12.5: Effect Size

There's a few different ways you could measure the effect size in an ANOVA, but the most commonly used measures are η2 (***eta squared***) and partial η^2. For a one way analysis of variance they're identical to each other, so for the moment I'll just explain η^2. The definition of η^2 is actually really simple:

$$\eta^2=\frac{\mathrm{SS}_b}{\mathrm{SS}_{tot}}$$

That's all it is. So when I look at the ANOVA table above, I see that SS_b=3.45 and SS_{tot}=3.45+1.39=4.84. Thus we get an η2 value of

$$\eta^2=\frac{3.45}{4.84}=0.71$$

The interpretation of η2 is equally straightforward: it refers to the proportion of the variability in the outcome variable (`mood.gain`) that can be explained in terms of the predictor (`drug`). A value of η2=0 means that there is no relationship at all between the two, whereas a value of η^2=1 means that the relationship is perfect. Better yet, the η^2 value is very closely related to a squared correlation (i.e., r^2). So, if you're trying to figure out whether a particular value of η^2 is big or small, it's sometimes useful to remember that

$$\eta=\sqrt{\frac{SS_b}{SS_{tot}}}$$

can be interpreted as if it referred to the *magnitude* of a Pearson correlation. So in our drugs example, the η^2 value of .71 corresponds to an η value of $\sqrt{.71}$ =.84. If we think about this as being equivalent to a correlation of about .84, we'd conclude that the relationship between `drug` and `mood.gain` is strong.

The core packages in R don't include any functions for calculating η^2. However, it's pretty straightforward to calculate it directly from the numbers in the ANOVA table. In fact, since I've already got the `SSw` and `SSb` variables lying around from my earlier calculations, I can do this:

```
SStot <- SSb + SSw          # total sums of squares
eta.squared <- SSb / SStot  # eta-squared value
print( eta.squared )
```

```
## [1] 0.7127623
```

However, since it can be tedious to do this the long way (especially when we start running more complicated ANOVAs, such as those in Chapter 16 I've included an `etaSquared()` function in the `lsr` package which will do it for you. For now, the only argument you need to care about is `x` , which should be the `aov` object corresponding to your ANOVA. When we do this, what we get as output is this:

```
etaSquared( x = my.anova )
```

```
##         eta.sq eta.sq.part
## drug 0.7127623   0.7127623
```

The output here shows two different numbers. The first one corresponds to the η^2 statistic, precisely as described above. The second one refers to "partial η^2", which is a somewhat different measure of effect size that I'll describe later. For the simple ANOVA that we've just run, they're the same number. But this won't always be true once we start running more complicated ANOVAs.[207]