But now let's control for the effect of our co-variate (which we first need to scale and centre)…

```
> cond$Gaming <- scale(cond$Gaming)
> model_ancova <- aov_4(Ability ~ Gaming + Condition + (1 | Participant),
data = cond, factorize = FALSE)
Contrasts set to contr.sum for the following variables: Condition
> anova(model_ancova)
Anova Table (Type 3 tests)

Response: Ability
          num Df den Df     MSE       F     ges    Pr(>F)    
Gaming         1     41 0.55171 53.5636 0.56643 5.87e-09 ***
Condition      2     41 0.55171  0.8771 0.04103   0.4236    
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The factor Condition is now <u>not</u> significant with an F < 1. However, our covariate *Gaming Frequency* is significant. Adding it means a lot of the variance we previously attributed to our experimental factor is actually explained by our covariate. Note, the F values are calculated using Type III Sum of Squares by the `aov_4()` function - more on that in a bit…

Rather than calculating over the raw means which are:

Water Group = 4.82

Double Espresso Group = 9.02

Single Espresso Group = 6.69

```
> describeBy(cond$Ability, group = cond$Condition)

 Descriptive statistics by group 
group: Double Espresso
   vars  n mean   sd median trimmed  mad  min   max range  skew kurtosis   se
X1    1 15 9.02 1.19   9.01    9.07 0.73 6.24 11.07  4.83 -0.26     0.16 0.31
-------------------------------------------------------------------------------------
group: Single Espresso
   vars  n mean   sd median trimmed  mad  min  max range skew kurtosis   se
X1    1 15 6.69 0.98   6.37    6.63 0.78 5.25 8.88  3.63 0.69    -0.53 0.25
-------------------------------------------------------------------------------------
group: Water
   vars  n mean   sd median trimmed mad  min  max range skew kurtosis  se
X1    1 15 4.82 1.16   4.75    4.82 0.8 2.53 7.09  4.56 0.03    -0.57 0.3
```