Exam 3

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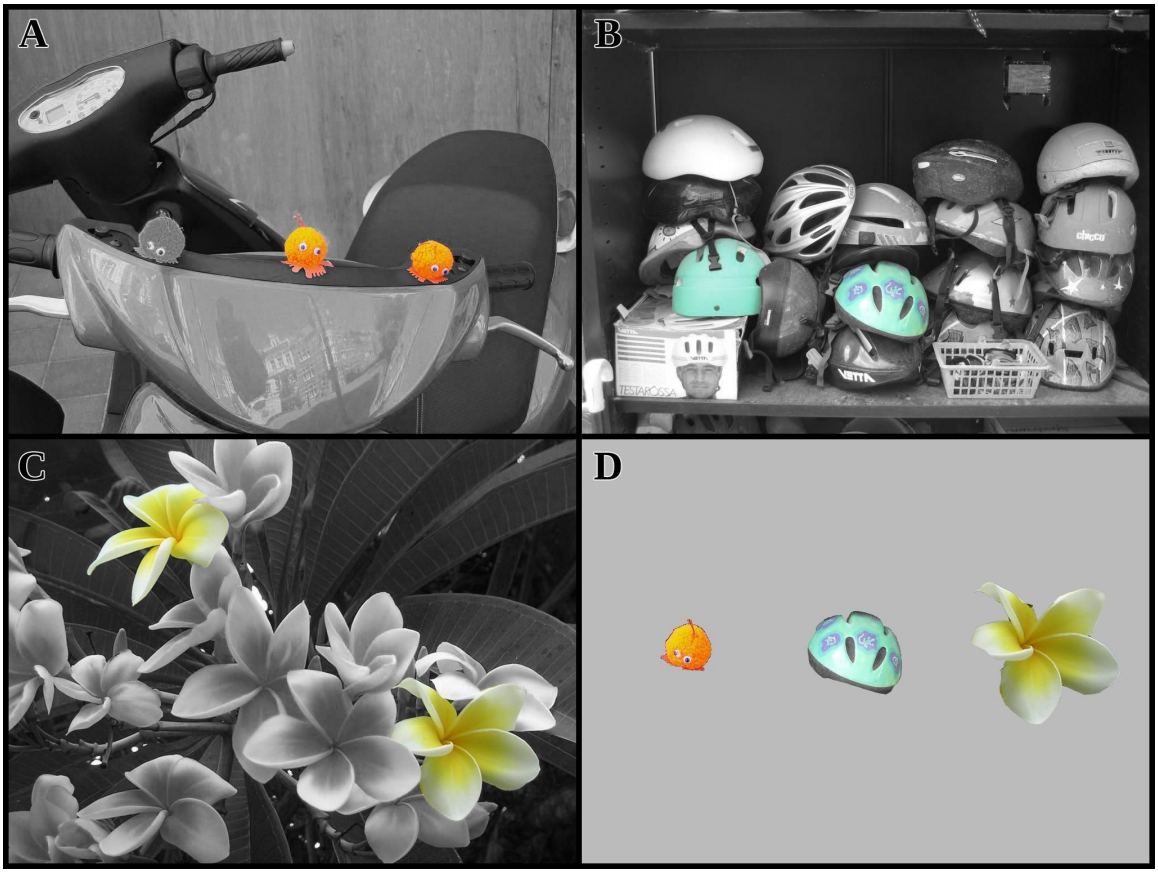
Exam 3: Where's Waldo

The following data set includes an experiment with 120 participants, each of whom completed 45 repeated measurements of a visual search task across a number of conditions. In this task, they were shown a target, and then asked to find the target in a complex screen. Sometimes the target would be in that screen, and other times it would not (the 'type' column). They would first determine if the target was there or not, and then click on the target. There were a number of different targets (probeFile) and different screens (baseimage). Also we could measure the overall size of the target (size) in pixels, and centrality, in pixels from the center of the screen. We measured overall time to find the target (responsetime), and whether their response was correct (corr) for each trial. For each of the factors, recode with polynomial or helmert contrasts so that we can examine interactions.



```
##recode the factors that look like numbers
data <- read.csv("training-pooled.csv")
head(data)

##   subnum trial baseImage stimCode    type probeCond probe
## 1    101     1        i9      100 PRESENT         4     1
## 2    101     2      i294       20 PRESENT         4     2
## 3    101     3      i264       20  ABSENT         2     3
## 4    101     4      i264       20 PRESENT         4     2
## 5    101     5      i264        3 PRESENT         4     3
## 6    101     6        i9        0  ABSENT         1     3
##                    probeFile clickResp corr  time1  time2
responsetime size
## 1   Stimuli/Probes/i9-1.png         1    1 103216 104906
1690   92
## 2 Stimuli/Probes/i294-2.png         1    1 110328 112842
2514  237
## 3 Stimuli/Probes/i264-3.png         1    0 117656 119339
1683  161
## 4 Stimuli/Probes/i264-2.png         1    1 131720 134225
2505  172
## 5 Stimuli/Probes/i264-3.png         1    1 139751 142378
2627  161
## 6   Stimuli/Probes/i9-3.png         1    0 146856 148362
1506   80
##   Centrality
## 1        236
## 2        317
## 3        389
## 4        143
## 5        389
## 6        259

data$subnum <- as.factor(data$subnum)
data$probeCond <- as.factor(data$probeCond)
data$probe <- as.factor(data$probe)
```

1 Identifying outliers and influential points and transforming dependent measure

To begin, we want to use response time as the dependent measure. However, we suspect that it will be non-normal, and might have some highly influenntial outilers. Examine the raw data and choose an appropriate transformation that will make it as normally-distributed as possible. Then, examine whether there are any highly-influential points that require removal. Discuss your rationale for removing any

points, and demonstrate (using histograms, q-qplots, or violin plots) that the transformed data are reasonable, both overall and for each baseimage condition.

2. ANOVA for base image condition

For this question, pretend we did not have repeated measures (ignore the subnum variable), and build an ANOVA modeling using your transformed RT as a dependent measure. Consider only the correct responses, so filter out any whose corr values is 0. Include baseimage, type, and a baseImage x type interaction, and size and centrality as numerical covariates. Use a type-II ANOVA, and determine which variables are significant. For each one, discuss in words what that means. Also conduct a type-III ANOVA, and discuss whether either the main effect of type or baseimage changed, or the type x baseimage interaction. For the Type-II model, compute post-hoc tests for baseImage and the baseimage by type interaction to determine which levels differed from eachother.
Report the post-hoc tests, and the overall effect sizes, and discuss both the relative importance of these predictors, and the overall proportion of variance being predicted by this model. Is it good or bad?

3. Repeated Measures

Now, incorporate subject number as a randomized factor, specifying error strata with Error(subnum/(baseImage*type)). Report the appropriate F test for the main effects of baseimage and type and their interaction (pulling them from the proper error strata of the output). Compute, report, and discuss the effect sizes eta^2 for the two main effects and the interaction.

4. EzANOVA

Use an ezANOVA to build the same model, excluding the size and centrality variables if the model won't incorporate continuous predictors. Examine the sphericity test. If it is significant, report the adjusted F tests values using the GG or HF correction, for baseimage and type and baseimage:type; otherwise report the uncorrected numbers. The ezANOVA does not like unbalanced designs, so use the original data (with no rows removed). You will need to specify both baseImage and type as within variables, which you can do with the argument within=.(baseImage,type) inside the ezANOVA function.

5. Mixed-effects model

Finally, use lme4 (lmer) or nlme (lme) to build the same model as a mixed effects model, treating subject as a randomized factor. Again, report the significance of the baseImage and type and their interaction. Create a second model without the

interaction term, and compare the two models with an anova(). Discuss which of the the two models you would prefer.