

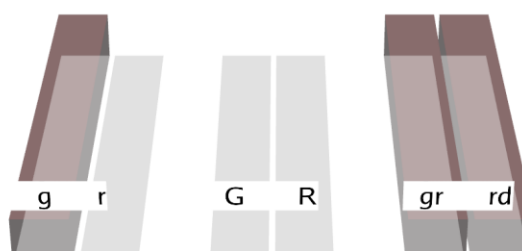
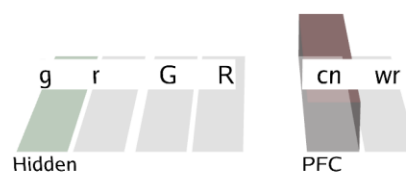
Computational Cognitive Neuroscience – CH10

Zhuo Wang ScM BME Brown ID# 140641091

Question 10.1

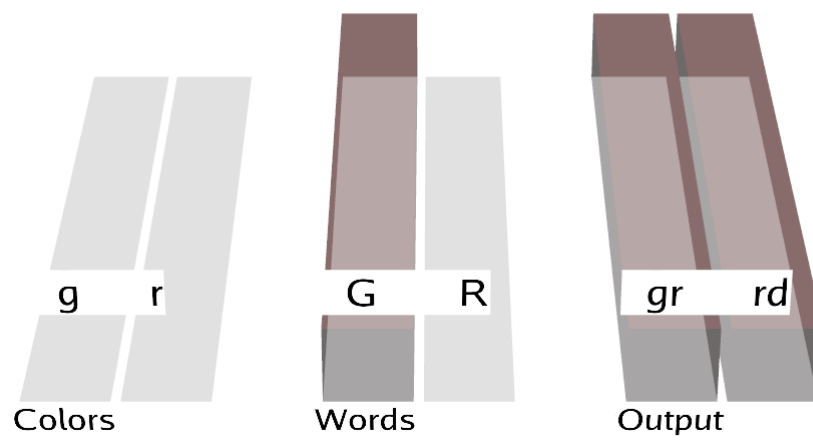
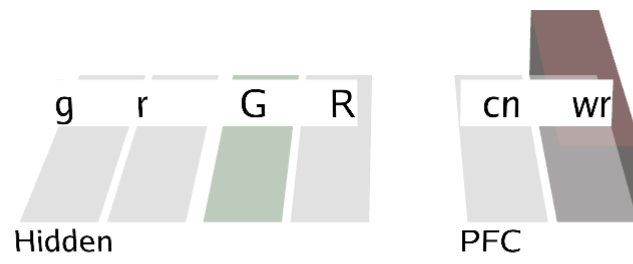
g:

you need to report the weight values in numeric form

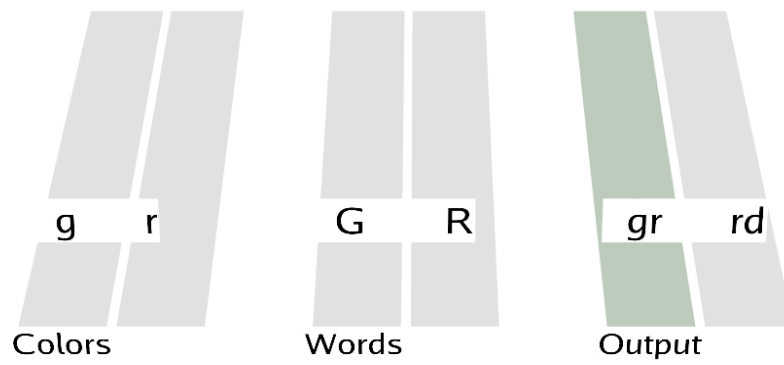
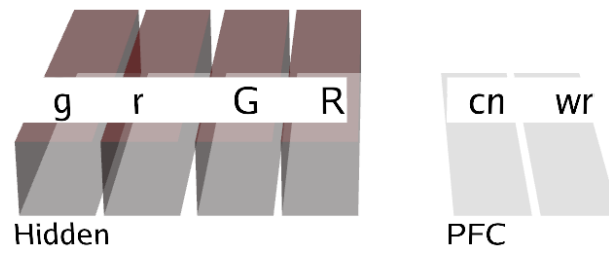


G:

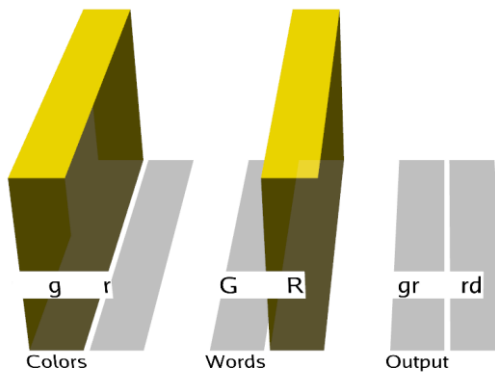
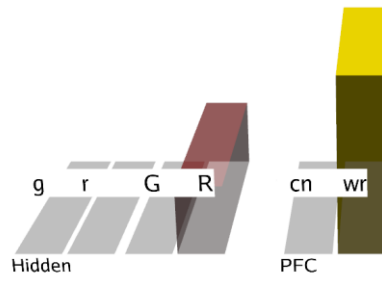
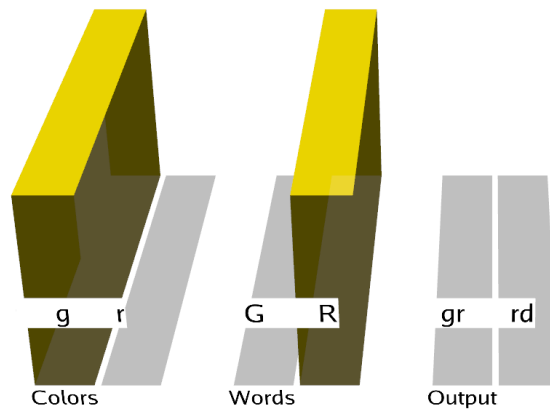
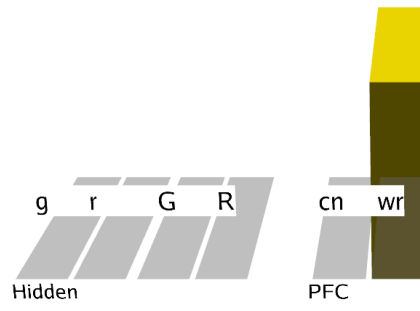
0.5

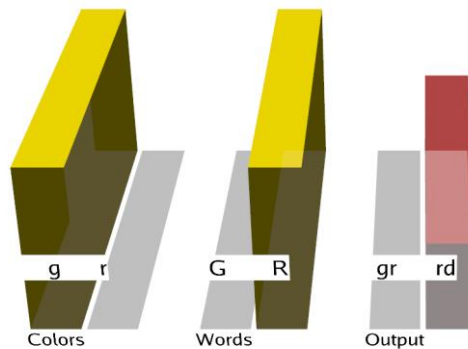
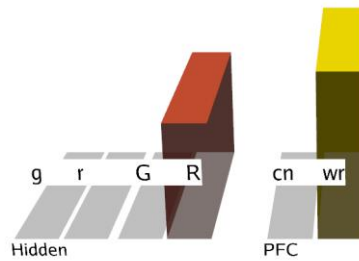


gr:



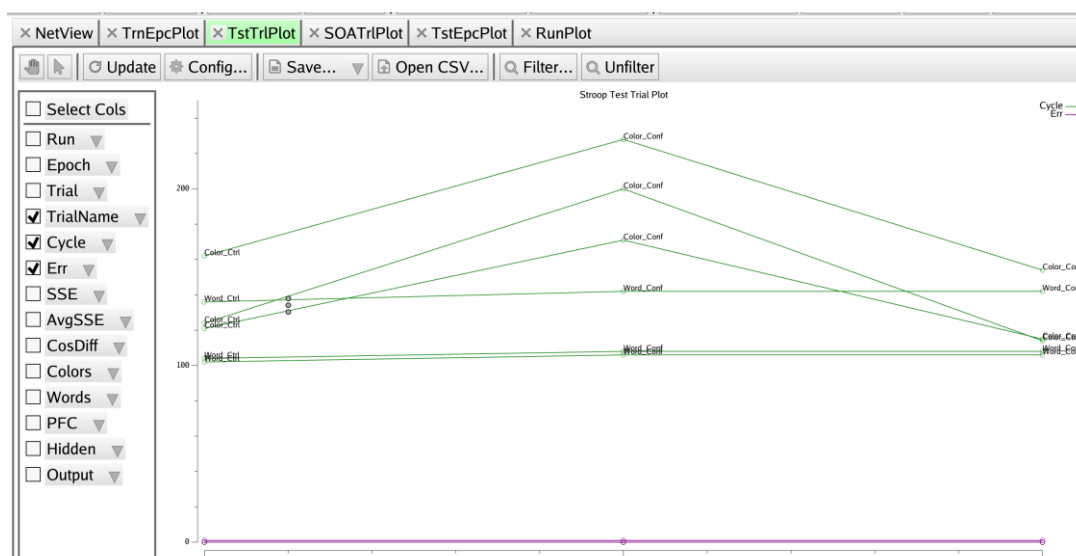
Question 10.2





When the network receives input from conflicting color naming conditions, the hidden unit is activated from both paths. At this point, the “wr” unit will activate quickly in the word reading response, because the network has learned the corresponding word reading output during the training process. Competition and suppression mechanisms in the PFC come into play, trying to limit the activity of the hidden unit to ensure the correct output. This results in an extended activation time for the hidden unit “R” to resolve the conflict and respond correctly. As I observed. During competitive activation and suppression of hidden units, the activation of response output units may be delayed because the competition of hidden units takes more time to resolve the conflict.

Question 10.3



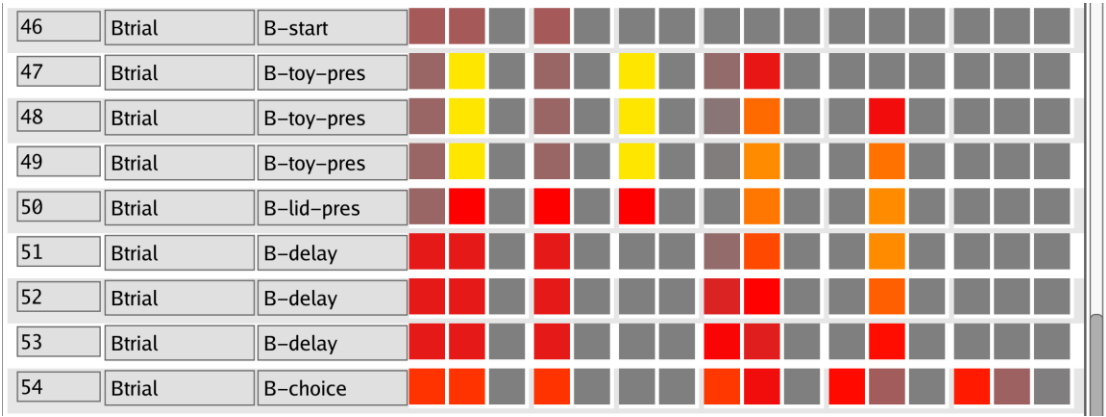
you missed the second part of the ques about the patient groups.

0.75

When reducing PFC Gain. Slower response times specifically observed in the conflict color naming condition.

When increasing Overall Slowing. Slower response times across all conditions, including control, conflict, and congruent conditions.

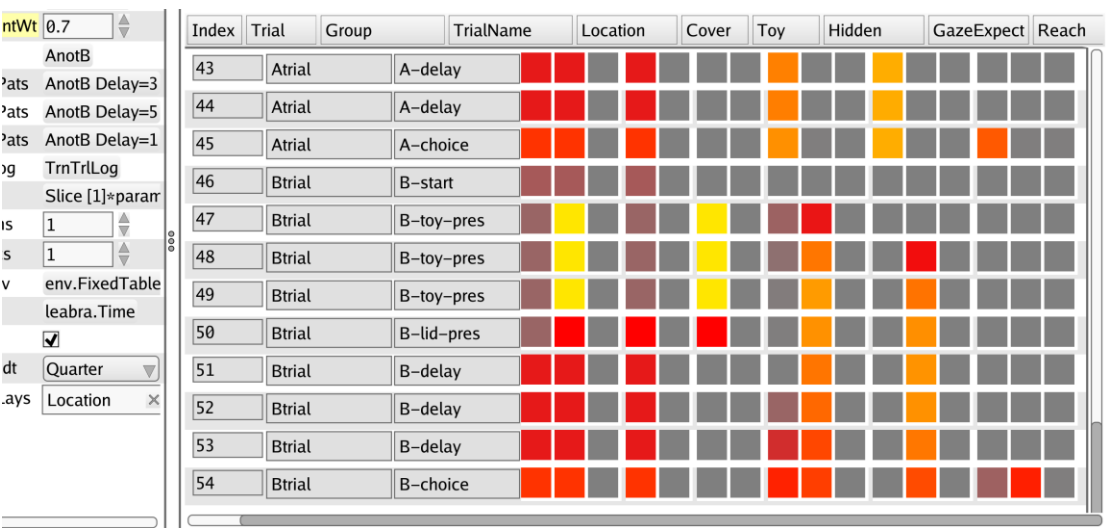
Question 10.4



0.75

In the delayed trials, GazeExpect maintains activation at the “B” location, which indicates that the internal network indicates a temporary shift to the “B” location. However, during the choice trail, Reach is at the “A” location despite the activation at the “B” location during the delay trails. During the B trials, the network moved toward “A” even though the toy was moved to “B”, mirroring the behavior of small babies in A-not-B task. Babies usually tend to show a sustained response.

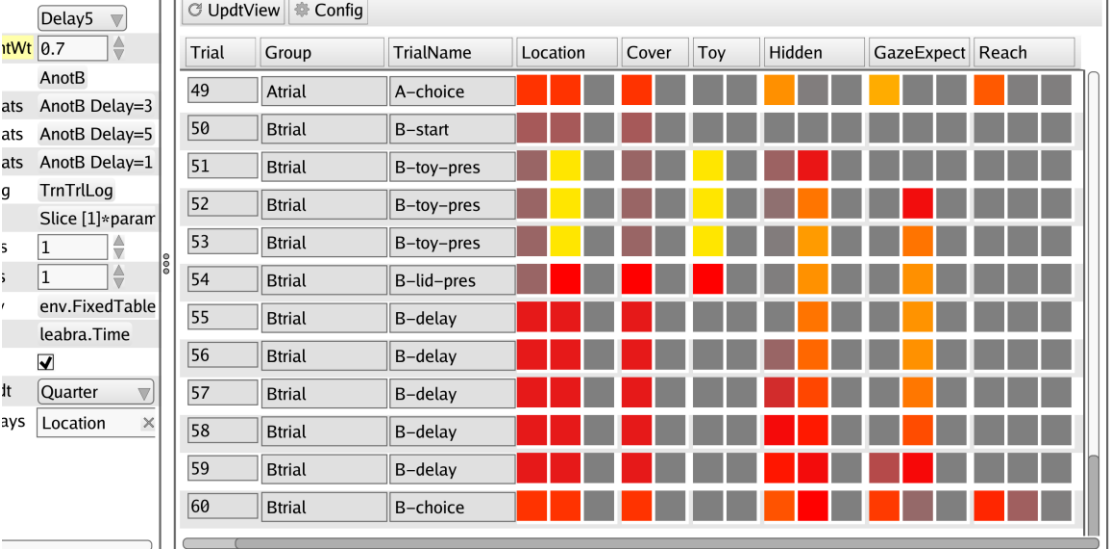
Question 10.5



In the delayed trials, GazeExpect maintains activation at the “B” location, which indicates that the internal network indicates a temporary shift to the “B” location. During the choice trail, Reach is at the “B” location. For both “A” and “B” locations, more stable and long-lasting representations are produced during the delay phase due

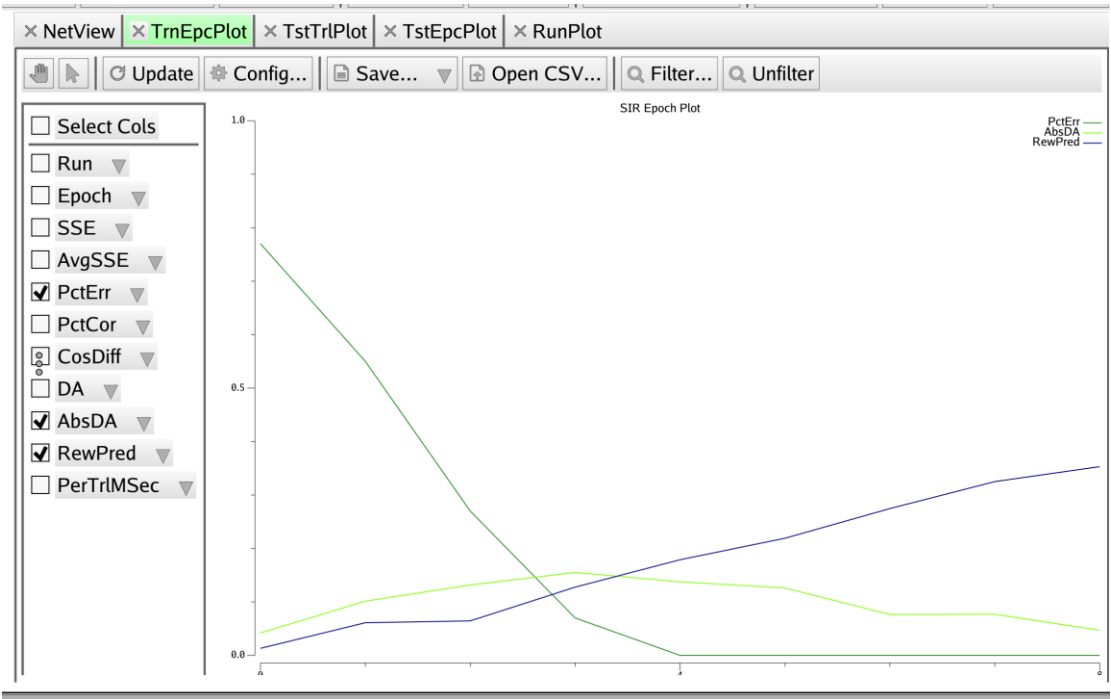
to the PFC’s stronger recurrent connections. The network’s capacity to store and process data about both locations concurrently throughout the delay is improved by this enhanced stability in preserving the representations of both locations.

Question 10.6



The Reach output changes to location “A”. The network shows stronger persistence or a stronger bias towards reaching the “A” location in the choice phase, even when the “B” location is changed, as a result of this prolonged time of reinforcement or preservation of the “A” location representation over the delay.

Question 10.7



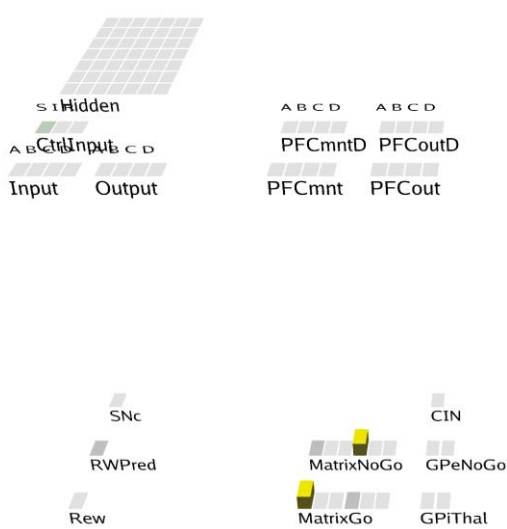
0.75

At the start of the training epochs, the AbsDA value tends to be high, indicating a substantial discrepancy between the expected outcomes and the actual performance of the model during Recall trials. Correspondingly, the PctErr initially starts high, reflecting a high percentage of errors in the model's behavior or responses.

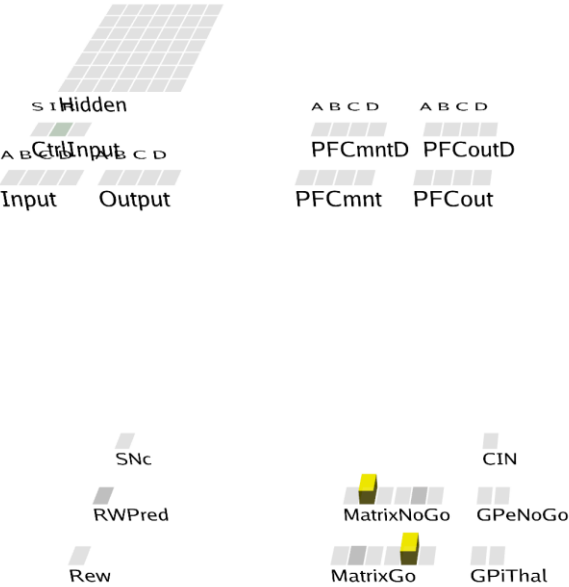
As training progresses and AbsDA decreases, the PctErr follows suit, gradually reducing until the network achieves better accuracy in the task. The decline in error rates and the concurrent decrease in AbsDA signal indicate successful learning and adjustment in the model's behavior to align with the expected outcomes.

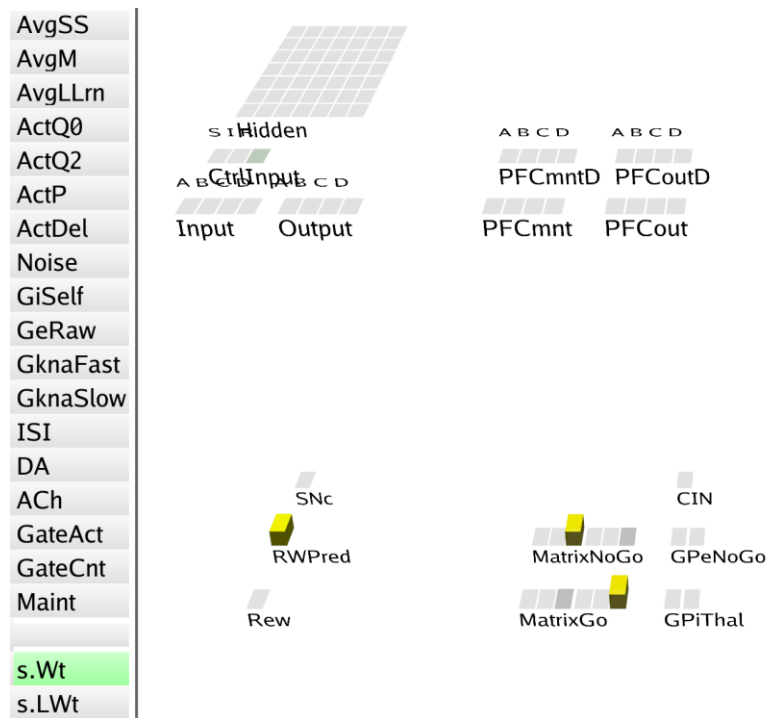
Question 10.8

AvgSS
AvgM
AvgLLrn
Lrn ActQ0
L ActQ2
L ActP
f ActDel
g Noise
i GiSelf
nt GeRaw
v GknaFast
Med GknaSlow
ISI
g DA
1 ACh
GateAct
low GateCnt
Maint
Ge
s.Wt
s.LWt



AvgSS
AvgM
AvgLLrn
ActQ0
ActQ2
ActP
ActDel
Noise
GiSelf
GeRaw
GknaFast
d GknaSlow
ISI
DA
ACh
GateAct
/ GateCnt
Maint
s.Wt
s.LWt





Store input weights allow the network to update and maintain the relevant information in the PFC stripes. This information is held until a Recall trial, where the corresponding Matrix stripe is activated, allowing the network to recall the stored information for output.

Weaker Ignore input weights ensure that the irrelevant information presented during Ignore trials does not trigger updates in the PFC. As a result, the stored information in the PFC stripes remains unaffected by the input presented during Ignore trials.

During Recall trials, the appropriate Matrix stripe receives activation from the Recall input weights, allowing the information maintained in the corresponding PFC stripe to be output to the subsequent layers of the network. This output corresponds to the stored information retrieved from the PFC based on the gating action triggered by the Recall input.