



We put the pieces together!

A Primer on Effect Size

*The primary product of a research inquiry is one or more measures of **effect size**, not *p* values.*

~Jacob Cohen (p. 1310)

In the *real world* (or at least the real world of statistics) researchers are primarily concerned with answering two very basic questions.

1. Are my results statistically significant?

In other words, is my outcome the result of chance, or is it representative of conditions that genuinely exist? The answer to this question is found by examining the *P* value. If your *P* value is $\leq .05$, for instance, this indicates there is a very small likelihood that you came to a particular outcome by chance. This gets to the heart of the precision of your estimate, which is, of course affected by sample selection, sample size, distribution of the sample, and so forth.

2. Are my results practically significant?

This gets to the *so what* aspect of your research. It is possible to identify a statistically significant outcome, but if it only affects 1 person out of a million, it really doesn't mean much in a practical sense. In order to answer to this question, we must estimate effect size. Please refer to *Selecting and computing the appropriate effect size* for additional detail on computing effect sizes.

A graphical presentation of the potential answers to these two questions helps us understand the interaction between theory and practicality.

		Statistical Significance	
Practical Significance	Statistically Significant with $P < .01$ or $P < .05$ (depending on the desired level of significance)	Not Statistically Significant with $P > .01$ or $P > .05$	Still Practically Significant with an effect size greater than .25 or .3 (anything over .5 is a large effect)
	Practically Significant with an effect size greater than .25 or .3 (anything over .5 is a large effect)		
	Statistically Significant with $P < .01$ or $P < .05$ (depending on the desired level of significance)	Not Statistically Significant with $P > .01$ or $P > .05$	Not Practically Significant with an effect size less than .25 In other words, trivial!
	Not Practically Significant with an effect size less than .25 In other words, trivial!		Not Practically Significant with an effect size less than .25 In other words, trivial! ²

This makes it easy to see that the answers to our two basic questions might fall into any one of these four quadrants. The most desirable outcome, of course, is to have results that are both statistically and practically significant. This means that your outcome has a healthy probability of replication, and the effects of your outcome hold meaning for a large number of people (or situations, etc.).

When you stop and think about it, estimates of effect sizes are all around us. Consider the following examples:

10% chance of rain today

Whiter teeth in just 2 weeks!

Only 2 Advil tablets for all day relief!

More 4G cities than any other carrier!

Each of these advertising claims makes a statement about effect size in terms that we all understand. Many of the decisions that we make every day are based on some sense of effect size. Weather, time of day, and traffic reports affect our choice of routes because we estimate delays and levels of frustration without even being aware of it. We trek back to the car to retrieve our forgotten grocery bags because we care about the environment. We change our dietary and exercise habits to improve our health. Our cumulative experiences have honed our ability to estimate and interpret innumerable effects in our everyday lives (Ellis, 2010). In fact, we are so sensitized to the impact of decisions on the conditions of our lives that we seldom make a decision without first considering the consequences of alternate choices.

Given the emotional level of importance that estimates of effect size have on the relatively unsophisticated choices that we make every day, we should be cognizant of the impact that effect sizes have on research outcomes. Including estimates of effect size in journal article submissions can exert an influence not only on acceptance, but also on the dispersion of results throughout the profession.

References

Cohen, J. (1990). Things I have learned (so far). *American Psychologist*, 45(12), 1304-1312.

Ellis, P. D. (2010). *The essential guide to effect sizes, statistical power, meta-analysis, and the interpretation of research results*. New York: Cambridge University Press.