# Psychology 205: Psychometric Theory
# Qualtrics and Using R to score scales

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# Outline

# The web as a data collection tool

1. Web survey tools: Qualtrics
   - http://www.weinberg.qualtrics.com
   - http://www.weinberg.northwestern.edu/weinbergit/teaching-research/qualtrics/ for help
   - If you don't have an account, start one (non-Weinberg students will need special access)
   - Fairly straightforward help menus for designing and collecting data
2. Recruit participants and initiate study
   - list serves
   - friends on Facebook
3. Save raw results as a csv or excel spreadsheet
4. Move data to R

# Using Qualtrics

1. http://www.weinberg.qualtrics.com
2. 
3. http://www.weinberg.northwestern.edu/weinbergit/teaching-research/qualtrics/ for a tutorial
4. Create a project
5. Formulate your questions
6. (look at possible items at http://ipip.ori.org - single construct scales)
7. Select appropriate demographic items
8. Create your items using the new items menu
9. Distribute your survey, perhaps by sending a link to it.

# Getting your data

1. Once it has started running, you can go to the Data & Analysis tab
2. You can Export the data as a data table
3. Using the csv option
4. Open the file using a spreadsheet
5. Delete the second line (once you have confirmed the items)
6. Select the first through last line, but just the columns you want
7. Copy to your clipboard
8. Use R

# Several tutorials

1. Short one for 205
    - https://personality-project.org/revelle/syllabi/205/scoring.pdf)
2. Longer one as part of the "how to" help files for psych
    - https://personality-project.org/r/psych/HowTo/scoring.pdf

# 5 steps towards scoring your data

1. read the data in using the read.clipboard functions
   - my.data $<-$ read.clipboard()
   - perhaps read.clipboard.csv() if comma separated files
   - perhaps read.clipboard.tab() if tab delimited (excel) file
2. describe the data using the describe function
   - describe(my.data)
   - describeBy(my.data, my.data$sex) # if you want to have break downs by some variable
3. Create a scoring key (or keys) for your items
   - keys$<-$make.keys(my.data, list(scale1=c(1,3,5, -6), scale2 = c(2,4,7))
4. score the scales using the score.items function
   - scores $<-$ score.items(keys,my.data)
   - scores #to see the statistics
   - my.scores $<-$ scores$scores #to get the actual scores
   - describe(my.scores)

# Type I and Type II error and the process of science

1. Type I error as probability of rejecting the null if null is true
2. Type II error as probability of failing to reject null if null is false
3. But what is the probability that a significant finding is actually a type I error?
4. Partly depends upon the probability of null being true
   - We tend to do studies that are not likely to have an effect – one that is unusual and not obvious
5. Also depends upon power

Table: Two states of world and two experimental conclusions

| | True State of World | |
|---|---|---|
| Experimenter says | No Difference | Difference |
| No Difference | Correct acceptance | failure to reject |
| Difference | Incorrect rejection (Type I) | Correct rejection |

We need to consider the probability that a significant result reflect real differences. This will depend upon the power of the study and the base rate of real differences.

# Consider a hypothesis with 10% chance of being correct

With Very high power (99%)

Table: Even a study with high power has a high number of type I errors

| | True State of World | | |
|---|---|---|---|
| Experimenter says | No Difference | Difference | total |
| No Difference | 855 | 1 | 856 |
| Difference | 45 | 99 | 143 |
| Total | 900 | 100 | 1000 |

45/143 =31% of significant studies are incorrect

# Now consider a hypothesis with 10% chance of being correct

With Very low power (20%)

Table: A study with low power is more likely to have significant effects that are type I errors

| | True State of World | | |
|---|---|---|---|
| Experimenter says | No Difference | Difference | total |
| No Difference | 855 | 80 | 935 |
| Difference | 45 | 20 | 65 |
| Total | 900 | 100 | 1000 |

45/65 =69% of significant studies are incorrect