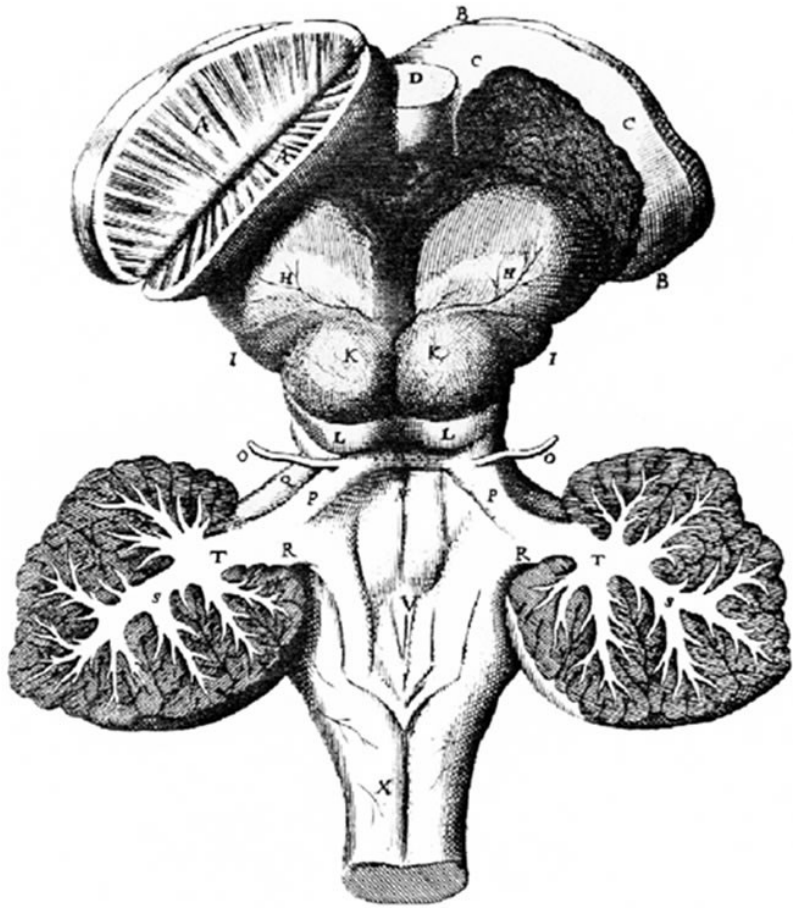
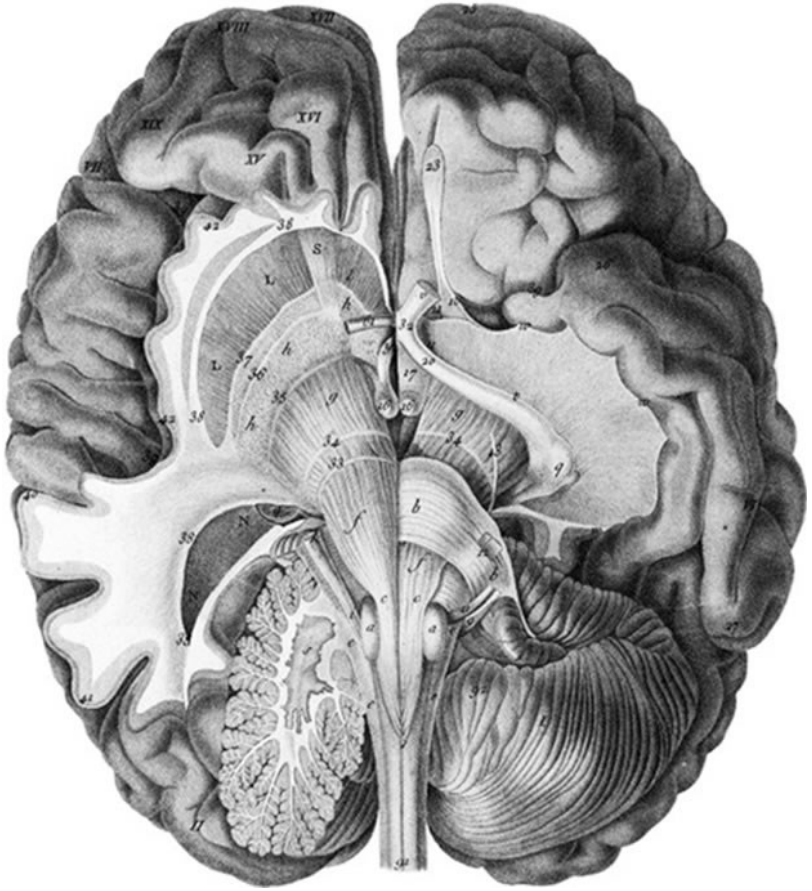
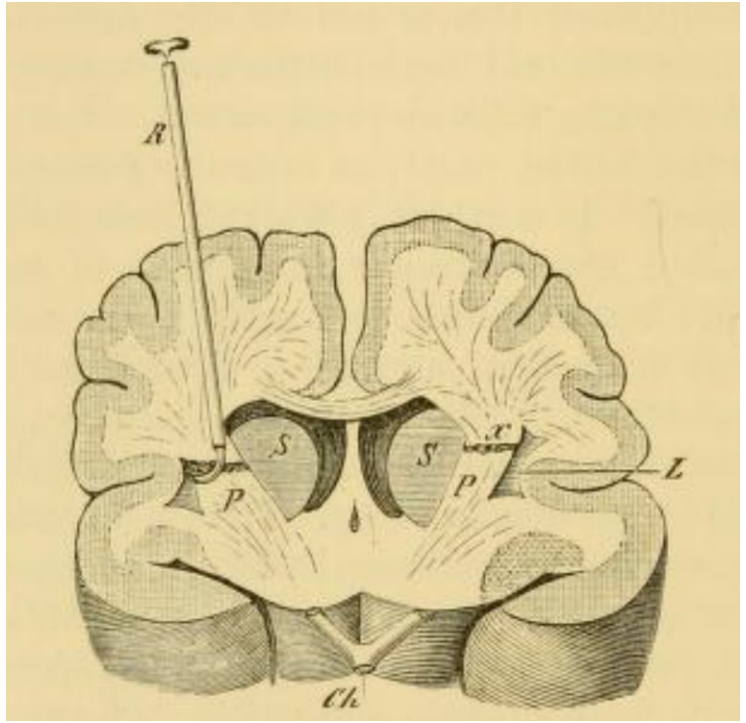
basal ganglia and their contribution to motor control



(Thomas Willis, 1664)

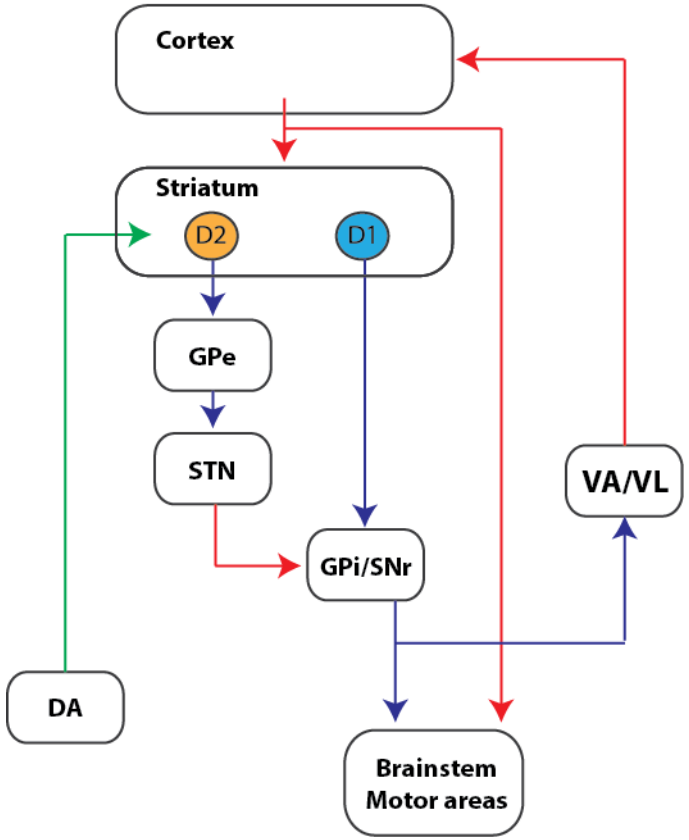


(Franz J Gall, 1810)

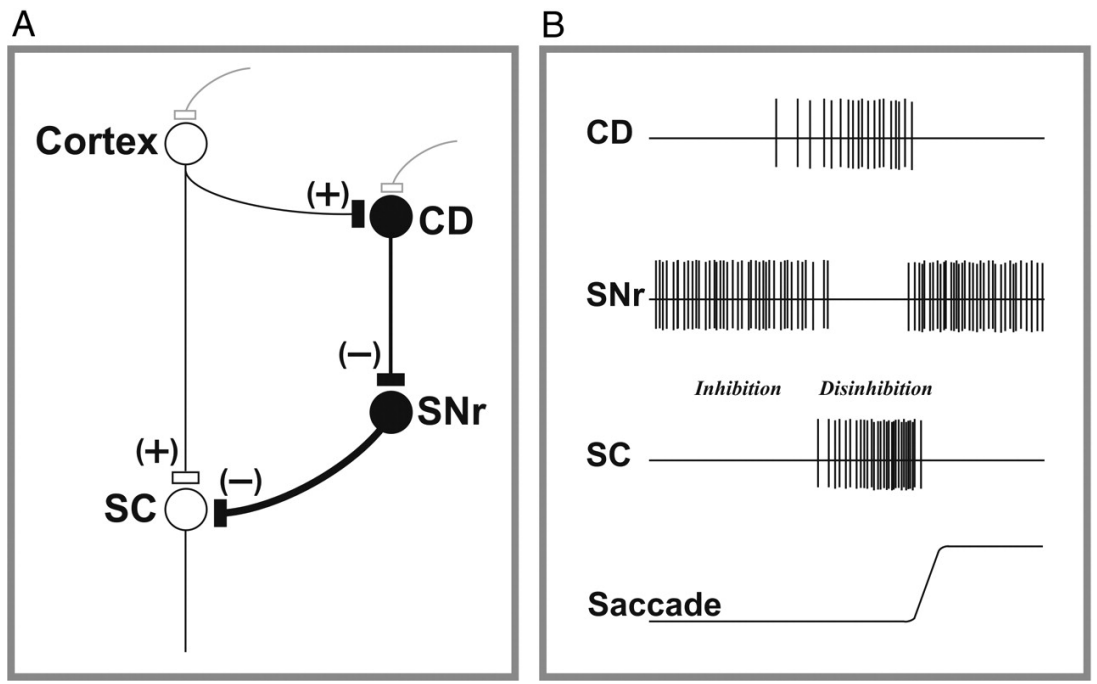


(The Functions of the Brain, David Ferrier, 1876)

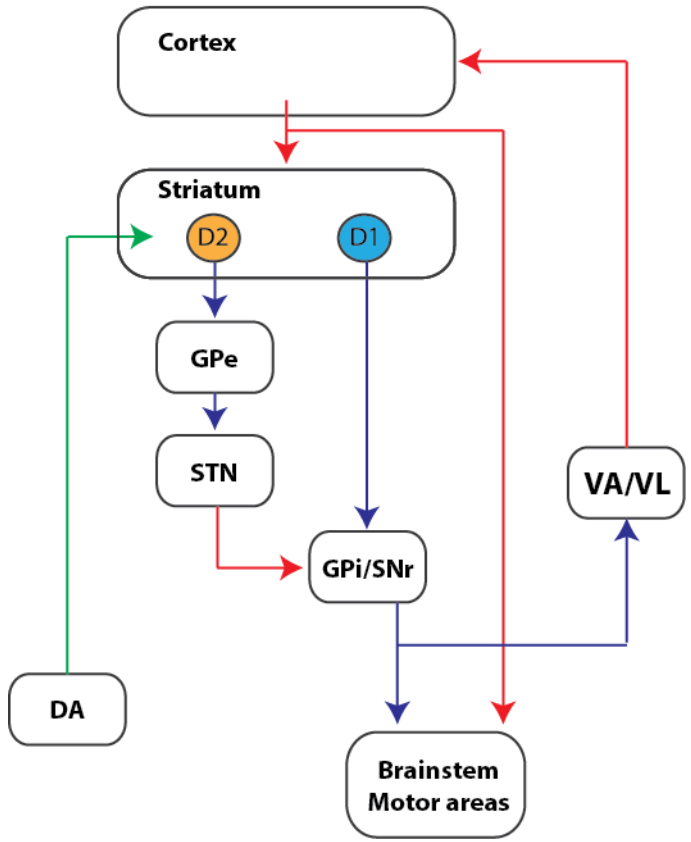
"The corpus striatum is the centre in which movements primarily dependent on volition proper tend to become organized"



(1980 – 1990)

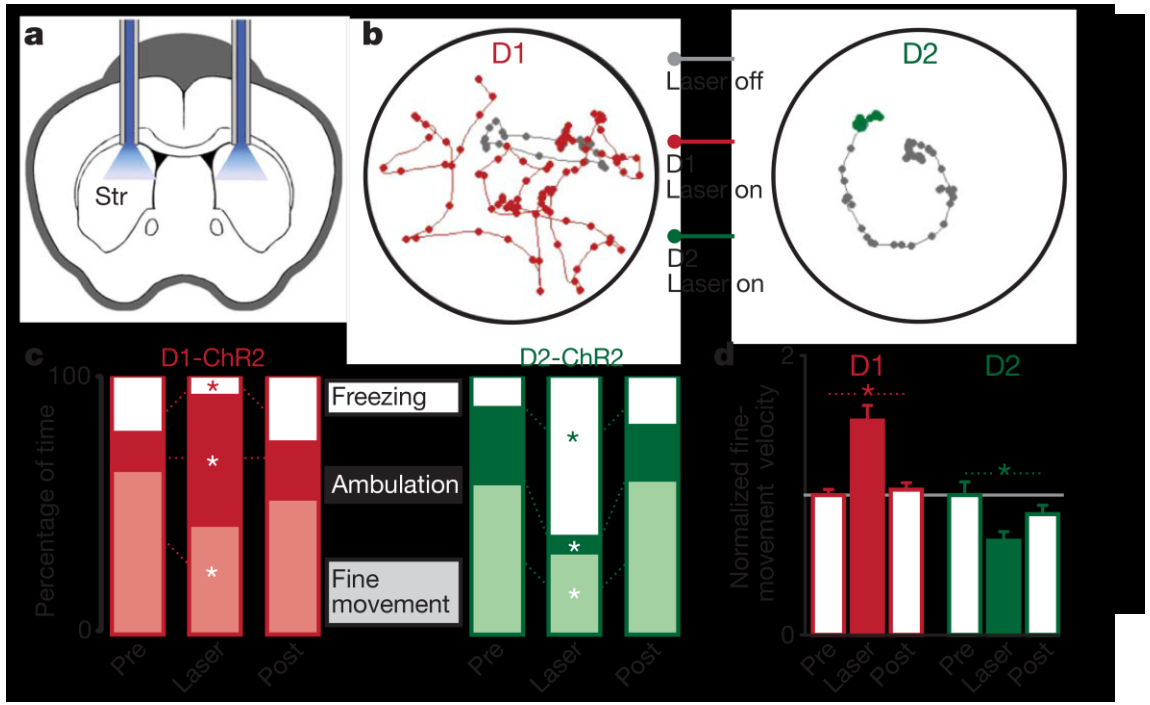


(Hikosaka et al., 2000)

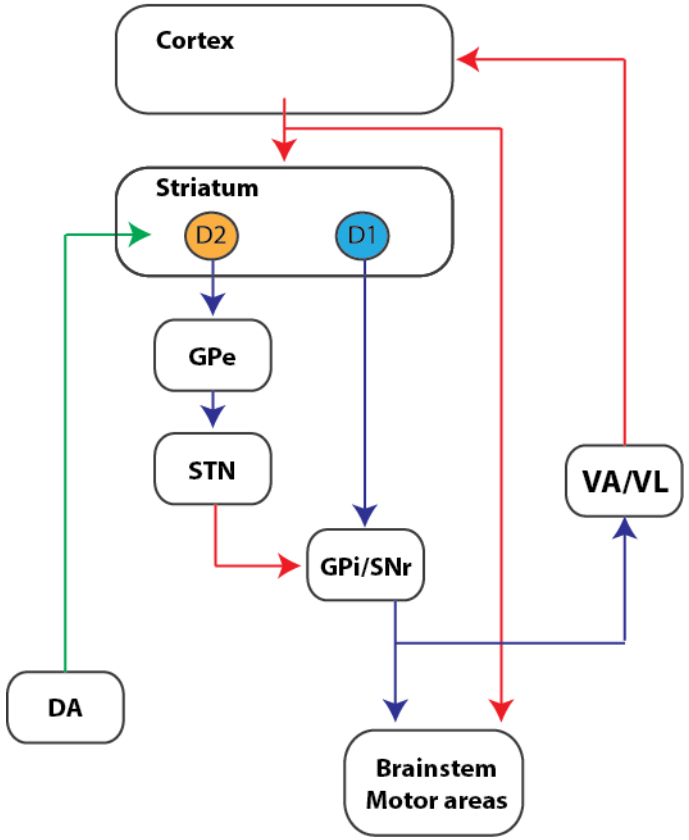


(1985 – 1990)

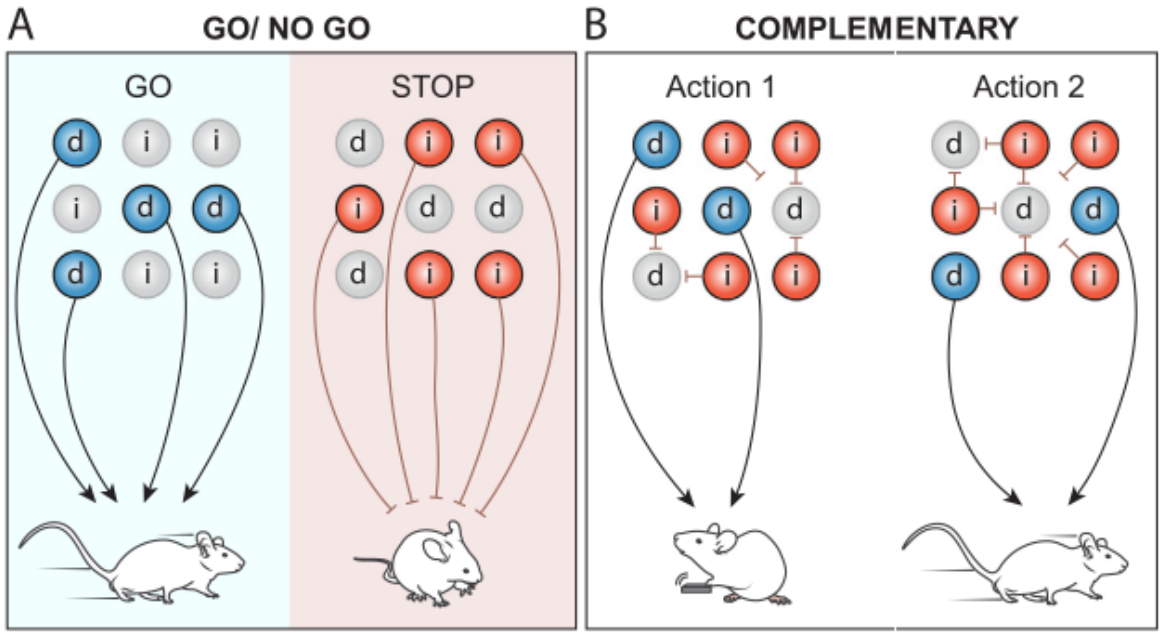
direct and indirect pathways



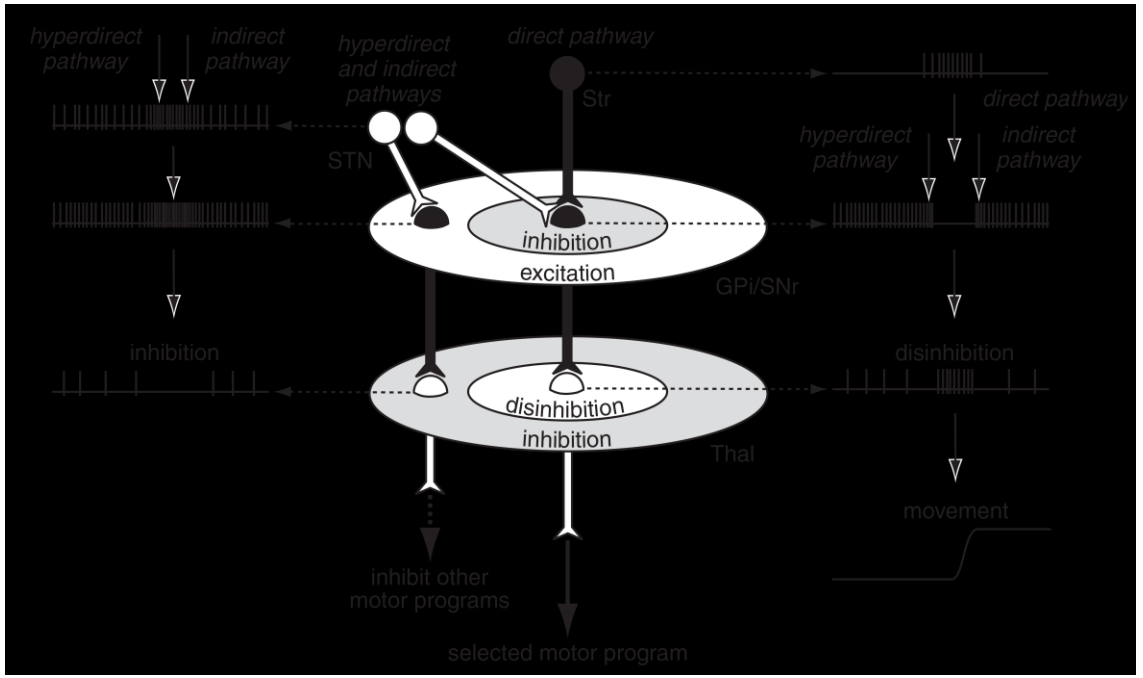
(Kravitz et al., 2010)



direct and Indirect pathways interactions

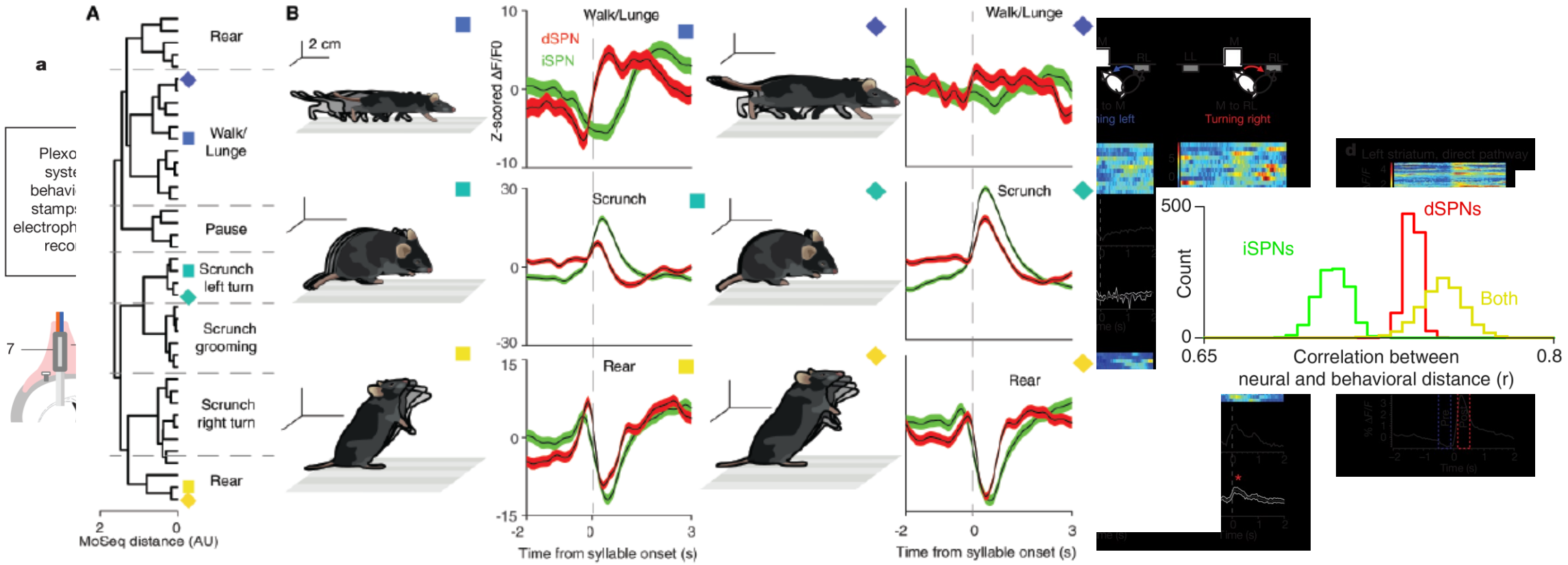


(Bariselli et al., 2018)



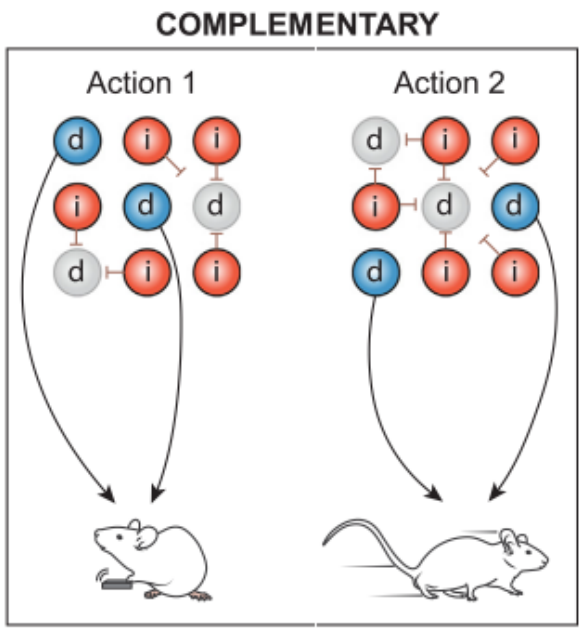
(Nambu., 2007)

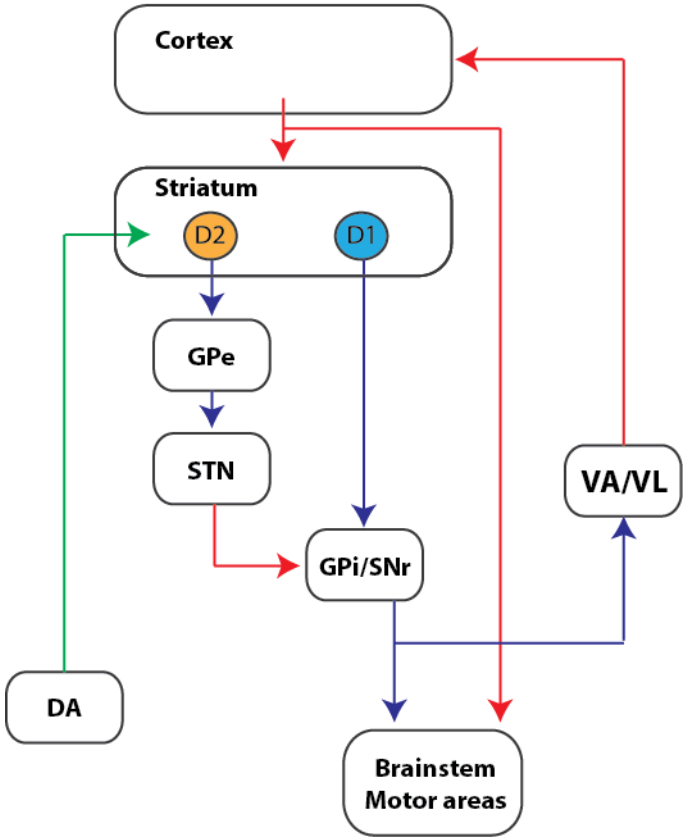
how do the direct and Indirect pathways interact during action selection?



(Cui et al., 2013)

(Markowitz et al., 2018)

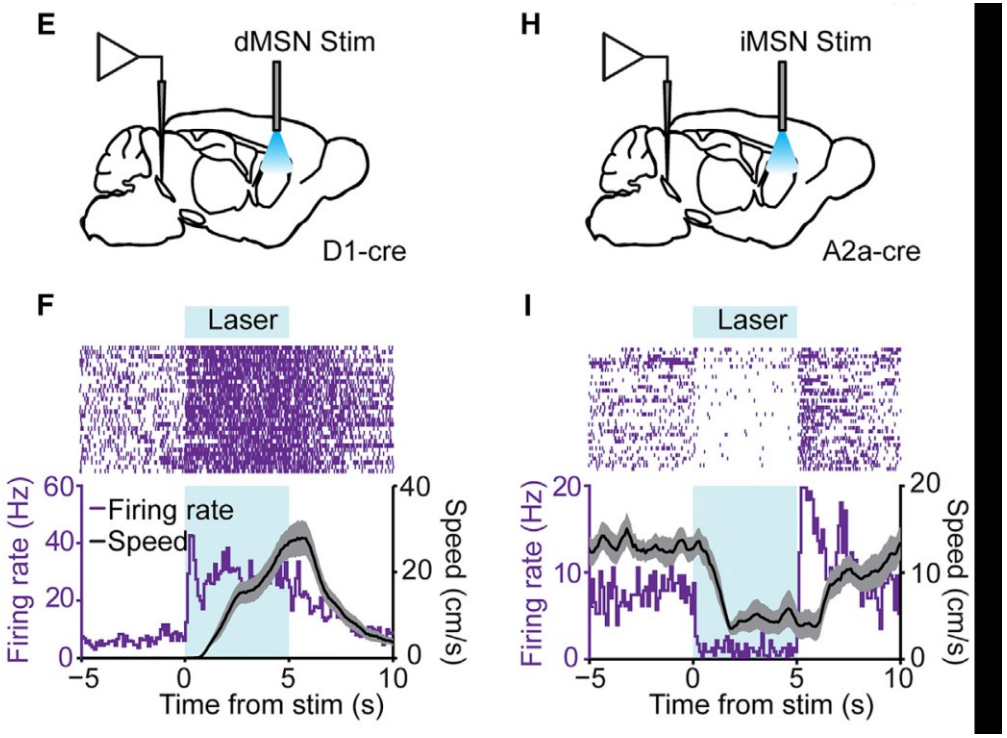


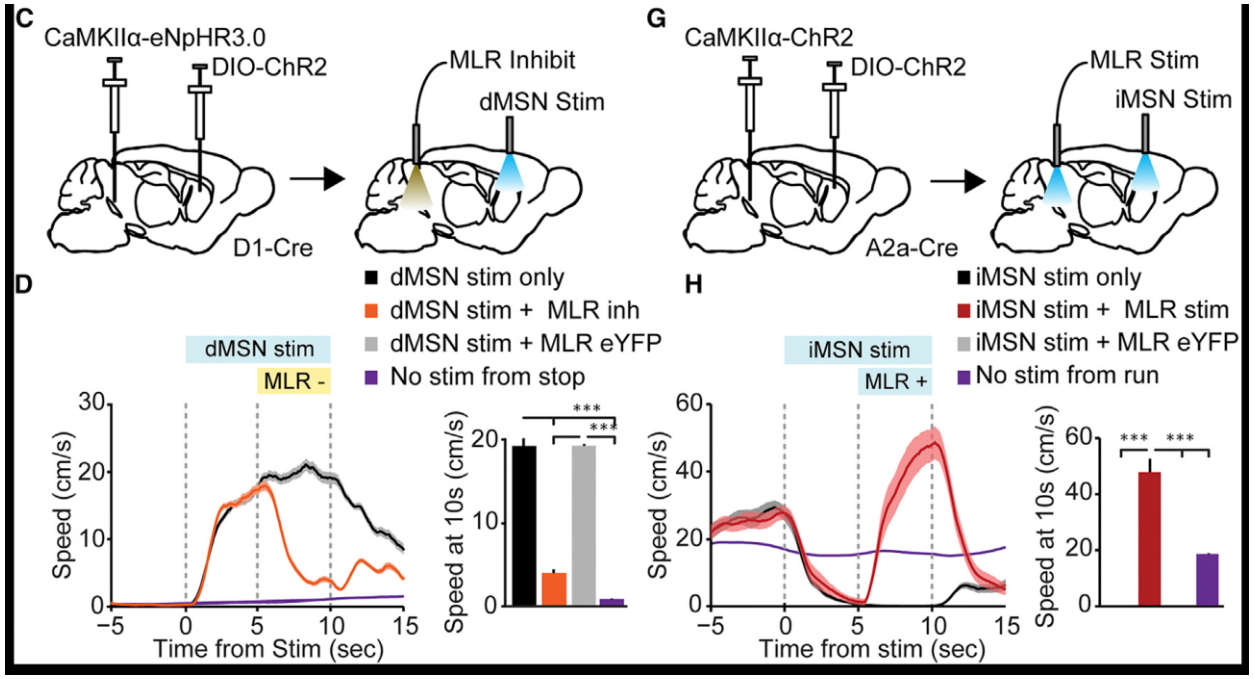


- action selection?
- motor vigor?
- behavioural sequences?

action selection

striatum > snr > MLR for running

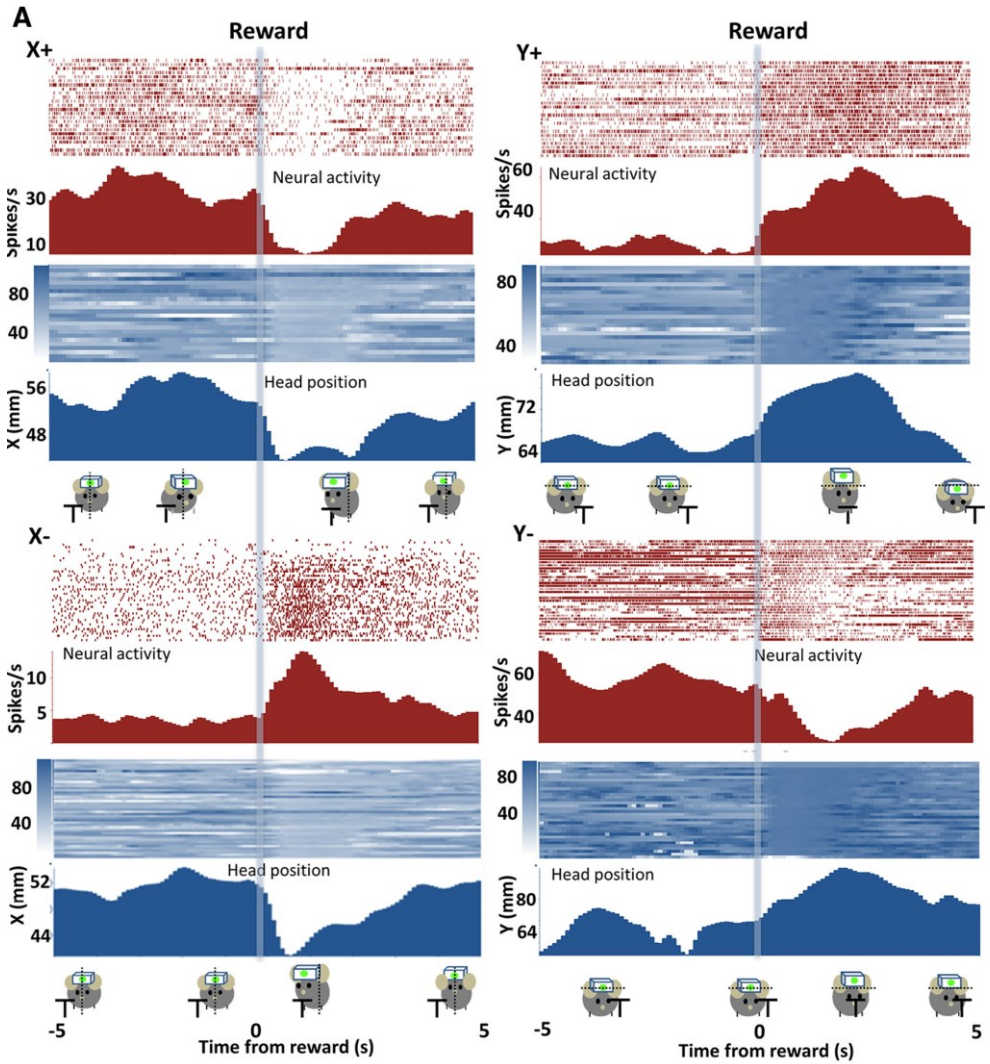




(Roseberry et al., 2016)

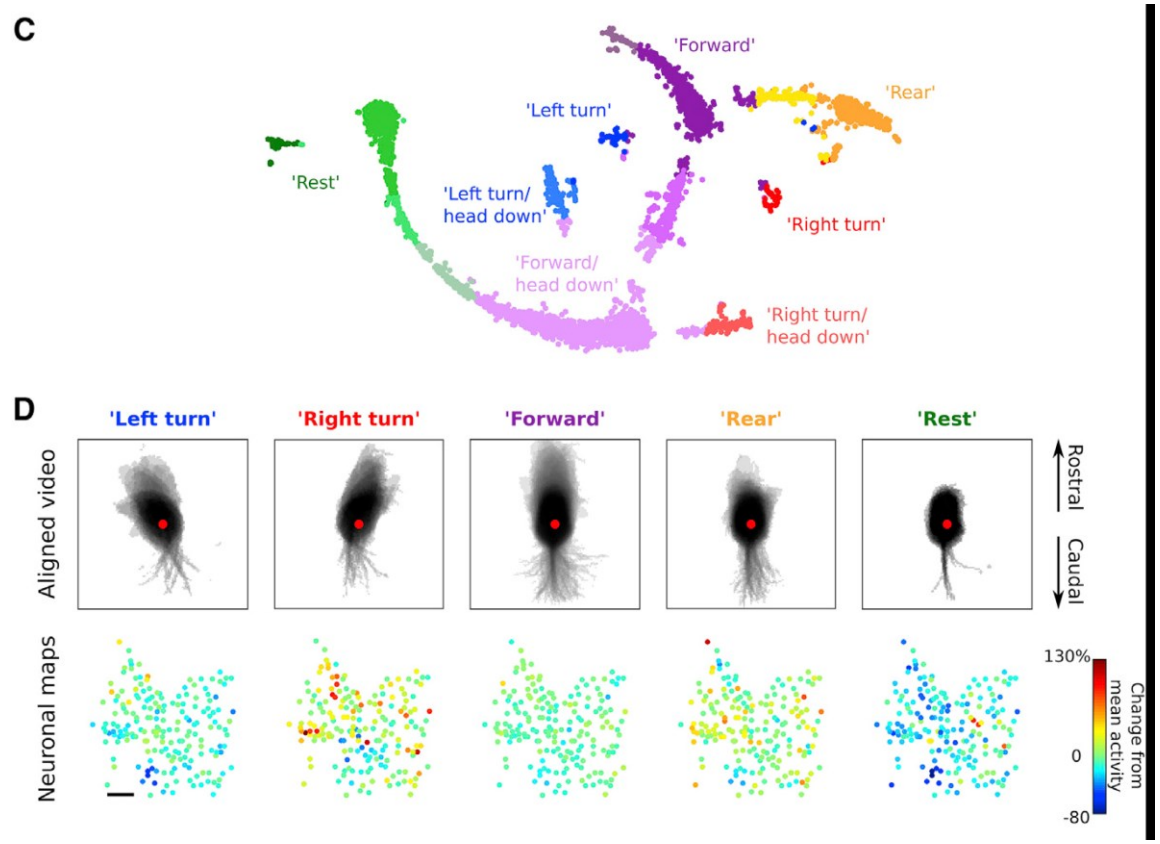
coding for action selection

SNr



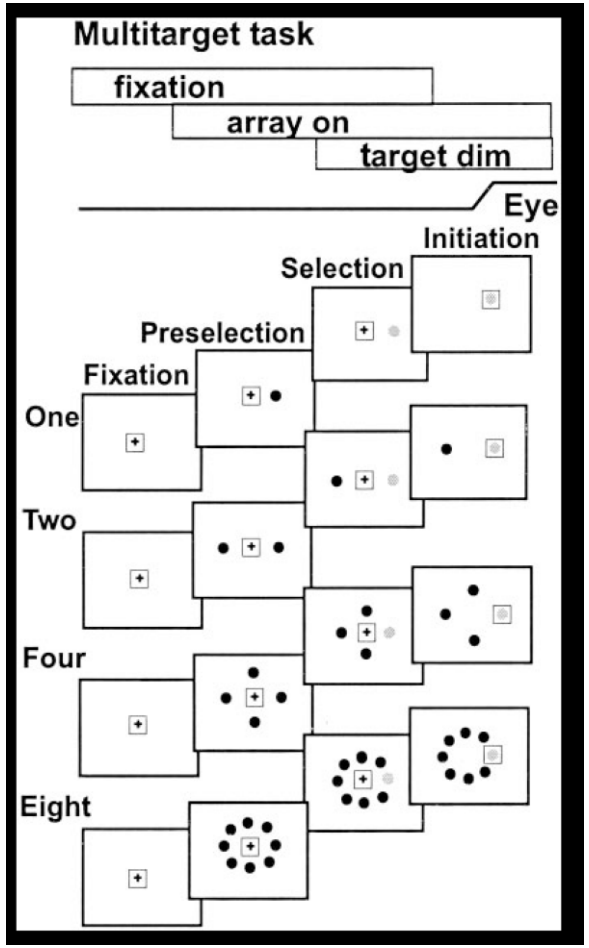
(Barter et al., 2015)

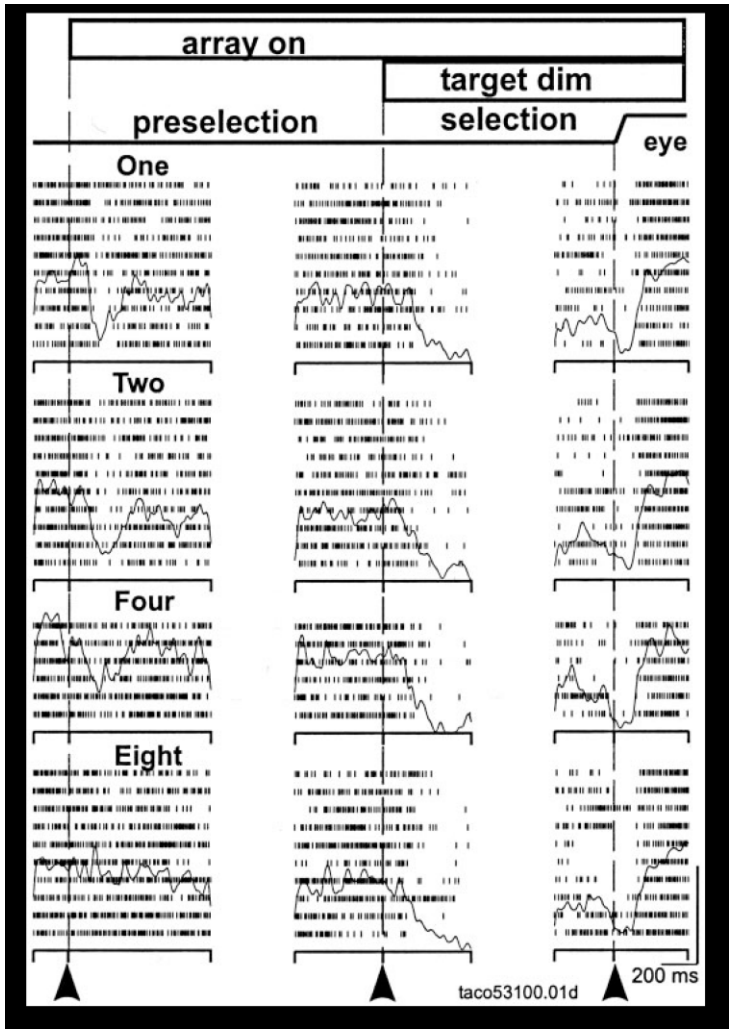
striatum



(Klaus et al., 2017)

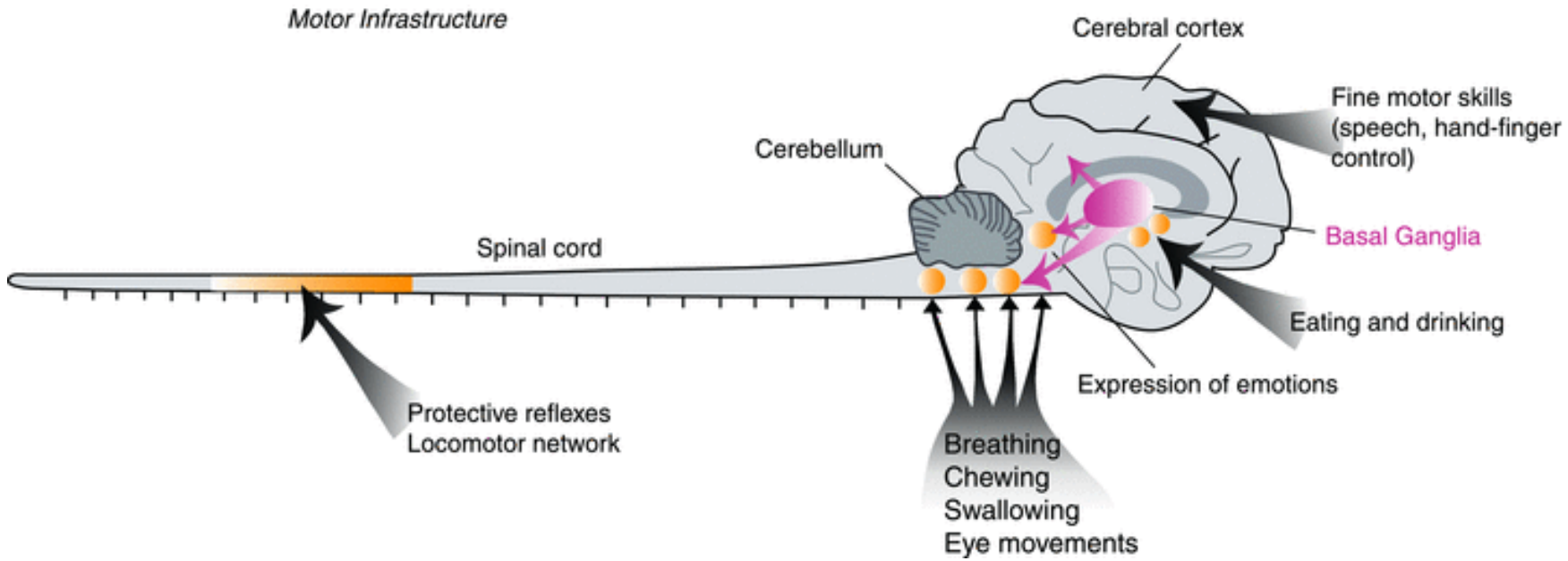
Spatial Attention





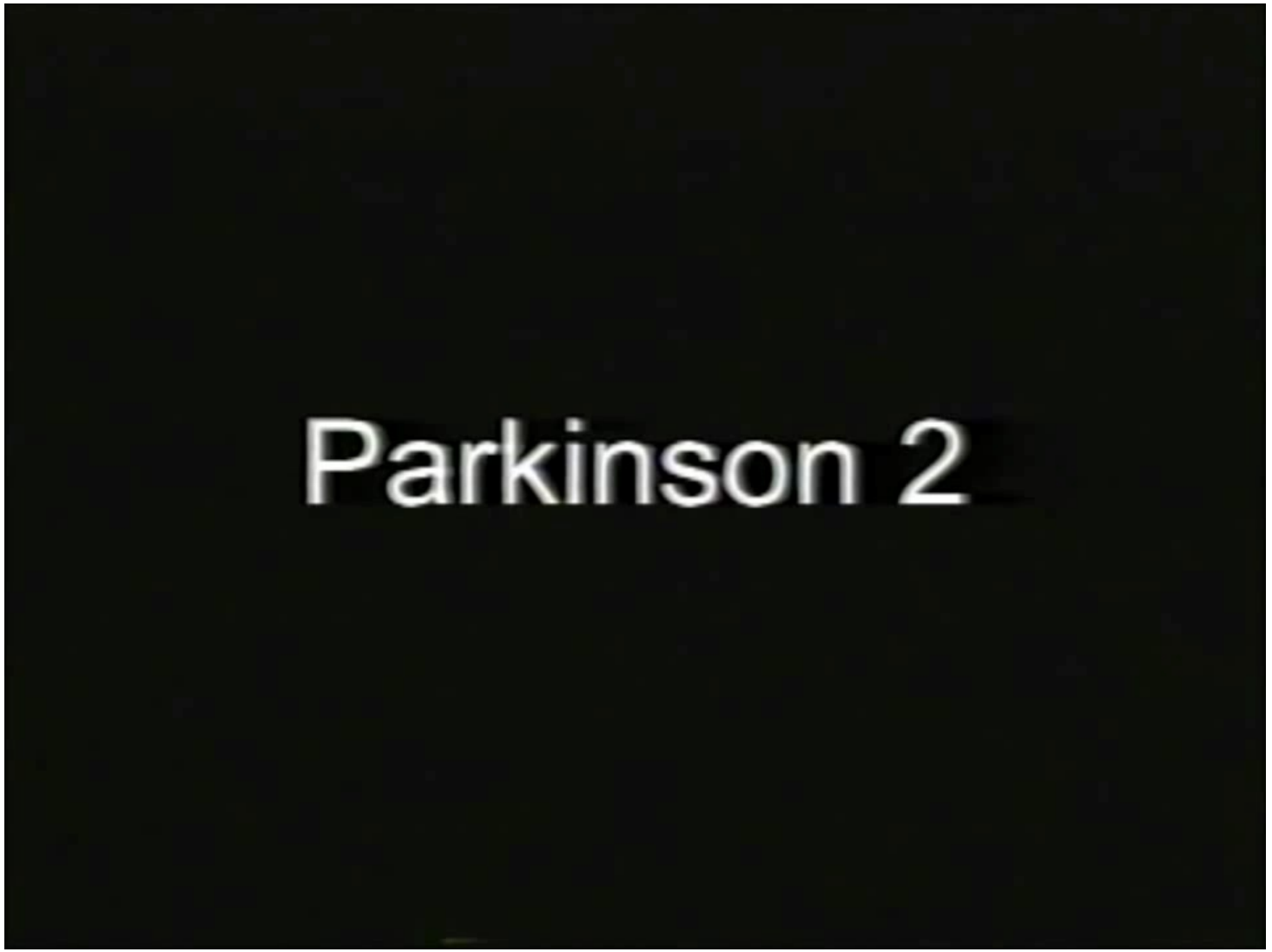
(Basso and Wurtz., 2002)

basal ganglia can select actions

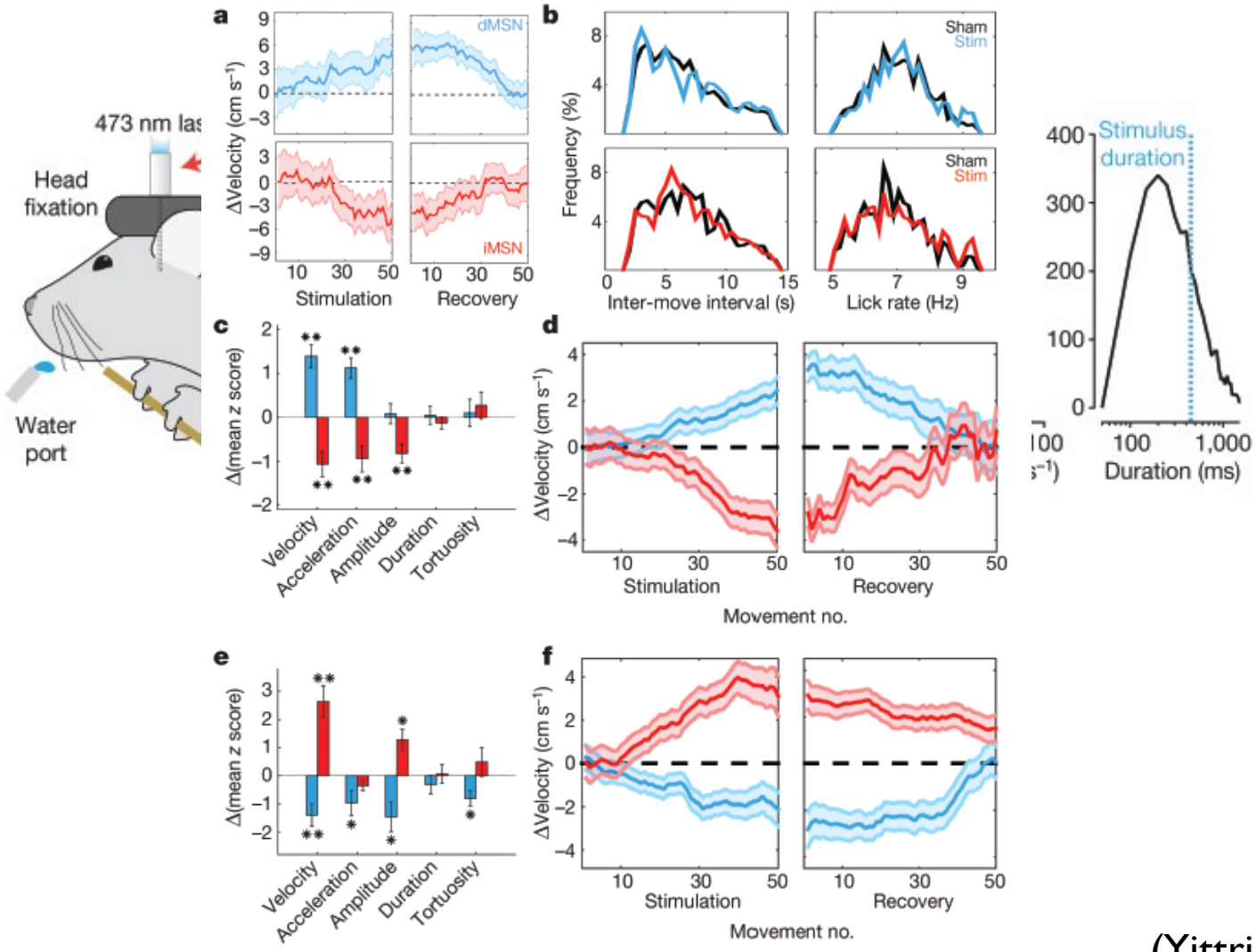


(Grillner et al., 2013)

multiple controllers

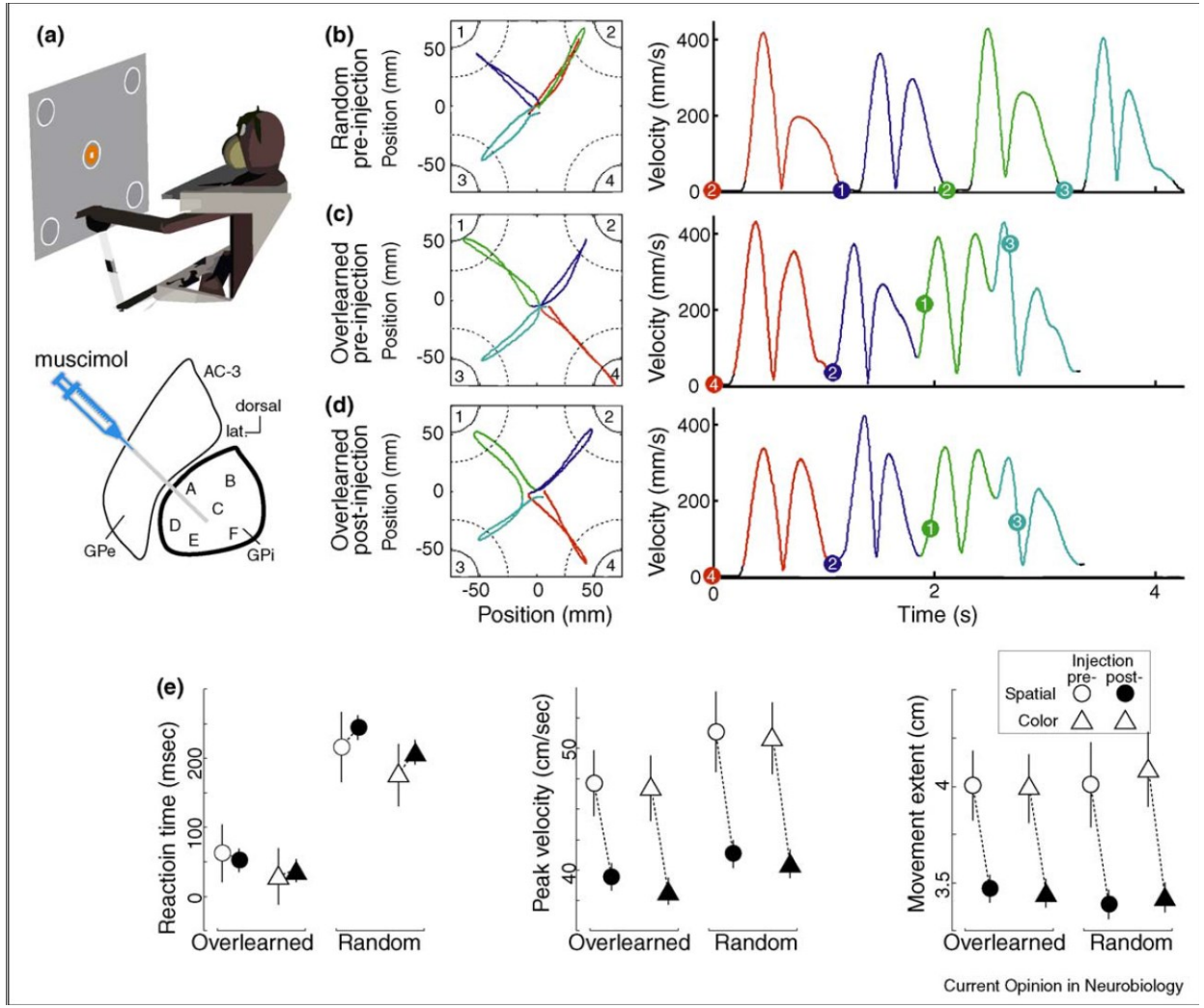


movement vigor



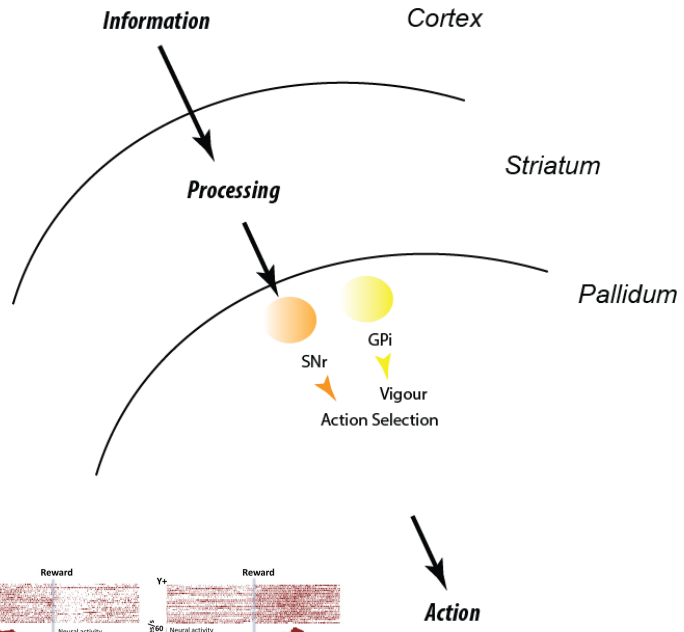
(Yittri et al., 2016)

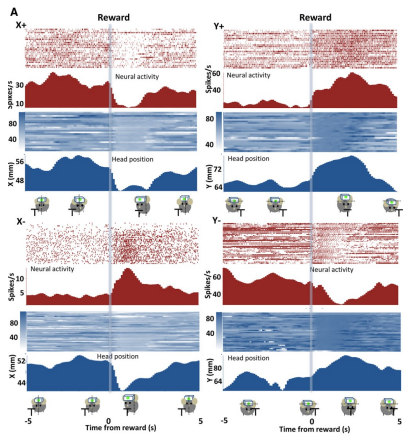
movement vigor

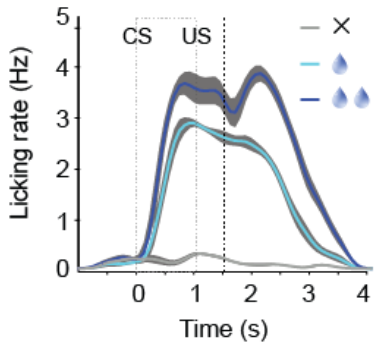


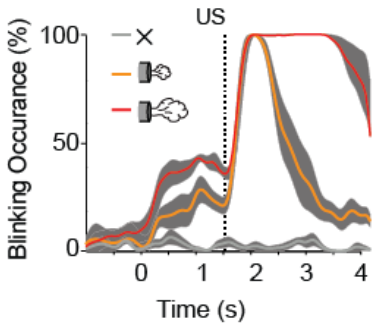
(Turner and Desmurget et al., 2010
See also Turner and Desmurget review 2010)

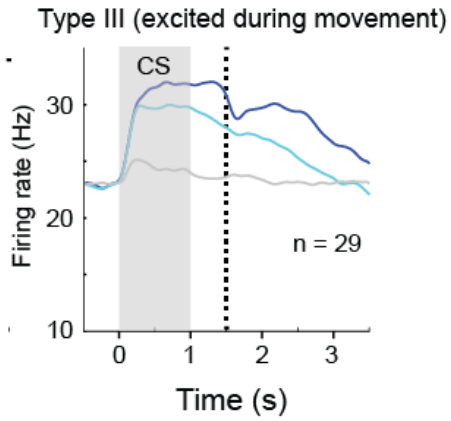
coding for vigor

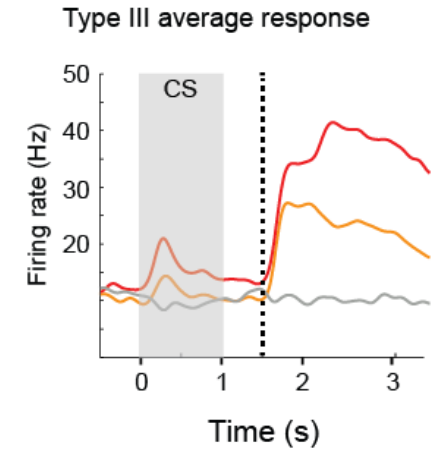


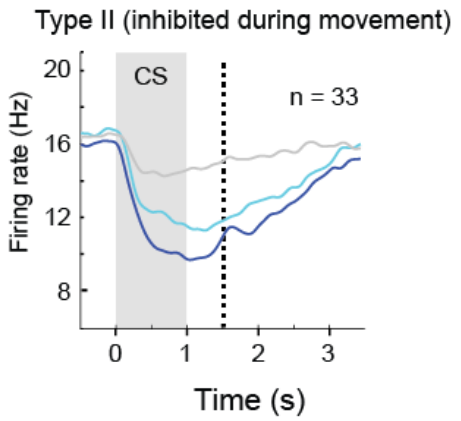


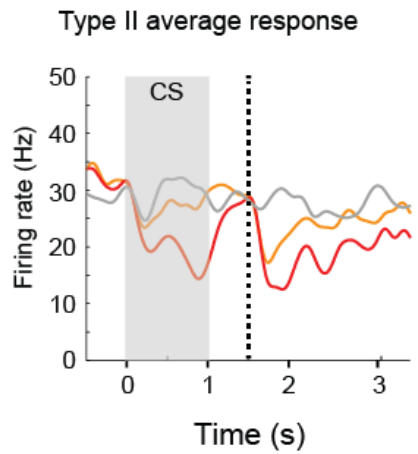




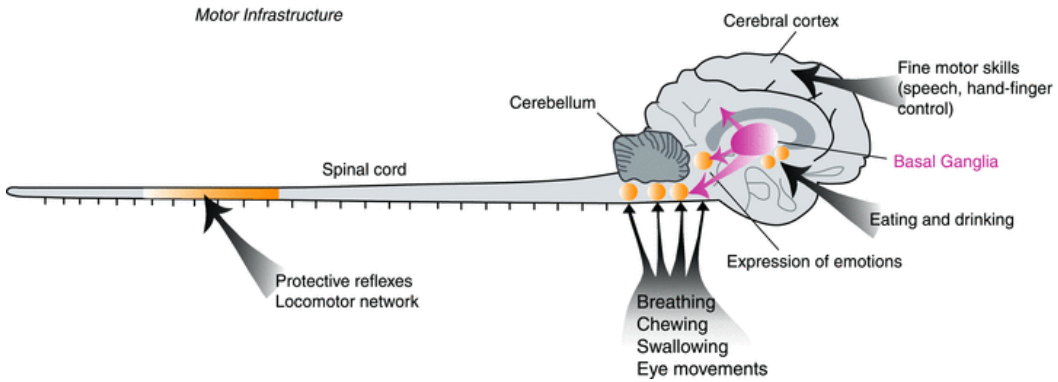




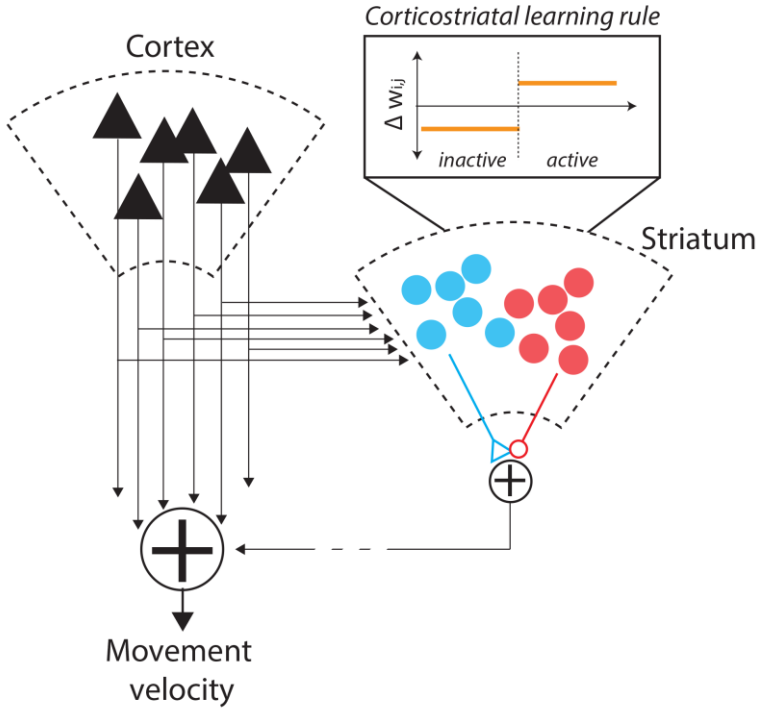




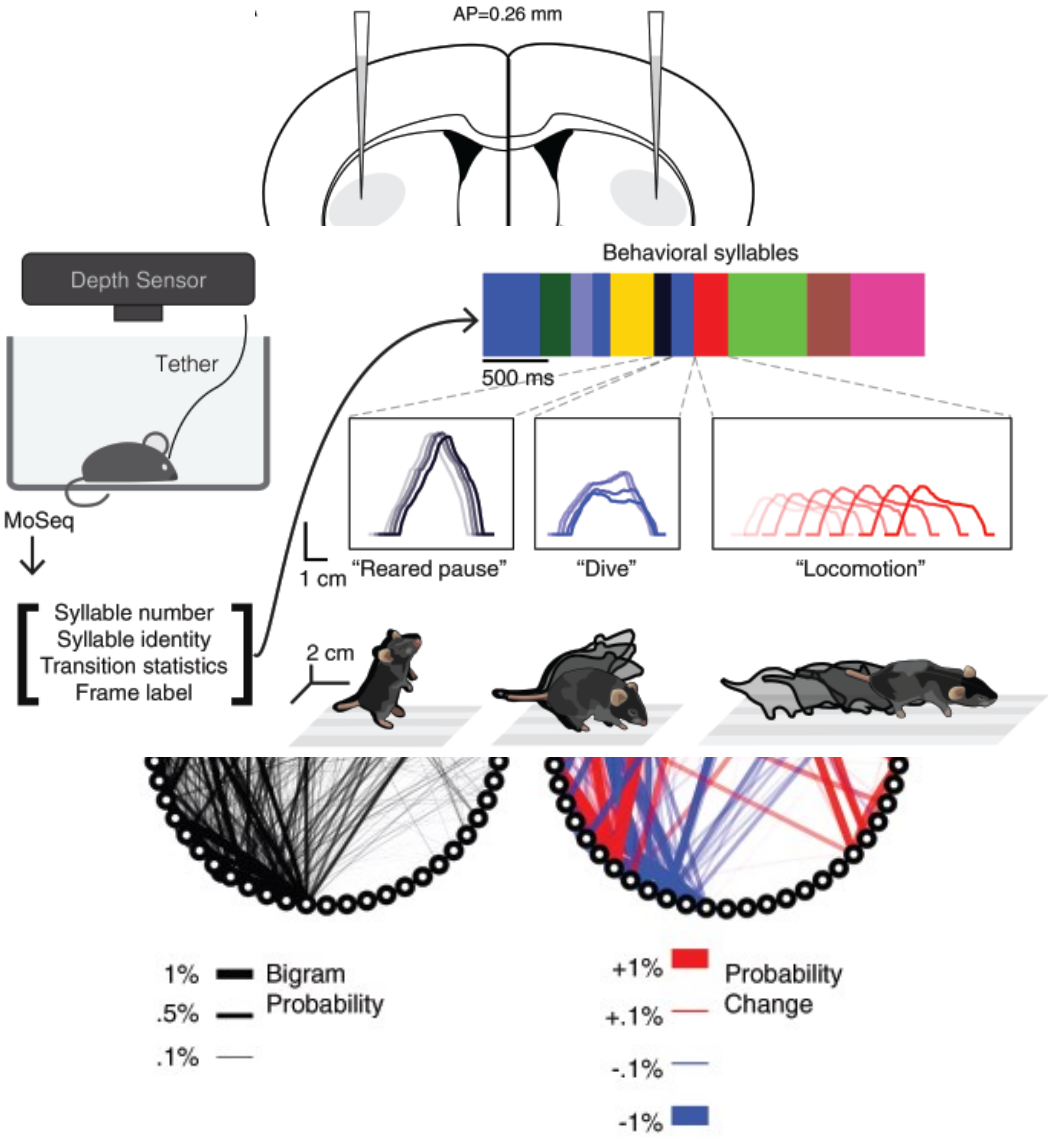
selection

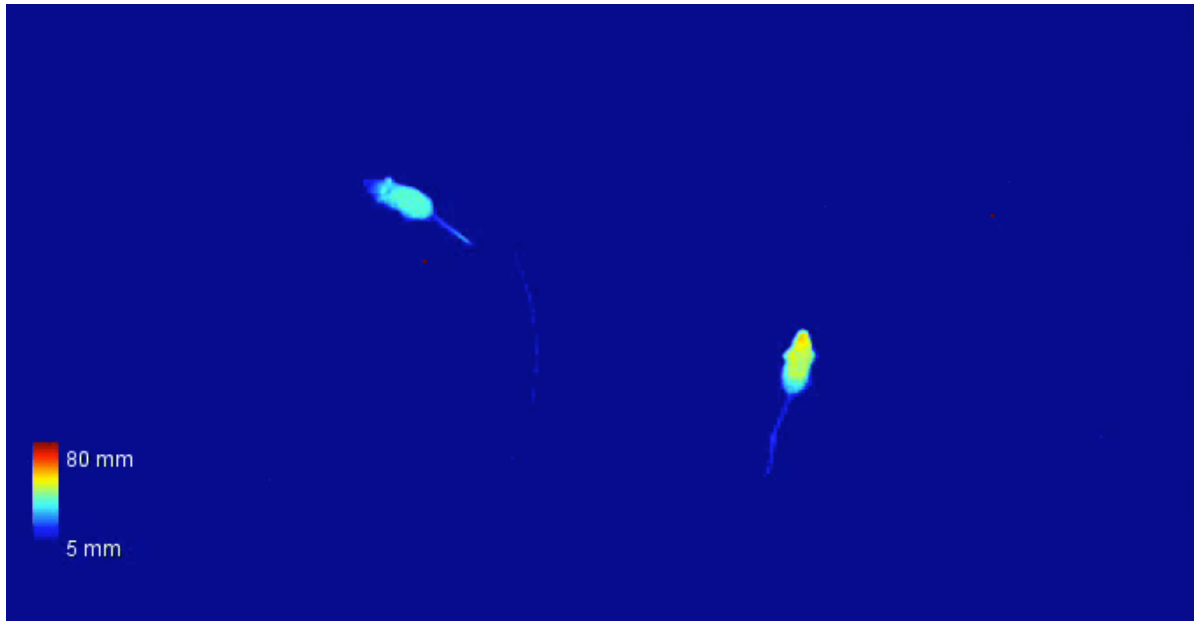


vigor



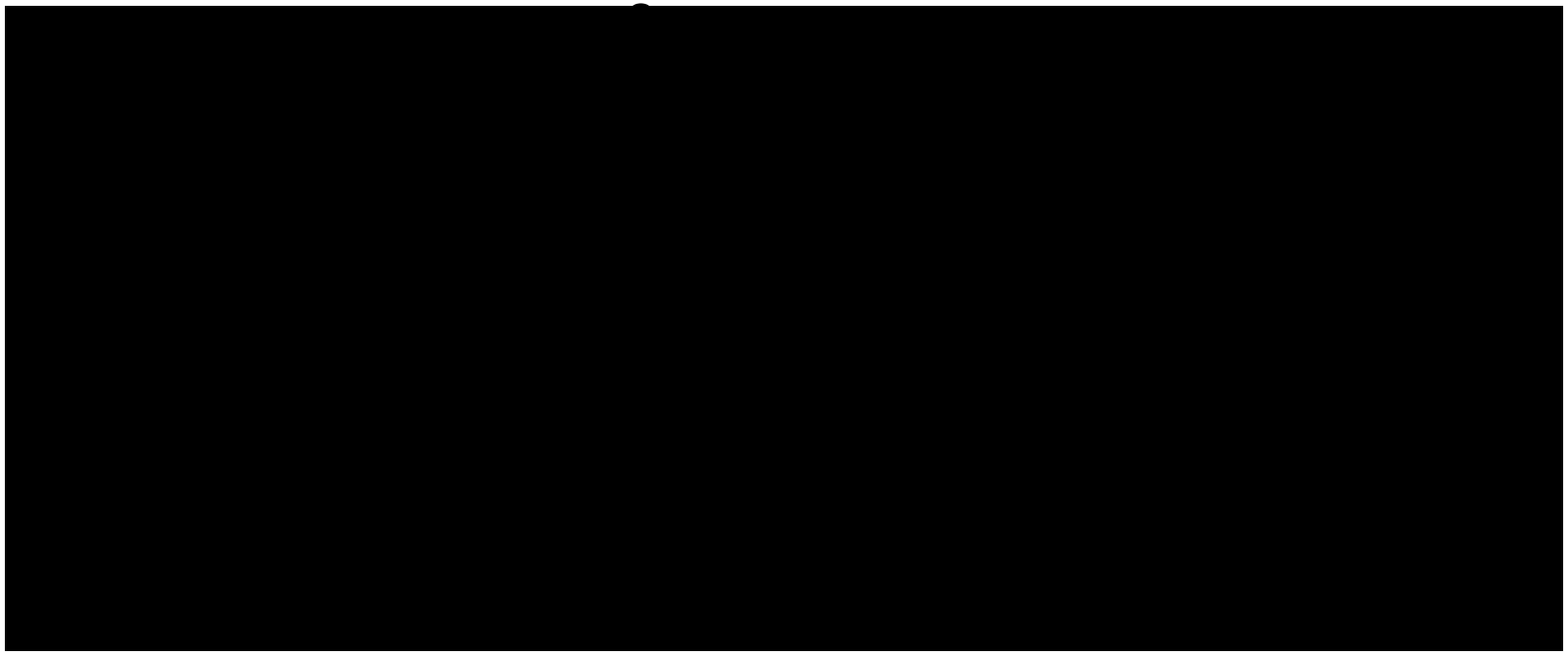
sequence
s

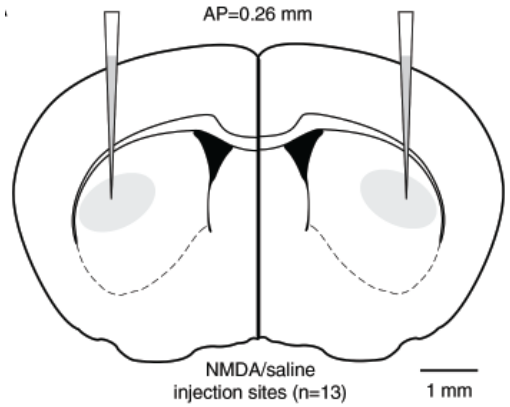


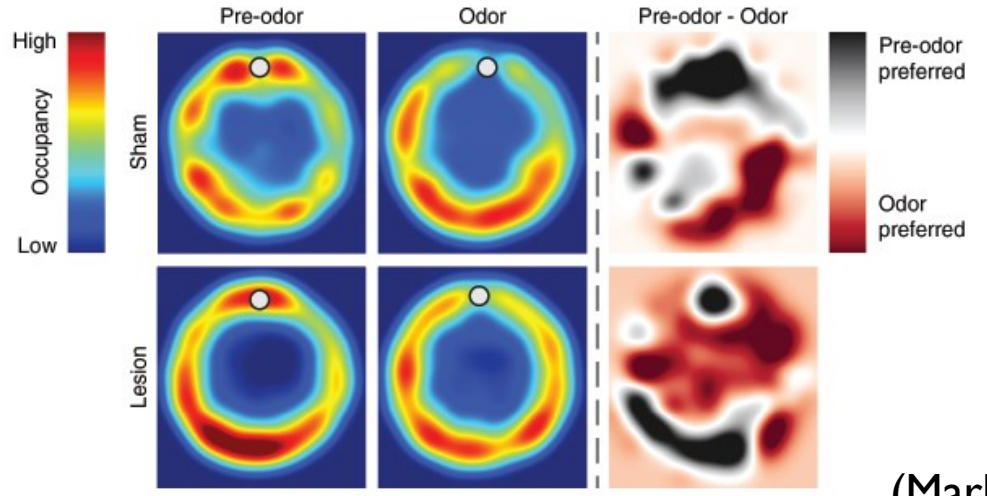


(Markowitz et al., 2018)

sequence

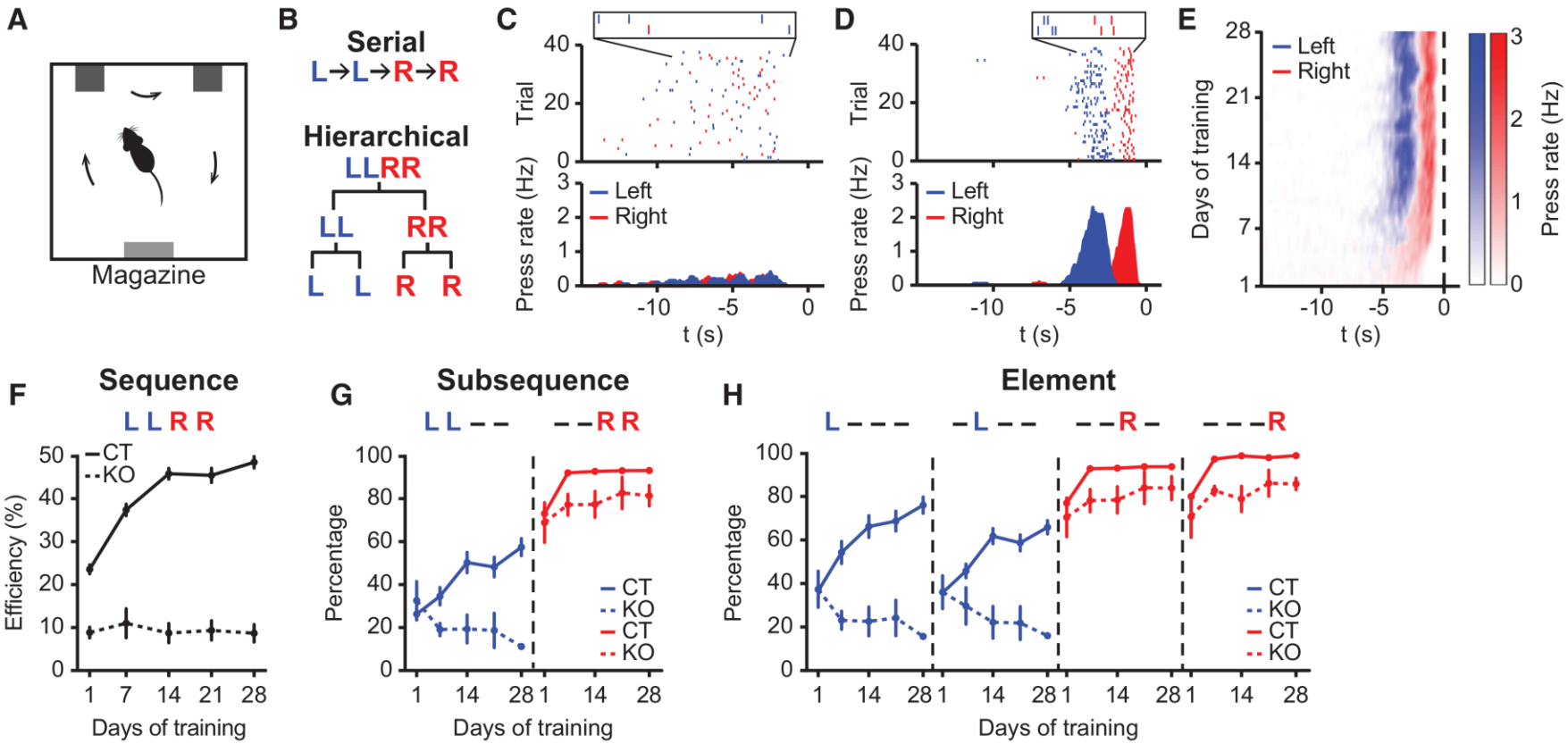






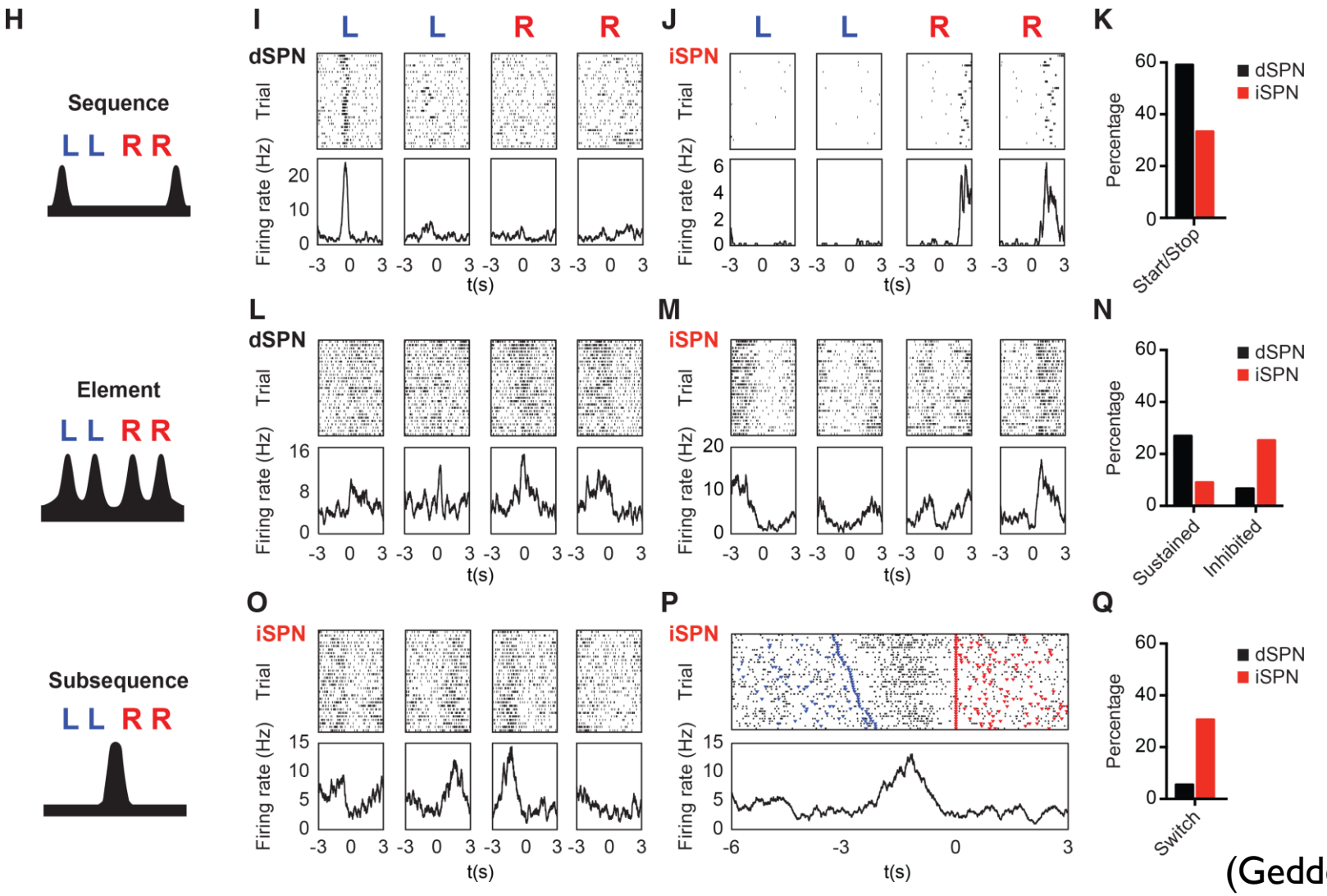
(Markowitz et al., 2018)

sequence
s



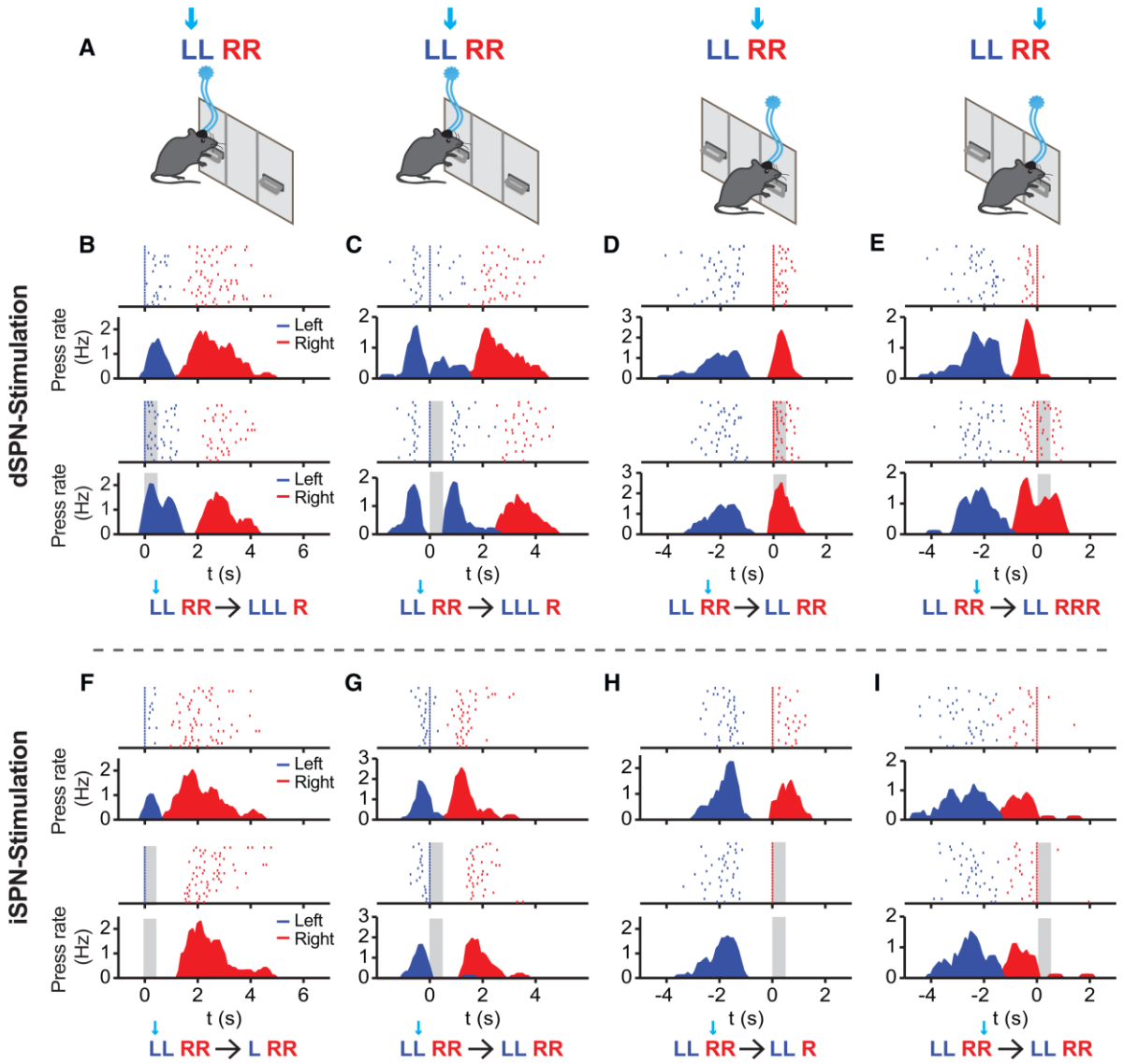
(Geddes et al., 2018)

sequence
s



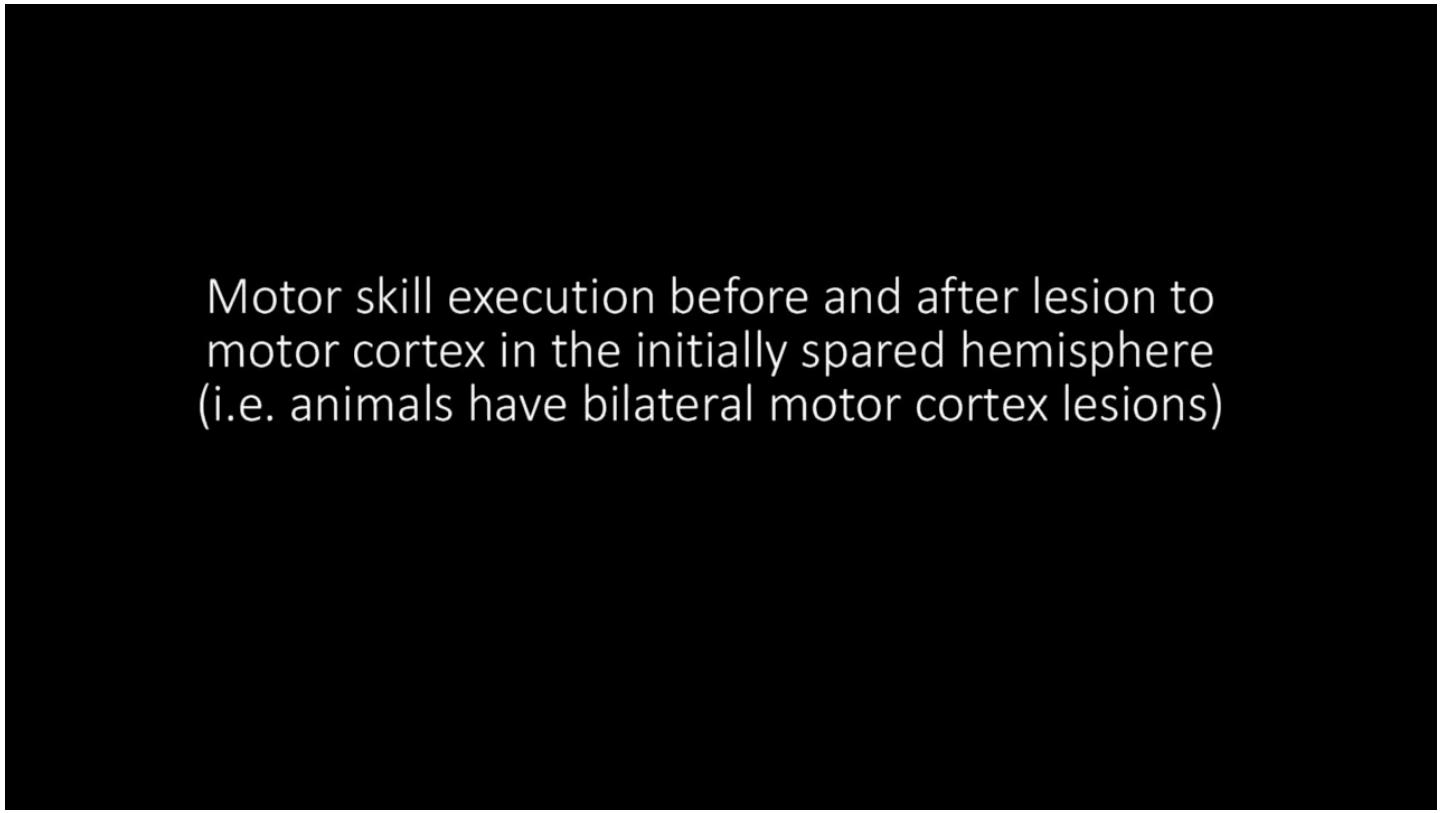
(Geddes et al., 2018)

sequence
s



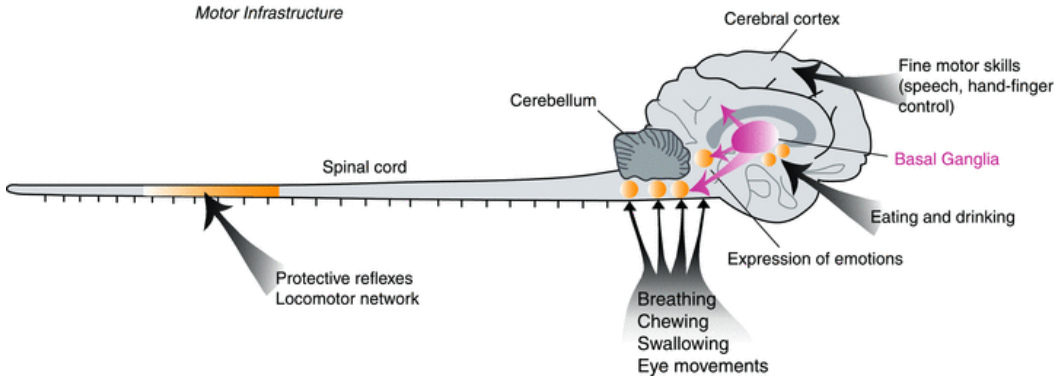
(Geddes et al., 2018)

sequences

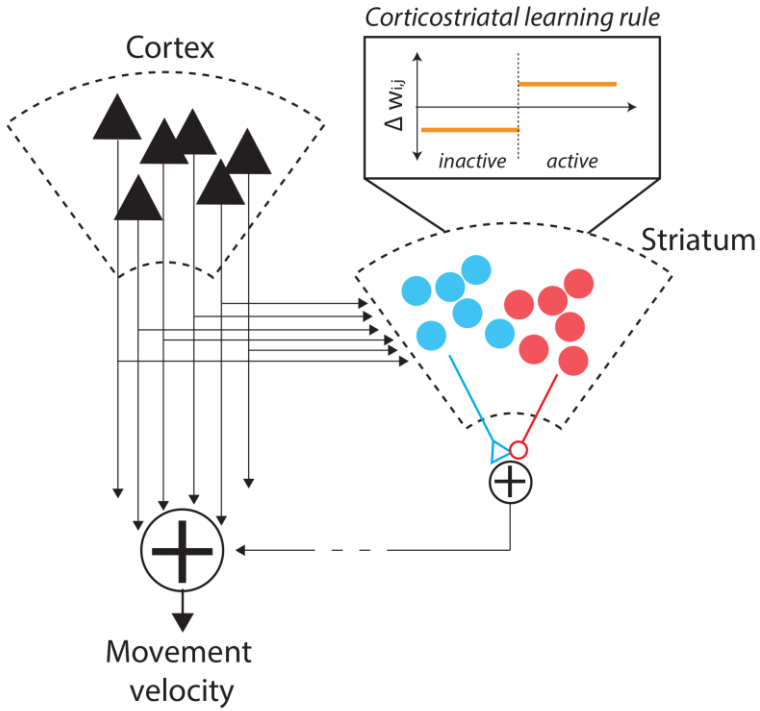


(Kawai et al., 2015)

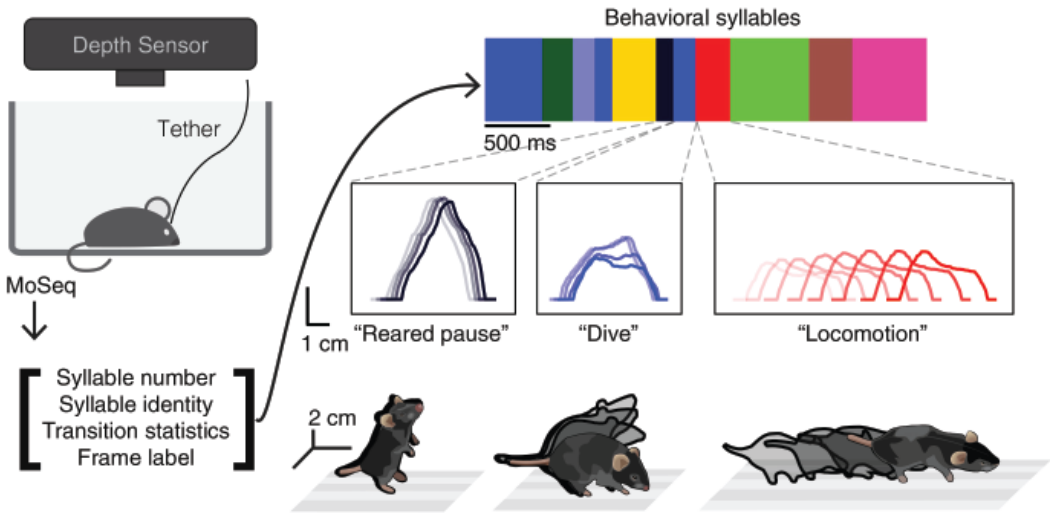
selection



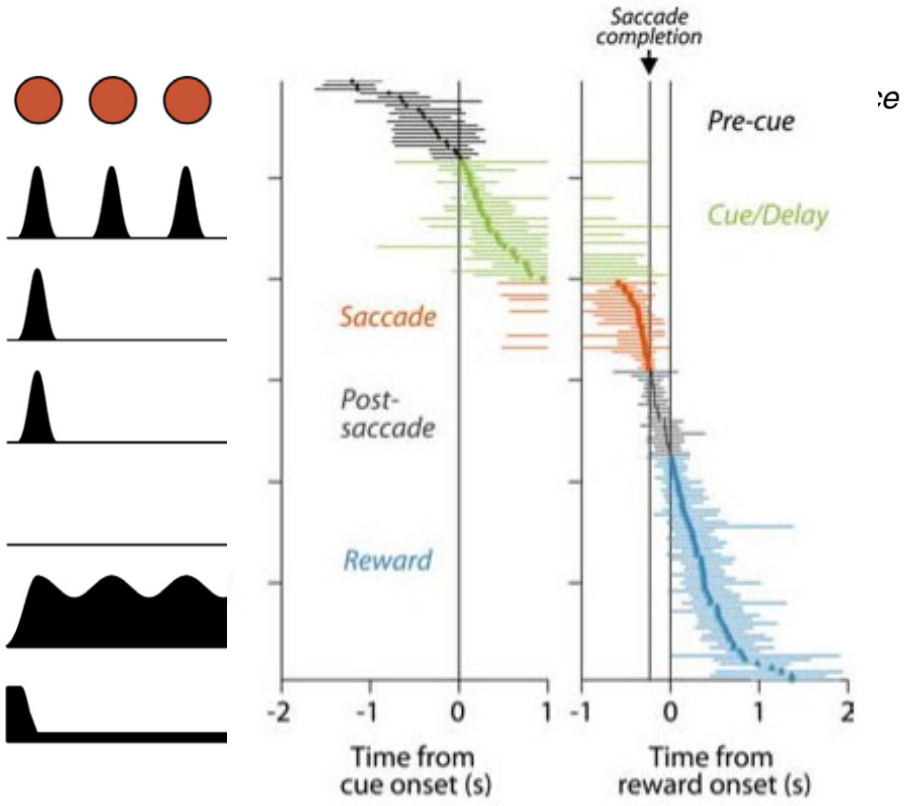
vigor



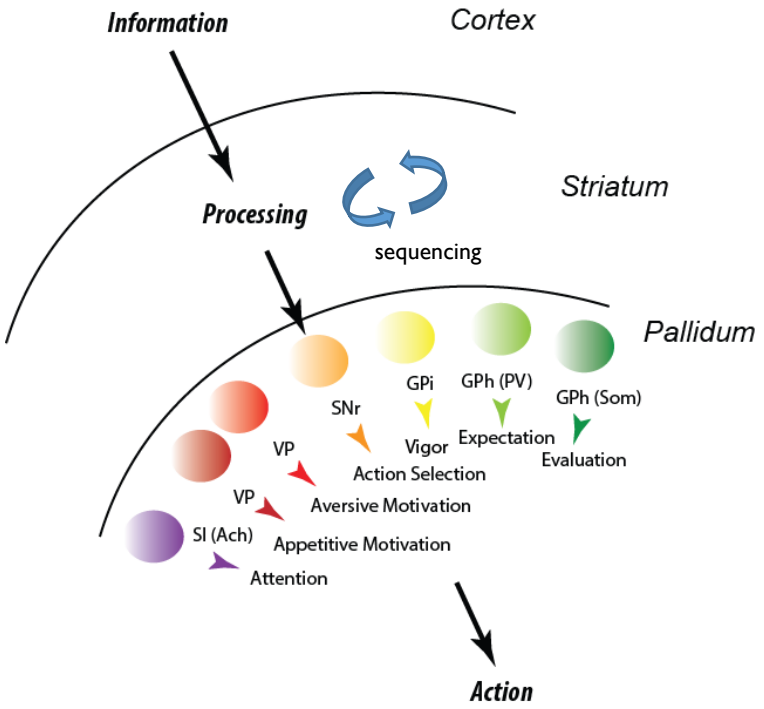
sequencing



Basal ganglia motor control: selection, sequencing and vigor



(Jin et al., 2015)



(Lau and Glimcher., 2007)

Basal ganglia motor control: selection, sequencing and vigor