

## Understanding Statistics and Experimental Design

### Exercise about non-parametric test

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

The researcher finds that these data violate the assumption of homogeneity of variance, and so she decides to analyze the data using a nonparametric test. Perform the test to determine whether or not the drug was effective. Use  $\alpha = 0.05$ , and assume that the researcher had reason to expect a reduction in pain with the placebo.

### Exercises about 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 currencies for participants in a light clipboard versus a heavy-clipboard condition. With the provided partial-eta-squared effect size for the F test use the program G\*Power to estimate the *post hoc* power of this test.

3) A two-sample F test is equivalent to a two-sample *t*-test, so convert the reported F value to a *t* value:

$$t = \sqrt{F}.$$

Convert the *t* value to an estimate of Cohen's *d* effect size:

$$d = t \sqrt{\frac{n_1 + n_2}{n_1 n_2}}$$

Compute Hedge's correction to make Cohen's  $d$  unbiased:

$$J = 1 - \frac{3}{4(n_1 + n_2 - 2) - 1}$$

and compute the Hedge's  $g$  effect size as:

$$g = Jd.$$

Use G\*Power to estimate *post hoc* power for the test (Use  $g$  as "Effect size  $d$ "). Alternatively, use the *R pwr* library to compute power. Does the power estimate match the value computed in question 1)? What might explain the difference?