Cohen g (es_cohen_g)

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Introduction

The *es_cohen_g* function (and *es_cohen_g_arr* in VBA) calculates an effect size known as Cohen's g. This effect size measure can be used with a one-sample binomial test, Wald, or Score test, if the expected proportion is 0.5.

It is simply the difference between the observed proportion and the expected proportion of 0.5

This document contains the details on how to use the functions, and formulas used in them.

1 About the Function

1.1 Input parameters:

- **data**
  The data to be used. Note for Python this needs to be a pandas data series.

- *Optional parameters*
  - **codes** (default is none)
    Two codes for the two categories to be compared. For example if the data has a list of scores with "national" and "international", the codes used can be exactly those: "national", "international".
    This makes it possible to also use a nominal data set (with more than two categories) and then select the two for this test to be used, and keep it in line with a one-sample binomial, Wald, or score test.

  - **out** (default is "value") – only applies to VBA non-array function
    Choice what to show as result. Either:
    - "value": show the p-value (significance)
    - "qual": show the qualification

1.2 Output:

- The **value**, and the **classification**. Except for the non-array version in VBA (Excel) which will only show the requested output via the 'out' parameter.

- The array version in VBA (*es_cohen_g_arr*) requires **two rows** and **two columns**.

1.3 Dependencies

- **Excel**
  None.
  You can run the **es_cohen_g_addHelp** macro so that the function will be available with some help in the 'User Defined' category in the functions overview.

- **Python**
  The following additional libraries will have to be installed:
  - *pandas*
    the data input needs to be a pandas data series, and the output is also a pandas dataframe.

- **R**
  No other libraries required.

2 Examples

2.1 Excel

	A	B	C	D	E	F	G
1	data						
2	1						
3	2		value	-0,184210526	=es_cohen_g(A2:A20;;C3)		
4	2		qual	medium	=es_cohen_g(A2:A20;;C4)		
5	1						
6	2		Cohen g	Qualification			
7	2		-0,1842105	medium			
8	1						
9	1		C6:D7	=es_cohen_g_arr(A2:A20)			
10	2						
11	2						
12	2						
13	2						
14	2						
15	2						
16	1						
17	2						
18	1						
19	2						
20	2						
21							

2.2 Python

```
[2]: dataList = ['Female', 'Male', 'Male', 'Female', 'Male', 'Male', 'Female', 'Female',
                 'Male', 'Male', 'Male', 'Male', 'Male', 'Male', 'Female', 'Male',
                 'Female', 'Male', 'Male']
     data = pd.Series(dataList)
```

```
[3]: es_cohen_g(data)
```

[3]:

	Cohen g	Classification
0	0.184211	medium

```
[4]: codes = ['Female', 'Male']

     es_cohen_g(data, codes)
```

[4]:

	Cohen g	Classification
0	-0.184211	medium

2.3 R

```
> data <- c("Female", "Male", "Male", "Female", "Male", "Male", "Female", "Female", "Mal
e", "Male", "Male", "Male", "Male", "Male", "Female", "Male", "Female", "Male", "Male")
> es_cohen_g(data)
           g classify
1 -0.1842105   medium
> |
```

3 Details of Calculations

3.1 The Effect Size

$$g = P - \frac{1}{2}$$

With

$$P = \frac{k}{n}$$

Symbols:

- n is the number of cases in the analysis
- k is the number of successes.

3.2 Interpretation

Table 1

Rule of thumb for Cohen g interpretation

Cohen's g	*Interpretation*
0.00 < 0.05	Negligible
0.05 < 0.15	Small
0.15 < 0.25	Medium
0.25 or more	Large

Note. Adapted from Cohen (1988, pp. 147–149)

4 Source

Cohen's g can be found in *Statistical power analysis for the behavioral sciences* (2nd ed) (Cohen, 1988), on page 147.

(5.2.1) $$\mathbf{g} = \mathbf{P} - .50 \text{ or } .50 - \mathbf{P} \qquad \text{(directional)},$$

and

$$\mathbf{g} = |\mathbf{P} - .50| \qquad \text{(nondirectional)}.$$

(Cohen, 1988, p. 147)

References

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). L. Erlbaum Associates.