Examining the role of dissociable frontal-BG circuits in action suppression

Chelsea Lang

University of California Riverside
October 3, 2019

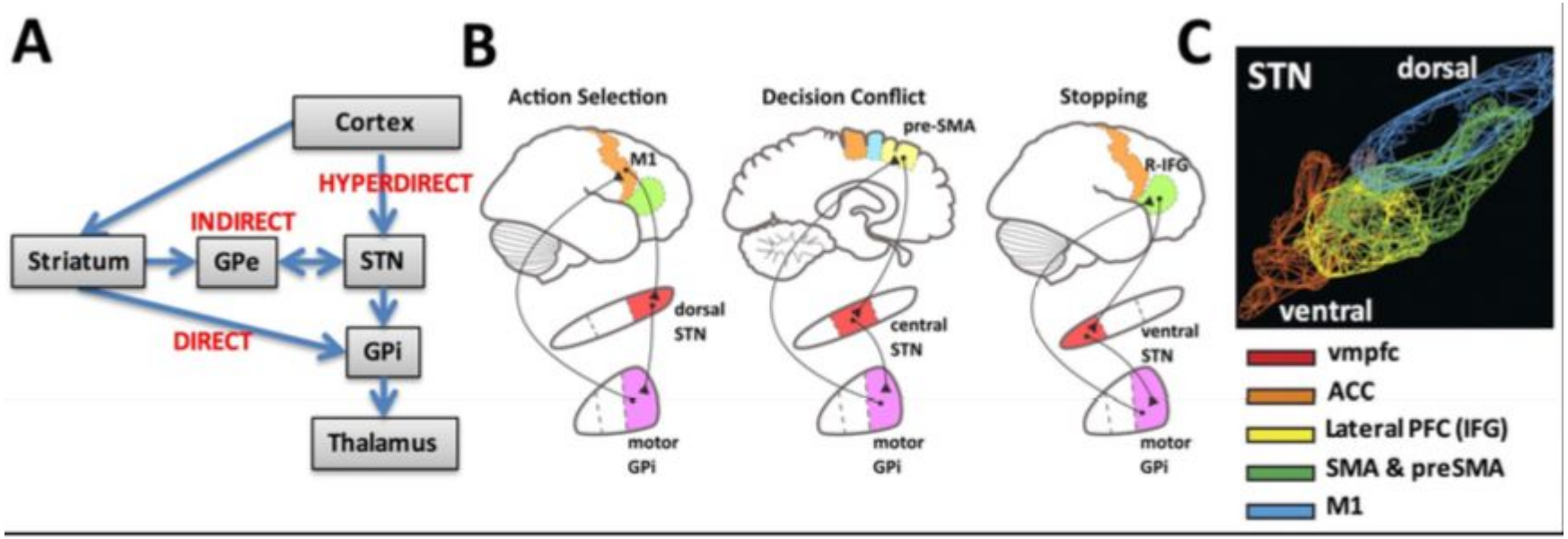
Wagner, Johanna, Christopoulos, Vasileios.

Action Suppression

- Action suppression occurs in: action selection, decision conflict, and outright stopping
- Failure of action suppression contributes to various neuropsychiatric diseases
  - Parkinson's disease (PD) Patients *DO* have action regulation deficits
  - Deep brain stimulation (DBS) in PD patients

Research Question

- Do dissociable frontal-BG circuits mediate distinct action suppresion functions?
  - How are actions regulated?

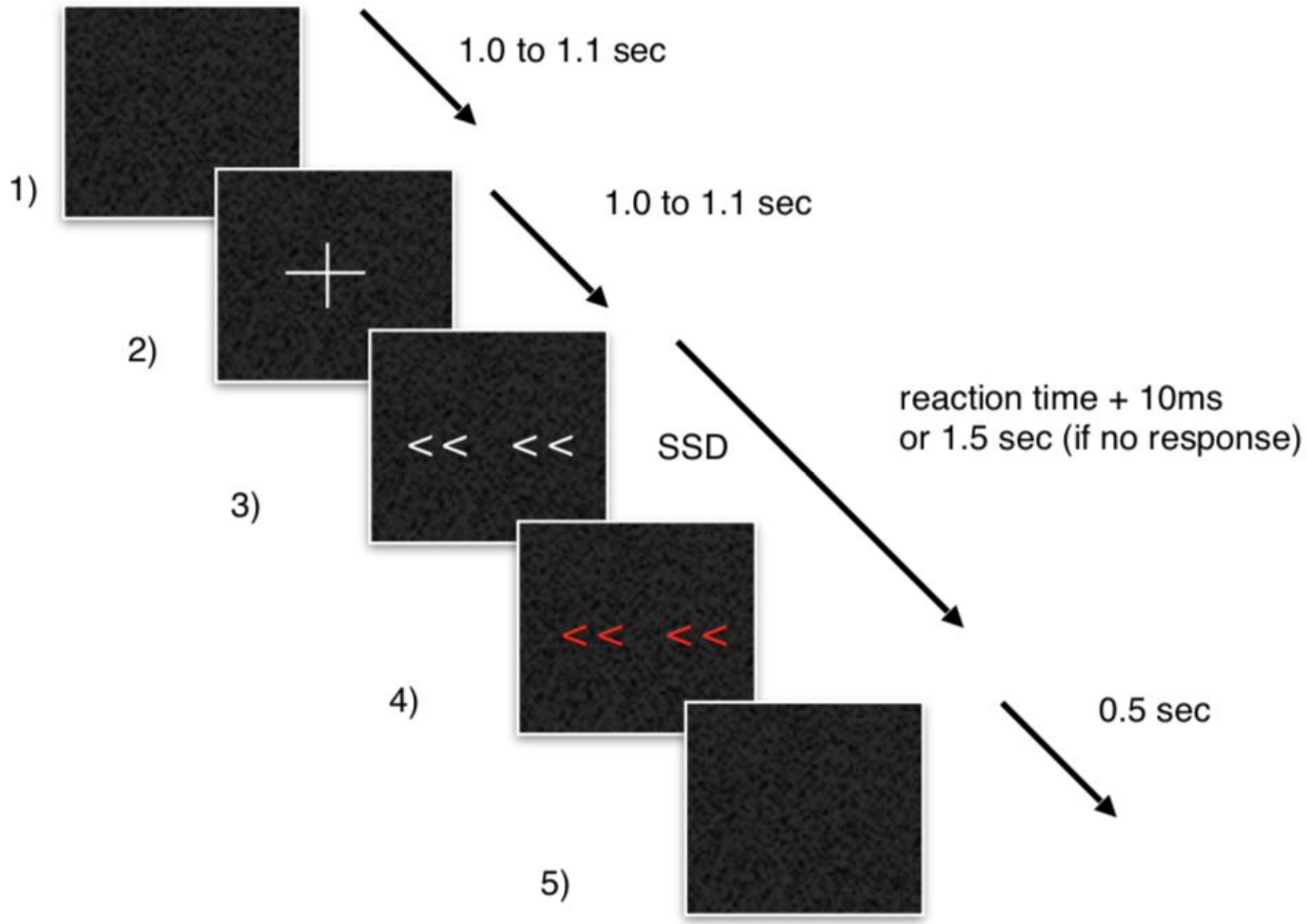


Goals

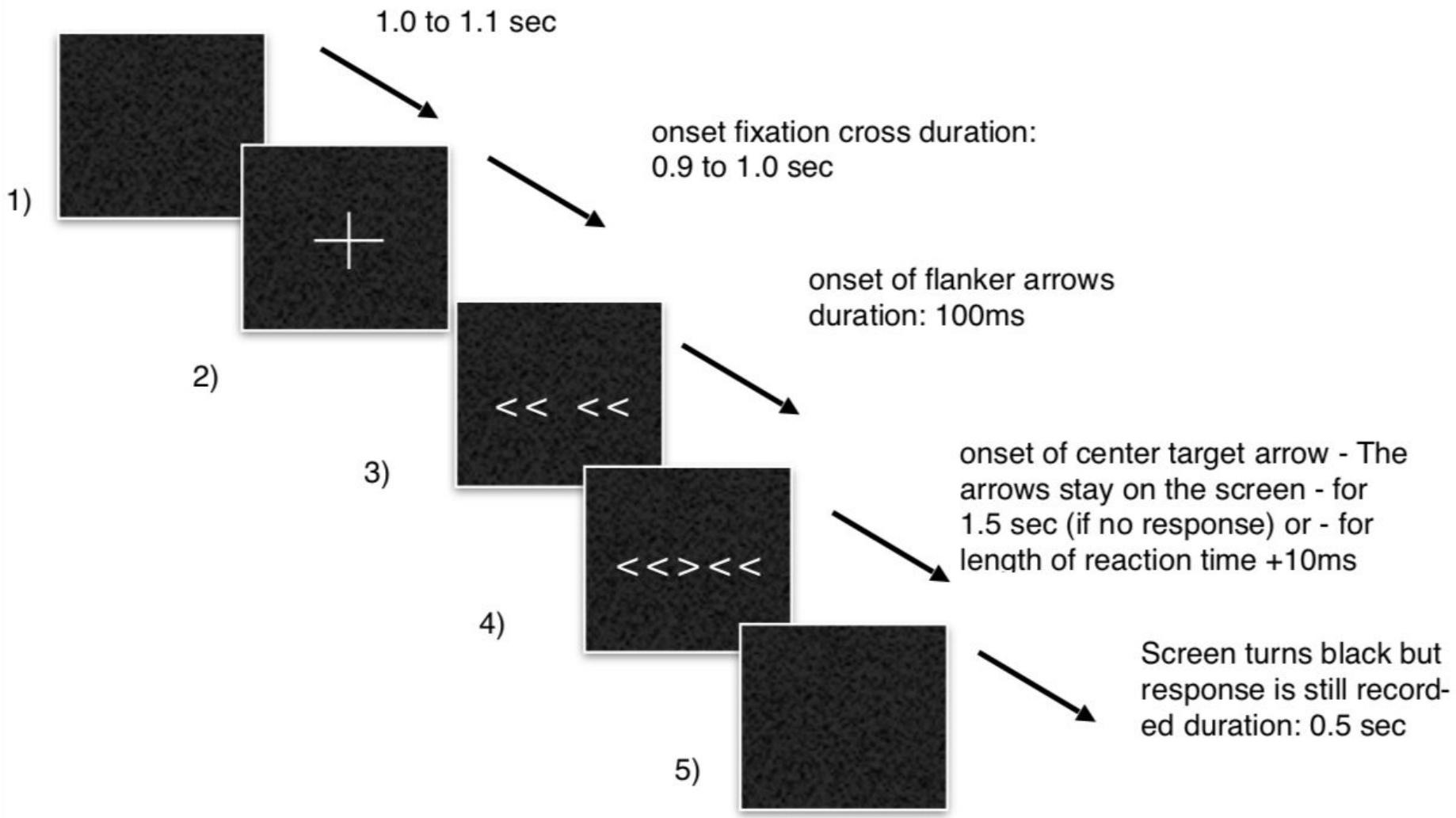
- To demonstrate spatially, temporally, and spectrally dissociable circuits mediate distinct types of action suppression using concurrent ECoG and basal ganglia unit and LFP recordings
- Use fMRI and invasive electrophysiology to test whether DBS differentially modulates distinct action suppression circuits
- To develop a biologically-derived computational model of action choice that includes action suppression

Group	N
Healthy	32
PD	7
Total	39

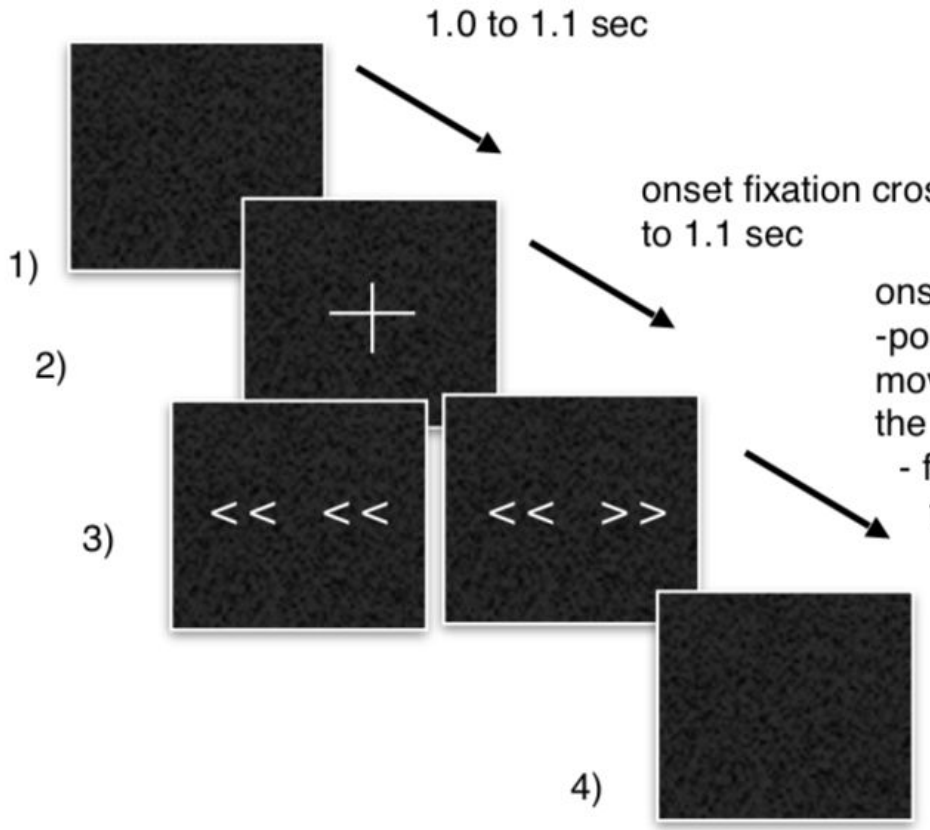
Stop Signal Task



Eriksen Flanker Task



Choice Task

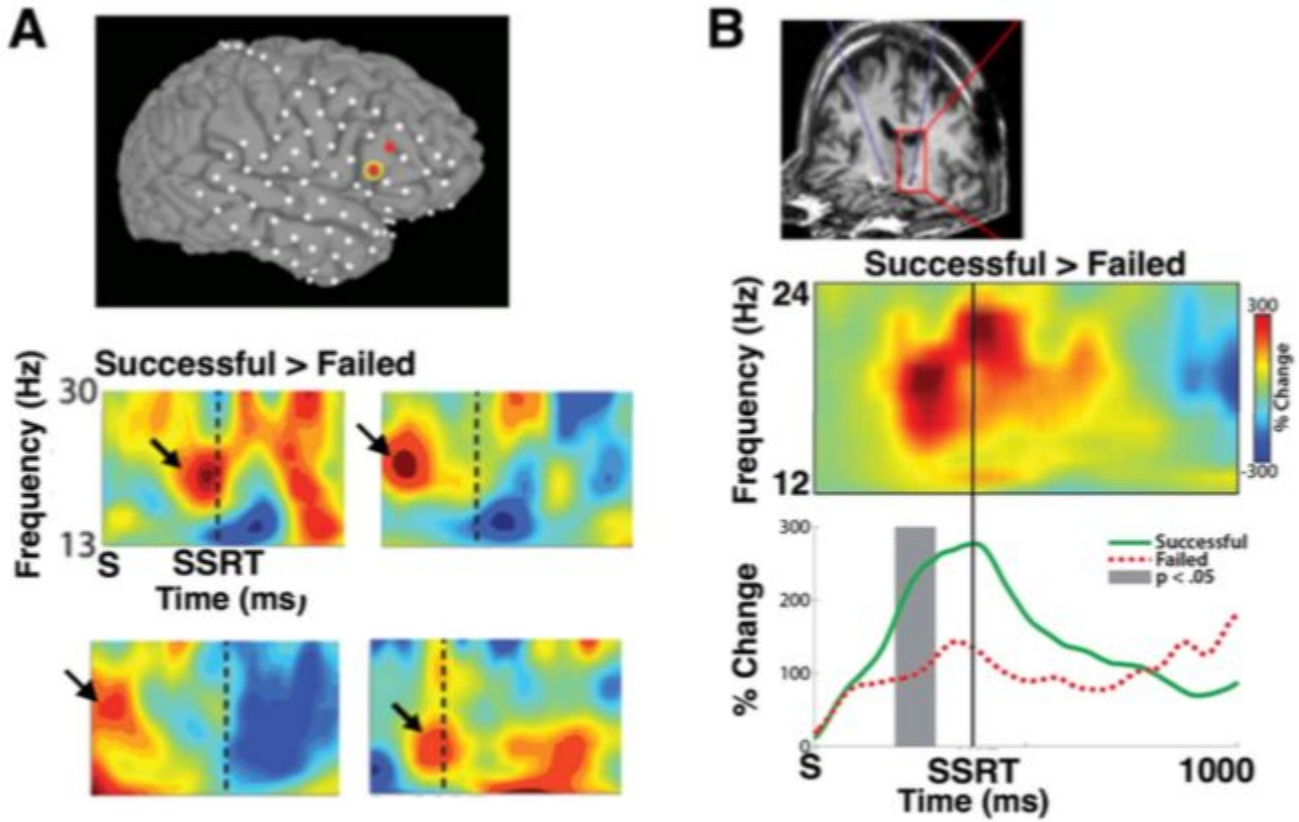


onset fixation cross duration: 1.0 to 1.1 sec

onset of arrows
-pointing < > for free choice or either < or > for cued movement)
the arrows stay on the screen
- for 1.5 sec (if no response) or - for length of reaction time +10ms

Screen turns black but response is still recorded
duration: 0.5 sec

Preliminary Results



Results from Stop Signal Task

Subject	SSD (ms)	SSRT (ms)	Failed RT (ms)	Go RT (ms)
S2	569	265	749	835
S5	499	247	664	746
S6	575	310	732	886
S7	395	243	564	639
S8	252	264	482	516
S12	301	365	839	666
S13	277	368	524	645
S14	343	400	562	743
S17	246	982	NaN	1228
S19	330	239	561	569
S22	365	383	681	748
S23	280	363	630	643
S24	480	50	NaN	660
S25	310	357	621	667
S26	240	396	568	636
S27	195	353	568	548
S30	307	235	515	542
100	278	240	484	519
101	247	259	492	506
103	453	259	NaN	712
AVERAGE	**347**	**329**	**602**	**683**

Results from Eriksen Flanker Task

	Incongruent	Congruent
Subject	RT (ms)	RT (ms)
S6	580	488
S101	502	475
S107	675	563
S111	858	836
S112	628	563
S113	568	527
S117	517	493
AVERAGE	**618**	**564**

Future Directions

Possible contributions to action suppression

- Pause Error Adjustment
- Sequential congruents
- Reaction time