New insights on the contribution of medial prefrontal cortical regions for the flexible adaptation of active avoidance responses during threat.

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Introduction
• The medial prefrontal cortex (mPFC) has been implicated in active avoidance responses during threat.
• However, how distinct subregions of the mPFC contribute to avoidance remain unclear.
• Inhibitory activity (but not prefrontal) is needed for shuttle avoidance (Moscarito 2013).
• Prefrontal activity (but not inhibitory) is needed for platform-mediated avoidance (Braço-Rivera 2014).
• We revisited the contributions of the IL and PL regions, as well as inputs from the hippocampus, during a new dynamic platform avoidance task, using optogenetic-mediated neuronal silencing.
• Some implications for cognitive and behavioral inflexibility are discussed.

Brain regions of interest

Dynamic platform avoidance task

Validation of the new dynamic platform avoidance task in males and females

Conclusions
• The dynamic platform task is effective for studying the acquisition and adaptation of active avoidance responses.
• Tone is the main predictor of shock.
• Actively oriented towards the allocation of information to allow the flexible adaptation of active avoidance.
• PL activity seems trivial (though, see Diehl et al., 2018).
• Hippocampal inputs contribute to active avoidance.
• Collectively, these findings suggest that prefrontal cortical integration is essential for adapting avoidance responses.

Future Directions
• The current research project investigates the roles of distinct prefrontal cortical regions in active avoidance and behavioral flexibility.
• Using similar methodology, new projects in the lab are exploring the impact of aging to produce mPFC dysfunction and behavioral inflexibility.
• Understanding the neural mechanisms underlying age-associated cognitive impairments (i.e., behavioral inflexibility) could provide new insights for the development of novel strategies that may be effective to prevent age-related cognitive decline and improve quality of life during aging and/or neuropathological disease (e.g., Alzheimer's)

References

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