Correlation – Effect size & Power Example

I am planning to run a study to examine the relationship between physical activity and behavioral problems in children. I expect to find a correlation of about .-47.

(a) Calculate the effect size for these results (to 2 decimals). Always report the effect size as positive.

.47

(b) What total sample size should I use to avoid a 20% chance of a TypeII error?

33

(c) Is this an appropriate sample size to use for the planned replication?

- (●) Yes, this sample size will provide adequate power.
- ( ) No, this sample size won't provide enough power.

a. The correlation IS the effect size. Remember to report decimals and to always report all effect sizes as positive, so the answer is ➔ .47

b. The effect size of .47 would be rounded down to .45, following the rounding rules (below).

20% chance of a Type II error corresponds with 80% power. Using the Table (below) the sample size (S) corresponding to r = .45 & .80 power is ➔ 33

c. 80% power is the "industry standard" – since our sample size estimate was based on a power of .80, then this is an appropriate sample size to use. Answer is ➔ Yes

Here are the rounding rules when using the Power Table!!

Using the Power Table

The power table has .5 increments for the effect size (r) values -- it is important to always round the r-value correctly!

- So …
  - Round down to if the effect size ends in 1, 2, or 3 (e.g., .21, .22 and .23 all round down to .20)
  - Round up if the effect size ends in 4 (e.g., .24 rounds up to .25)
- Also …
  - Round down to if the effect size ends in 6, 7, or 8 (e.g., .26, .27 and .28 all round down to .25)
  - Round up if the effect size ends in 9 (e.g., .29 rounds up to .30)
- But …
  - Any r < .10 will be rounded up to .10 when using the power table (but not to report the effect size!!)

Power, Effect Size & Sample Size*

r ? / ? power	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

* "**S**" values given for α = .05

Values taken from (Friedman, 1982 & Cohen, 1988), with some interpolation.

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BG ANOVA – Effect size & Power Example

75 consumers that preferred Burger Whatz-it had a mean heath consciousness score of 88.2, whereas the 73 consumers that preferred Veggie Whatz-it had a mean health consciousness score of 96.3, F(1,146) = 4.97.

(a) Calculate the effect size for these results (to 2 decimals). Always report the effect size as positive.

.18

(b) What sample size should be used in next study to take only a 40% risk of a Type II error?

257

(c) How many participants will be in each condition?

129

(d) Is this an appropriate sample size to use for the planned replication?

- ○ Yes, this sample size will provide adequate power.
- ◉ No, this sample size won't provide enough power.

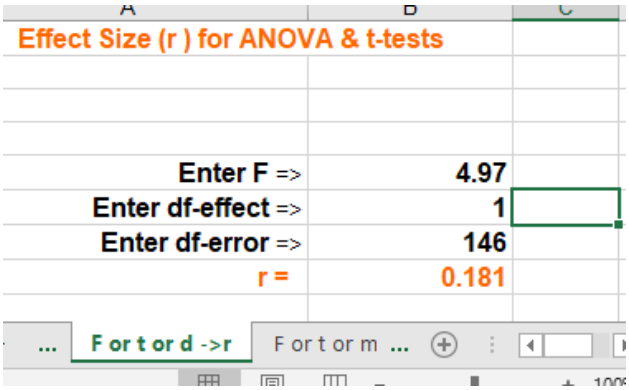
a. Use the Computator (shown below) to calculate the effect size from the F and df given. Answer ➔ .18

b. The effect size of .18 would be rounded down to .15, following the rounding rules (shown above).

40% risk of a Type II error corresponds with 60% power. Using the Table (below) the sample size (S) corresponding to r = .15 & .60 power is ➔ 257

c. This is a BG study (with different participants in each IV condition), so the 257 participants have to be split between the two IV conditions, so Number in each condition ➔ 257/2 129

d. 80% power is the "industry standard" – since our sample size estimate was based on a power of .60, then this is NOT- an appropriate sample size to use (it would be under-powered). Answer is ➔ No



Effect Size (r) for ANOVA & t-tests

Enter F =>	4.97
Enter df-effect =>	1
Enter df-error =>	146
r =	0.181

... F or t or d ->r F or t or m ...

Power, Effect Size & Sample Size*

r ? / ? power	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

* "S" values given for α = .05

Values taken from (Friedman, 1982 & Cohen, 1988), with some interpolation.

WG ANOVA – Effect size & Power Example

80 graduates received an average of 62.3 on the well-known depression inventory six-months prior to graduation and an average of 83.6, six-months following graduation, F(1,79) = 9.55.

(a) Calculate the effect size for these results (to 2 decimals). Always report the effect size as positive.

.33

(b) What sample size should be used in next study to have 50% power?

42

(c) How many participants will be in each condition?

42

(d) Is this an appropriate sample size to use for the planned replication?

- ○ Yes, this sample size will provide adequate power.
- ◉ No, this sample size won't provide enough power.

a. Use the Computator (shown below) to calculate the effect size from the F and df given.
Answer ➔ .33

b. The effect size of .33 would be rounded down to .30, following the rounding rules (shown above).

50% risk of a Type II error corresponds with 50% power. Using the Table (below) the sample size (S) corresponding to r = .30 & .50 power is ➔ 42

c. This is a WG study (with the same participants in boyh IV conditions), so the 42 participants are in both IV conditions, so
Number in each condition ➔ 42

d. 80% power is the "industry standard" – since our sample size estimate was based on a power of .50, then this is NOT an appropriate sample size to use (it would be under-powered).
Answer is ➔ No

A	B	C
Effect Size (r) for ANOVA & t-tests		
Enter F =>	**9.55**	
Enter df-effect =>	**1**	
Enter df-error =>	**79**	
r =	**0.328**	

Power, Effect Size & Sample Size*

r ? / ? power	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

* "**S**" values given for α = .05

Values taken from (Friedman, 1982 & Cohen, 1988), with some interpolation.

Chi-square – Effect size & Power Example

Each of 25 dentist and 25 other health care practitioners were asked whether or not they had cavities. More dentists tended to have cavities than not and the other health care practitioners tended to not have cavities, X(1)=4.06.

(a) Calculate the effect size for these results (to 2 decimals). Always report the effect size as positive.

.29

(b) What total sample size should I use in a replication of this study to have 90% power?

109

(c) How many participants will be in each condition?

55

(d) Is this an appropriate sample size to use for the planned replication?

- (●) Yes, this sample size will provide adequate power.
- ( ) No, this sample size won't provide enough power.

a. Use the Computator (shown below) to calculate the effect size from the Chi-square and the total number of people in the study (25 dentists & 25 other health care → N=50)
Answer → .29 (rounded up from .285)

b. The effect size of .29 would be rounded up to .30, following the rounding rules (shown above).

We're looking for 90% power. Using the Table (below) the sample size (S) corresponding to r = .30 & .90 power is → 109

c. Since the stat is Chi-square, we know this is a BG study (with different participants in each IV condition), so the 109 participants have to be split between the two IV conditions, so
Number in each condition → 109/2 55

d. 80% power is the "industry standard" – since our sample size estimate was based on a power of .90, then this IS an appropriate sample size to use (it would be under-powered). Answer is → Yes

Effect Size (r) for Chi-Square

Enter Chi-Square =>	4.060
Enter df =>	1
Enter N =>	50
r =	0.285

... ChiSq->r pr_chi>r Ou ...

Power, Effect Size & Sample Size*

r ? / ? power	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
.20	124	32	21	15	14	13	11	9	7	5			
.30	208	93	53	34	24	18	14	11	9	8	7	6	5
.40	296	132	74	47	33	24	19	15	12	10	8	7	6
.50	382	170	95	60	42	30	23	18	14	12	9	8	7
.60	488	257	143	90	62	45	34	24	20	16	13	11	9
.70	613	300	167	105	72	52	39	29	23	28	15	12	10
.80	781	343	191	120	82	59	44	33	26	20	16	13	11
.90	1045	459	255	160	109	78	58	44	34	27	21	17	13

* "S" values given for α = .05

Values taken from (Friedman, 1982 & Cohen, 1988), with some interpolation.