University of Iowa Stead Family Children's Hospital

More Power to You: Calculating Your Effect Size

Kelly Pelzel & Beth Troutman, University of Iowa
with assistance from
Allison Momany, University of Iowa
& John Paul Abner, Milligan College

UC Davis 18th Annual Conference on PCIT
for Traumatized Children
September 17, 2018

Overview

University of Iowa Stead Family Children's Hospital

- What is effect size and how does it relate to statistical significance?
- Why calculate effect size with your own PCIT data?
- How do you handle data from families who drop out?
- Step-by-step instructions on how to calculate effect size (with example).
- Why interpret PCIT effect sizes with caution?
- Time to calculate your effect size (if you brought deidentified data).

What is Effect Size (Hartmann et al., 2015)

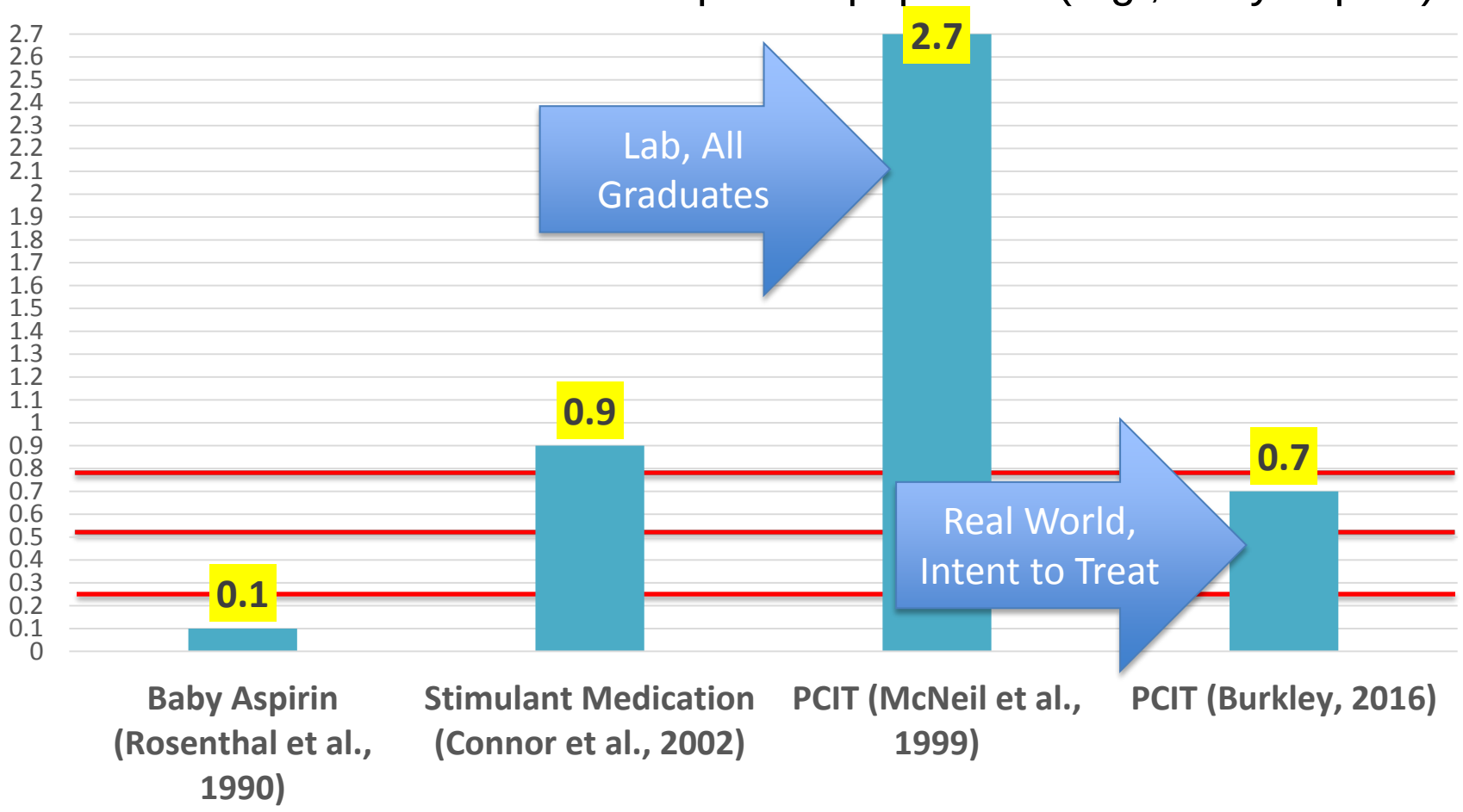
University of Iowa Stead Family Children's Hospital

- Effect size is an estimate of the magnitude of a difference
- It is used to convey the importance or strength of result.
- Whether or not a finding is statistically significant depends on both the effect size and the sample size.
- If you have an estimate of effect size, you can estimate how many participants you would likely need to get a statistically significant result. This is called a power analysis.

Effect Size Examples (Cohen's *d*)

University of Iowa Stead Family Children's Hospital

- Effect sizes are generally categorized as trivial (d < .2), small (d = .2 to .5), medium (d = .5 to .8), or large (d > .8) (Cohen, 1992)
- Even trivial effect sizes can have an impact at pop. level (e.g., baby aspirin)



Effect Size Illustrator

University of Iowa Stead Family Children's Hospital

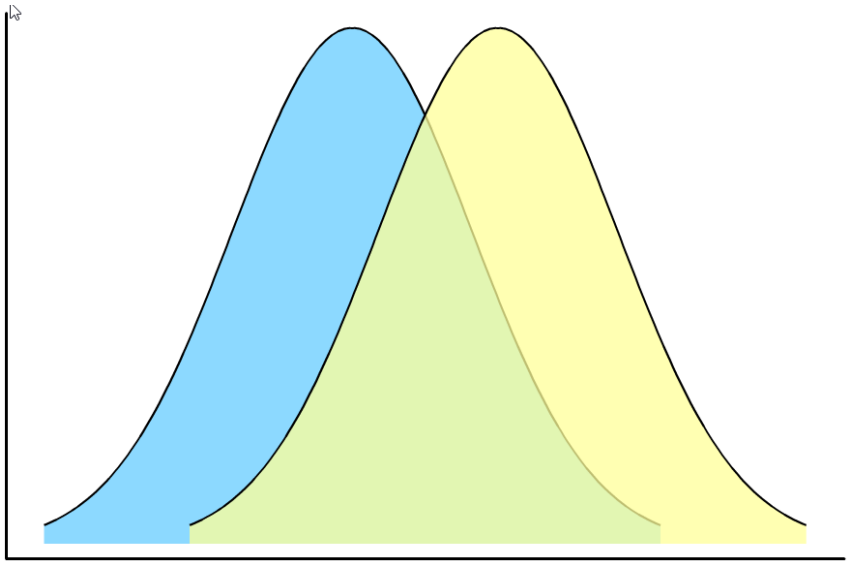
- Gardner's Effect Size Illustrator:

http://esi.medicine.dal.ca/effect-size-illustrator.html#app=fb33&1a02-selectedIndex=0

GAME TIME: SEEING IS BELIEVING!

University of Iowa Stead Family Children's Hospital

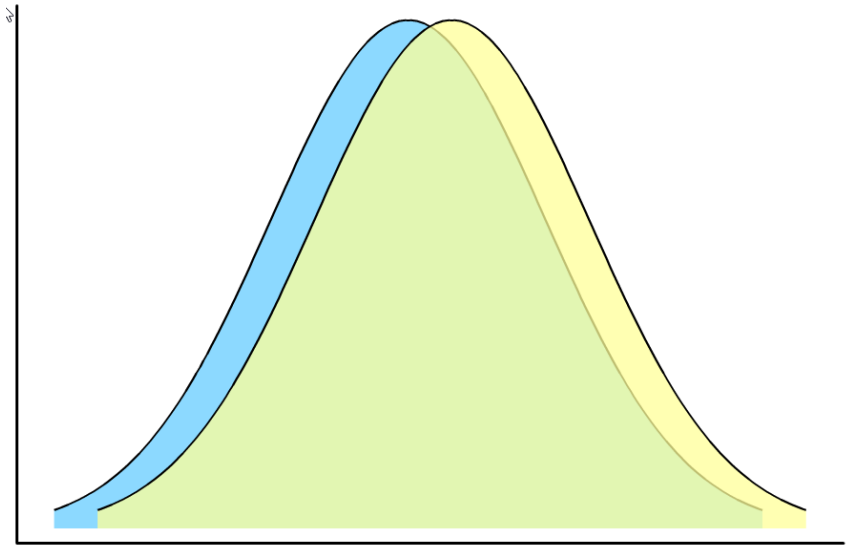
- 4 multiple choice items
- Illustration displayed represents the effect size of one of the three studies listed (ECBI intensity scores)
- Studies were included in the Thomas et al., 2016 meta-analysis
- Blue curve received PCIT
- Grading on the honor system
- Candy for winners!



a. Eyberg et al., 1995
(-1.23)

b. McCabe et al., 2009
(-0.67)

c. Mersky et al., 2016
(-0.27)

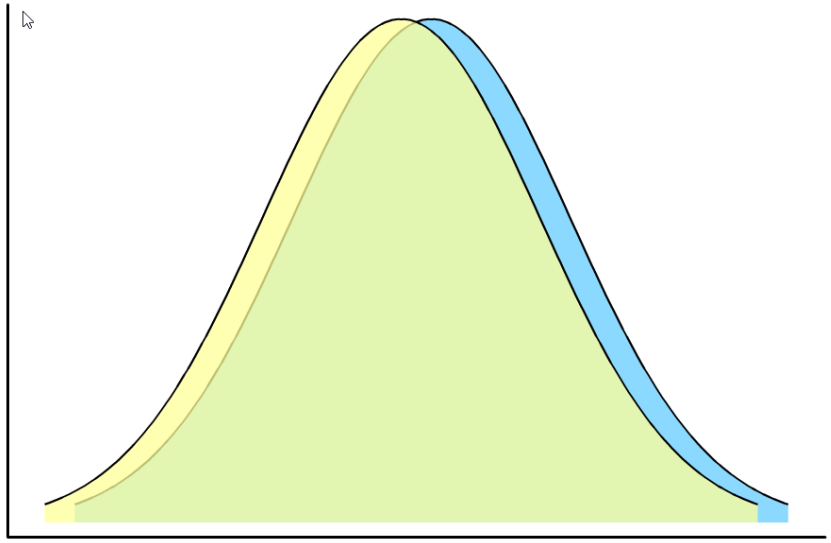


a. Danko, 2015
(-0.25)

b. Webb et al., 2016
(-0.13)

c. Solomon et al., 2008
(-0.32)

#3

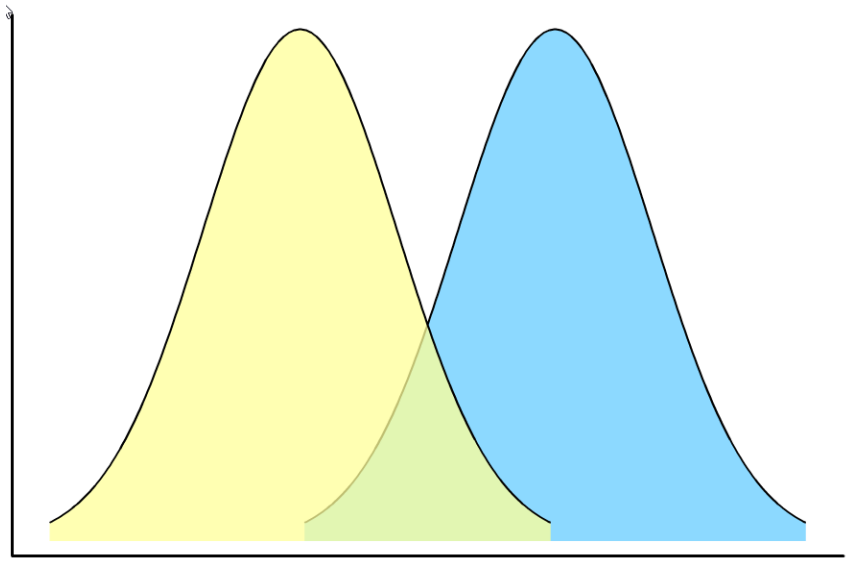


a. Thomas & Zimmer-Gembeck, 2011 (-0.28)

b. Chaffin et al., 2004 (0.22)

c. Thomas & Zimmer-Gembeck, 2012 (-0.25)

#4



a. Bagner et al., 2010 (-2.72)

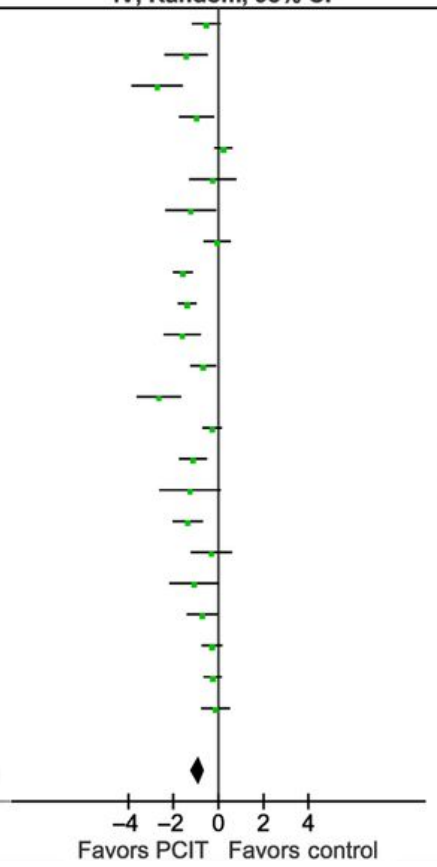
b. McNeil et al.,1999 (-2.65)

c. Bagner & Eyberg, 2007 (-1.43)

Thomas et al., 2017 (Figure 2)

University of Iowa Stead Family Children's Hospital

Study or Subgroup	PCIT Mean	PCIT SD	PCIT Total	Control Mean	Control SD	Control Total	Weight, %	SMD IV, Random, 95% CI	Risk of Bias A	B	C
Abrahamse et al, 2015	104.65	39.92	17	124.8	34.46	25	4.7	−0.54 (−1.17 to 0.09)	+	+	−
Bagner and Eyberg, 2007	100.63	26.22	10	143.14	30.33	12	3.7	−1.43 (−2.39 to −0.47)	+	+	−
Bagner et al, 2010	43	4.3	11	64.6	9.5	14	3.2	−2.72 (−3.86 to −1.58)	+	+	+
Brestan et al, 1997	133	37.7	16	170	36	13	4.2	−0.97 (−1.75 to −0.19)	?	?	+
Chaffin et al, 2004	57.148	3.0948	75	56.4	4	35	5.4	0.22 (−0.18 to 0.62)	?	?	+
Danko, 2015	117	27.86	7	125.71	36.8	7	3.4	−0.25 (−1.30 to 0.80)	+	?	+
Eyberg et al, 1995	120.4	18.8	10	172.4	62	6	3.2	−1.23 (−2.35 to −0.10)	?	?	−
Foley, 2011	89.65	46.04	19	92.08	42.73	24	4.8	−0.05 (−0.66 to 0.55)	−	−	+
Leung et al, 2009	102.21	26	48	140.19	22.17	62	5.3	−1.58 (−2.01 to −1.14)	−	−	+
Leung et al, 2015	111.65	26.37	54	152.99	32.26	57	5.3	−1.39 (−1.81 to −0.97)	+	+	+
Matos et al, 2009	51.52	10.51	20	68.36	9.74	12	4.1	−1.60 (−2.43 to −0.77)	?	?	+
McCabe et al, 2009	89.5915	39.7685	40	118.5	48.34	18	4.9	−0.67 (−1.24 to −0.10)	?	?	+
McNeil et al, 1999	105.5	26.55	18	176.79	25.9	14	3.6	−2.65 (−3.63 to −1.66)	−	−	−
Mersky et al, 2016	123.8483	37.4731	58	134	36.65	33	5.3	−0.27 (−0.70 to 0.16)	?	?	+
Nixon et al, 2003	125.9751	19.6893	37	148.35	19.05	17	4.7	−1.13 (−1.75 to −0.52)	?	?	+
Querido, 2004	10.2	3.27	5	21	10.03	6	2.7	−1.27 (−2.63 to 0.09)	?	?	−
Schuhmann et al, 1998	117.6	40.4	22	169.7	34.1	20	4.6	−1.36 (−2.04 to −0.68)	+	?	−
Solomon et al, 2008	59.7	4.95	10	62.22	9.77	9	3.8	−0.32 (−1.22 to 0.59)	−	−	+
Stokes, 2015	98.67	25.86	6	150.5	53.4	10	3.3	−1.08 (−2.18 to 0.02)	−	−	−
Terao, 1999	100.41	36.16	17	127.65	37.87	17	4.5	−0.72 (−1.41 to −0.02)	−	−	+
Thomas and Zimmer-Gembeck, 2011	139.1	35.4	42	148.9	33.4	34	5.2	−0.28 (−0.74 to 0.17)	?	?	−
Thomas and Zimmer-Gembeck, 2012	133.7	38.1	60	143.1	36.7	40	5.4	−0.25 (−0.65 to 0.15)	?	?	+
Webb et al, 2016	123.22	26.07	45	127.17	41.79	12	4.7	−0.13 (−0.77 to 0.51)	−	+	+
Total (95% CI)			647			497	100.0	−0.87 (−1.17 to −0.58)			



Why Calculate Effect Size?

University of Iowa Stead Family Children's Hospital

- Compare your effectiveness to the benchmark.
- Compare the effectiveness of a modification to the effectiveness of the standard approach.
- Compare effectiveness with a specific population.

What about the Non-Completers?

University of Iowa Stead Family Children's Hospital

How do you handle data from families who drop out?

- Leave them out
- Include them ("intent to treat with last observation carried forward")
- Include some of them (e.g., everyone who had at least two sessions, everyone who had at least two ECBIs, everyone who at least made it through CDI)

So, How Sweet is It? (Calculating Effect Size)

University of Iowa Stead Family Children's Hospital

One sample, all given same outcome measure pre/"post" treatment
(in MS Excel put pre-tx score in Column A and post-tx score in Column B)

1. To calculate effect size, you will need the following (example in parenthesis below is for using MS Excel if you were calculating effect size for 10 patients):

   a. Pre-treatment outcome measure mean (in Excel fx =AVERAGE(A1:A10)
   b. Pre-treatment outcome measure SD (in Excel fx =STDEV(A1:A10)
   c. "Post"-treatment outcome measure mean (in Excel fx =AVERAGE(B1:B10)
   d. "Post"-treatment outcome measure SD (in Excel fx =STDEV(B1:B10)
   e. Correlation btwn pre-tx &"post"-tx scores(in Excel fx =CORREL(A1:A10, B1:B10)

2. Normally distributed scores (you can make a histogram as well as use the SKEW and KURT fxs in MS Excel if you have concerns that your pre and/or "post" tx scores aren't generally shaped like a bell curve)

3. A effect size calculator that can handle repeated measures data: https://www.psychometrica.de/effect_size.html (use Calculator #4 - "Effect size estimates in repeated measures designs")

Interpret with Caution

University of Iowa Stead Family Children's Hospital

- Why interpret PCIT effect sizes with caution?
  - ECBI scores are part of graduation criteria and are also an outcome measure.
    (You might also tend to exclude individuals with low pre-treatment ECBI scores from PCIT.)
  - Small samples can have non-normal distributions.
  - Missing data
  - Pre/post EBCI scores don't tell the whole story.

Contact Information

University of Iowa Stead Family Children's Hospital

IoWA-PCIT

Integration of Working Models of Attachment into Parent Child Interaction Therapy.

Kelly Pelzel, Ph.D.
Clinical Assistant Professor
Department of Psychiatry
Carver College of Medicine
University of Iowa
Iowa City, Iowa
kelly-pelzel@uiowa.edu

Beth Troutman, Ph.D.
Clinical Professor
Department of Psychiatry
Carver College of Medicine
University of Iowa
Iowa City, Iowa
beth-troutman@uiowa.edu