Our unrestricted connectivity analysis revealed patterns that were largely in line with what we hypothesized from the visual neuroscience literature. First, significant increases in functional connectivity were observed in brain regions such as the supramarginal gyrus, angular gyrus, and lateral occipital cortex, areas implicated in the categorization of visual information and other higher order visual processes (cannon et al 2007). Similarly, increases in functional connectivity were observed in areas like the precuneous cortex, intracalcarine cortex , brain regions associated with consciousness and visio-spatial imagery (al-ramadhani et al 2021, Nakamura et al 2020) as well as in the cingulate cortex, an area implicated in emotion regulation (stevens et al 2011).

Additionally, we observed that these increases in functional connectivity were significantly correlated to decreases in amygdala reactivity during a fear task as reported in Cushing et al (2023), such that the greater the increase in functional connectivity pre- to post-treatment, the greater the decrease in amygdala reactivity pre- to post-treatment.

In the context of a neuro-reinforcement trial, these results are unsurprising considering the reinforcement of the Ventral Temporal Cortex as a target. The repeated rewarding of VTC activation could possibly influence downstream processes, strengthening the connectivity of those areas in the network that we observed. Furthermore, increases in functional connectivity in areas of the brain such as the cingulate cortex provide a potential bridge between VTC reinforcement and amygdala decreases by modulating one’s ability to regulate emotions on a neural level.

Our primary strength in this analysis lies with the sample of participants with clinically diagnosed animal phobias. Even as previous trials (taschereau dumochel, cortese, 2018) have observed reductions in amygdala reactivity from neuro-reinforcement, finding evidence of intermediate changes in a phobic sample further validates the possibility of neuro-reinforcement as an intervention for those struggling most severely from animal phobias and other fear disorders.