

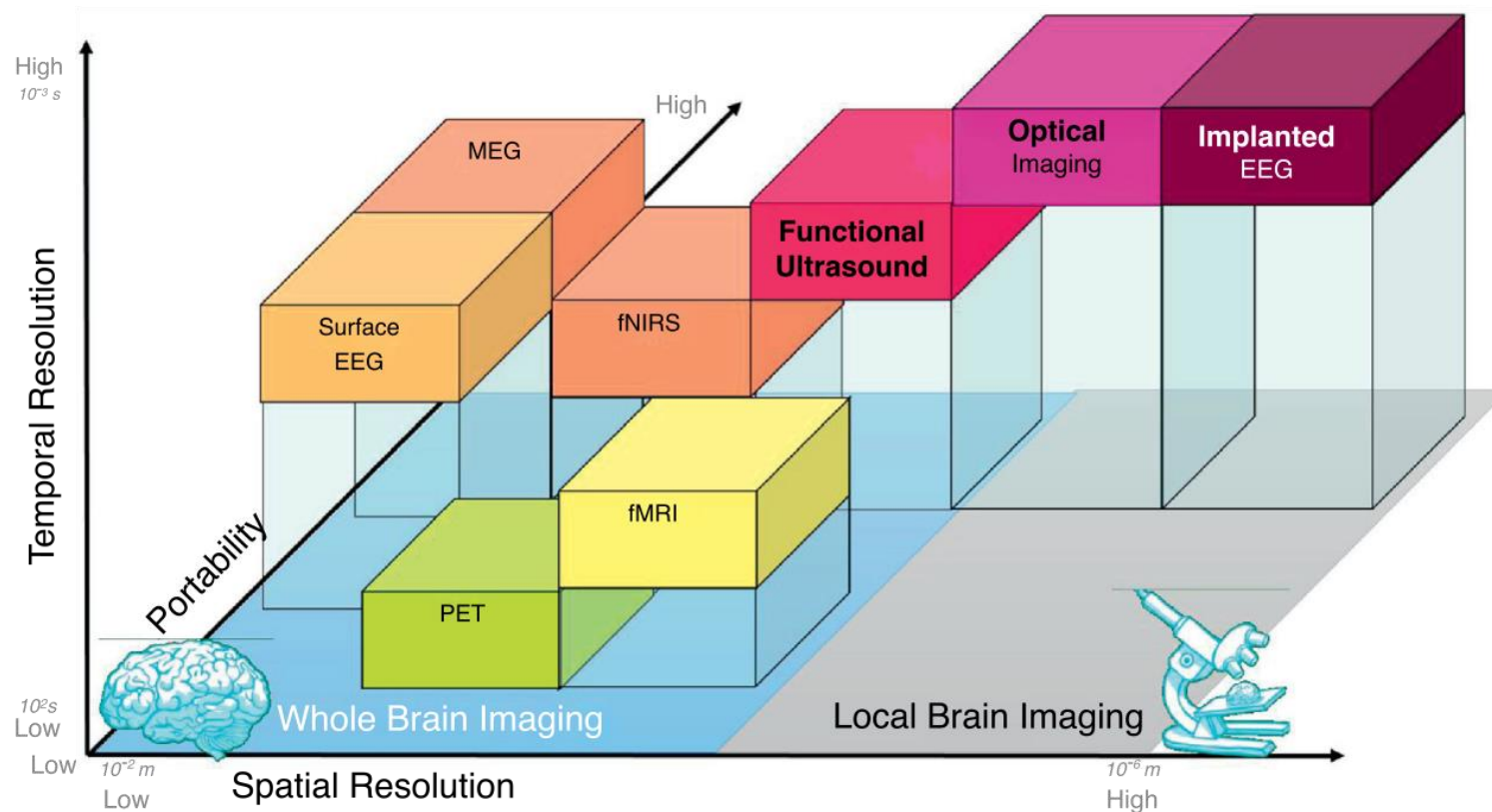


How Meditation Changes the Brain

Boung-chul Lee
Korean Academy of Meditation in Medicine

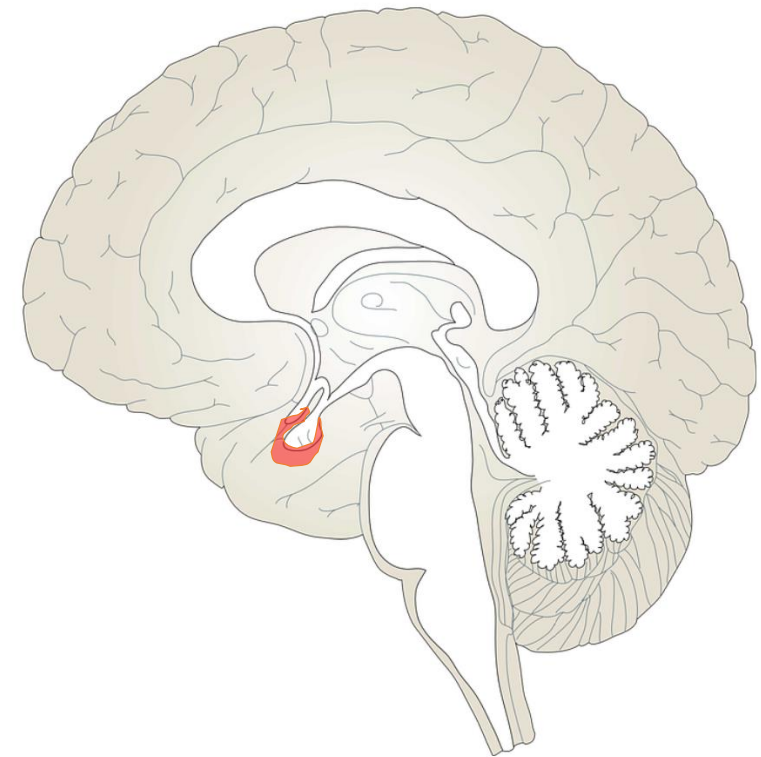
Tools of Brain Function Study

	Spatial resolution	Temporal resolution	Cost	Invasion
fMRI	1mm	6-10s	high	none
EEG	1cm	1ms	medium	none
PET	4mm	1min	Very high	Radiation



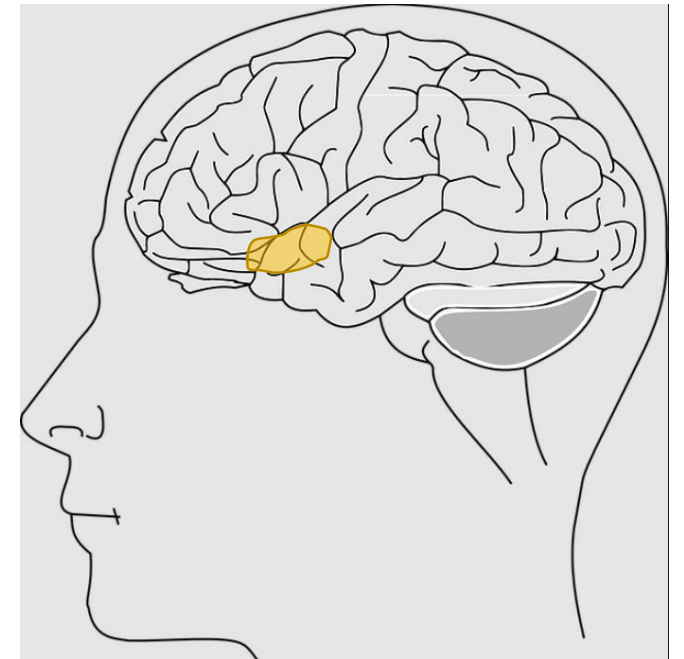
Amygdala

- Feelings of fear and anxiety
- Activated in case of PTSD
- Activity suppressed by prefrontal cortex
- Activity reduced by mindfulness meditation



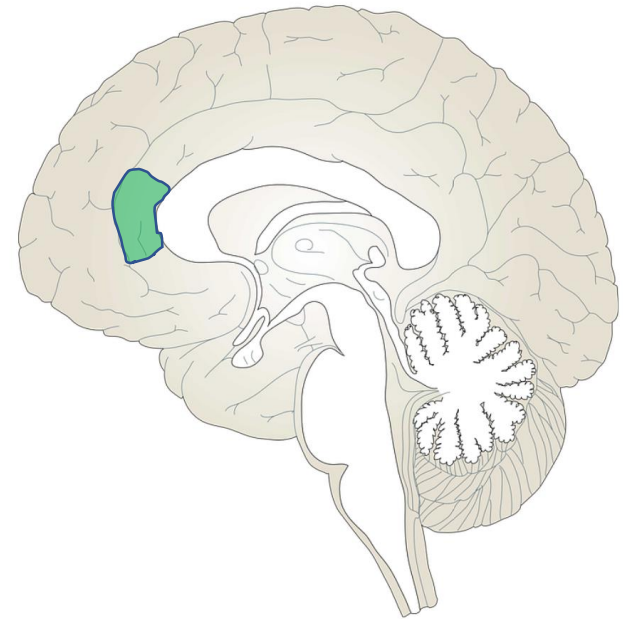
Insula

- Activates sympathetic nervous system in executive functions (Vargas, 2016)
- Regulates cognitive function & emotion (Mrazek , 2016)
- Interoceptive sensation
- Activated after meditation practice / Cortex thickened in advanced meditation practitioners (Tang, 2015)
- For advanced practitioners, insula was more activated to negative sound stimuli (Lutz, 2008)



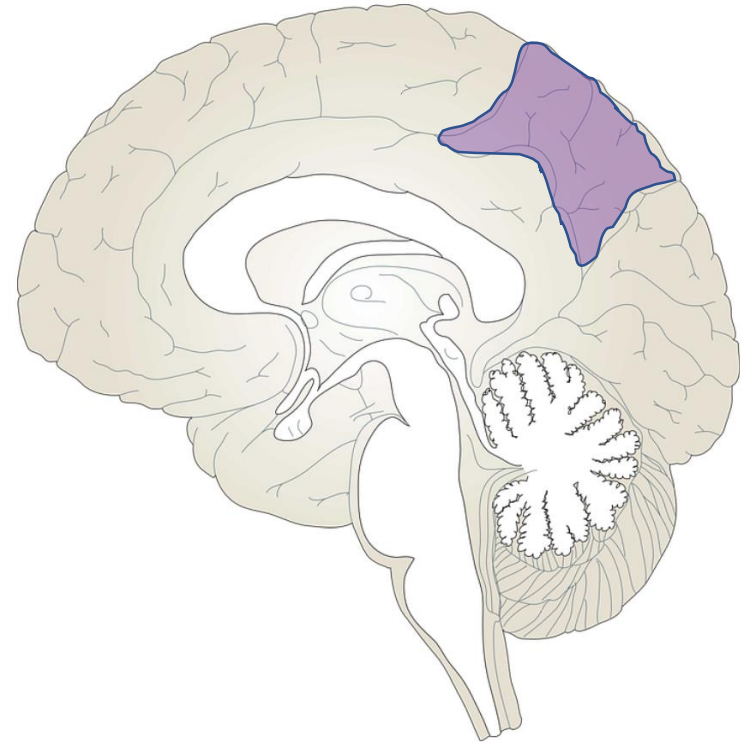
Anterior Cingulate Cortex (ACC)

- Attention allocation, impulse regulation, emotional regulation
- Abnormal findings in ADHD & OCD
- Sustenance of attention during meditation / Activity reduced for advanced meditation practitioners



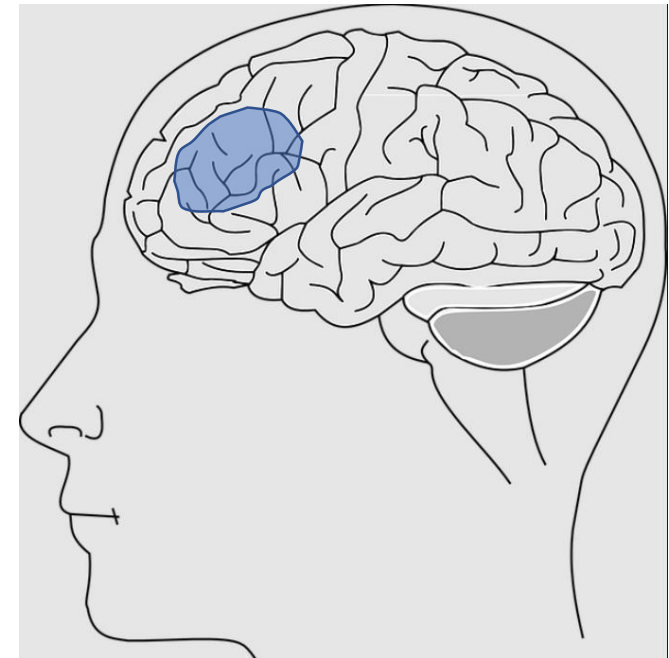
Precuneus

- Default mode network (Buckner, 2008)
- Reduced activity in advanced practitioners / Beginning practitioners also showed reduced activity in precuneus in the state of meditative absorption (Brewer, 2014)
- Strengthened from mindfulness training for ADHD patients (Bachmann, 2018)



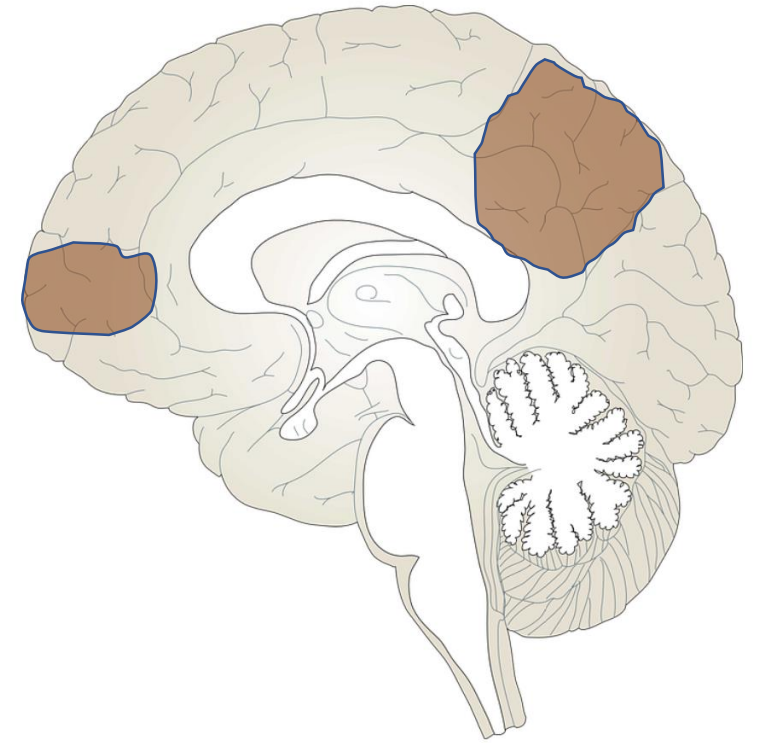
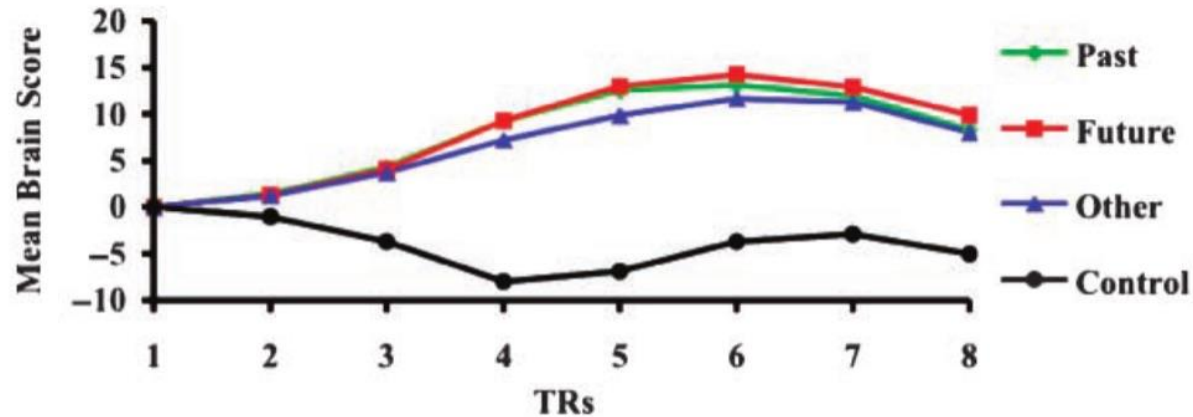
DLPFC; Dorsolateral prefrontal cortex

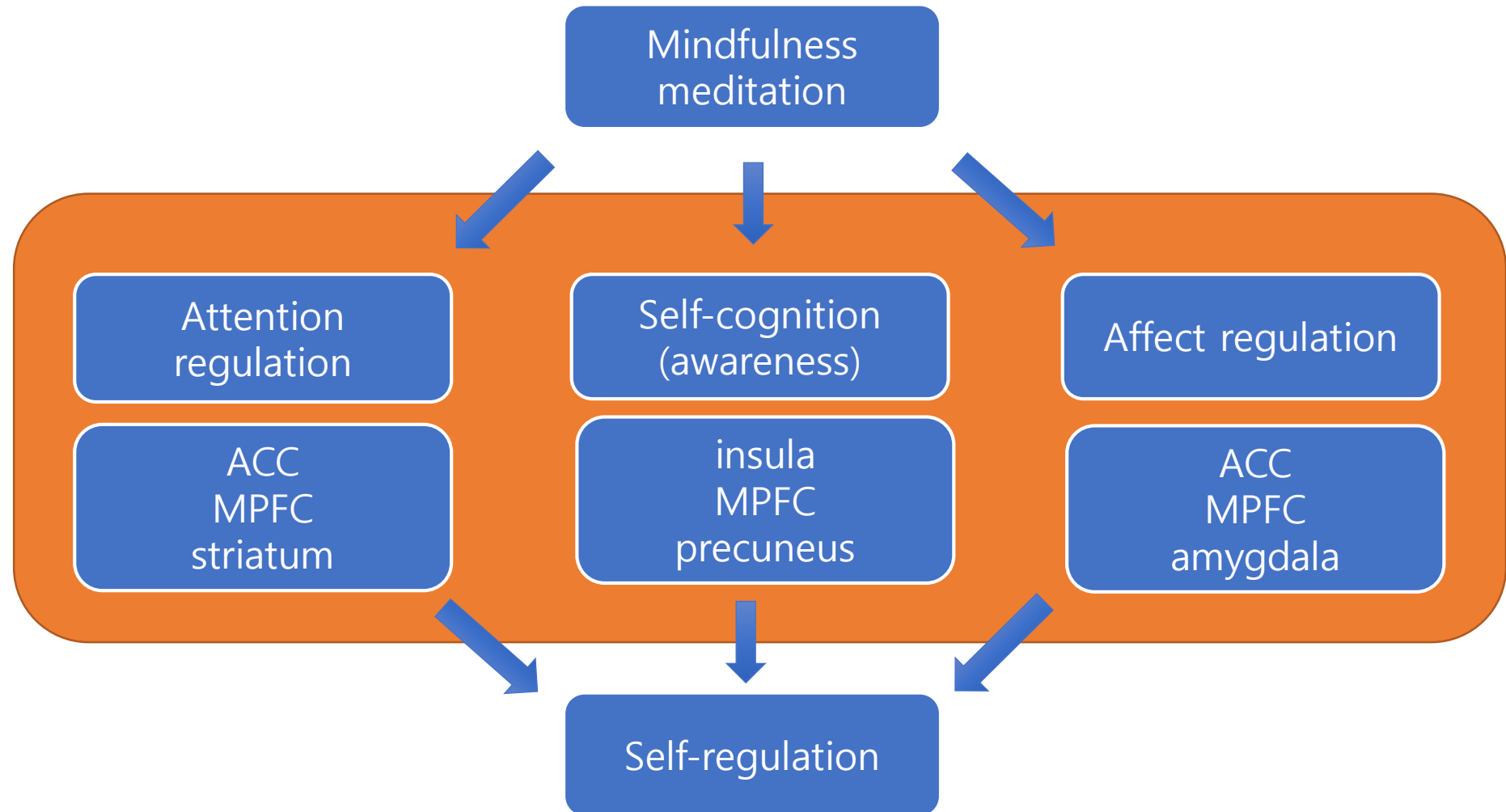
- Engages in mental concentration
- Self-control and self-regulation which enable final conclusion by putting together various information
- Activated in beginning practitioners but reduced activity in advanced practitioners

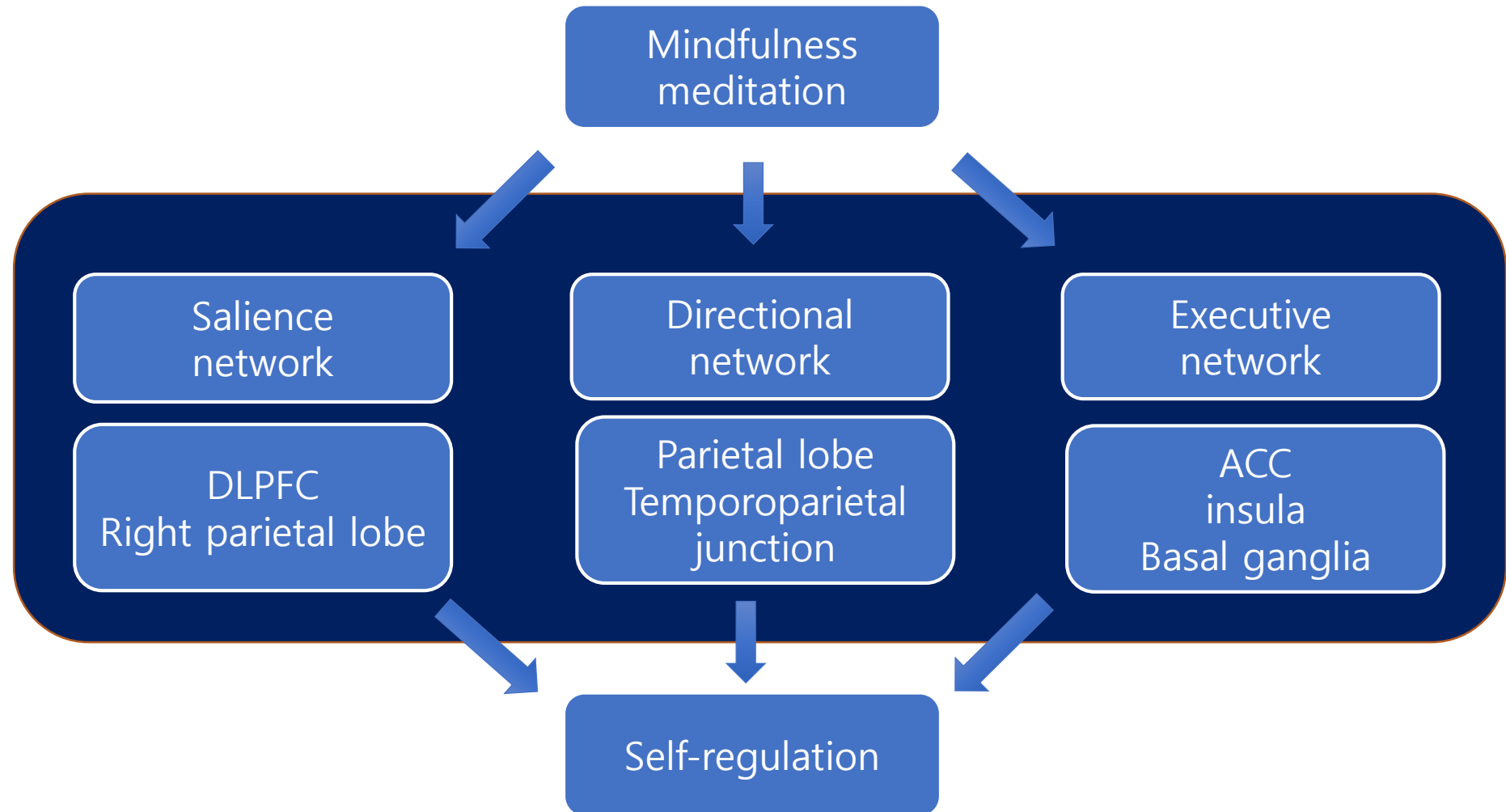


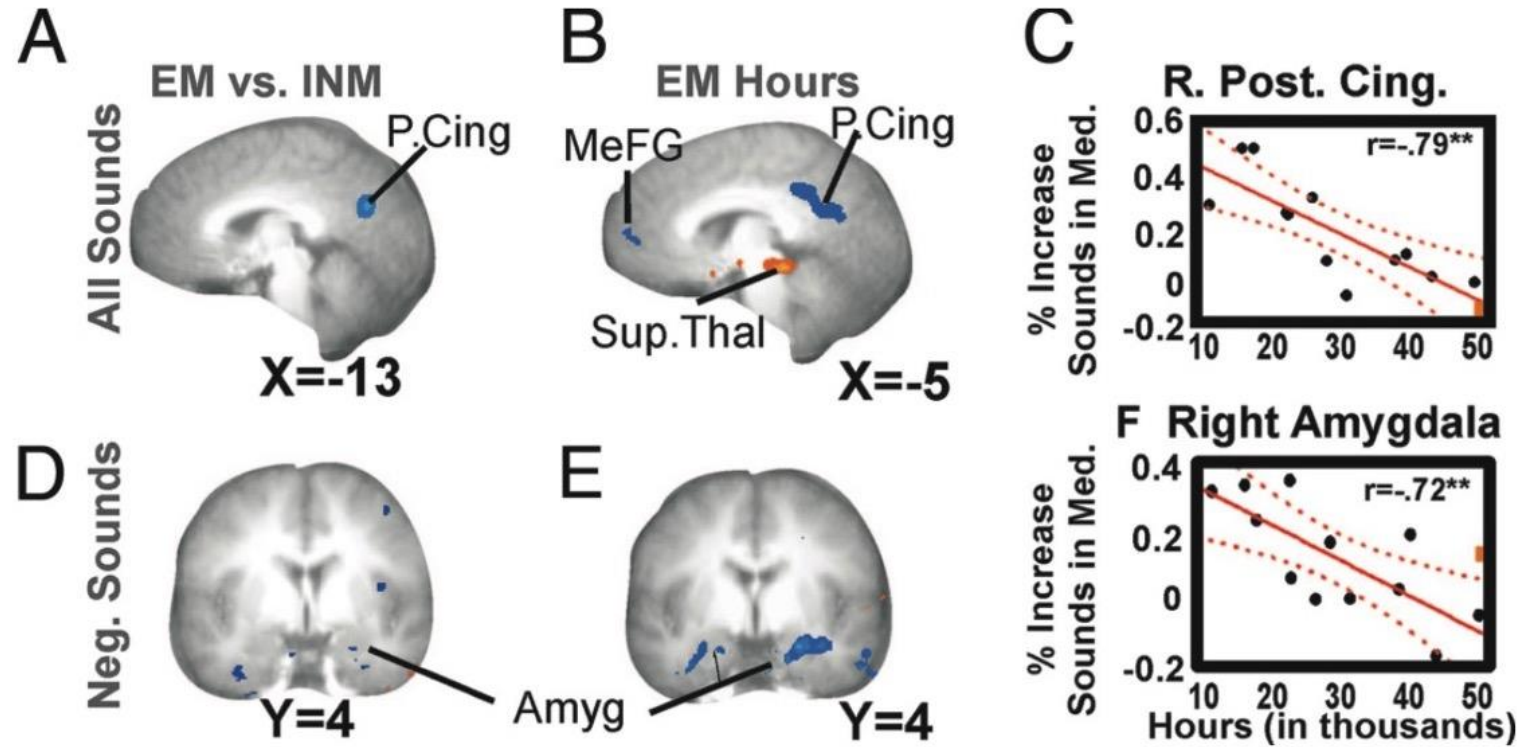
DMN; Default Mode Network

- Zoning out, daydreaming
- Activated when thinking about the past or future (Spreng, 2010)
- Activation reduced through meditation (Fox, 2014)



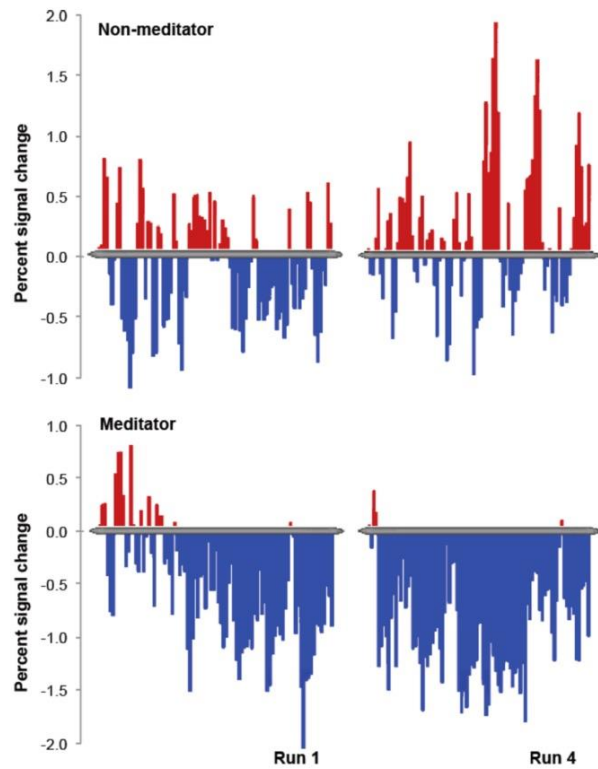




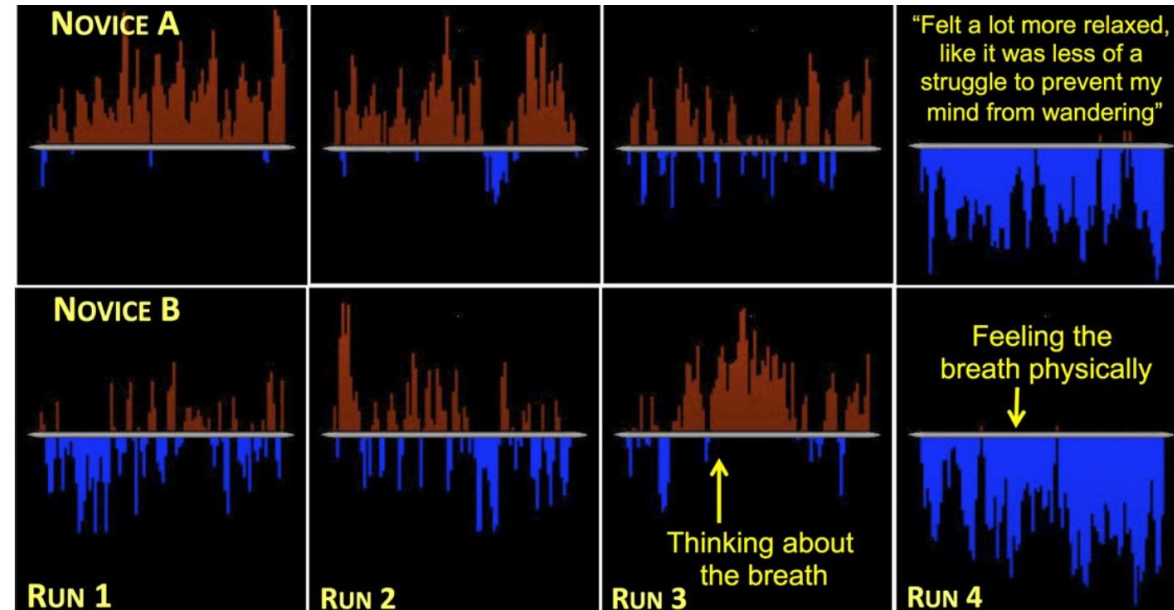


With more advanced practice, more reduced activity in right posterior cingulate cortex toward noise

With more advanced practice, more reduced activity in right amygdala toward negative noise

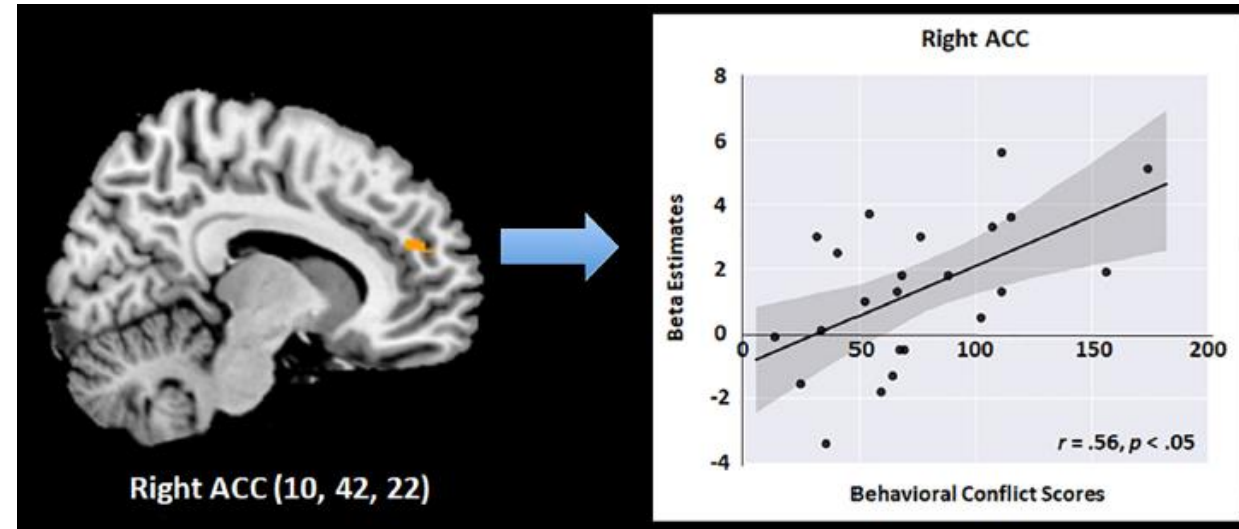
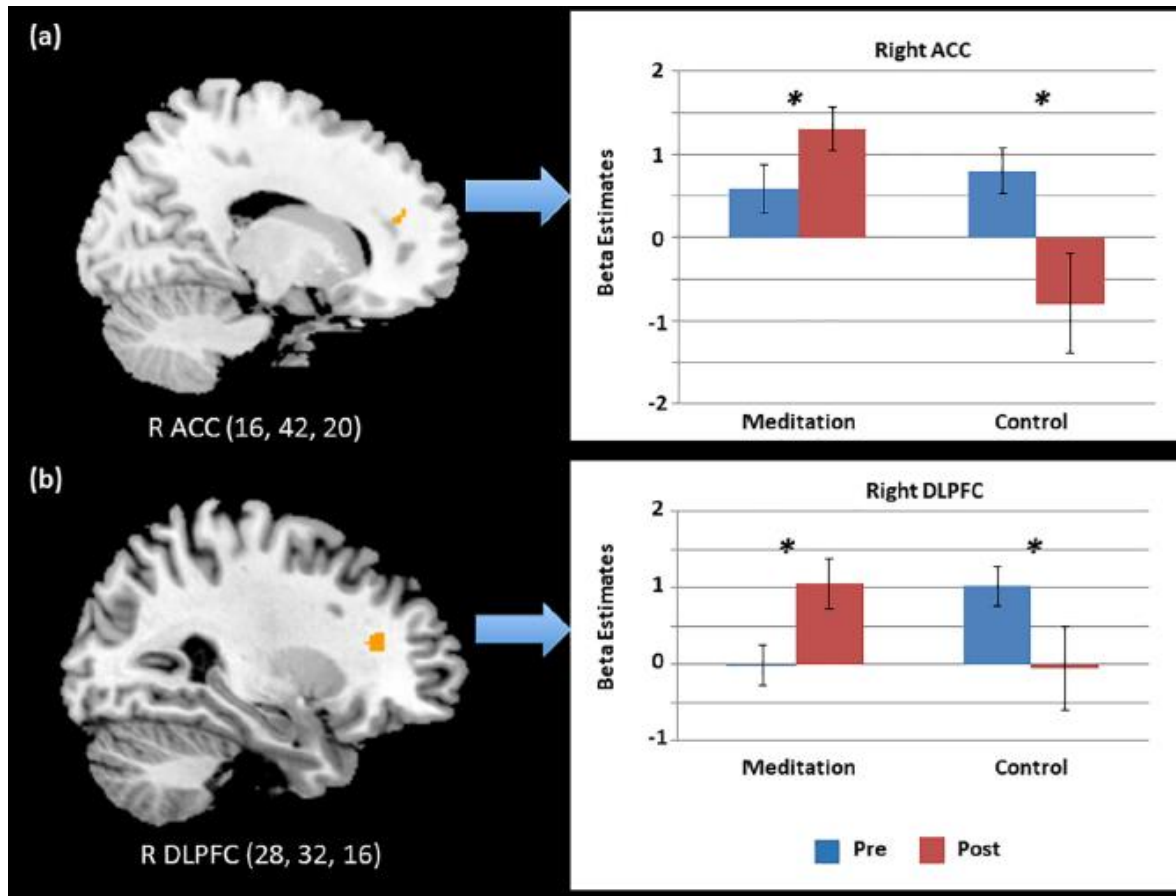


(Garrison, 2013)



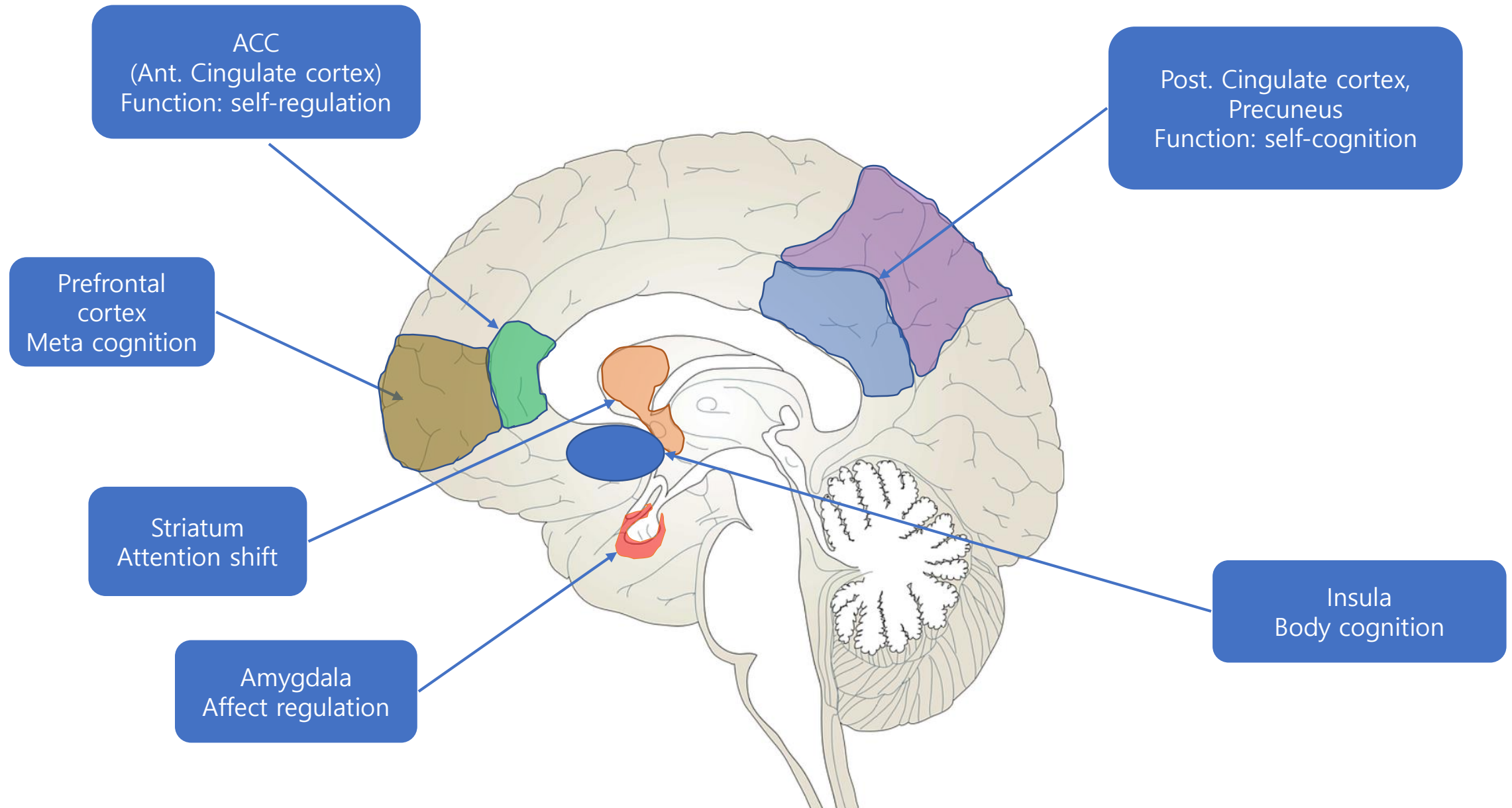
(Brewer, 2014)

Activity of posterior cingulate cortex reduced during meditation practice
or in the state of meditative absorption



At short meditation experiences (like Templestay) activity increased in ACC & DLPFC when attention level was examined.

Brain areas activated from meditation





Thank You!