

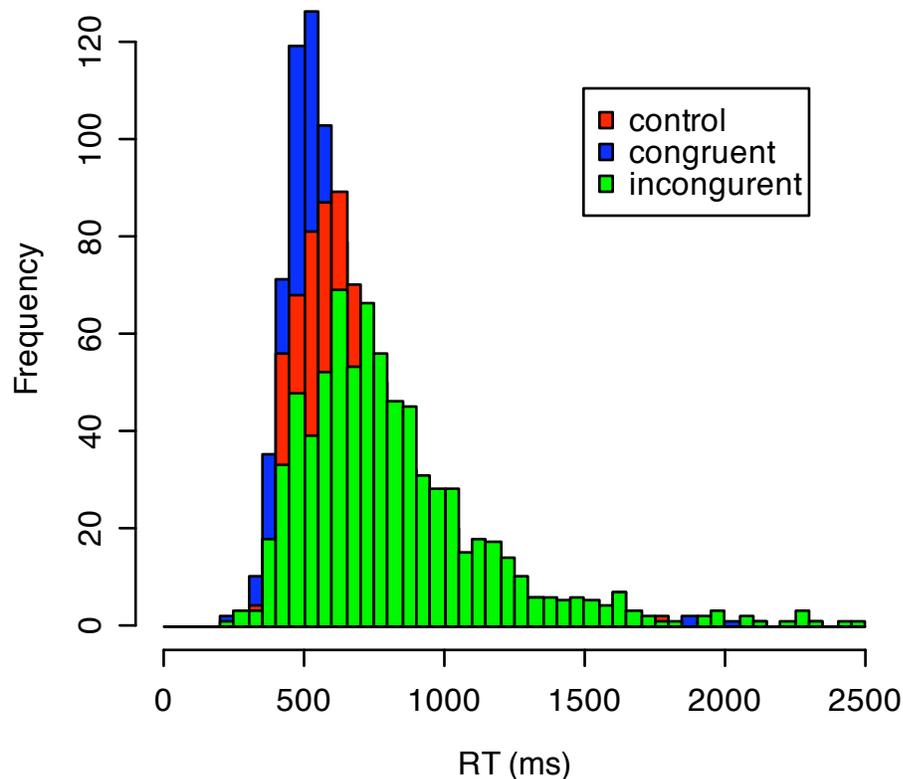
Lab 2 Part 2: The Stroop Effect continues....

Goal

Last time we analyzed our data when subjects responded to COLOR OF THE FONT and the words were upright. Today we will take one last step to consider how we run an ANOVA in R. Then you will work on analyzing the remaining parts of the data. Fortunately, this should be a rather simple modification to the R instructions we already covered.

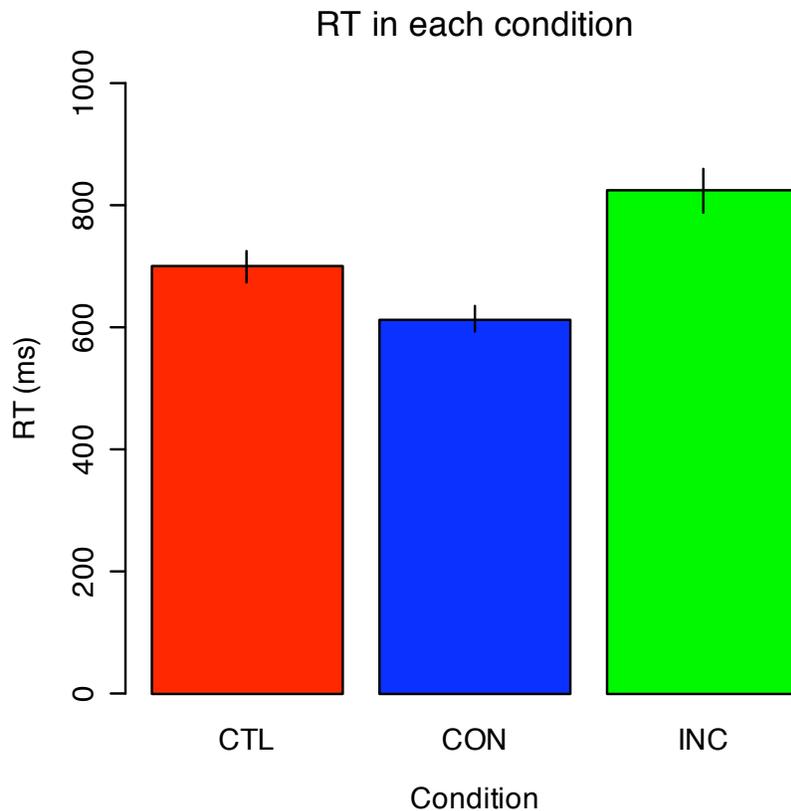
Step 1 - Plot a RT distribution for the COLOR, UPRIGHT condition:

We covered this last time (and it is included in the lab2 directions PDF). You should get something that looks like the below. See the updated PDF to see how to add a legend like the one below. Save the figure in so you can later put it in your paper.



Step 2 - Plot a bar chart of RTs for the COLOR, UPRIGHT condition:

We also covered this last time (and it is included the lab2 directions PDF). You should get something that looks like this. Remember to save the figure for your paper. There should also NOT be a title on the plot despite the example below. So make sure you name the file so you know what data this corresponds to (COLOR, UPRIGHT).



Step 3 - Do stats on your RT data to prove it is significant:

First we do the “omnibus” ANOVA to see if there is an effect, then compute the “pairwise” t-test to compare individual conditions.

Step 4 - Plot a bar chart of accuracies for the COLOR, UPRIGHT condition:

This should look and act identical to the above, but should show the average hit rate /accuracy in this condition instead of RT. It requires a simple change to the line that looks like:

```
rtbycondition = tapply(coloruprightdata$rt, list
(coloruprightdata$subj,coloruprightdata $trialtype),mean)
```

So that instead of RT by condition we get HIT RATE by condition. Hint you can compute it using the `coloruprightdata$hit` column.

Step 5 - Do stats on your accuracy data to prove it is significant:

This is easy if you have already got step 3. Just repeat on the different data. If the results do not turn out significant this is ok. However, look that the accuracies follow the same pattern as the RTs did so you can argue in the paper that there were not strong speed-accuracy tradeoffs.

Step 6 - Repeat steps 1-5 for the RESPONDING TO COLOR, UPSIDE DOWN trials

Now you have to go back and re-do this analysis, this time for the color upside down trials. We're looking to see if the stroop effect still happens when the words are upside down (as we attempted to interfere with the automatic reading process).

Step 7 - Repeat steps 1-5 for the RESPONDING TO WORD trials

Finally, we want to see if there is a Stroop effect when responding to WORD (ignoring font color). Note that there isn't a Control condition here, only congruent/incongruent trials. This means your RT distributions and t-test will only have two things in them. However, we can ultimately perform a simple t-test to see if RT still was different in the different conditions.

Note: Your final paper will have 6 figures. There are three "contrasts" we are interested in RESPOND TO COLOR-UPRIGHT, RESPOND TO COLOR-UPSIDEDOWN, and RESPOND TO WORD. Each will have a RT distribution and a RT bar chart Note that the RESPOND TO WORD contrast will only have 2 bars/condition though. Thus in total 6 figures will appear in your paper.

Step 9 - Two way ANOVAS

Compute a 2-way ANOVA comparing upright and upside down trials as a function of Control, Congruent, Incongruent. This gives us a better picture of if upside down trials really were different than the upright ones. In addition we will do a two-way ANOVA comparing Congruent/Incongruent when responding to COLOR and WORD. This also gives us a "global" test of our effect. However, we'll have to dig more into the details of ANOVA to understand how to interpret and report these results.

Minimal Analyses and charts expected for Lab 2

UPRIGHT

- HISTOGRAM
- BAR on RT
- 1-way ANOVA on RT (three levels: CTL, CON, INCON)
- Pairwise T-tests between individual conditions (if the ANOVA is significant)

- 1-way ANOVA on HIT RATE (three levels: CTL, CON, INCON), checking for speed/accuracy tradeoff
- Pairwise T-tests between individual conditions (if the previous ANOVA is significant)

UPSIDE DOWN

- HISTOGRAM
- BAR on RT
- 1-way ANOVA on RT (three levels: CTL, CON, INCON)
- Pairwise T-tests between individual conditions (if the ANOVA is significant)
- 1-way ANOVA on HIT RATE (three levels: CTL, CON, INCON), checking for speed/accuracy tradeoff
- Pairwise T-tests between individual conditions (if the previous ANOVA is significant)
- COMPARE UPSIDE DOWN vs. RIGHT SIDE UP (2-way ANOVA)

RESPOND TO WORD

- HISTOGRAM
- BAR on RT (two levels: CON, INCON)
- Pairwise T-tests between individual conditions
- Pairwise t-tests on HIT RATE, checking for speed/accuracy tradeoff

Optional/extra: 2way anova comparing inconsistent and consistent between upright, respond-to-word and upright respond-to-color.

Code for 2-way ANOVA:

```
# get the data from the respond to COLOR for upright words
coloronlydata=cleandata[cleandata$respto==COLOR, ]

# get RT by condition
rtbycondition=tapply(coloronlydata$rt,list(coloronlydata$subj,coloronlydata
$triale, coloronlydata$rotate),median)

# reformat data for ANOVA
found = which(rtbycondition!=-999,arr.ind=T)
rtANOVA = data.frame(cbind(found,rtbycondition[found]))

# rename columns
names(rtANOVA) = c('subj','cond','rotate','rt')

# set of factors (i.e., columns that refer to discrete, experimenter conditions)
rtANOVA$subj=factor(rtANOVA$subj)
rtANOVA$cond=factor(rtANOVA$cond)
rtANOVA$rotate=factor(rtANOVA$rotate)

# run a 2-way ANOVA where both condition and rotation are a within-subjects factor
myaov = aov(rtANOVA$rt~rtANOVA$cond*rtANOVA$rotate+Error(rtANOVA$subj))

# print out ANOVA table
summary(myaov)
```

How to report results of 2-way ANOVA:

Main effect of condition $F(2,80)=120.05$, $p<.001$. No effect of rotation $F(1,80)=XX$, $p=.38$ and no interaction $F(2,80)=2.79$, $p=.07$