Mixed designs

some within, some between

Mixed designs

Today's goal:

Teach you about mixed designs, ANOVAs that have both within and between-subjects conditions

Outline:

- No theory! Just a quick example in R
- And another, using robust methods

Mixed designs in R

Yay! No theory!

Mixed designs in R

Dataset “speed.dat” (I’ve already made it long for you)

Effect of personality and looks on perceived attractiveness in speed dating

Variables:

participant: the participant ID

gender: Male or Female

personality: none, some, high

looks: ugly, average, attractive

Plotting

Some re-leveling:

```
speed$personality = factor(speed$personality,
levels=c("high","some","none"))
```

Box plot:

```
ggplot(speed,aes(looks,rating,color=personality))
+geom_boxplot()+facet_wrap(~gender)
```

Contrasts

Personality contrast:

```
any_v_none <- c(1/3,1/3,-2/3); hi_v_some <- c(1/2,-1/2,0)
contrasts(speed$personality) <- cbind(any_v_none,
hi_v_some)
```

Looks contrast:

```
any_v_ugly <- c(1/3,1/3,-2/3); att_v_av <- c(1/2,-1/2,0)
contrasts(speed$looks) <- cbind(any_v_ugly, att_v_av)
```

Contrasts

Gender contrast:

```
female_v_male <- c(-1/2,1/2)
contrasts(speed$gender) <- cbind(female_v_male)
```

ezANOVA

```
speedModel <- ezANOVA(data = speed, dv = .(rating),
wid = .(participant), between = .(gender), within = .(looks,
personality), detailed=T, type=3)
```

```
speedModel
```

Interpretation

> Yay! Sphericity!
>
> Three-way interaction effect is significant; the combined effect of looks and personality differs between males and females

lme

Let's make some non-orthogonal contrasts (totally allowed in lme)

Question: why did we create contrasts in ezANOVA, even when we can't inspect them?

Idea: for both looks and personality, let's compare low and high against average

Question: what kind of contrast is this?

lme

Dummy coding!

So basically, all we have to do is re-level:

```
speed$personality = factor(speed$personality,
levels=c("some","high","none"))

speed$looks = factor(speed$looks,
levels=c("average","attractive","ugly"))
```

lme

Baseline model:

```
baseline <- lme(rating ~ 1, random = ~1|participant/looks/
personality, data = speed, method = "ML")
```

Add main effects of looks, personality, and gender:

```
looks <- update(baseline, .~. + looks)
personality <- update(looks, .~. + personality)
gender <- update(personality, .~. + gender)
```

lme

Add 2-way interactions one by one:

```
looks_gender <- update(gender, .~. + looks:gender)
personality_gender <- update(looks_gender, .~. +
personality:gender)
looks_personality <- update(personality_gender, .~. +
looks:personality)
```

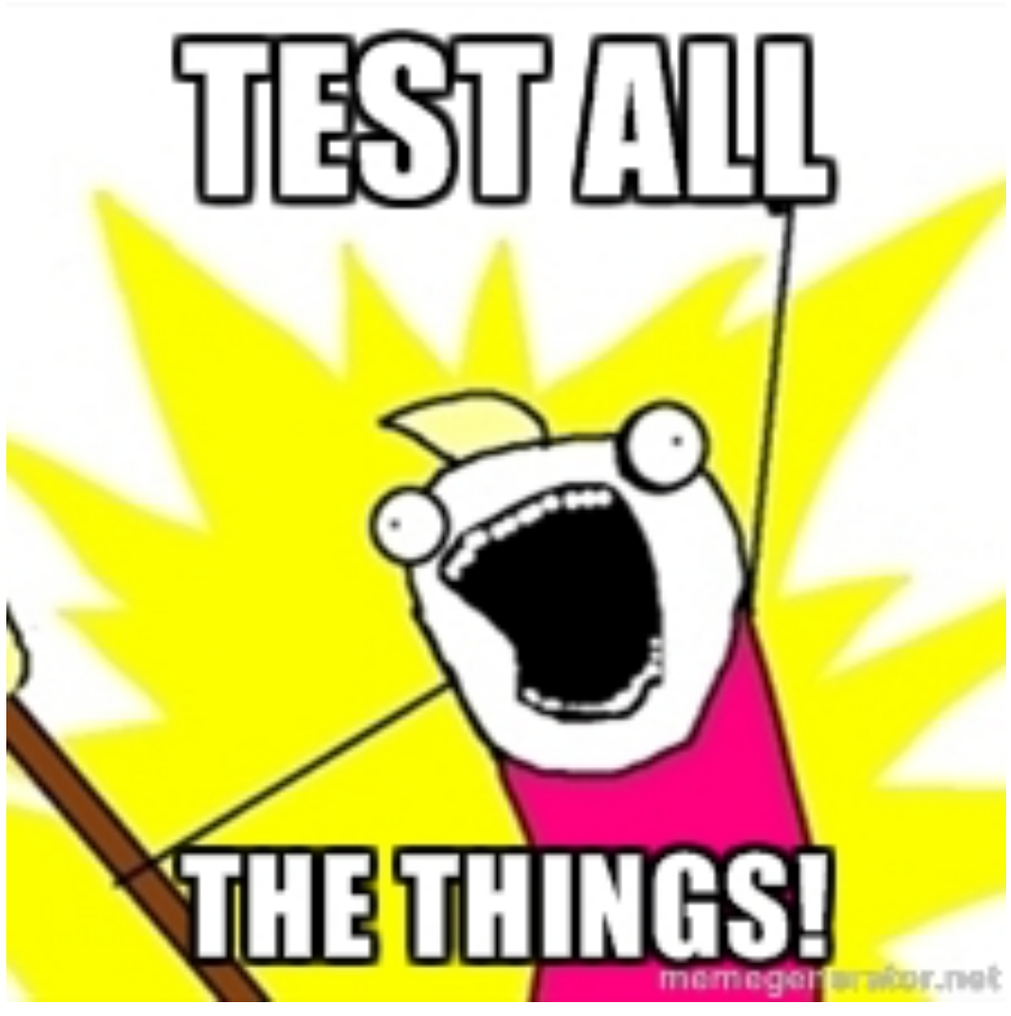
Full model (add 3-way interaction):

```
full <- update(looks_personality, .~. +
looks:personality:gender)
```

lme

Comparison:

anova(baseline,
looks,
personality,
gender,
looks_gender,
personality_gender,
looks_personality,
full)



lme

Get the contrast effects: summary(full)

Check out Field sections 14.6.3–14.6.9 for a very detailed discussion of these results

Tip: explain your effects with a graph!

What about the effect size?

Tip: don't even bother with omega

Report specific contrast effect sizes using $r = \sqrt{(t^2/(t^2+df))}$

Reporting: see section 14.8

Robust mixed designs

Note: only for 2-way mixed designs!

Robust versions

Dataset “profile.dat” (I’ve already made it long for you)

Effect of women’s relationship status (between) and profile picture (within) on creepy friend requests

Variables:

case: the participant ID

status: in a relationship, single

picture: alone, couple

requests: number of creepy friend requests

Robust versions

Trimmed means:

tsplit(requests~status*picture,id=case,data=profile,tr=0.2)

Bootstrapping:

Factor A: sppba(requests~status*picture, id=case, data=profile, nboot=2000)

Factor B: sppbb(requests~status*picture, id=case, data=profile, nboot=2000)

Interaction: sppbi(requests~status*picture, id=case, data=profile, nboot=2000)

Robust versions

Drawbacks:

- Limited to 2-way anova
- Can't inspect contrasts or post-hoc effects

Better options:

Robust lme (with a bootstrap function, see regression slides)

Sandwich estimator (see categorical data slides)

“It is the mark of a truly intelligent person
to be moved by statistics.”

T H A N K S !

George Bernard Shaw