Today, we'll talk about hypothesis tests for correlations.

As always, I would encourage you

to follow these and run this code in an R instance of your own.

The only package we'll be using here is ggm, the rests are there for completeness.

Now will have the same dataset as what we had before,

on the intelligence, weight and age.

But this time, let's suppose that actually it's a sample,

not a population quantity, not population values.

In fact, it's a sample of 20. Here's a question.

Can we test ordinary correlation between intelligence and weight?

Well, here's how we would do that,

we would use the t-test,

we would use the sample correlation times

the sample size minus 2 divided by 1 minus the square root of the sample.

Correlation, take a square root of that, basically,

when you plug in the numbers,

we get a t-score of 3.3.

Now, that has a t-distribution with n minus 2 degrees of freedom,

so when we then implement this in R,

and this is the two-tailed tests,

so we're taking 2 times b.

Whatever the absolute value of the t-score,

with lower tail equals 4,

so we're looking at upper tail just to,

can you embed this all in one line.

Then we get a p-value of 0.004 and of course, highly significant.

You can also use the pcor.test function in ggm.

Now, pcor.test here, we're giving it the correlation,

we gave it the number of variables we're conditioning on,

and we gave it the sample size,

and that gives us the t-value as before, 18 degrees of freedom,

so 20 minus 2 here and also same p-value.

Alternatively, we can use the Fisher's Z approximation.

The z-value would be 1.5 log 1 plus sample correlation,

minus sample correlation, which gives us 0.71,

that will have a mean zero and variance 1 over n minus 3.

We compute a two-sided p-value,

again using the same trick as before,

and actually the p-value is very, very similar.

But remember, our partial correlation was quite a bit smaller,

so you get an R,

the resulting calculus is this,

and will go if the effect is to gamble stored in this variable R12.3.

Now, if wanted to use the Fisher's Z transformation,

we would do that as we would in fact compute the transformation,

and it's actually interesting that this value is very,

very similar to the original correlations.

If you're familiar with this, and take a Taylor expansion of

this transformation, you'll see why.

But the variance here is same as before,

except now we have this additional p minus r element,

which is the number of variables we're conditioning on.

In fact, now our p-value is going to be 0.91.

Now, similarly, we could use pcor.test,

we're telling it that we want this correlation,

we are conditioning on one variable,

and we have 20 observations total.

Note the degrees of freedom are now 17,

and so if we conclude there was not sufficient evidence of correlation.