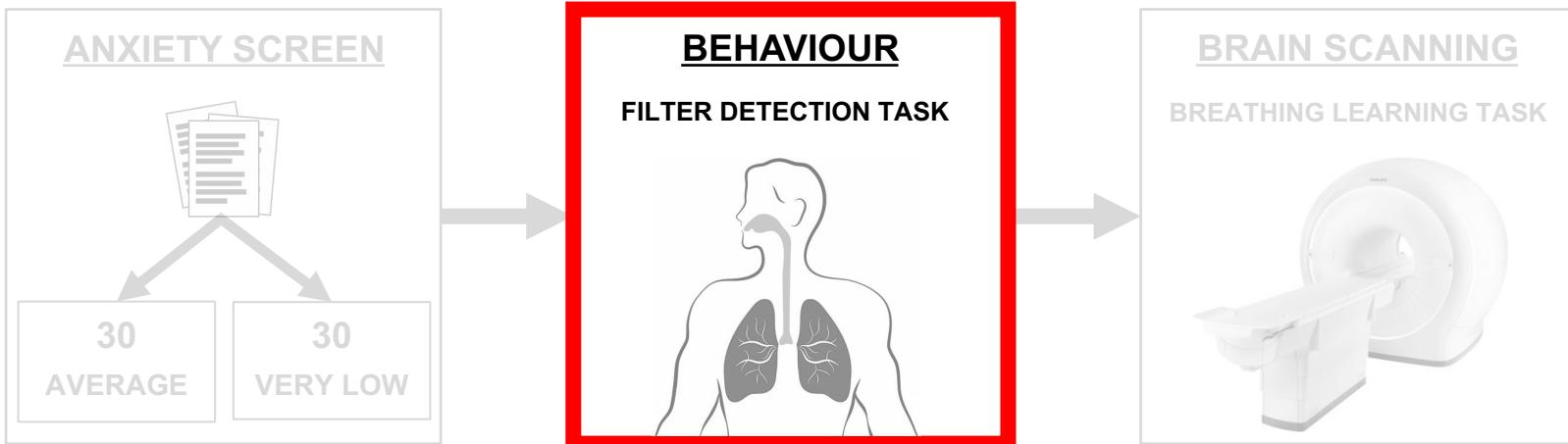
# INTEROCEPTION AND ANXIETY



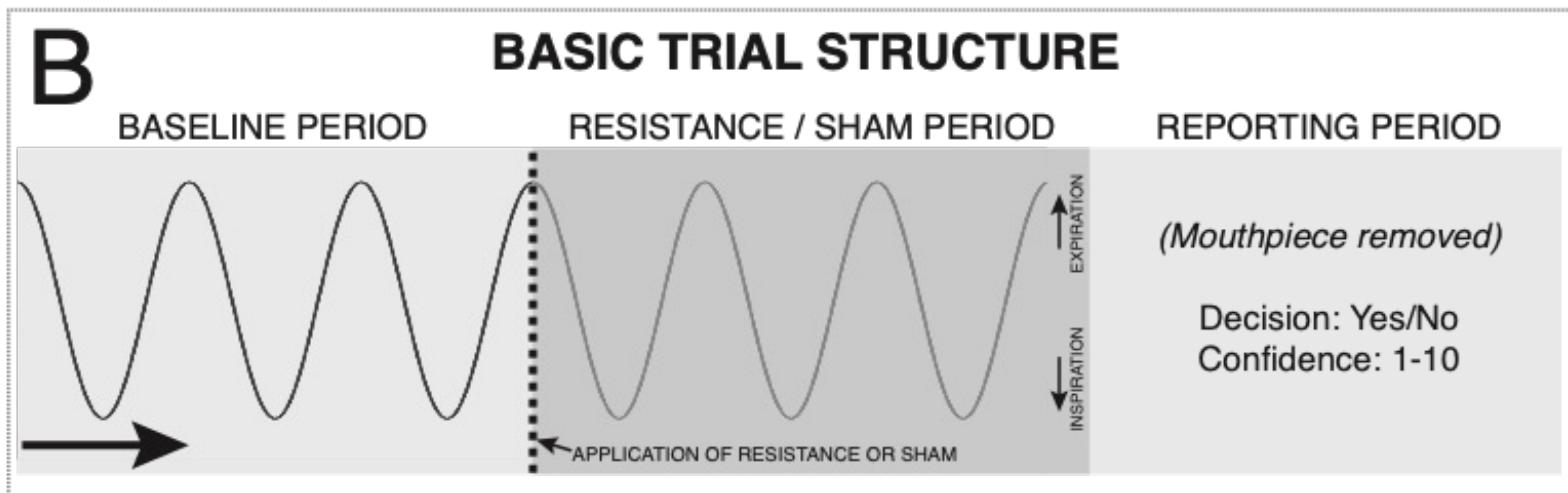
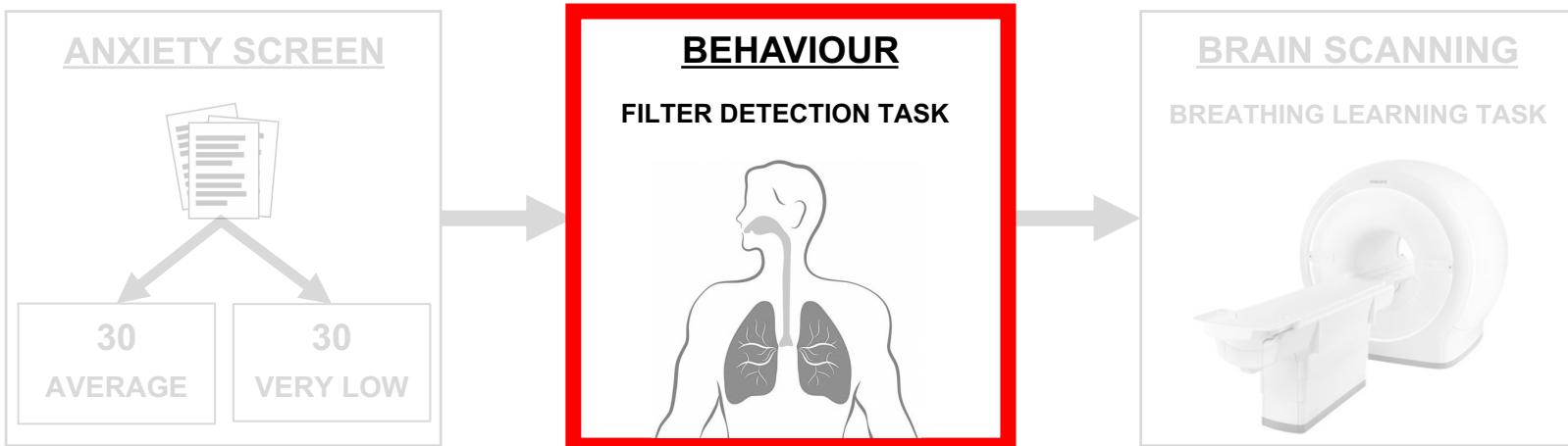
# INTEROCEPTION AND ANXIETY



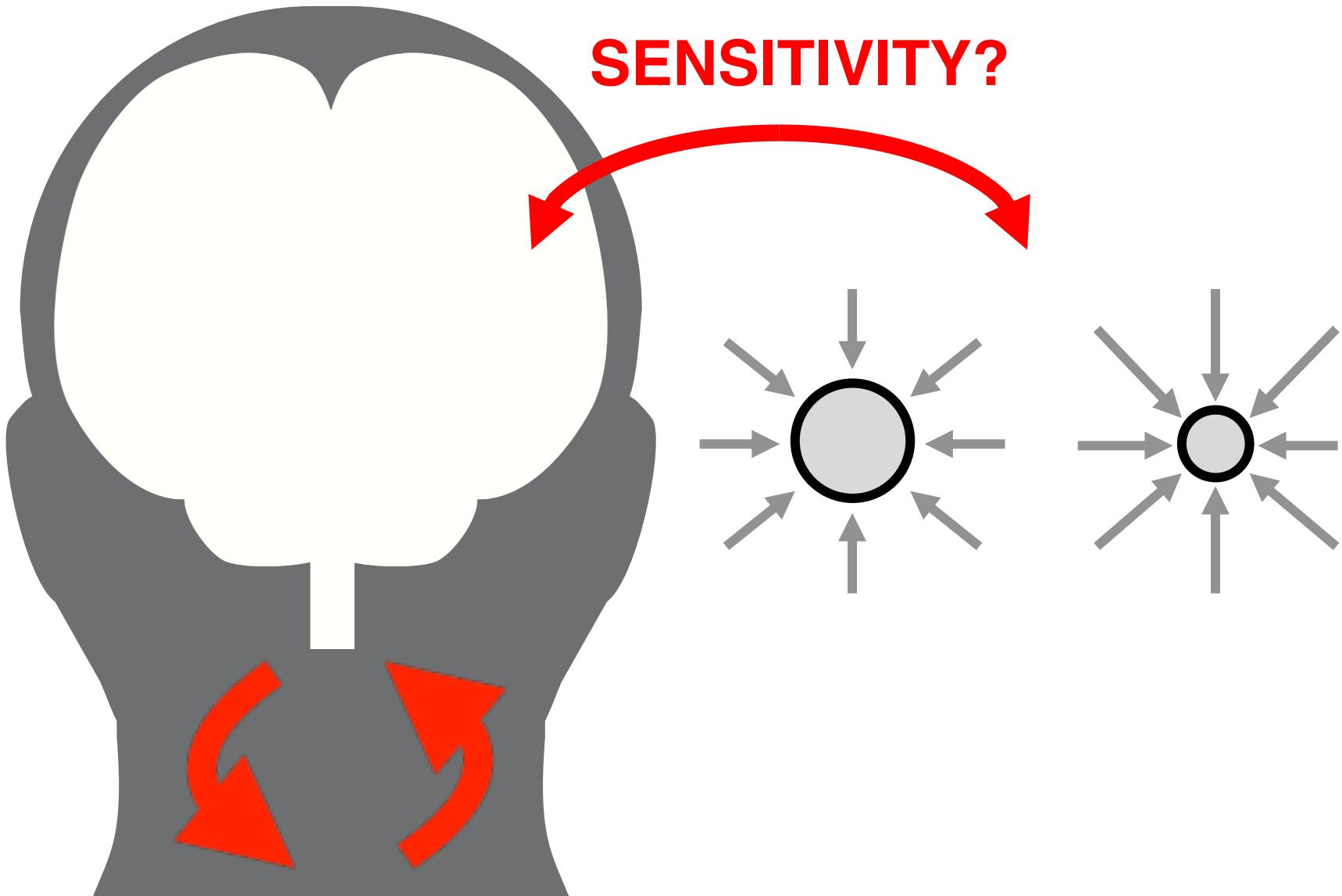
# INTEROCEPTION AND ANXIETY



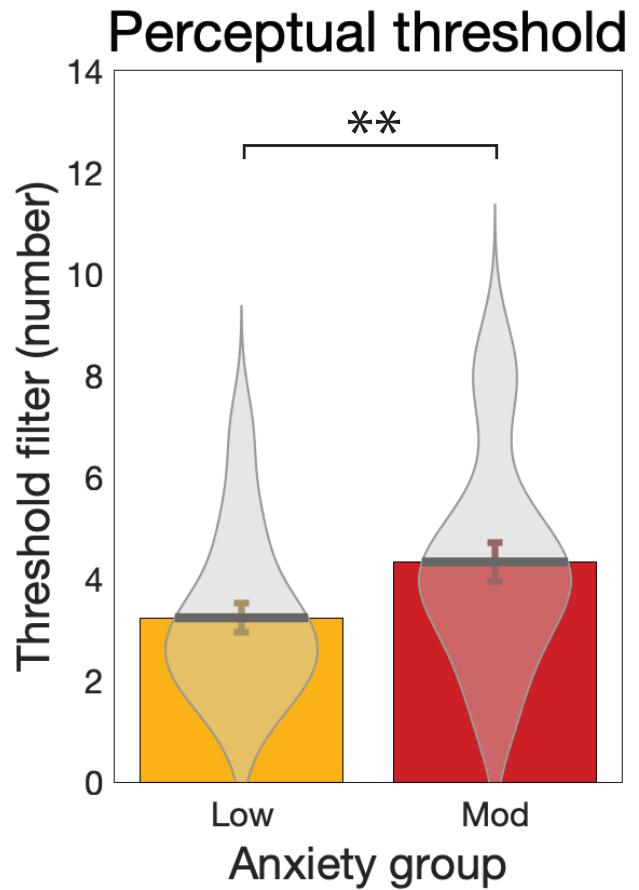
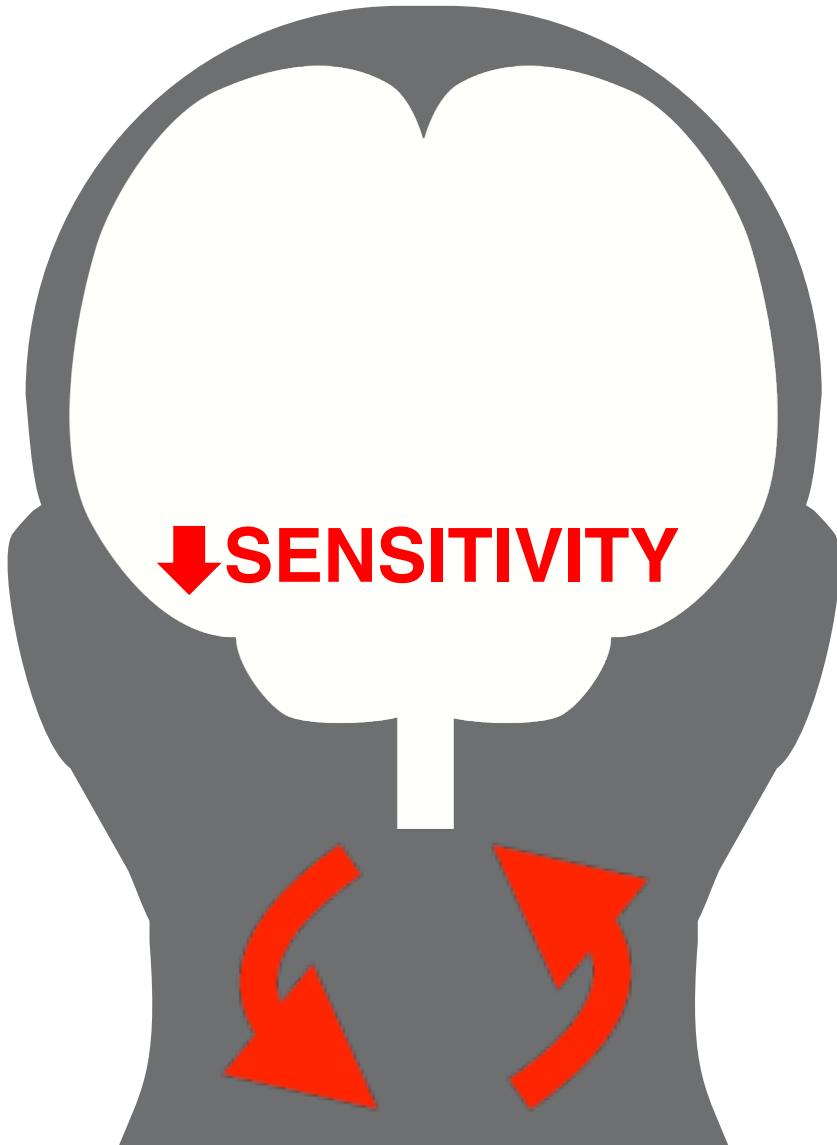
# INTEROCEPTION AND ANXIETY



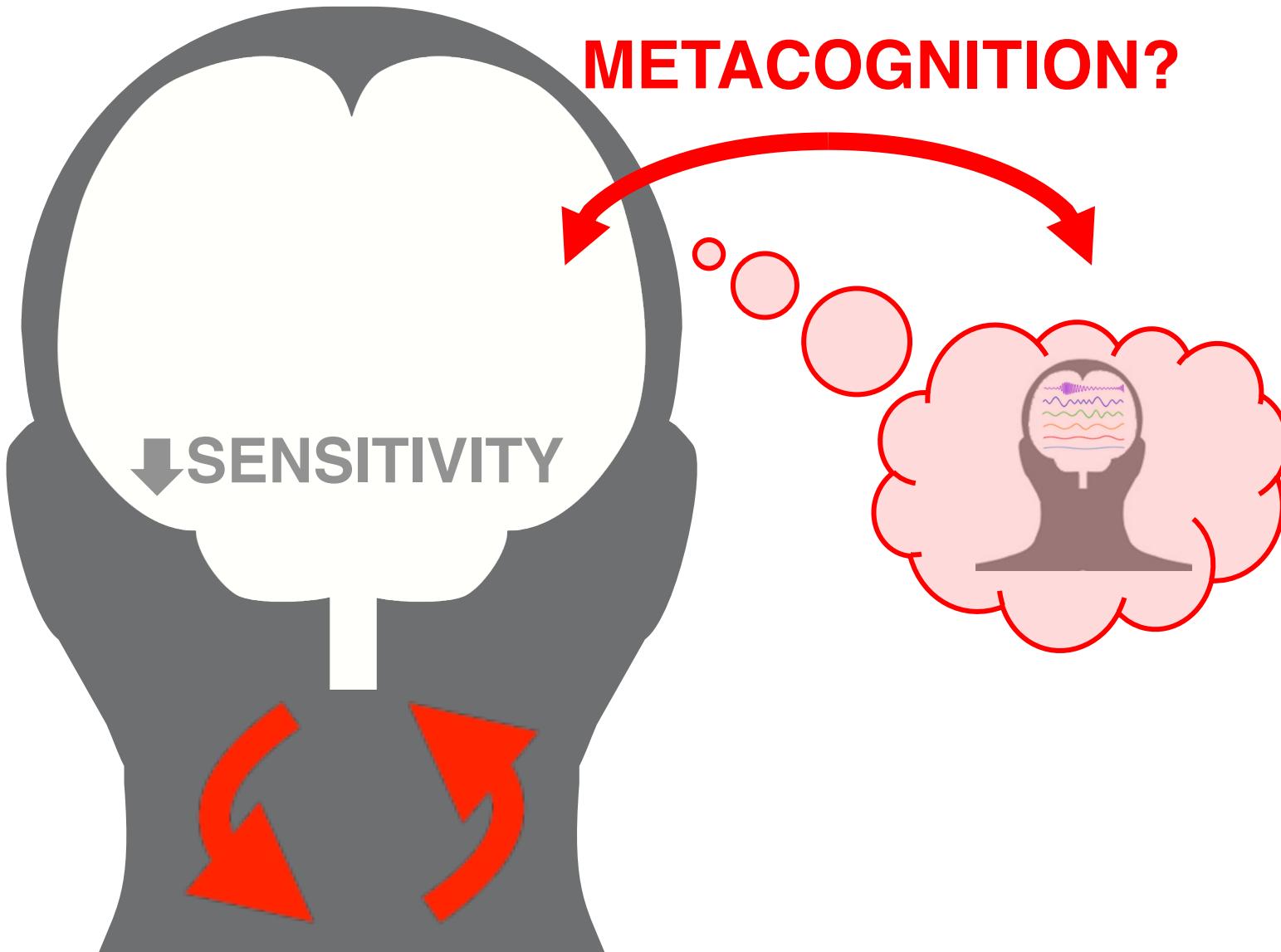
# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY

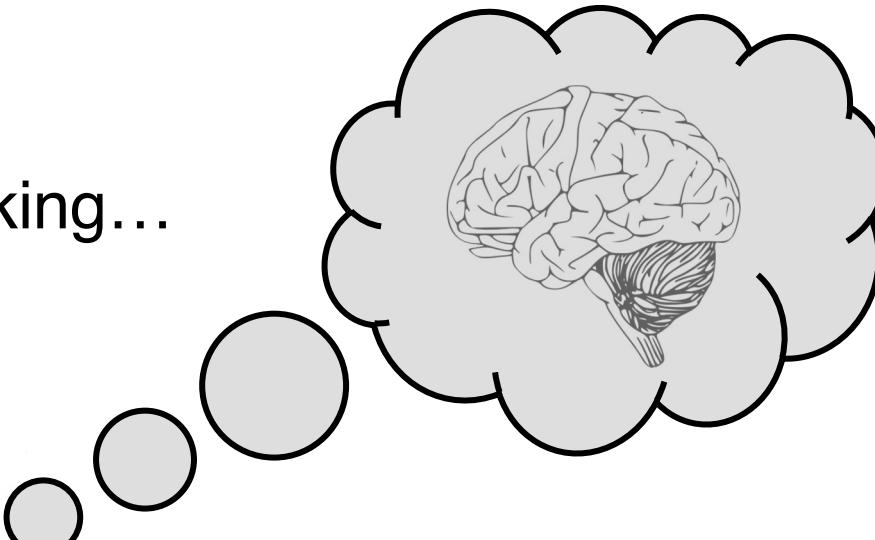
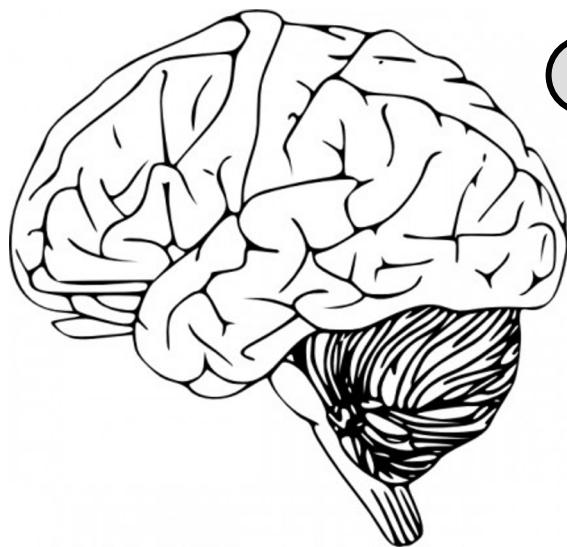


# INTEROCEPTION AND ANXIETY



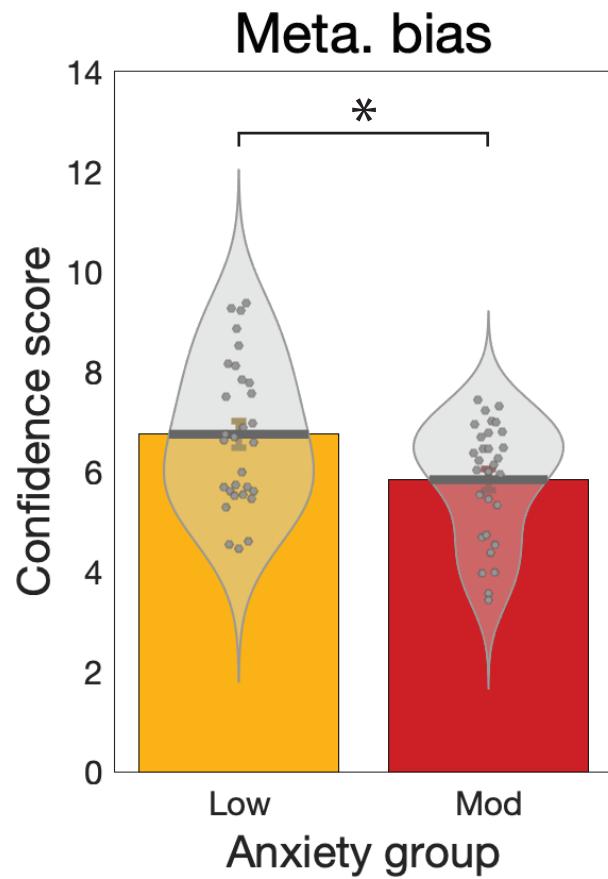
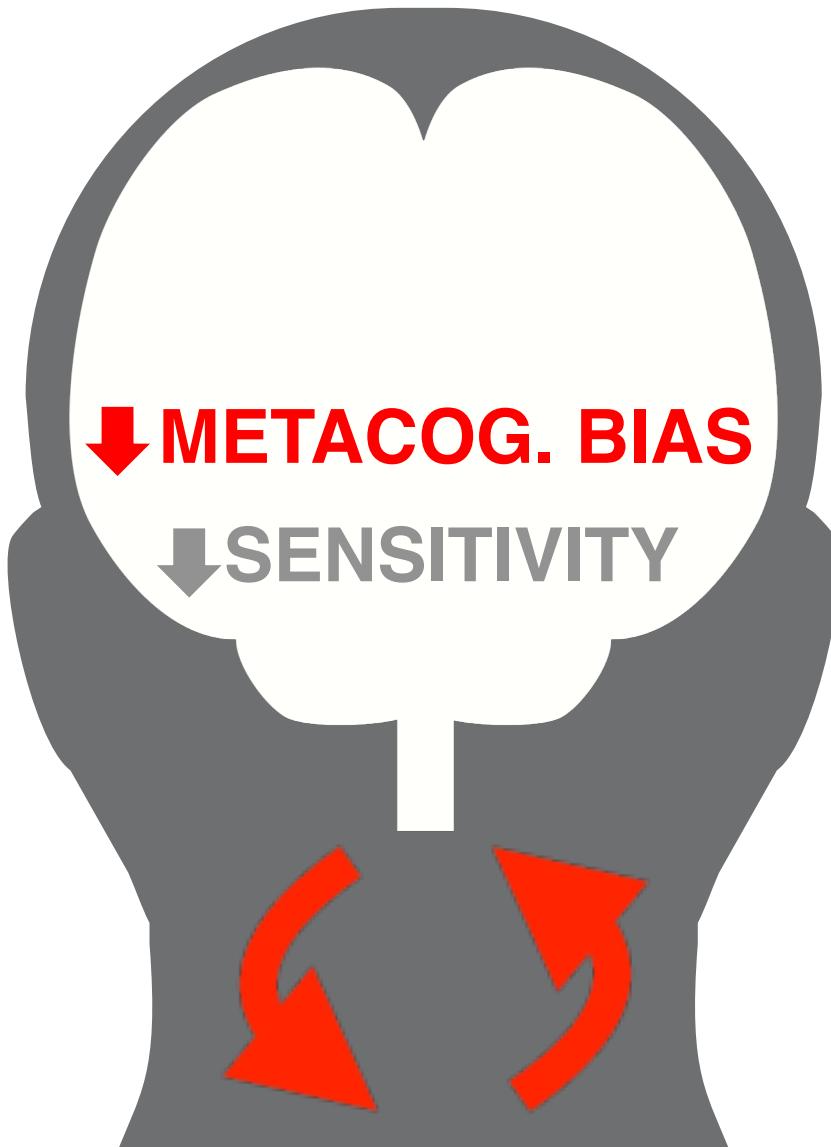
# METACOGNITION

Thinking... About thinking...

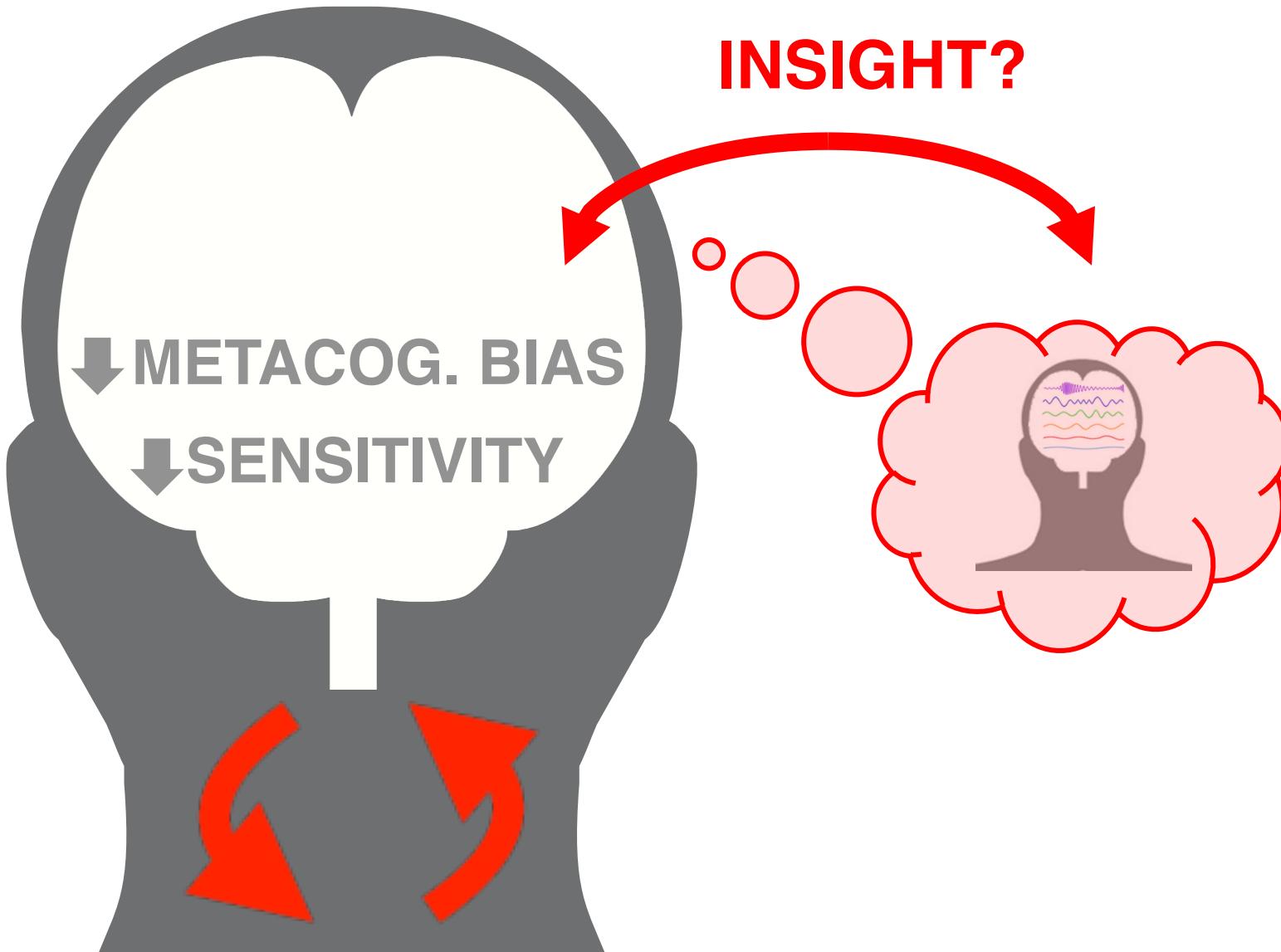


Metacognition research concerns the processes by which people self-reflect on their own performance (**monitoring**) and how they put their metaknowledge to use in regulating their behaviour (**control**)  
(Koriat, 2007)

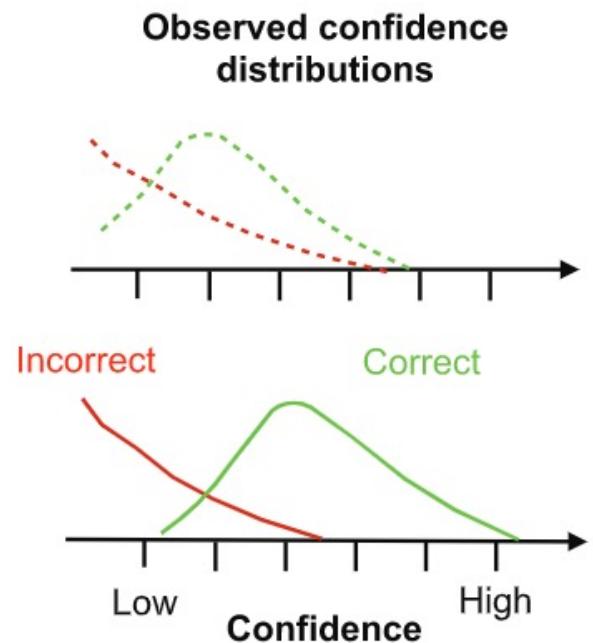
# INTEROCEPTION AND ANXIETY



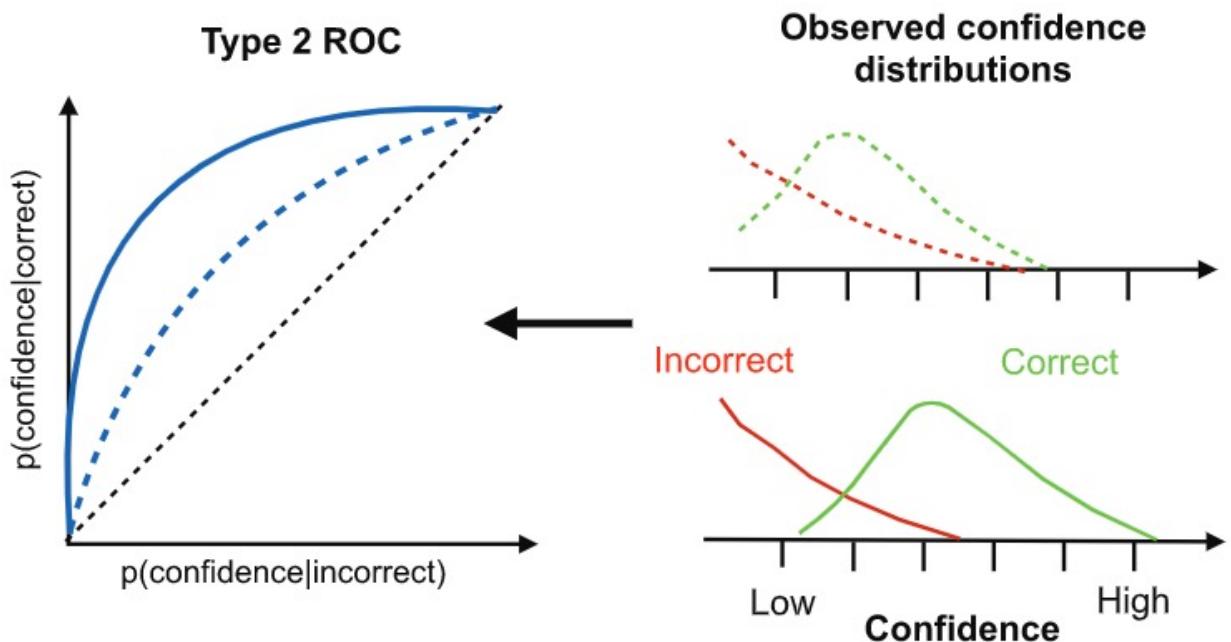
# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY

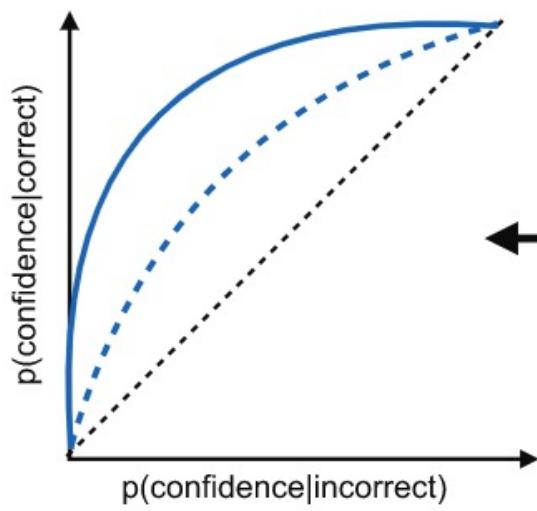


# INTEROCEPTION AND ANXIETY

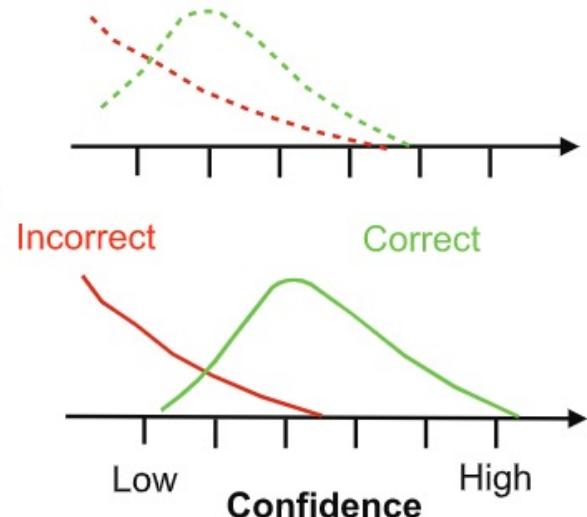
Type 1 SDT parameters

meta- $d'$  (fitted to  
type 2 ROC)  
compared to  
observed  $d'$

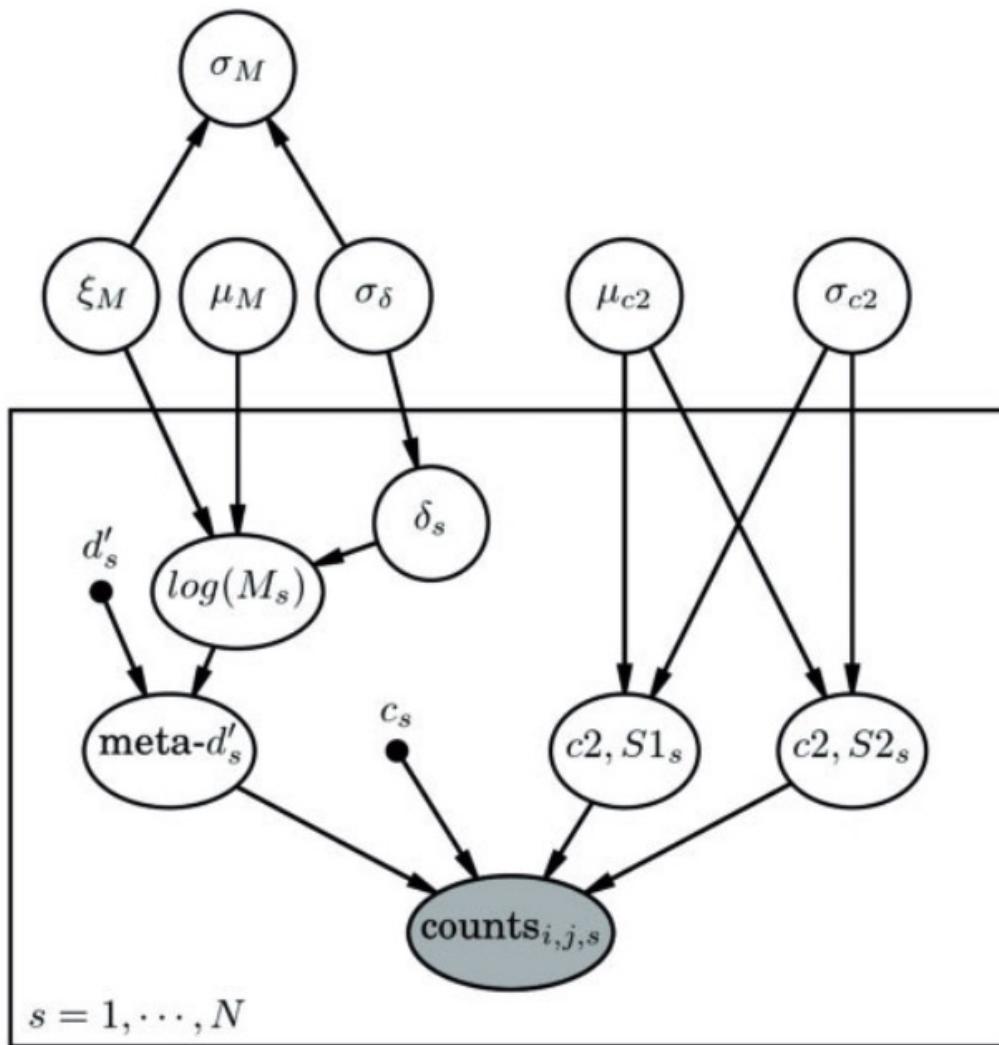
Type 2 ROC



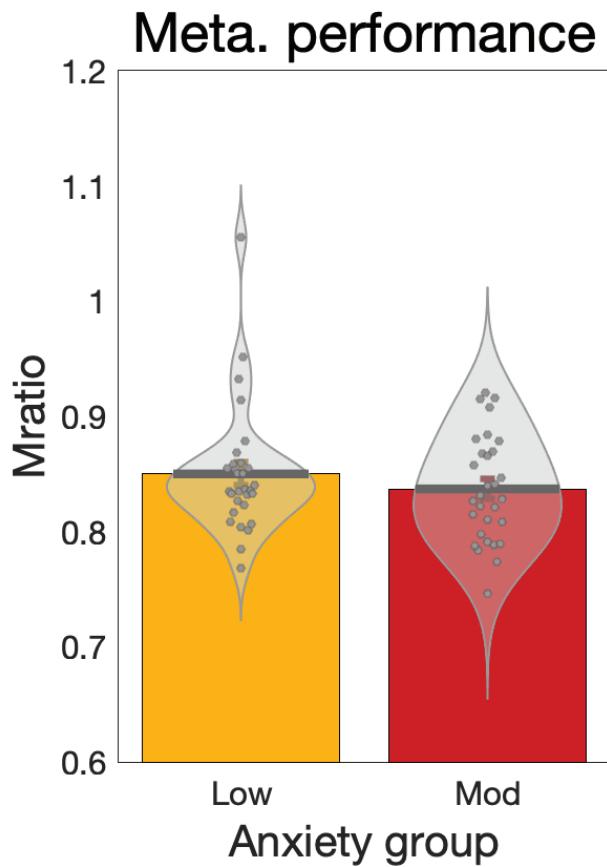
Observed confidence distributions



# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY



$$M_0 \sim N(0, 1)$$

$$\beta \sim N(0, 1)$$

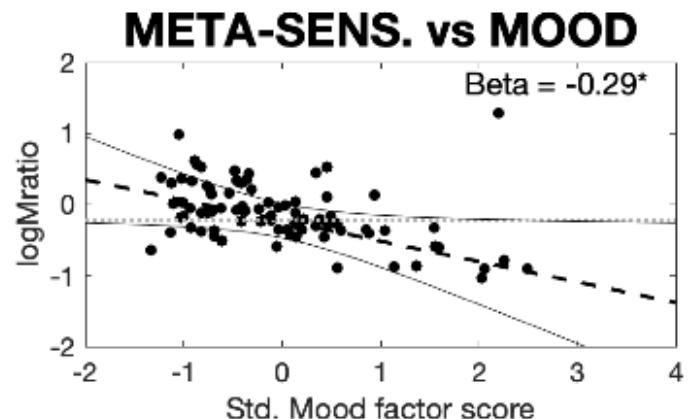
$$\sigma_\delta \sim HN(1)$$

$$\zeta \sim Beta(1, 1)$$

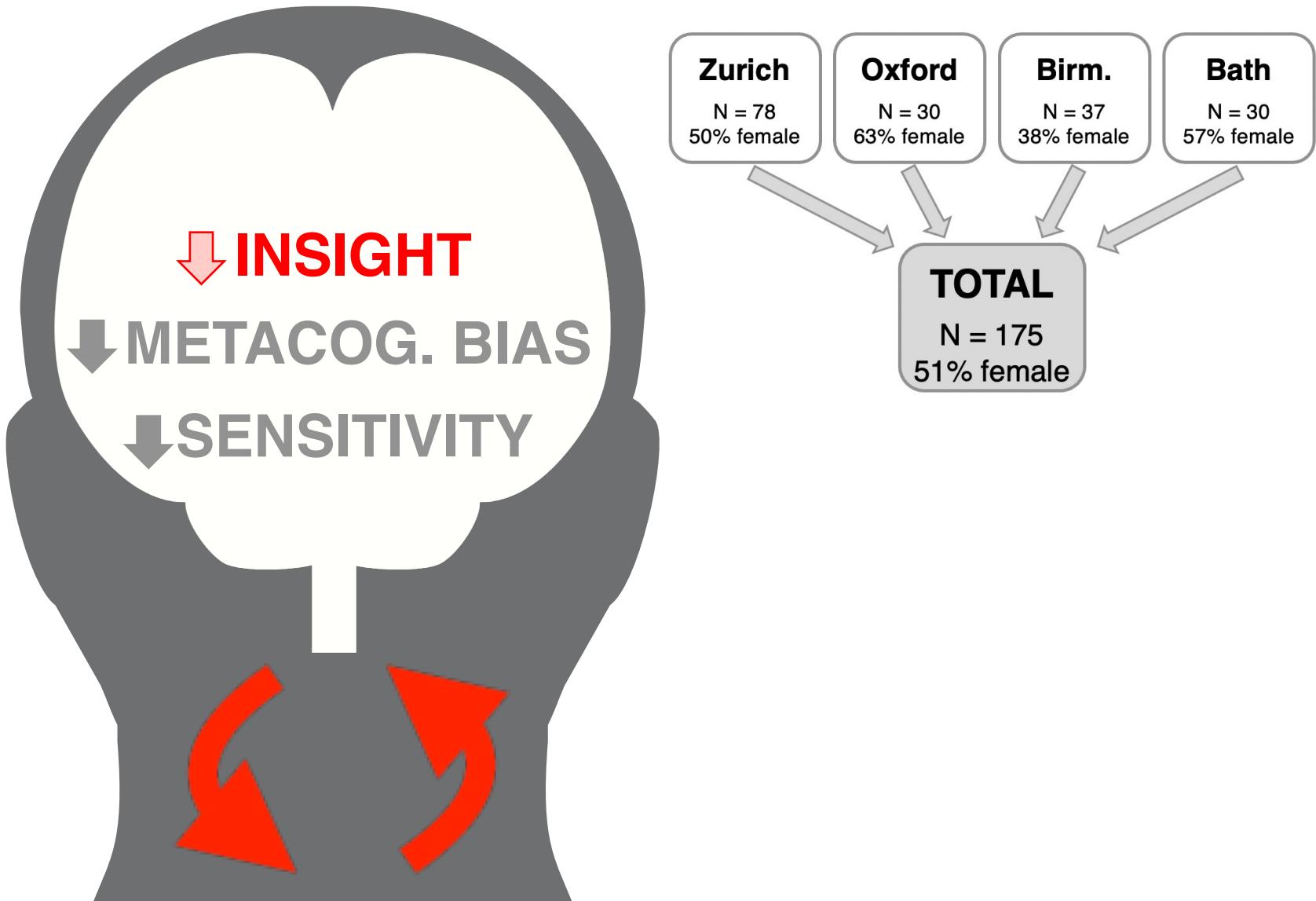
$$\delta_s \sim T(0, \sigma_\delta, 5)$$

$$\varepsilon_s = \zeta * \delta_s$$

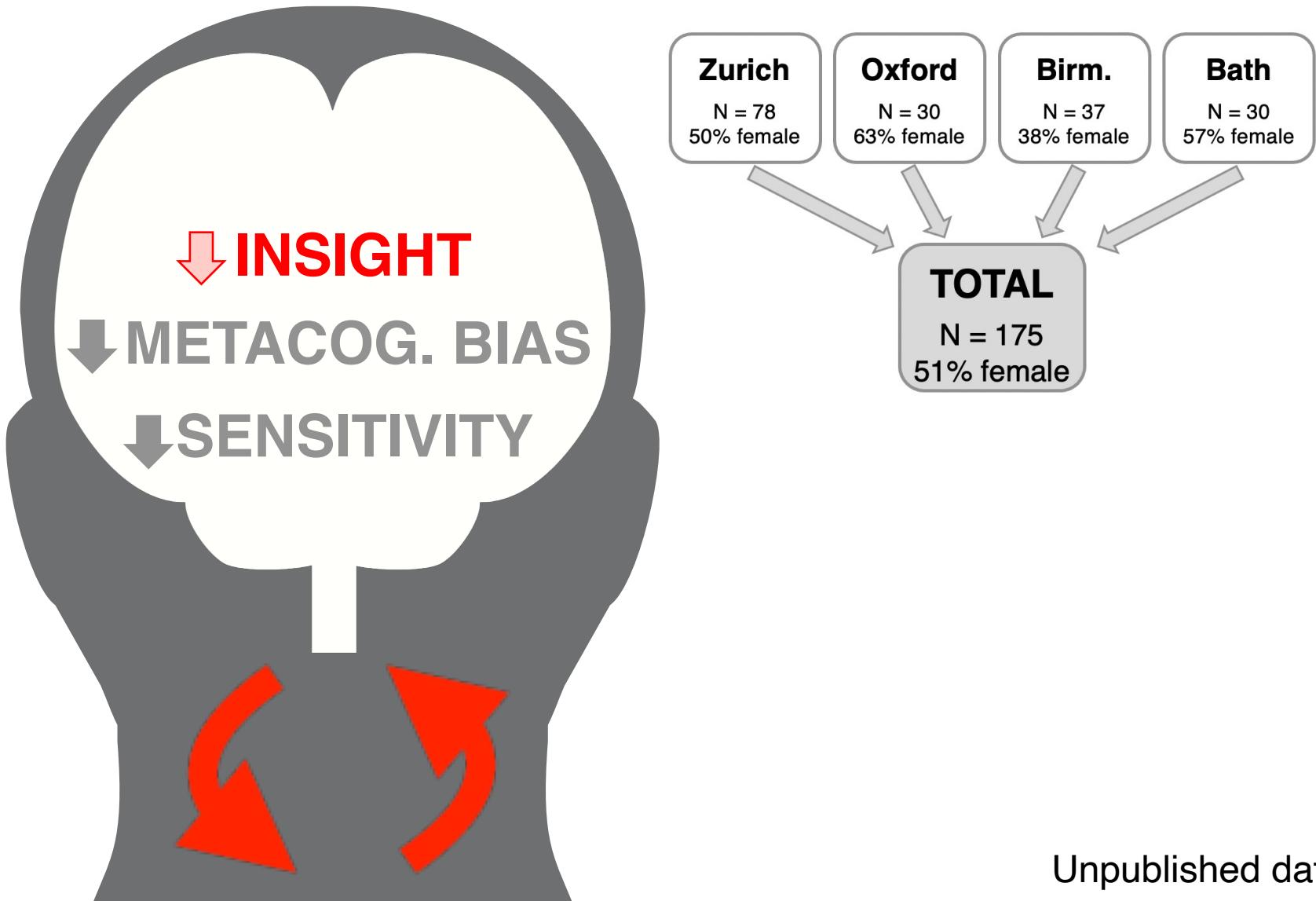
$$M_s = M_0 + \beta * X_s + \varepsilon_s$$



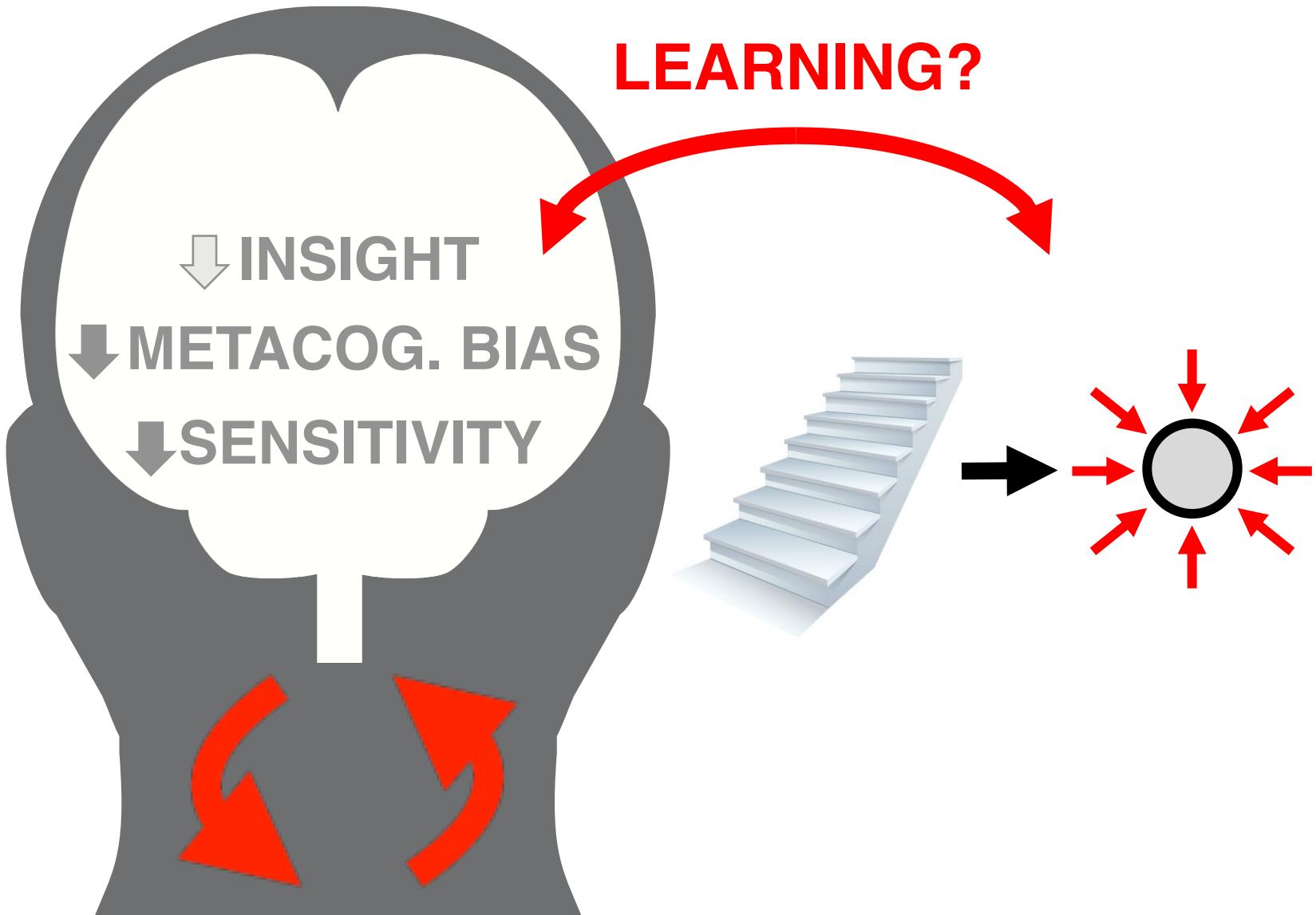
# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY



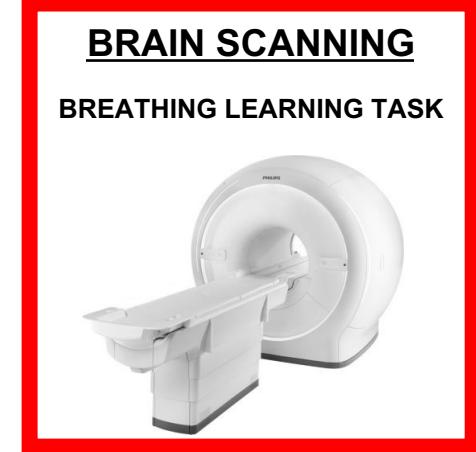
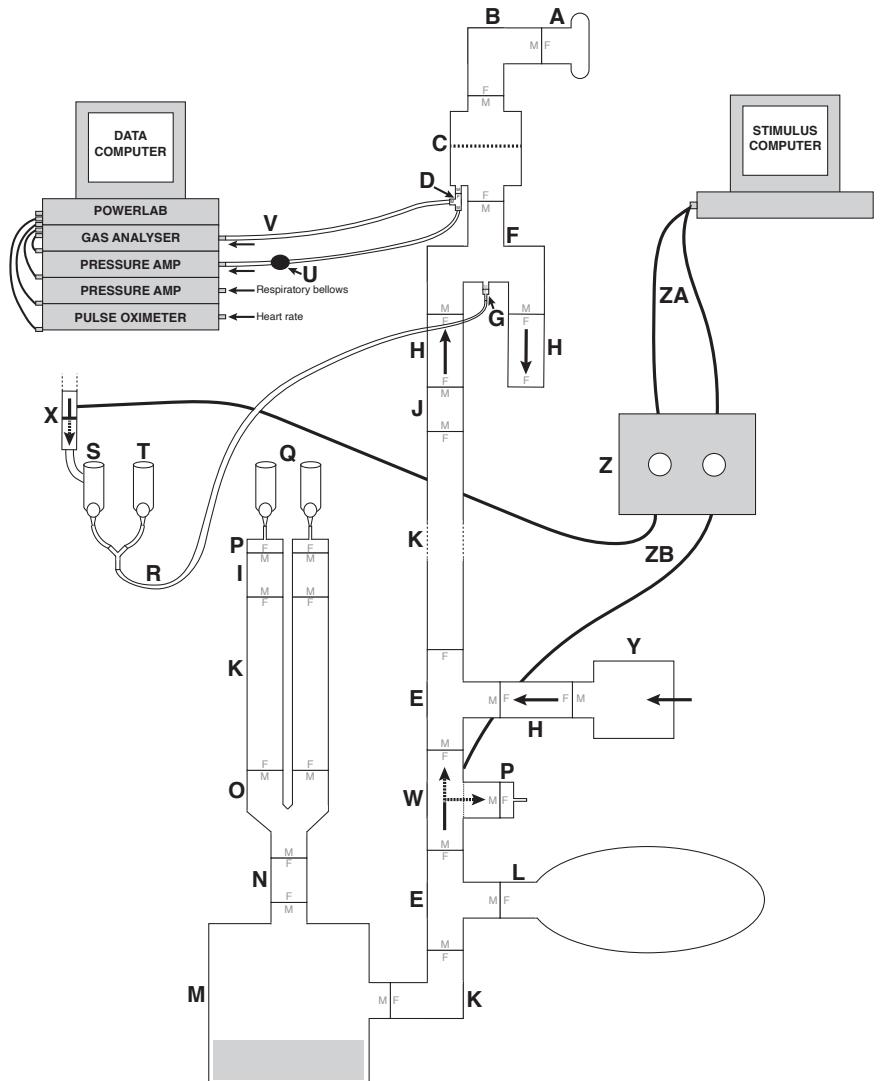
# INTEROCEPTION AND ANXIETY



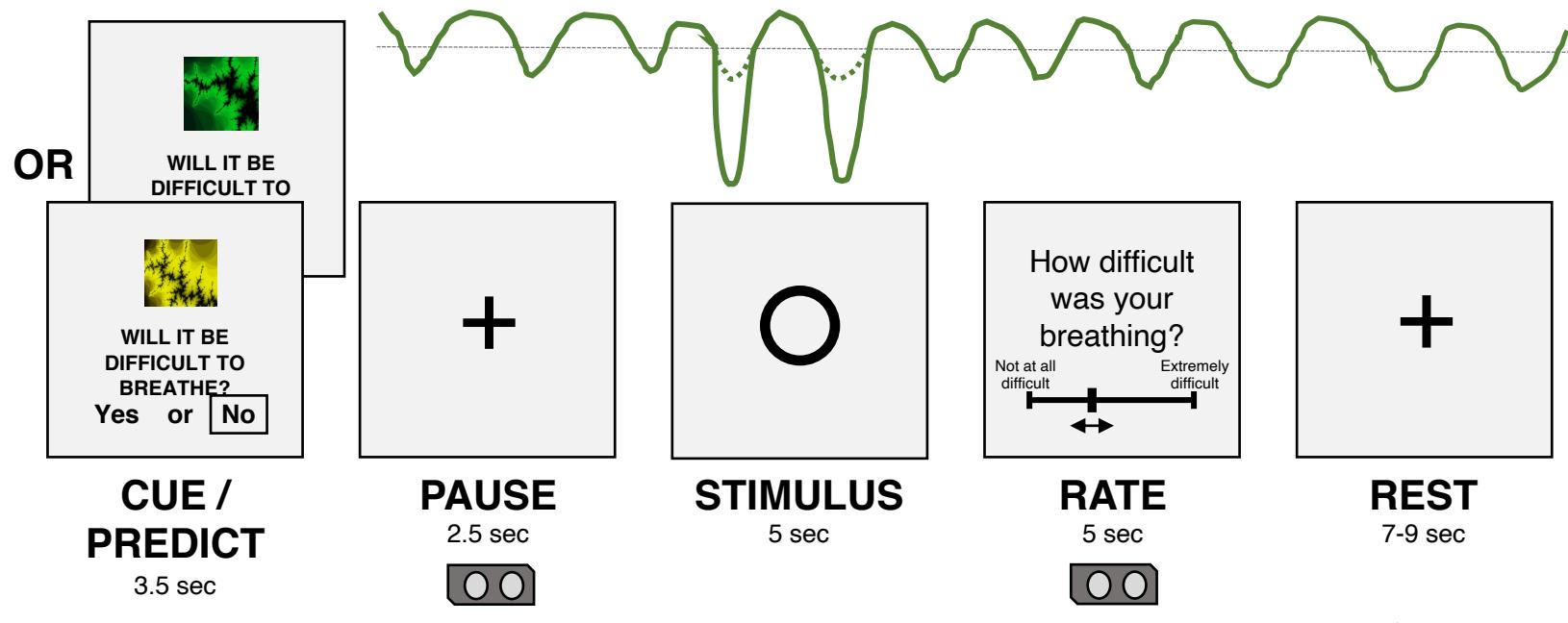
# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY



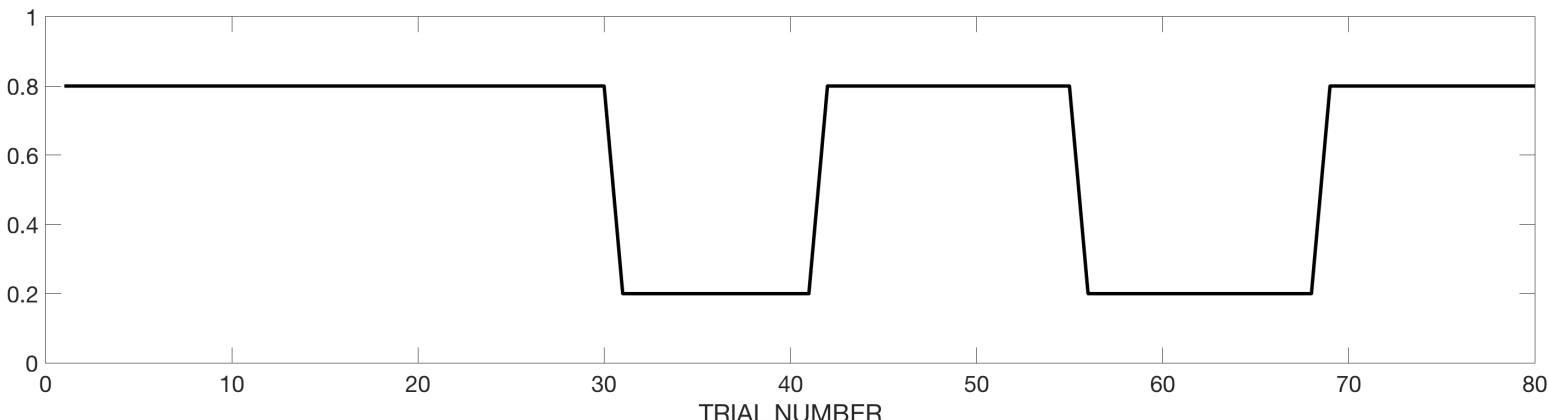
# INTEROCEPTION AND ANXIETY



# INTEROCEPTION AND ANXIETY



## PROBABILITIES

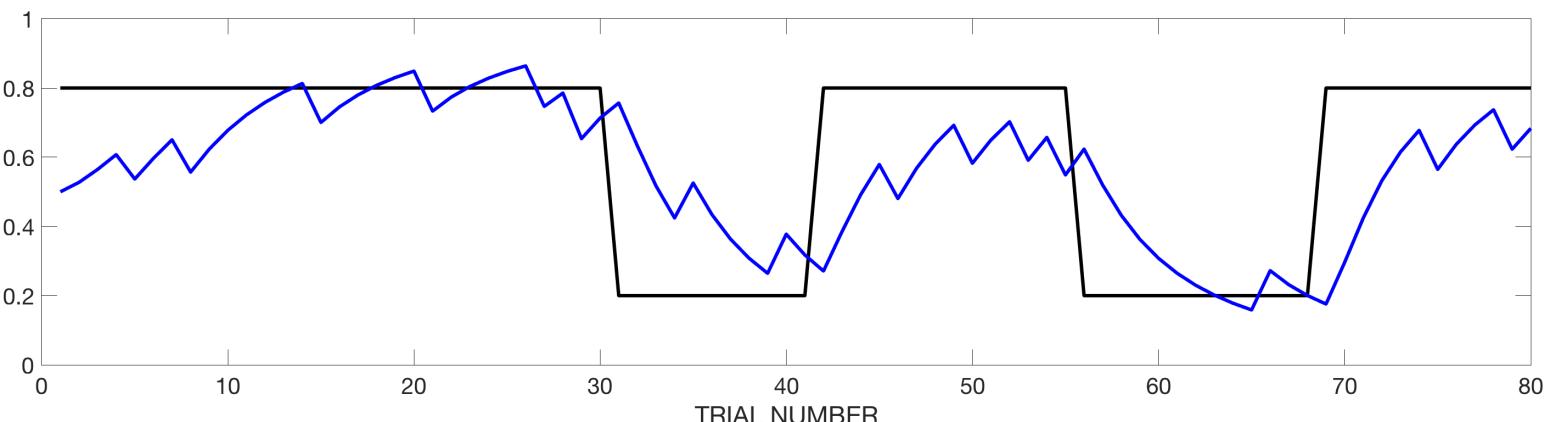


# INTEROCEPTION AND ANXIETY



## PREDICTIONS

$$V_{(k+1)} = V_{(k)} + \alpha \delta_{(k)}$$

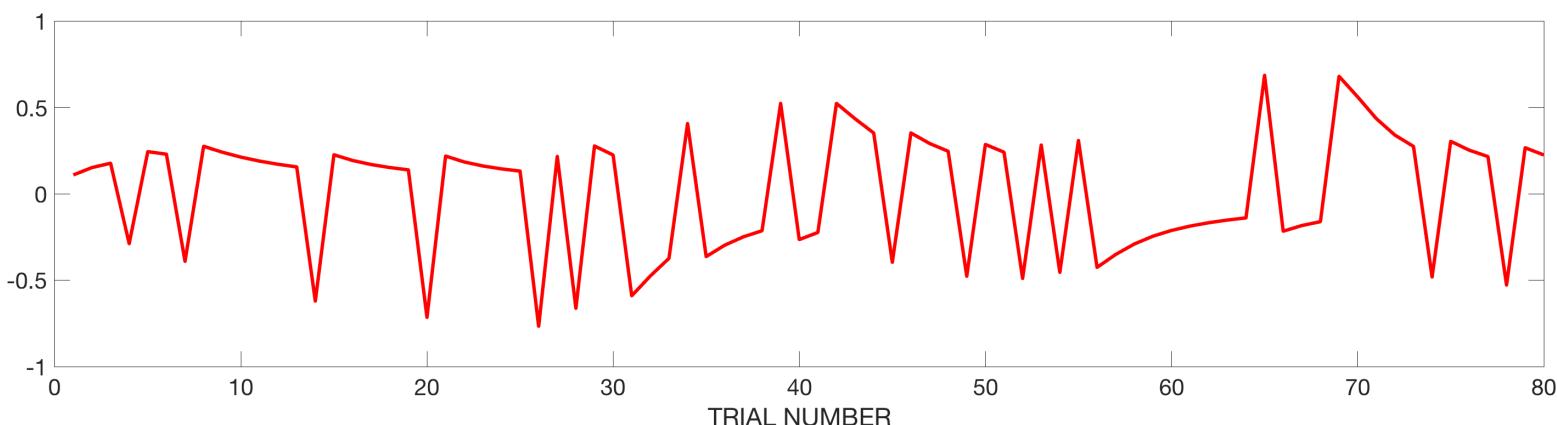


# INTEROCEPTION AND ANXIETY



## PREDICTION ERRORS

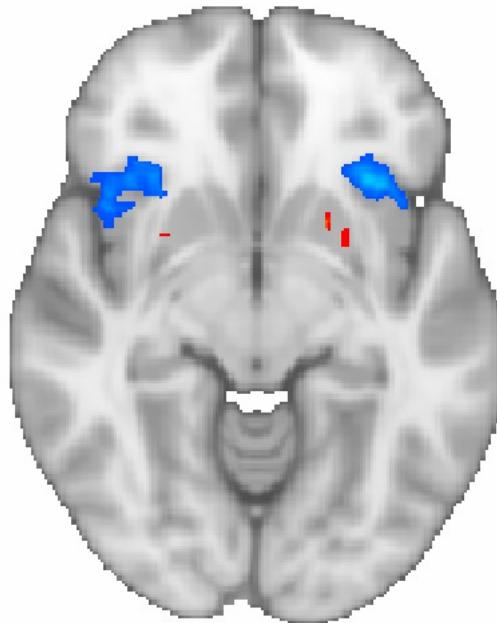
$$V_{(k+1)} = V_{(k)} + \alpha \delta_{(k)}$$



# INTEROCEPTION AND ANXIETY



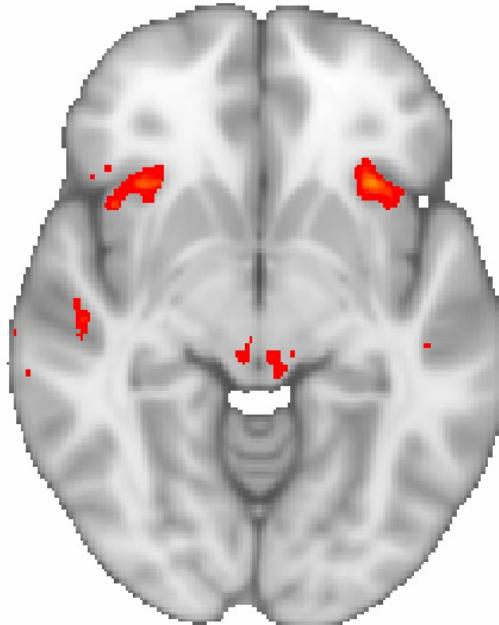
## PREDICTIONS



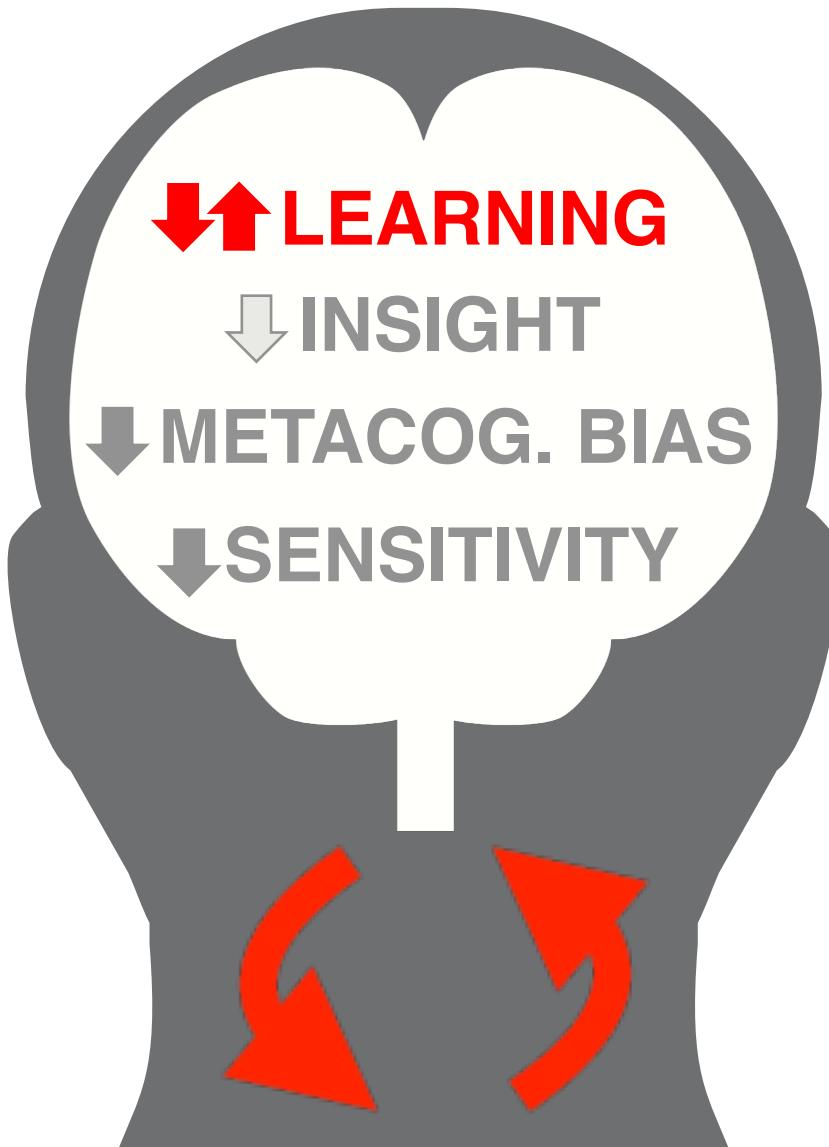
# INTEROCEPTION AND ANXIETY



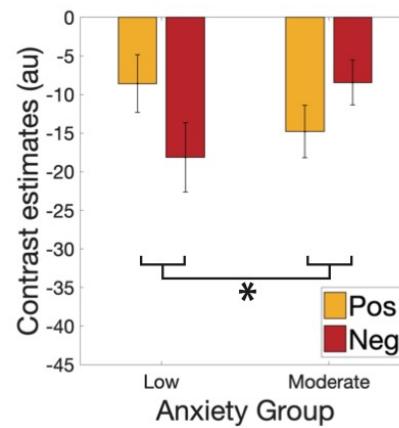
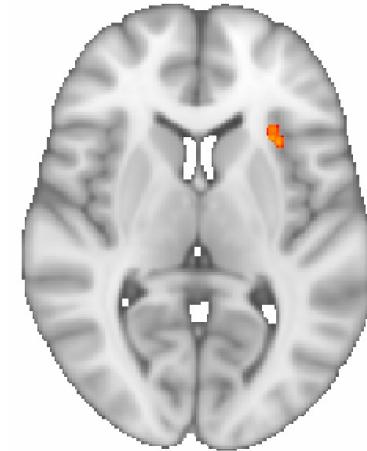
**ERRORS**



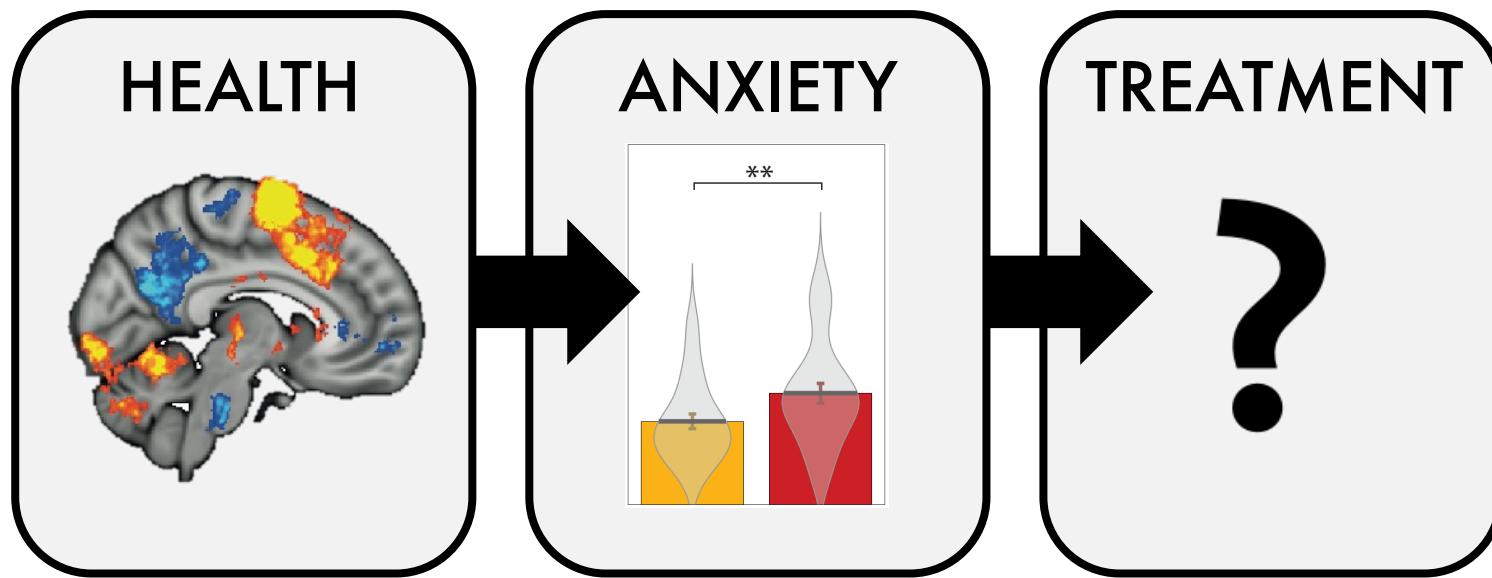
# INTEROCEPTION AND ANXIETY



## PREDICTIONS

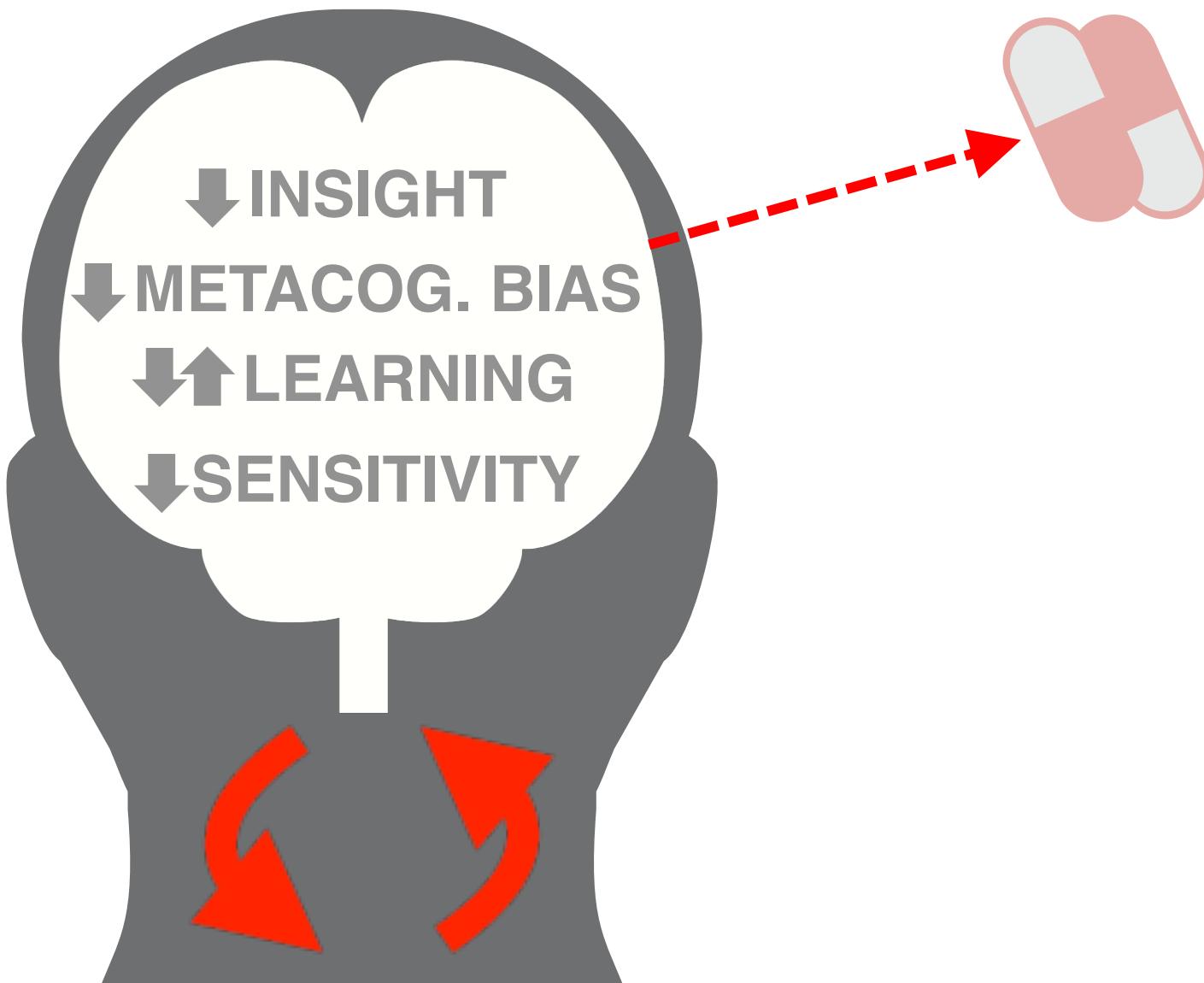


# RESEARCH PATHWAY

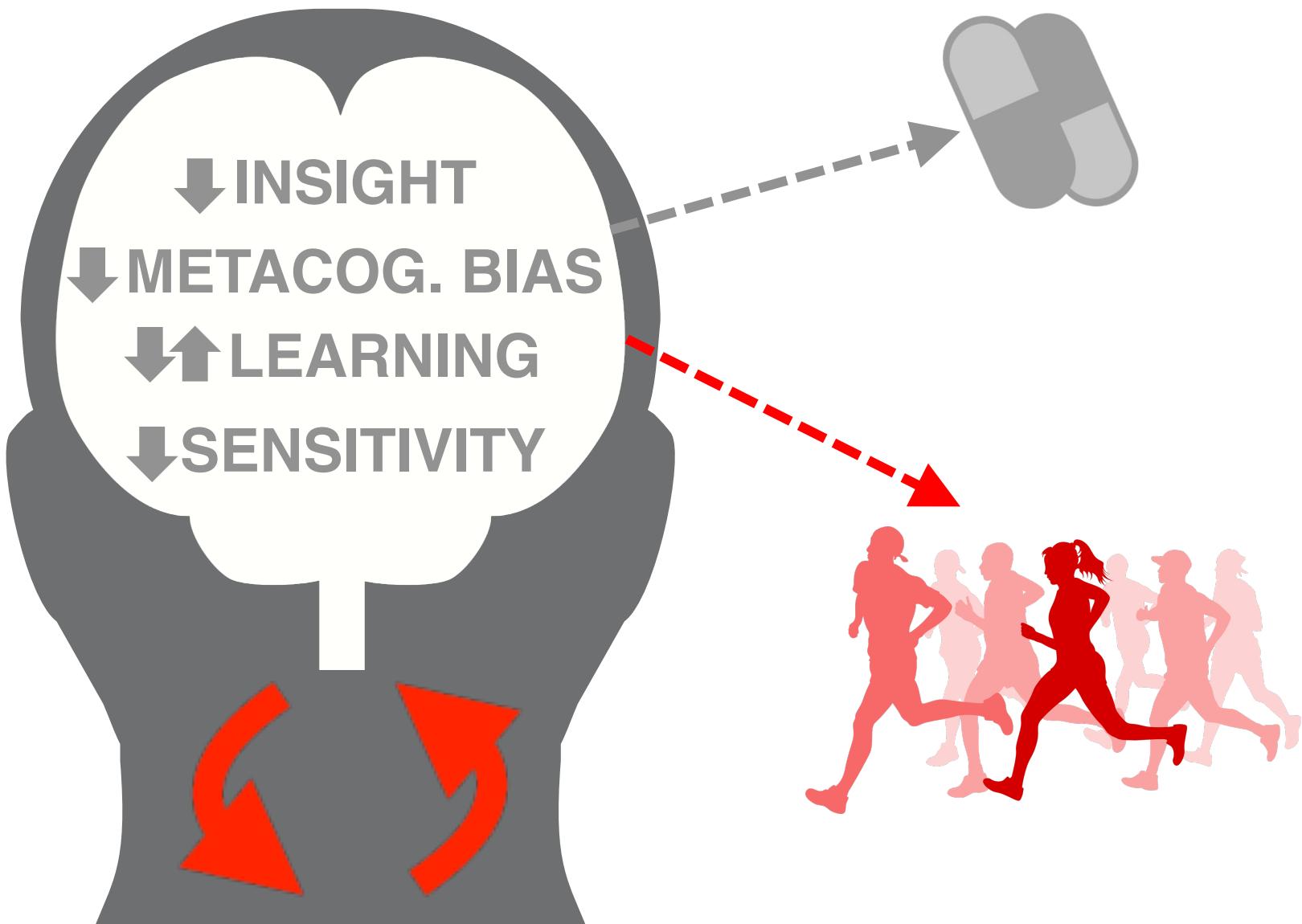


**Projects now running at Otago**

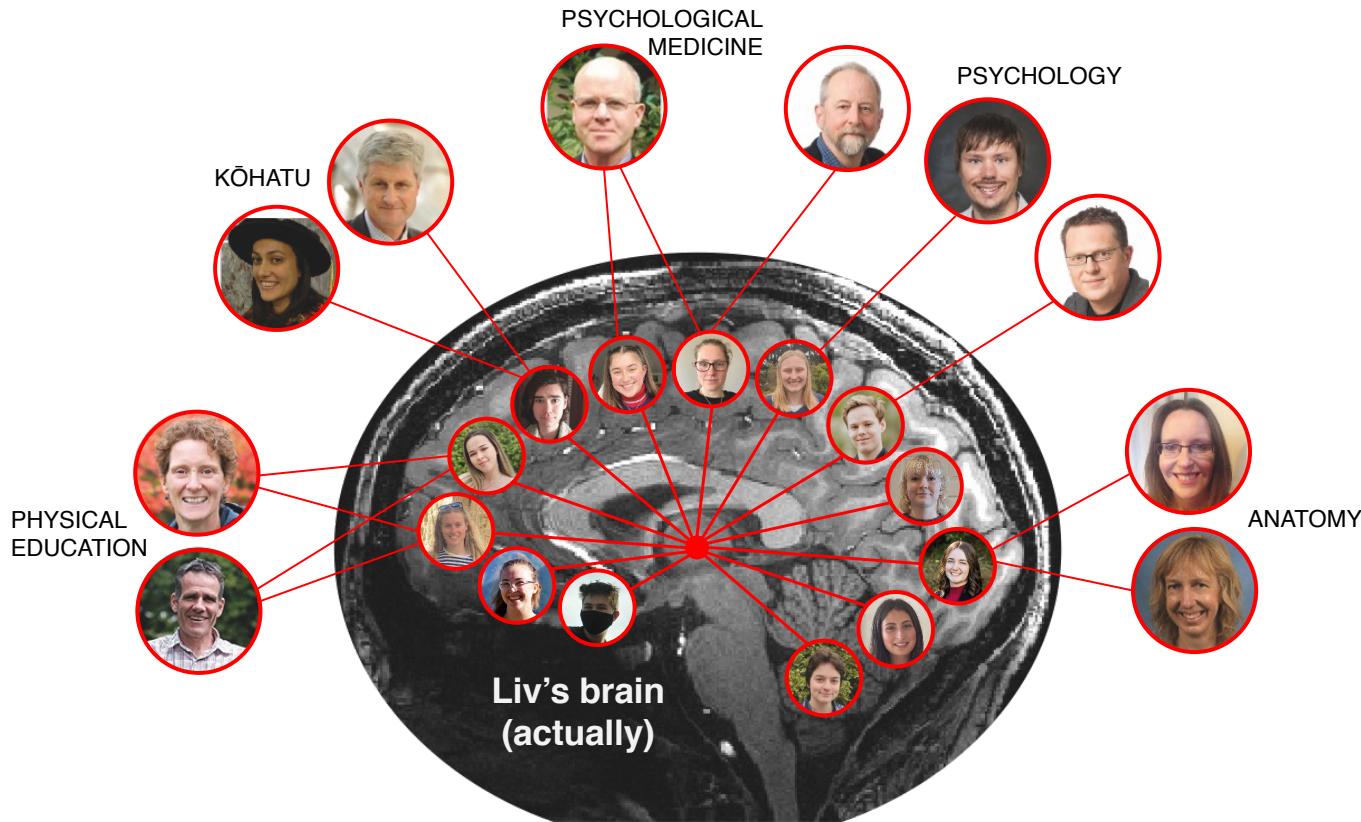
# TREATING ANXIETY



# TREATING ANXIETY



# RESEARCH GROUP



LIV (CO-PI)  
PSYCHOLOGY



FAYE (RESEARCH NURSE)  
PSYCHOLOGY



BRUCE (CO-PI)  
PHARMACY

# BREATHING AND THE BRAIN

## OXFORD

Kyle Pattinson  
Martyn Ezra  
Sarah Finnegan  
Andrea Dennis  
Mari Herigstad  
Anja Hayen  
Mark Jenkinson  
Stuart Clare  
  
...



JABBS



Translational Neuromodeling Unit

## ZURICH

Klaas Enno Stephan  
Laura Koechli  
Stephanie Marino  
Sandra Iglesias  
Stefan Fraessle  
Alexander Hess  
Lars Kasper  
  
...

ETH zürich



## OTAGO

Bruce Russell  
Jim Cotter  
Elaine Hargreaves  
Sam Harrison  
Paul Glue  
Merata Kawharu  
Kevin Crump  
  
...



Breathe Oxford

## INTERNATIONAL

Sarah Garfinkel  
Steve Fleming  
Micah Allen  
Fabien Vinckier  
Frederike Petzschner  
  
...

