Effect sizes for two means

Marcello Gallucci

February 23, 2018

Note

why is :

$$\eta^2_d = \frac{d^2}{4 + d^2}$$

Followng Wilcox and T.S. Tian (2001), $\sigma^2_\mu = (\frac{\Delta}{2})^2$ and $\sigma^2_Y = \sigma^2_\mu + \sigma$

INOTE: Cohen 8.2.2 p. 275 is wrong

$$\eta^2_d = \frac{\sigma^2_\mu}{\sigma_Y} = \frac{(\frac{\Delta}{2})^2}{(\frac{\Delta}{2})^2 + \sigma^2} = \frac{\Delta^2}{\Delta^2 + 4\sigma^2}$$

thus:

$$1 - \eta^2 = \frac{4\sigma^2}{\Delta^2 + 4\sigma^2}$$

and

$$\frac{\eta^2}{1 - \eta^2} = \frac{\Delta^2}{4\sigma^2}$$

This is ω^2 from Hays (1988). Taking the square root of it:

$$\sqrt{\frac{\Delta^2}{4\sigma^2}} = \frac{1}{2}d$$

which, by Cohen (1988, p. 276, eq 8.2.5) gives:

$$\sqrt{\frac{\Delta^2}{4\sigma^2}} = \frac{1}{2}d = f$$

We can then write:

$$\frac{\eta^2}{1 - \eta^2} = \frac{1}{4}d^2$$

which means:

$$\eta^2 = \frac{1}{4}d^2 \cdot (1 - \eta^2)$$

$$\eta^2 = \frac{1}{4}d^2 - \frac{1}{4}d^2\eta^2$$

$$\frac{\eta^2(4 + d^2)}{4} = \frac{1}{4}d^2$$

$$\eta^2 = \frac{d^2}{4 + d^2}$$

Derived results

Eta, f and d

$$\sqrt{\frac{\Delta^2}{4\sigma^2}} = \frac{1}{2}d = f = \frac{\eta^2}{1-\eta^2}$$

expected variances

$$\sigma_\mu^2 = (\frac{\Delta}{2})^2$$

and

$$\sigma_Y^2 = \sigma_\mu^2 + \sigma$$