Aarathi Devi Abstract
Interaction between viral infection and parasitoid resistance in Drosophila

The question of the why genetic variation persists in natural populations given natural selection, which is expected to erode such variation, is one of perennial interest. *Leptopilina boulardi*, parasitoid wasps, are small insects of the hymenopteran superfamily And their relationship with *Drosophila* has been a topic of interest. Parasitized *Drosophila* larvae ultimately die before maturation and subsequent reproduction. The impact of a rogue viral infection was observed in one set of lines in *D. mauritiana* suggests that flies infected with virus may be less likely to resist parasitism than uninfected flies. This has led us to hypothesize a role for coinfection in selecting against the fixation of resistance genes. Our primary goal in this experiment is to define the interaction between DCV and parasitoid wasp and to outline its effects on the costs of resistance by *D.mauritiana*. The study will be conducted in two separate phases. The first part will consist of introducing the parasitoid to *D.mauritiana* then infecting then flies that survived with DCV. The latter part will essentially be the reverse procedure in which we will first infect the flies with DCV then introduce the parasitoid after the infection. The four different outcomes expected in this experiment are death of wasp and fly, death of fly, alive fly with capsule present, and alive fly with no capsule present. Encapsulation represents the success of the parasitoid in implanting its egg in the fly. Based on our results, we found that virus has no significant effect on fly number. However, we saw that virus significantly increases encapsulation in flies which is in contrary to our original hypothesis. This alludes to an immune priming effect in which the drosophila immune system is already primed by the viral infection and therefore is able to react in a more efficient manner to the parasitoid wasp attack. This phenomenon sheds new light on the interaction of viral infection and drosophila-parasitoid wasp system.

Nick Pasternack Abstract
Modulating the sense of agency using transcranial magnetic stimulation

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We endeavored to learn about the neural underpinnings of the Sense of Agency (SoA) – a key component of neurological and psychiatric disorders. SoA is the sense of being in control of one's actions and thus the consequences of these actions. To modulate brain function, we utilized repetitive transcranial magnetic stimulation (rTMS), a safe, non-invasive form of brain stimulation that temporarily activates or inactivates the functioning of a node in a neural network (Siebner, 2009). Brain imaging studies have identified a neural network activated when manipulating the action-effect coupling (Nahab, 2011). The angular gyrus, AG (Khalighinejad, 2015), and the pre-supplementary motor area, PSMA (Ritterband, 2014), appear to be key nodes in this network. However, activation does not mean functional relevance. We measured SoA indirectly, through Intentional Binding (IB). IB refers to a perceived temporal attraction between an action and its outcome when someone feels SoA (Haggard, 2002). We had healthy participants make brisk hand movements which triggered a tone after a certain delay. We asked participants to estimate this delay when they were responsible for the hand movements (voluntary), when the experimenter moved the participant's hand (pulling), and when the participant observed the experimenter moving (viewing). We used four delays: 100, 400, 700, and 1000 ms. Since participants were in control of the movement for the voluntary condition (but not for the pulling condition), we subtracted the pulling time estimations for each delay from the voluntary time estimations (voluntary-pulling) to calculate the IB values for each delay. During each visit, the participant completed the above experiment both before and after 20 minutes of inhibitory (1 Hz) rTMS over different brain regions. Preliminary results suggest that rTMS over the presupplementary motor area (PSMA) is involved in processes related to SoA. Stimulation of the left angular gyrus (LAG) and right angular gyrus (RAG) had remarkably similar effects. This suggests that both the left angular gyrus (LAG) and right angular gyrus (RAG) may have related functions. Using this method in patients with disorders of volition with impaired SoA could provide new insights into the roles various brain regions play in complex movement disorders.