statistical analysis

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# recognition learning

# 2 x 15 ANOVA: cond x block  
rec\_train = read.table("rec\_train\_data.txt")[,c(1,2,3,5)]  
res.aov <- anova\_test(accuracy ~ cond \* block + Error(ID|block),data=rec\_train,   
 type=3, effect.size = "pes")  
get\_anova\_table(res.aov,correction = "auto")

## ANOVA Table (type III tests)  
##   
## Effect DFn DFd F p p<.05 pes  
## 1 cond 1.00 184.00 16.257 8.09e-05 \* 0.081  
## 2 block 8.66 1593.89 140.370 1.86e-189 \* 0.433  
## 3 cond:block 8.66 1593.89 2.463 1.00e-02 \* 0.013

The interaction term is significant but its effect size is small. Maybe we should run ANOVA on just blocks 8-15.

\*pse stands for partial eta square, which is a measure of effect size

## recognition transfer

# 2X4 ANOVA : condition x itemtype   
rec\_test = read.table("rec\_test\_data.txt")[,c(1,2,3,5)]  
levels(rec\_test$itemtype) = c("Foil","New","Old","Proto") #rename levels  
rec\_test$itemtype = factor(rec\_test$itemtype,  
 levels=c("Old","New","Proto","Foil")) #reorder factor level  
res.aov <- anova\_test(oldprop ~ cond \* itemtype + Error(ID|itemtype),data=rec\_test,   
 type=3, effect.size = "pes")  
get\_anova\_table(res.aov,correction = "auto")

## ANOVA Table (type III tests)  
##   
## Effect DFn DFd F p p<.05 pes  
## 1 cond 1.00 184.00 54.851 4.53e-12 \* 0.230  
## 2 itemtype 2.67 490.68 883.933 2.80e-187 \* 0.828  
## 3 cond:itemtype 2.67 490.68 64.664 3.66e-32 \* 0.260

As expected, all main effects and interactions are significant.

# planned contrasts between old, new med and prototypes  
rec\_test %>%  
 group\_by(cond) %>%  
 pairwise\_t\_test(oldprop ~ itemtype, paired = TRUE,   
 comparisons = list(c("Old","New"),c("Old","Proto")),  
 p.adjust.method = "bonferroni")

## # A tibble: 4 x 11  
## cond .y. group1 group2 n1 n2 statistic df p p.adj  
## \* <fct> <chr> <chr> <chr> <int> <int> <dbl> <dbl> <dbl> <dbl>  
## 1 nrep oldp~ Old New 95 95 3.59 94 5.30e- 4 1.00e- 3  
## 2 nrep oldp~ Old Proto 95 95 -10.2 94 6.53e-17 1.31e-16  
## 3 rep oldp~ Old New 91 91 24.5 90 1.35e-41 2.70e-41  
## 4 rep oldp~ Old Proto 91 91 2.21 90 2.90e- 2 5.90e- 2  
## # ... with 1 more variable: p.adj.signif <chr>

# NREP vs. REP: Old vs. New  
# y1 = rec\_test$oldprop[rec\_test$cond == "nrep" & rec\_test$itemtype == "Old"] - rec\_test$oldprop[rec\_test$cond == "nrep" & rec\_test$itemtype == "New"]   
# y2 = rec\_test$oldprop[rec\_test$cond == "rep" & rec\_test$itemtype == "Old"] - rec\_test$oldprop[rec\_test$cond == "rep" & rec\_test$itemtype == "New"]   
# t.test(y1,y2)

In both REP and NREP conditions, P(old) for old items is sig. higher than new medium distortions. In NREP condition, P(old) for old items is sig. higher than prototypes. In REP conditions, P(old) for old items is *NOT* sig. different from prototypes.

# classification learning

# 2 x 15 ANOVA: cond x block  
class\_train = read.table("class\_train\_data.txt")[,c(1,2,3,5)]  
res.aov <- anova\_test(accuracy ~ cond \* block + Error(ID|block),data=class\_train,   
 type=3, effect.size = "pes")  
get\_anova\_table(res.aov,correction = "auto")

## ANOVA Table (type III tests)  
##   
## Effect DFn DFd F p p<.05 pes  
## 1 cond 1.00 81.00 18.091 5.61e-05 \* 0.183  
## 2 block 7.14 578.08 56.776 1.29e-62 \* 0.412  
## 3 cond:block 7.14 578.08 1.690 1.07e-01 0.020

The interaction term is *NOT* significant. Again, maybe we should run ANOVA on just blocks 8-15.

# classification transfer

# 2 x 4 ANOVA : condition x new distortions  
## subset itemtype variable  
class\_test = read.table("class\_test\_data.txt")[,c(1,2,3,5)]  
class\_test1 = class\_test[class\_test$itemtype != "old",]  
class\_test1$itemtype = droplevels(class\_test1$itemtype)  
class\_test1$itemtype = factor(class\_test1$itemtype,  
 levels=c("proto","newlow","newmed","newhigh"))  
levels(class\_test1$itemtype) = c("Proto","Low","Med","High")   
  
## run ANOVA  
res.aov <- anova\_test(accuracy ~ cond \* itemtype + Error(ID|itemtype),  
 data= class\_test1,  
 type=3, effect.size = "pes")  
get\_anova\_table(res.aov,correction = "auto")

## ANOVA Table (type III tests)  
##   
## Effect DFn DFd F p p<.05 pes  
## 1 cond 1.0 81.00 0.494 4.84e-01 0.006  
## 2 itemtype 2.3 186.67 46.083 1.02e-18 \* 0.363  
## 3 cond:itemtype 2.3 186.67 0.393 7.05e-01 0.005

Only the main effect of item type is significant so the typicality gradient effect is confirmed.

# 2 x 3 ANOVA : condition x itemtypes (old, new med, proto)  
## subset itemtype variable  
class\_test = read.table("class\_test\_data.txt")[,c(1,2,3,5)]  
class\_test2 = class\_test[class\_test$itemtype %in% c("old","newmed","proto"),]  
class\_test2$itemtype = droplevels(class\_test2$itemtype)  
levels(class\_test2$itemtype) = c("New","Old","Proto")   
class\_test2$itemtype = factor(class\_test2$itemtype,  
 levels=c("Old","New","Proto"))  
  
## run ANOVA  
res.aov <- anova\_test(accuracy ~ cond \* itemtype + Error(ID|itemtype),  
 data=as.data.frame(class\_test2),  
 type=3, effect.size = "pes")  
get\_anova\_table(res.aov,correction = "auto")

## ANOVA Table (type III tests)  
##   
## Effect DFn DFd F p p<.05 pes  
## 1 cond 1.00 81.00 1.821 1.81e-01 0.022  
## 2 itemtype 1.62 131.04 13.607 2.12e-05 \* 0.144  
## 3 cond:itemtype 1.62 131.04 4.719 1.60e-02 \* 0.055

# planned contrasts across distortions  
# class\_test1 %>%  
# group\_by(cond) %>%  
# pairwise\_t\_test(accuracy ~ itemtype, paired = TRUE, p.adjust.method = "bonferroni")  
  
# planned contrast between old and new medium for both conditions  
class\_test2 %>%  
 group\_by(cond) %>%  
 pairwise\_t\_test(accuracy ~ itemtype, paired = TRUE,  
 comparisons = list(c("Old","New")),  
 p.adjust.method = "bonferroni")

## # A tibble: 2 x 11  
## cond .y. group1 group2 n1 n2 statistic df p p.adj  
## \* <fct> <chr> <chr> <chr> <int> <int> <dbl> <dbl> <dbl> <dbl>  
## 1 nrep accu~ Old New 44 44 1.00 43 3.23e-1 3.23e-1  
## 2 rep accu~ Old New 39 39 5.5 38 2.76e-6 2.76e-6  
## # ... with 1 more variable: p.adj.signif <chr>

The main effect of itemtype and the interaction effect are significant. In the REP condition, P(correct) for old items is sig. higher than new medium distortion. In NREP condition, P(correct) for old items is *NOT* sig. different from new medium distortion.