

## Understanding Statistics and Experimental Design

### Exercise about non-parametric tests

1. Ten people who suffer from chronic pain are given a rating scale that measures the intensity of their pain. They are then given a drug (actually a placebo) and encouraging information concerning its effectiveness. After taking the placebo, they again rate the intensity of their pain. Their ratings before and after the placebo is administered are listed below:

Patient	Before	After
1	48	35
2	27	29
3	36	29
4	44	21
5	22	24
6	35	30
7	29	27
8	48	37
9	25	28
10	32	24

- Do the data meet the assumption of the homogeneity of variances?
- Does the researcher have an *a priori* reason to expect the drug reduces people's ratings of pain? How does this guide the selection of an appropriate statistical test?
- Was the drug effective at reducing people's ratings of pain? Choose the appropriate test and use statistical software such as JASP to conduct the test, with  $\alpha = 0.05$ . Interpret the results appropriately.
- BONUS: Compute the statistical test without the use of statistical software.

### Exercises about effect size and statistical power

These questions use statistics derived from the article:

Jostmann, N. B., Lakens, D., & Schubert, T. W. (2009). Weight as an embodiment of importance. *Psychological Science*, 20(9), 1169-1174.

2. The main result in Study 1 is an F-test comparing participants' judgments of the value of foreign currencies depending on whether a clipboard they were holding was light or heavy. The effect size, partial-eta-squared ( $\eta_p^2$ ), is reported as part of the results.

- What other information, in addition to an effect size, is required for computing a statistical test's *retrospective* (sometimes called *post-hoc*) power?
- What are the benefits of computing a statistical test's retrospective power? Are there any dangers?
- Using the statistical software G\*Power, compute the retrospective power of Study 1 in Jostmann et al. (2009).

3. Study 1 reports an F-test and a partial-eta-squared effect size. We would like to interpret the effect size in a manner more familiar to our Signal Detection Theory framework in the course.

- The test statistic of the two-sample F-test can be related to the test statistic of a two-sample t-test, using which formula?

b) Compute the Cohen's  $d$  effect size using the  $t$ -statistic obtained in step a).