Distinct Functions of the Anterior and Posterior Regions of the Dorsomedial Striatum in Decision-Making Behavior

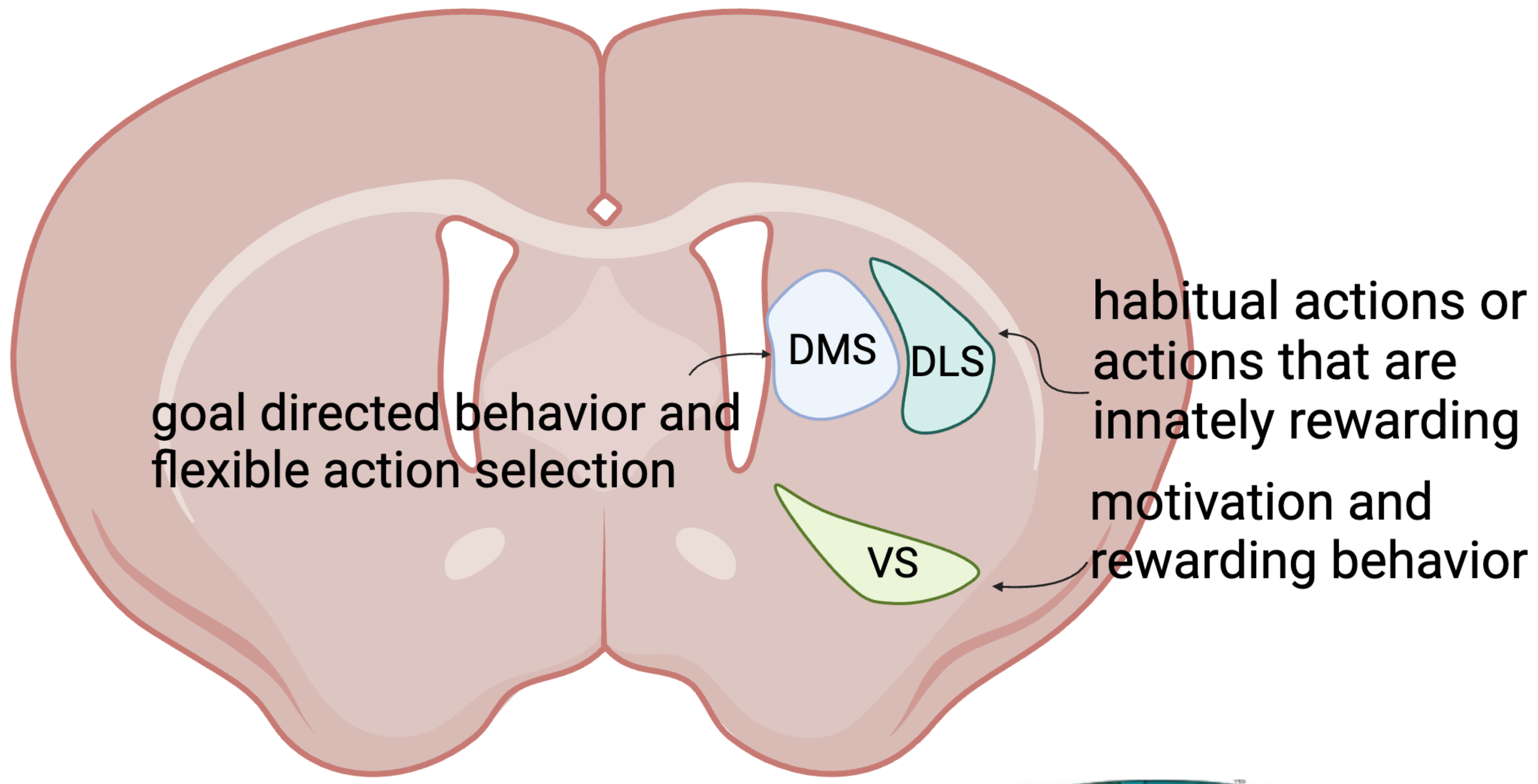
Marcella Soewignjo (COL'25)

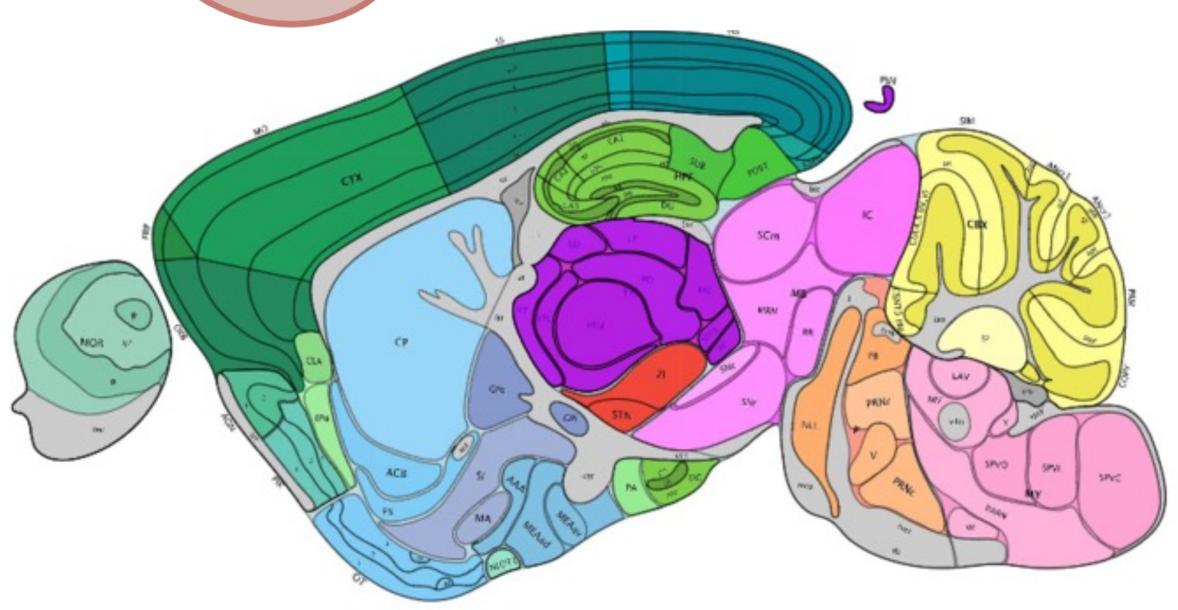
Mentor: Luigim Vargas

PI: Marc V Fuccillo, M.D., Ph.D.

Introduction

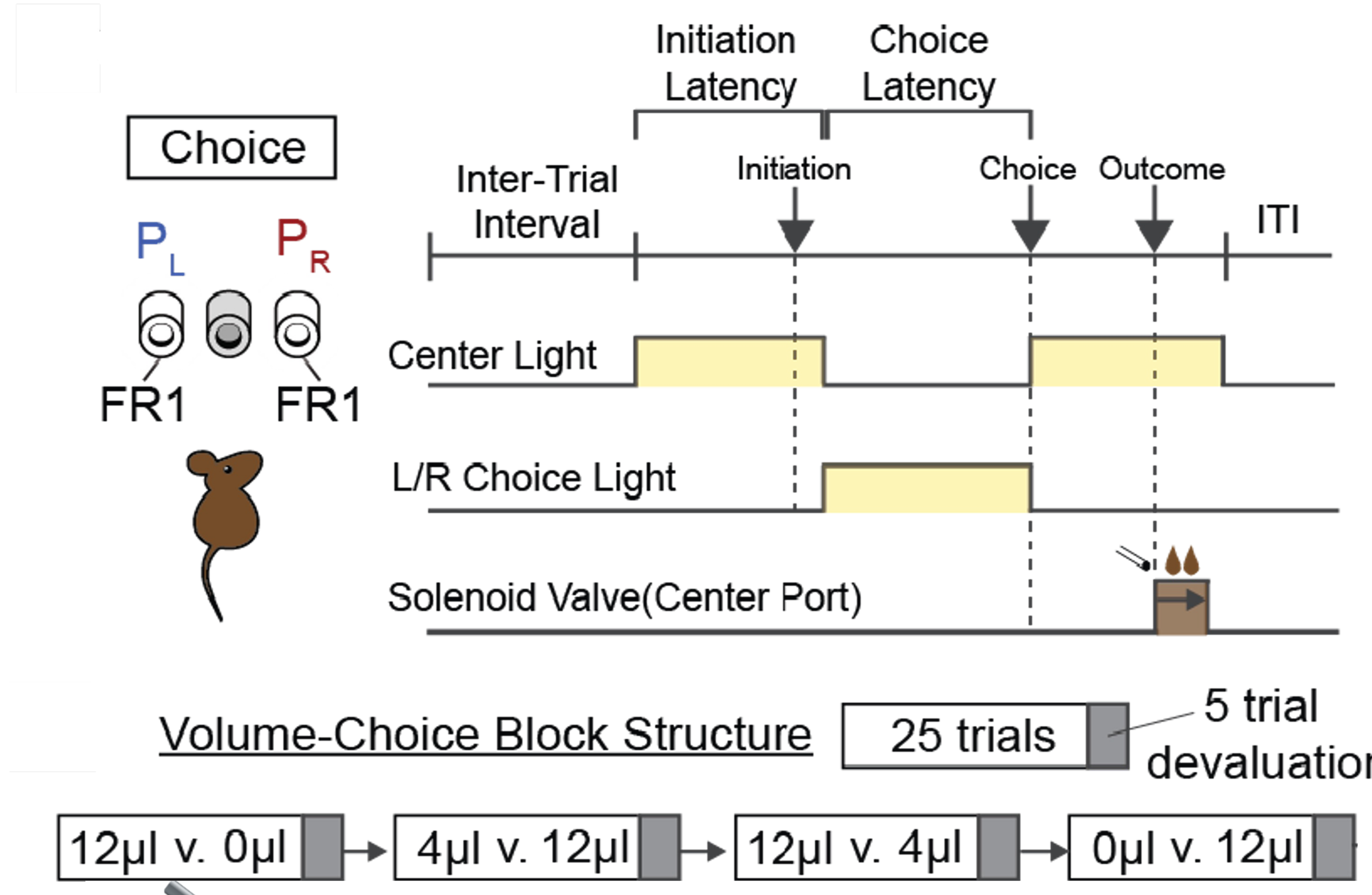
- The striatum is the input nucleus of the basal ganglia, a group of subcortical nuclei implicated in decision-making and reward reinforcement.
- Because of its heavy implication in motivated behavior, altered function of the striatum has been found to be associated with a multitude of psychiatric disorders.
- In mice, the function of the striatum is often observed through three regions: the dorsomedial striatum (DMS), the dorsolateral striatum (DLS), and the ventral striatum (VS).
- While the functional differences between the DMS, DLS, and VS have all been well documented, the differences between the anterior and posterior regions of the DMS are less understood.

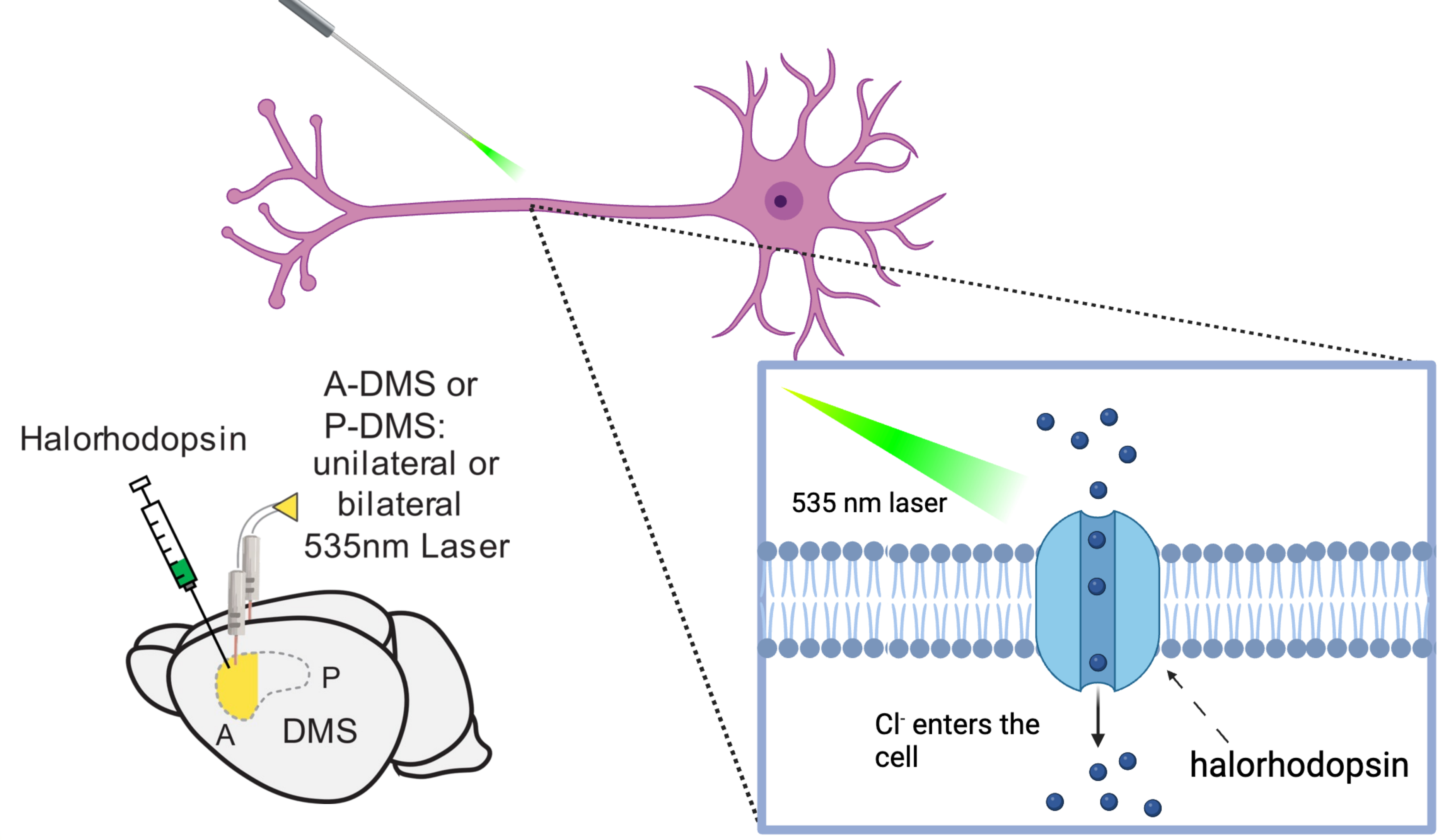




Methods

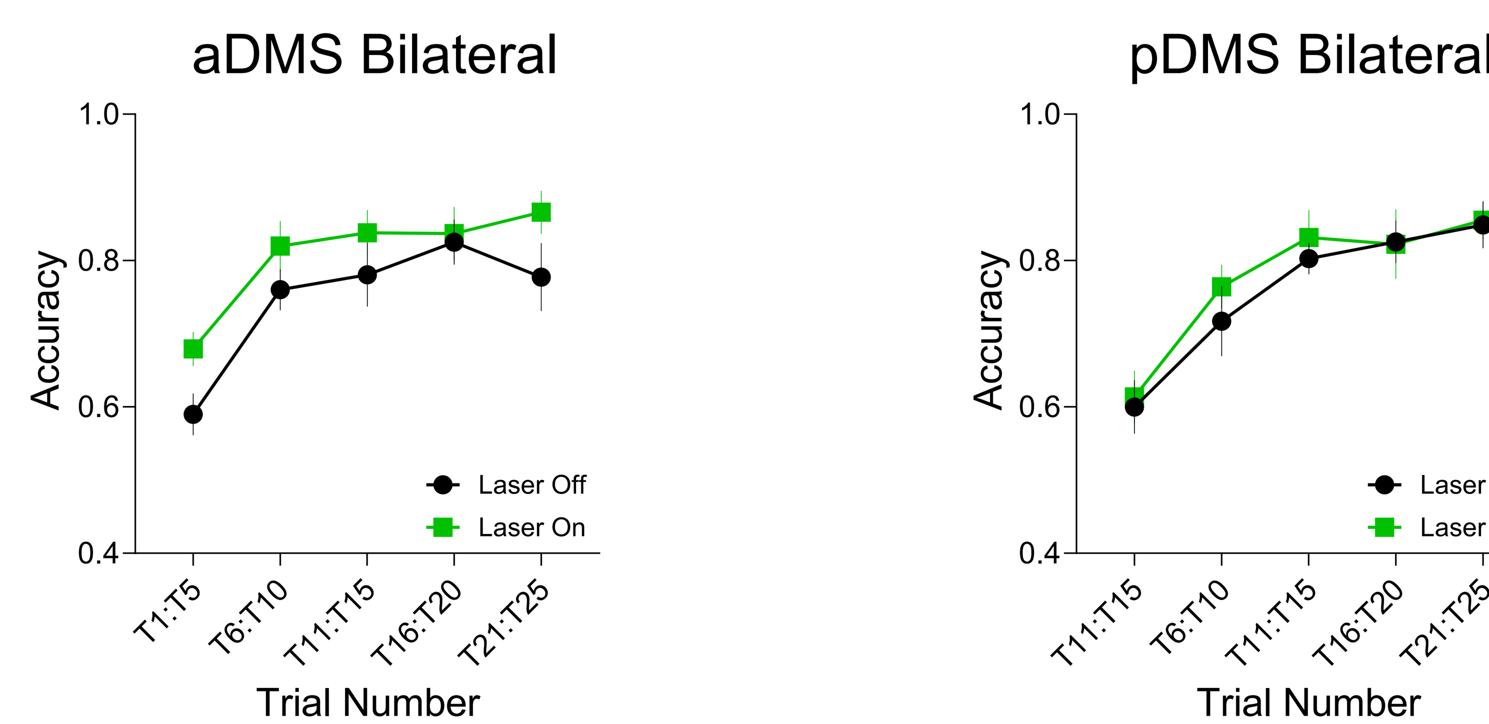
- Mice are trained to complete a decision-making task where they choose between two ports and use feedback to optimize their decisions.
- The mouse performs in blocks of 30 trials each with the left and right ports dispensing reward (chocolate milk) at either 12ul vs. 0ul or 12ul vs. 4ul. The optimal side switches after every block.
- To better understand how the anterior DMS (aDMS) and posterior DMS (pDMS) contribute to this behavioral task, we employ a technique called optogenetics to inhibit each area of the brain in either the pre-choice or post-choice phase.





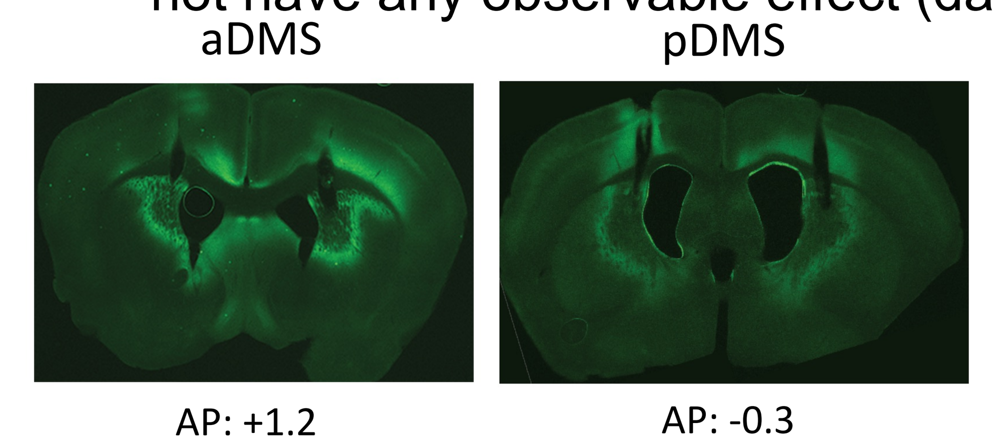
Bilateral Inhibition

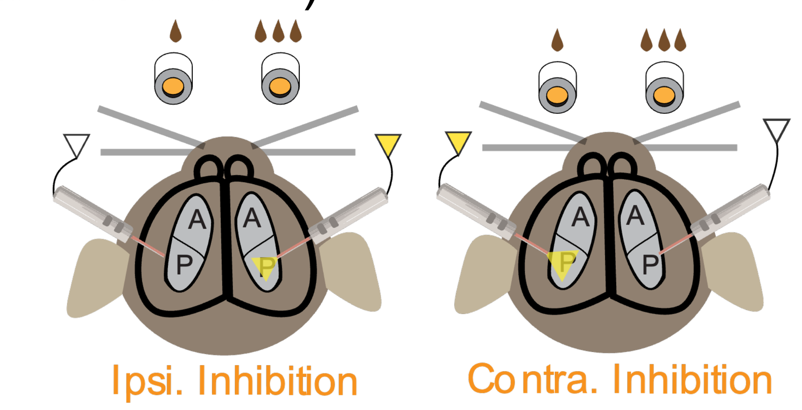
- Bilateral post-choice inhibition of the anterior DMS, but not the posterior DMS, improved the animals' performance.
- Bilateral pre-choice inhibition in either area did not affect the animals' choice or performance (data not shown)

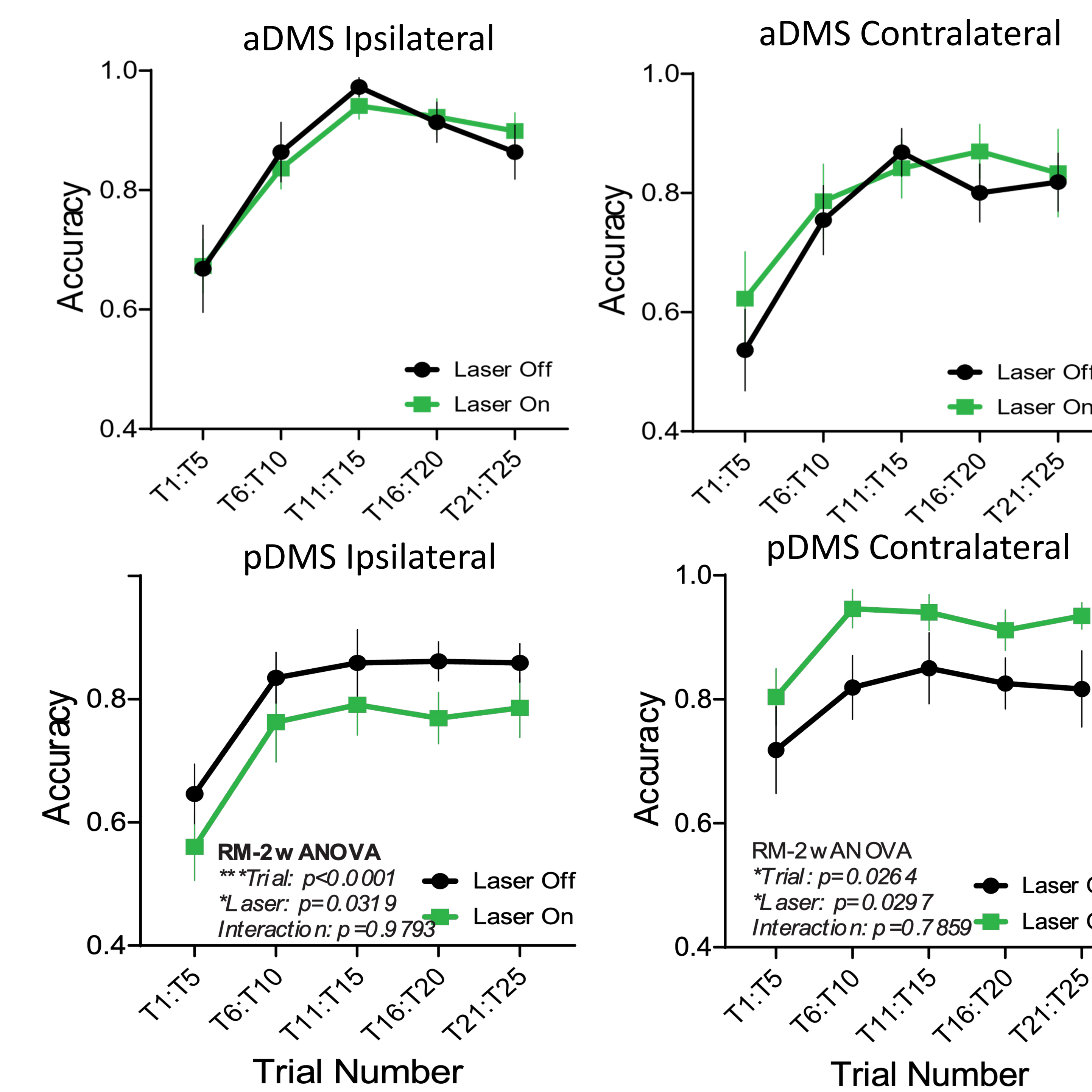


Unilateral Inhibition

- Unilateral pre-choice inhibition of the aDMS did not affect the animal's decision-making behavior.
- Unilateral inhibition of the pDMS in the animal pre-choice biased the animal towards choosing the side contralateral to the laser.
- Post-choice unilateral inhibition of the aDMS and pDMS both did not have any observable effect (data not shown).







Conclusion

- The timing of inhibition in both the aDMS and pDMS pose different results in performance suggesting that both regions of the striatum may have separate functions in decision-making behavior
- This is one part of a series of studies, further experimentation may include recordings and anatomical studies

Acknowledgements

I would like to thank Luigim Vargas (NGG Student) and Marc Fuccillo (M.D., Ph.D.) for the opportunity to participate in this research and for providing me with guidance and mentorship. Furthermore, I would like to thank Career Services for providing me with the financial support to continue participating in this research over this summer.

Perelman School of Medicine
University of Pennsylvania