

Power Calculation Practical

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Power Calculations Empirical

- Attempt to Grasp the NCP from Null
- Simulate Data under theorized model
- Calculate Statistics and Perform Test
- Given α , how many tests $p < \alpha$
- Power = (#hits)/(#tests)

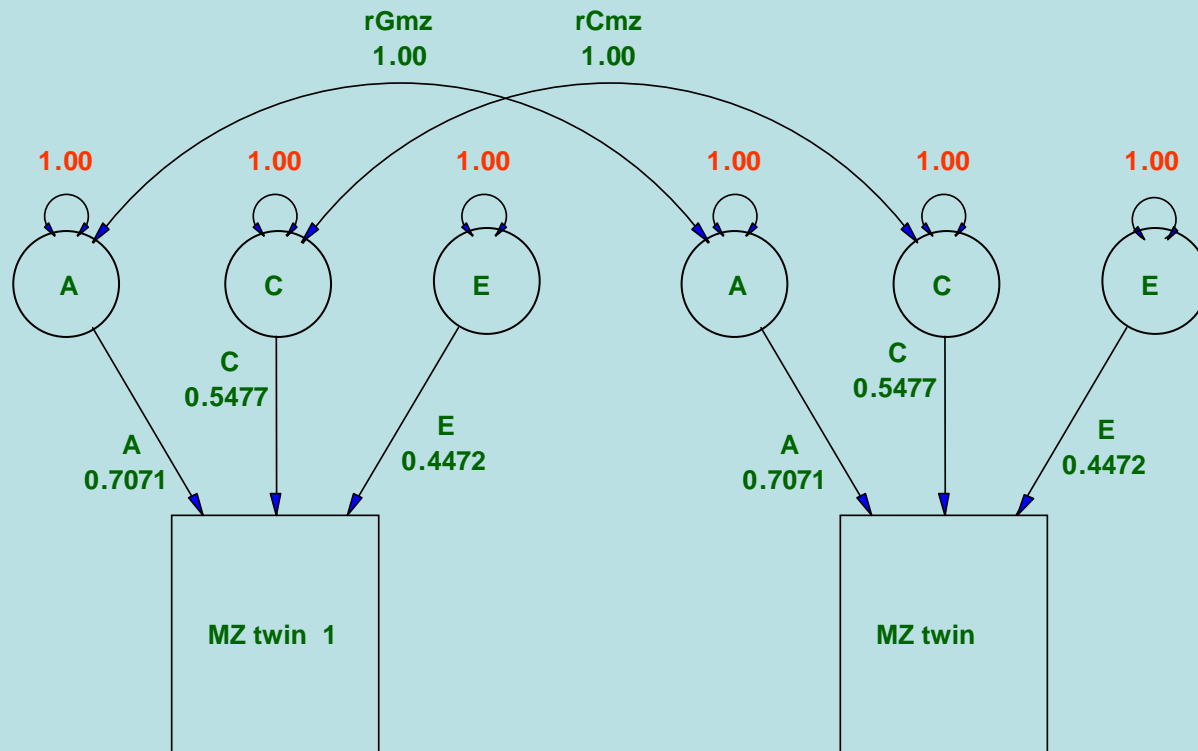
Practical: Empirical Power 1

- We will Simulate Data under a model online
- We will run an ACE model, and test for C
- We will then submit our results and Jeff will collate the empirical values
- While that is being calculated, we'll talk about theoretical power calculations

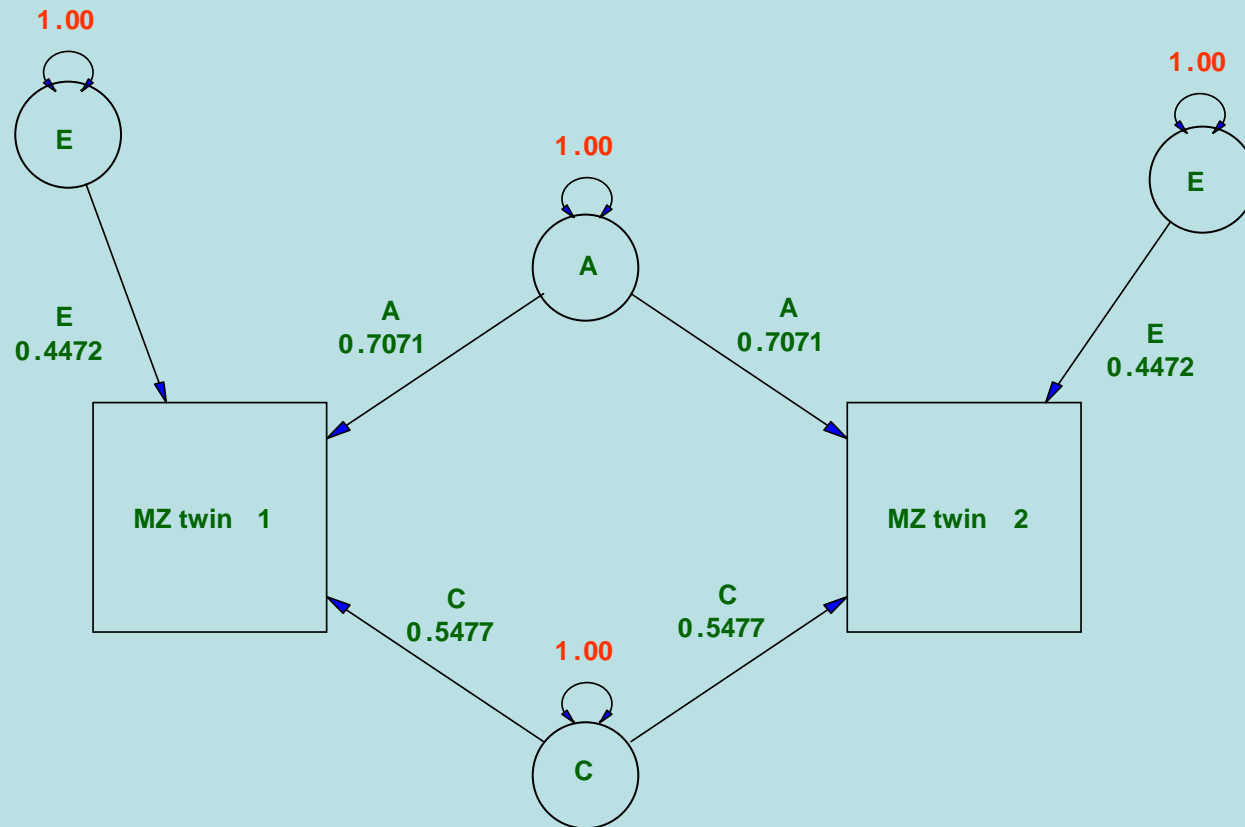
Practical: Empirical Power 2

- First get **2008powerpractical.ppt**, **ace.mx** and **rprog.R** from
- </faculty/ben/2008/power/practical/>.
- We'll talk about what the R program does before we run it

Simulation of the MZs: model



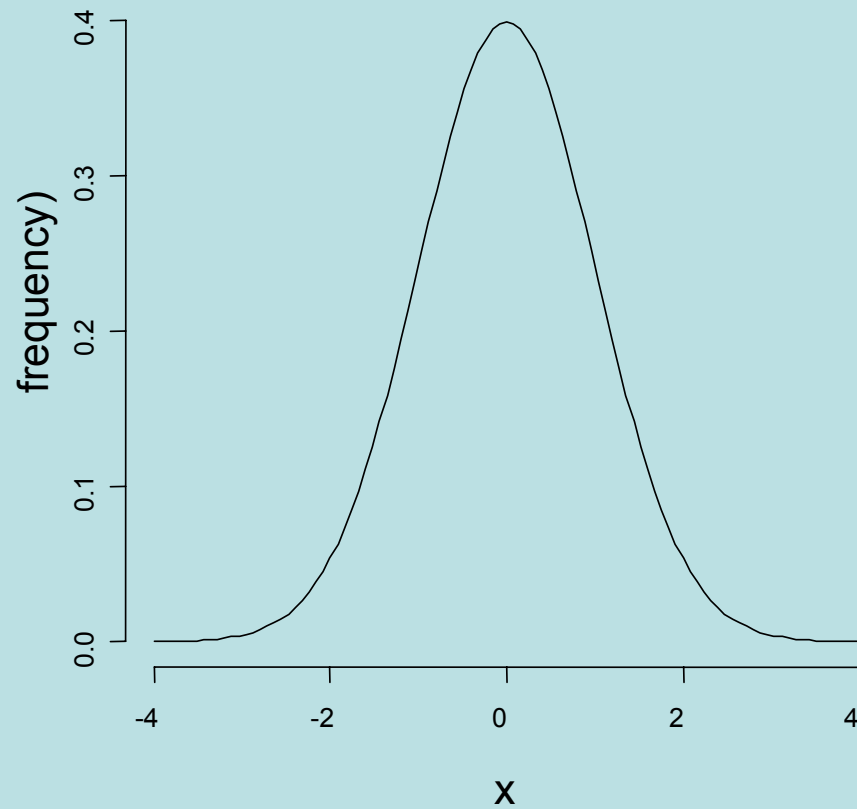
Redrawn MZ model



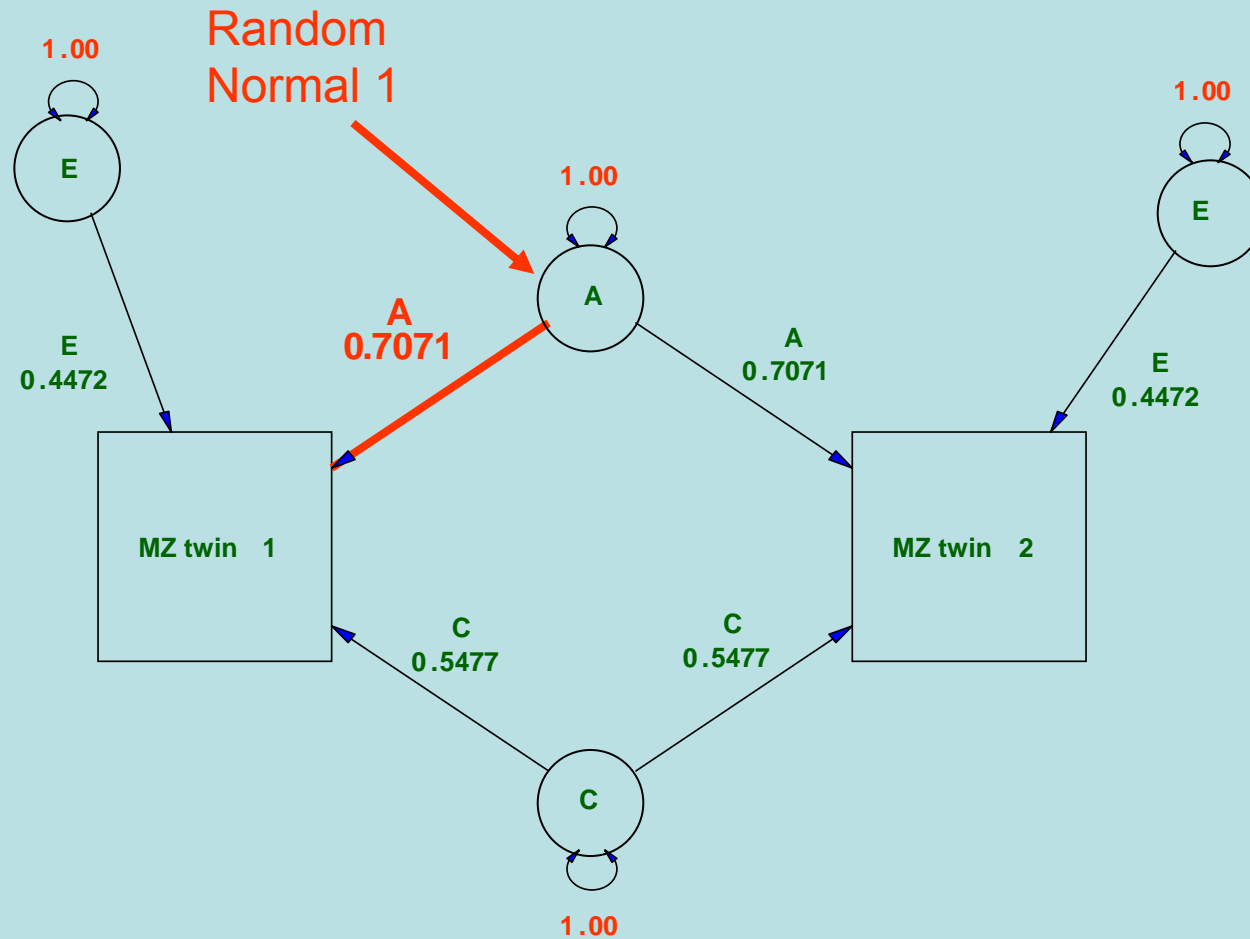
When we simulate

- From a path diagram, we can simulate trait values from simulating each latent trait
- These latent traits are assumed to be normal ($\mu=0, \sigma^2=1$)
- The latent trait is then multiplied by the path coefficient

What's a random normal



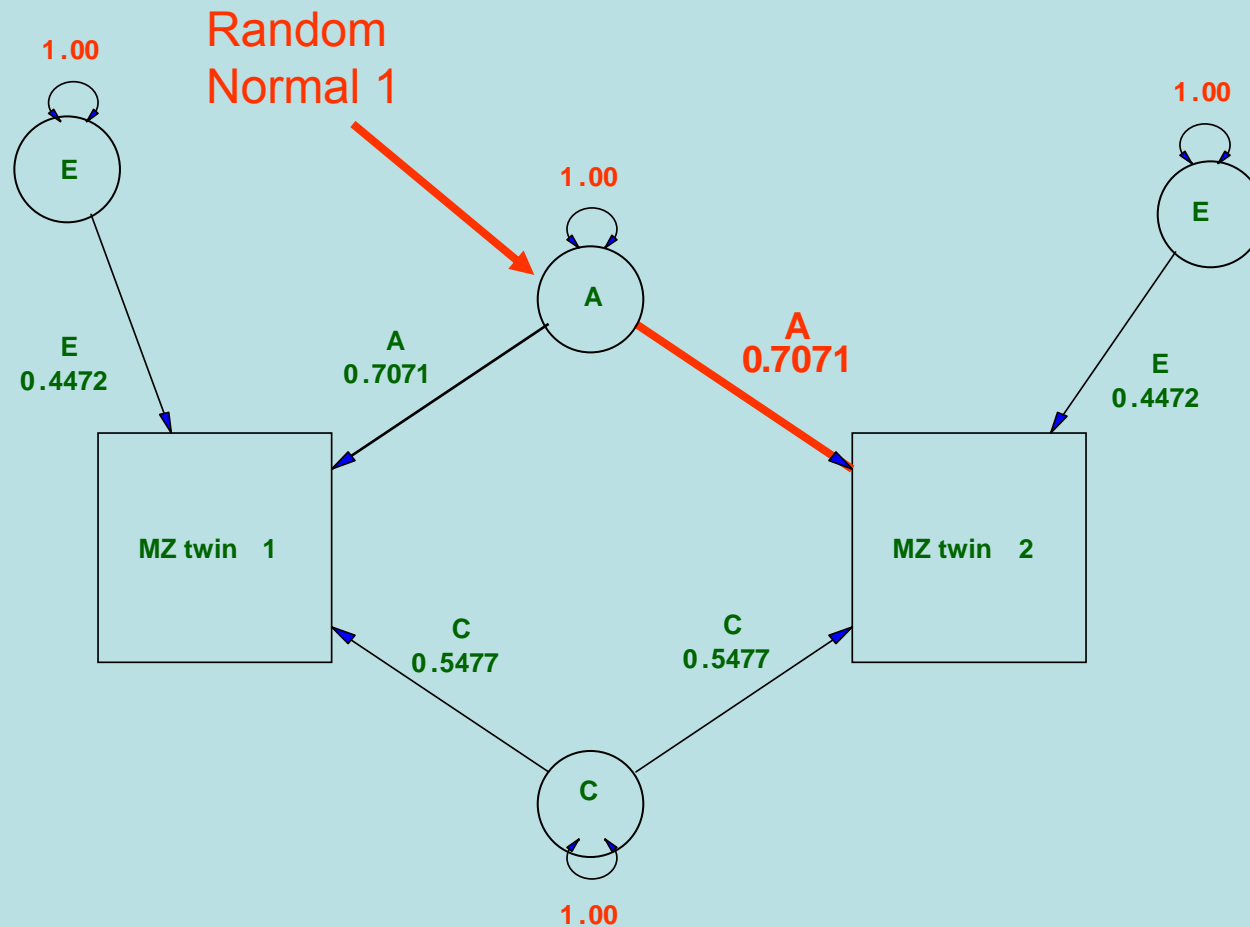
Redrawn MZ model



MZ twin 1 trait: $\text{Norm1} * A(0.7071) +$

MZ twin 2 trait:

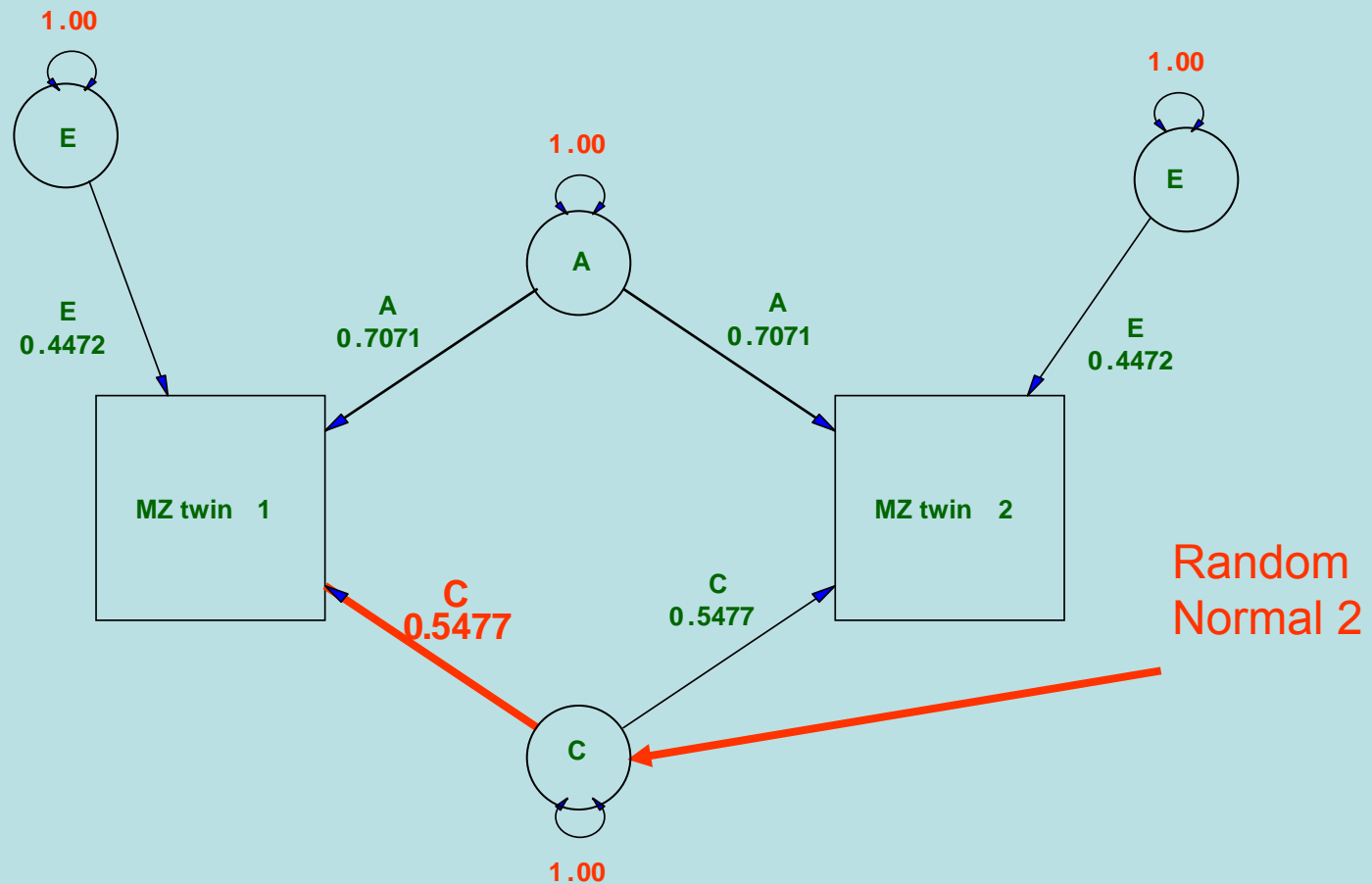
Redrawn MZ model



MZ twin 1 trait: Norm1*A(0.7071) +

MZ twin 2 trait: Norm1*A(0.7071) +

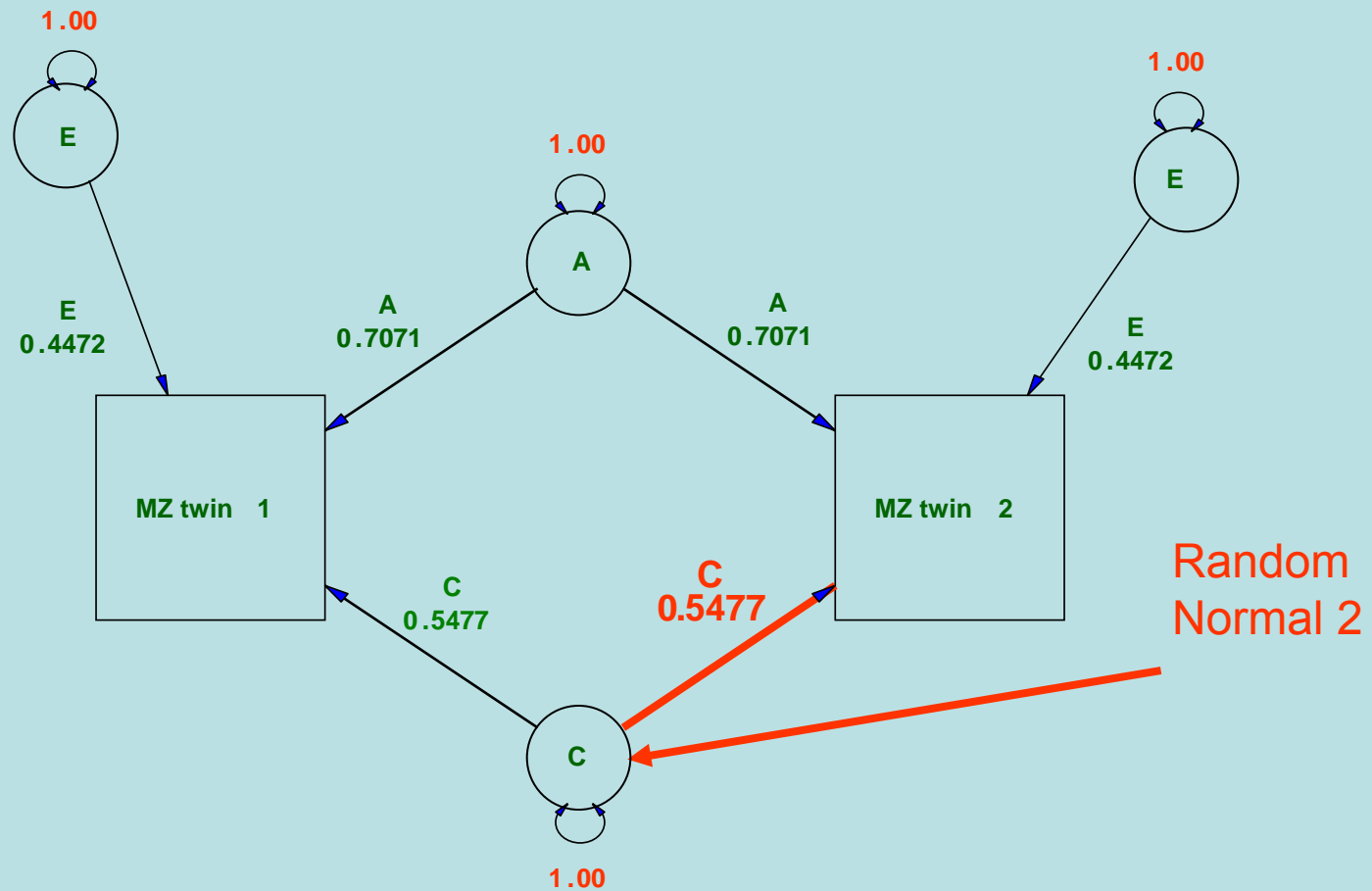
Redrawn MZ model



MZ twin 1 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477)$

MZ twin 2 trait: $\text{Norm1} \cdot A(0.7071) +$

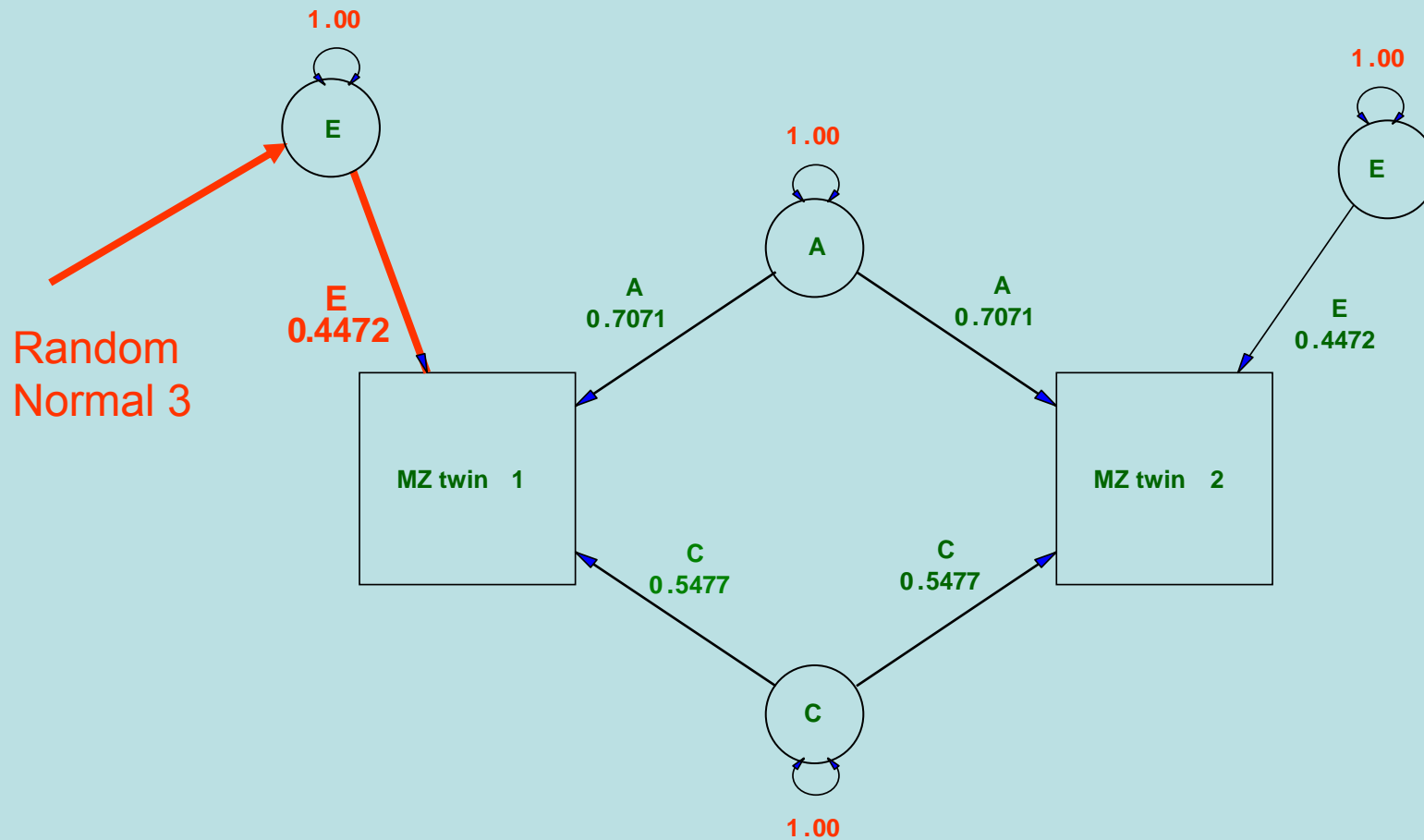
Redrawn MZ model



MZ twin 1 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477)$

MZ twin 2 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477)$

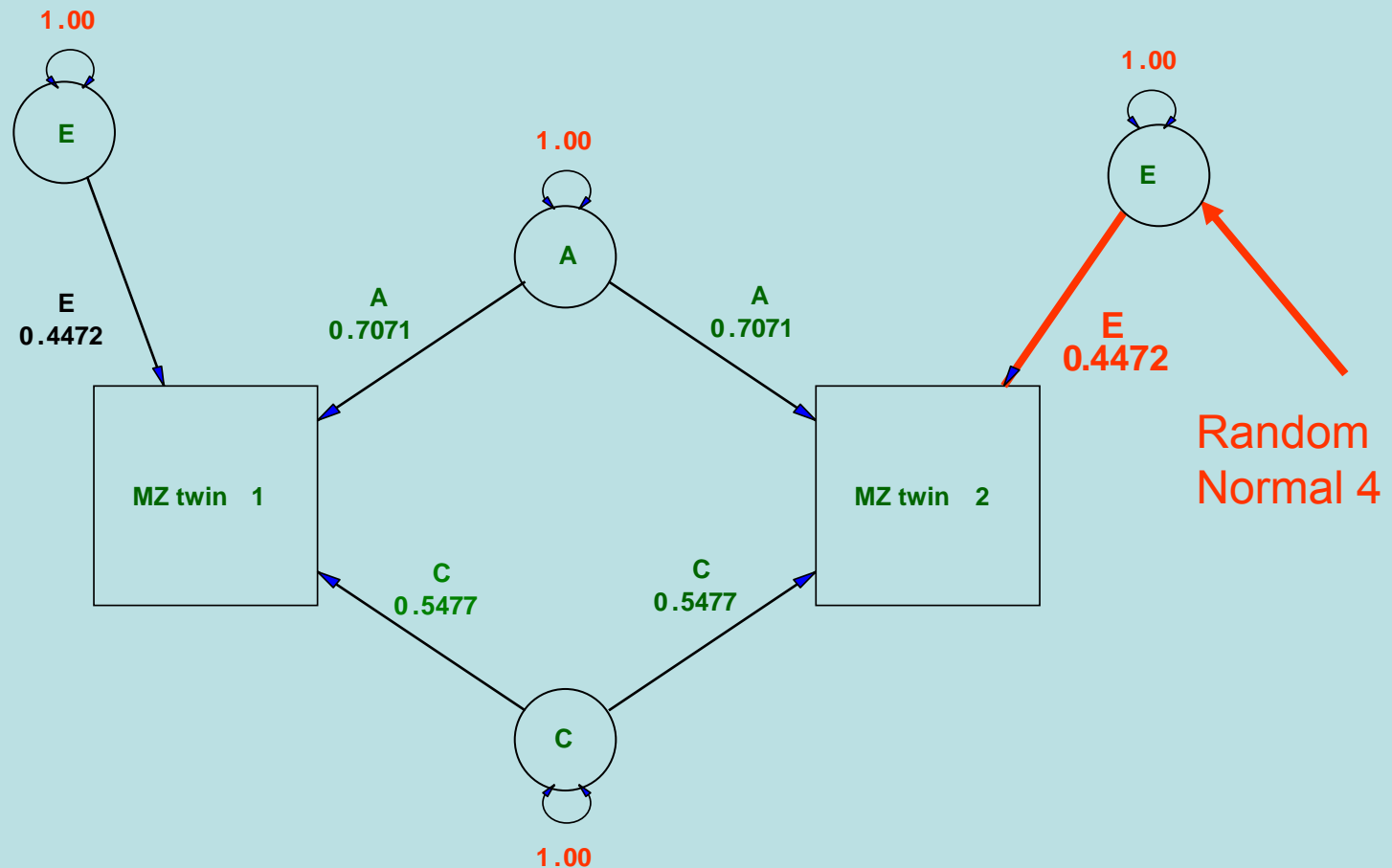
Redrawn MZ model



MZ twin 1 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477) + \text{Norm3} \cdot E(0.4472)$

MZ twin 2 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477) +$

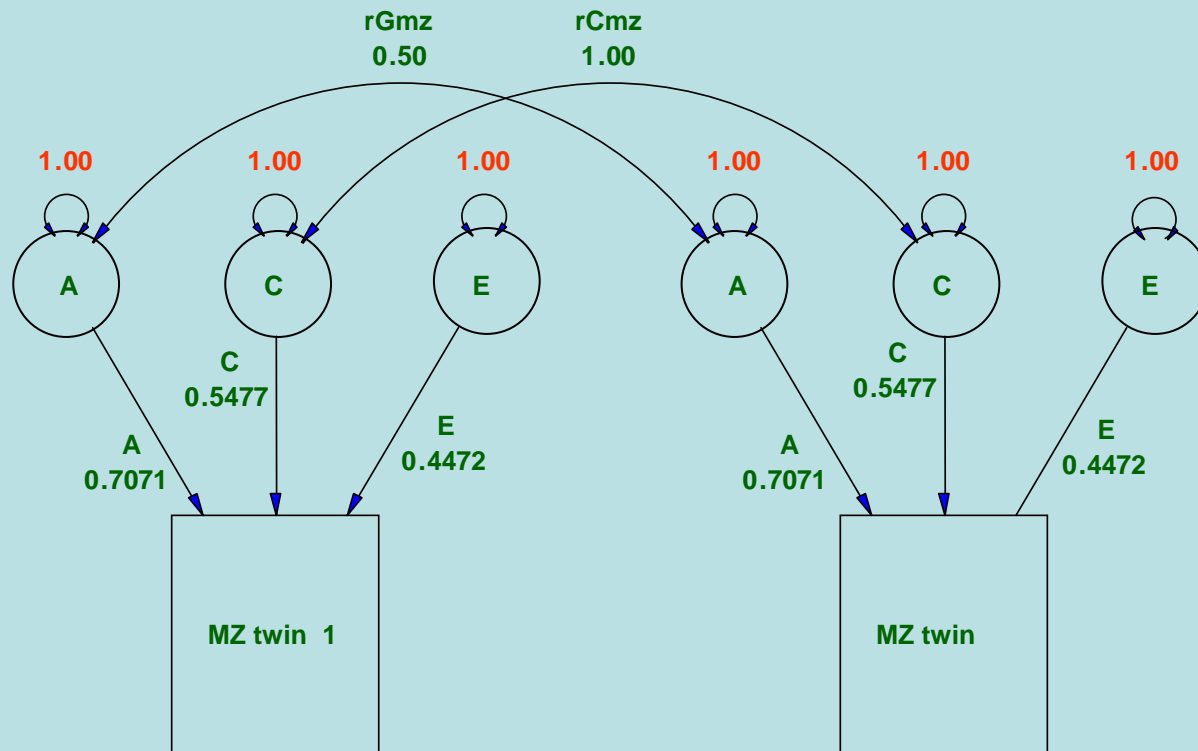
Redrawn MZ model



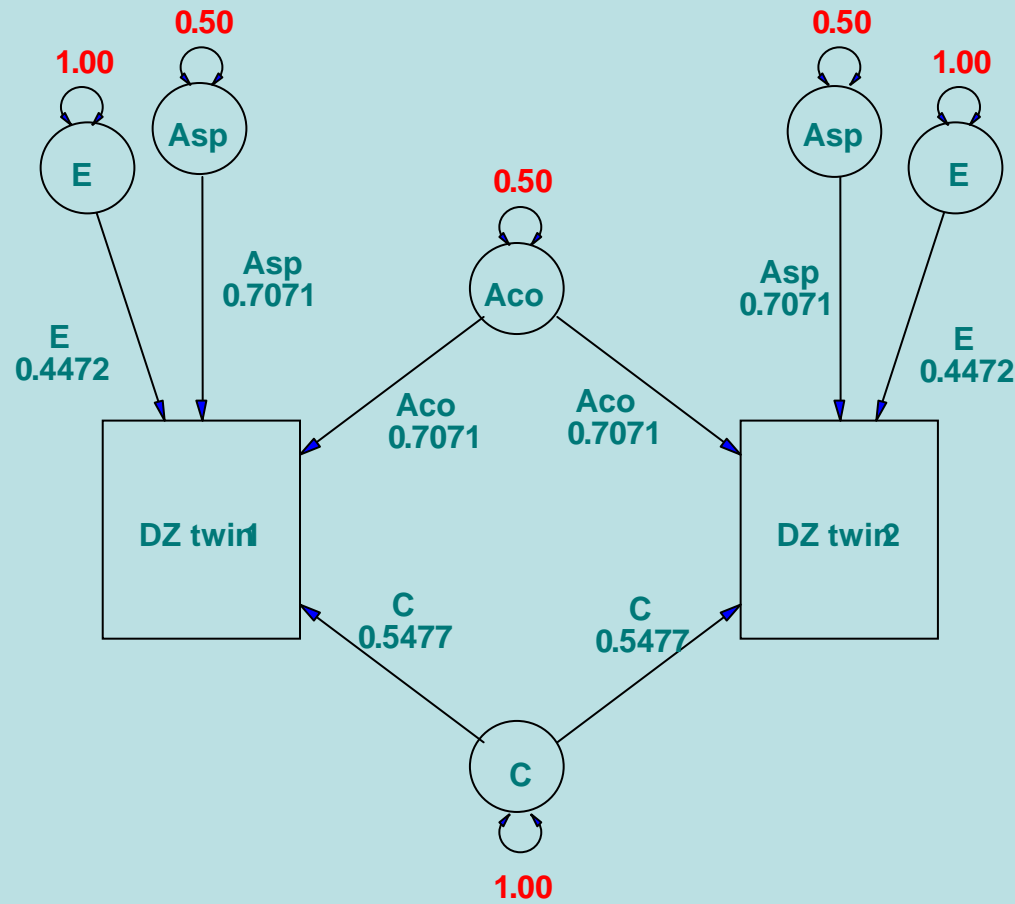
MZ twin 1 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477) + \text{Norm3} \cdot E(0.4472)$

MZ twin 2 trait: $\text{Norm1} \cdot A(0.7071) + \text{Norm2} \cdot C(0.5477) + \text{Norm4} \cdot E(0.4472)$

Simulation of the DZs: model



Redrawn DZ model



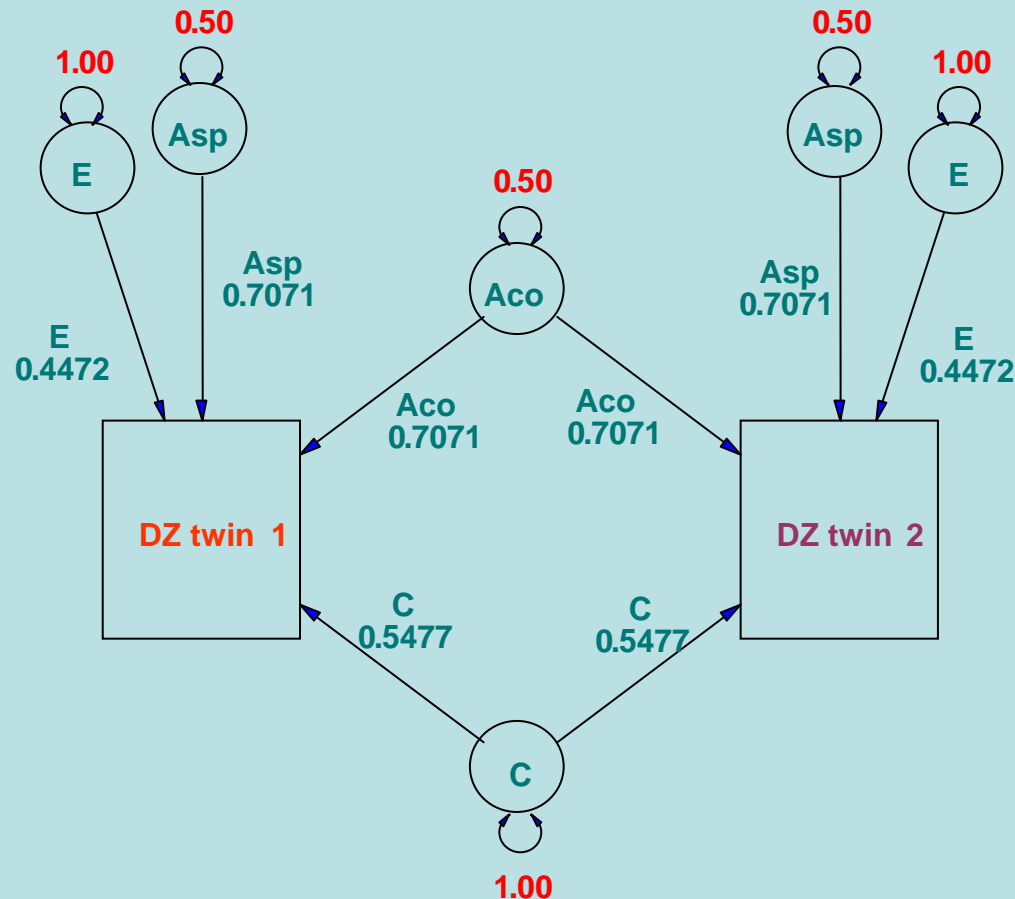
How many random normals will we need to supply a trait value for both DZ twins?

Redrawn DZ model

Note:

$$\sigma^2(K*X) = K^2*\sigma^2(x)$$

When K is a constant
hence
 $0.7071*\text{norm5}$



$$\text{DZ twin 1 trait: } 0.7071*\text{Norm5}*Aco(0.7071) + 0.7071*\text{Norm6}*Asp(0.7071) + \text{Norm7}*C(0.5477) + \text{Norm8}*E(0.4472)$$

$$\text{DZ twin 2 trait: } 0.7071*\text{Norm5}*Aco(0.7071) + 0.7071*\text{Norm9}*Asp(0.7071) + \text{Norm7}*C(0.5477) + \text{Norm10}*E(0.4472)$$

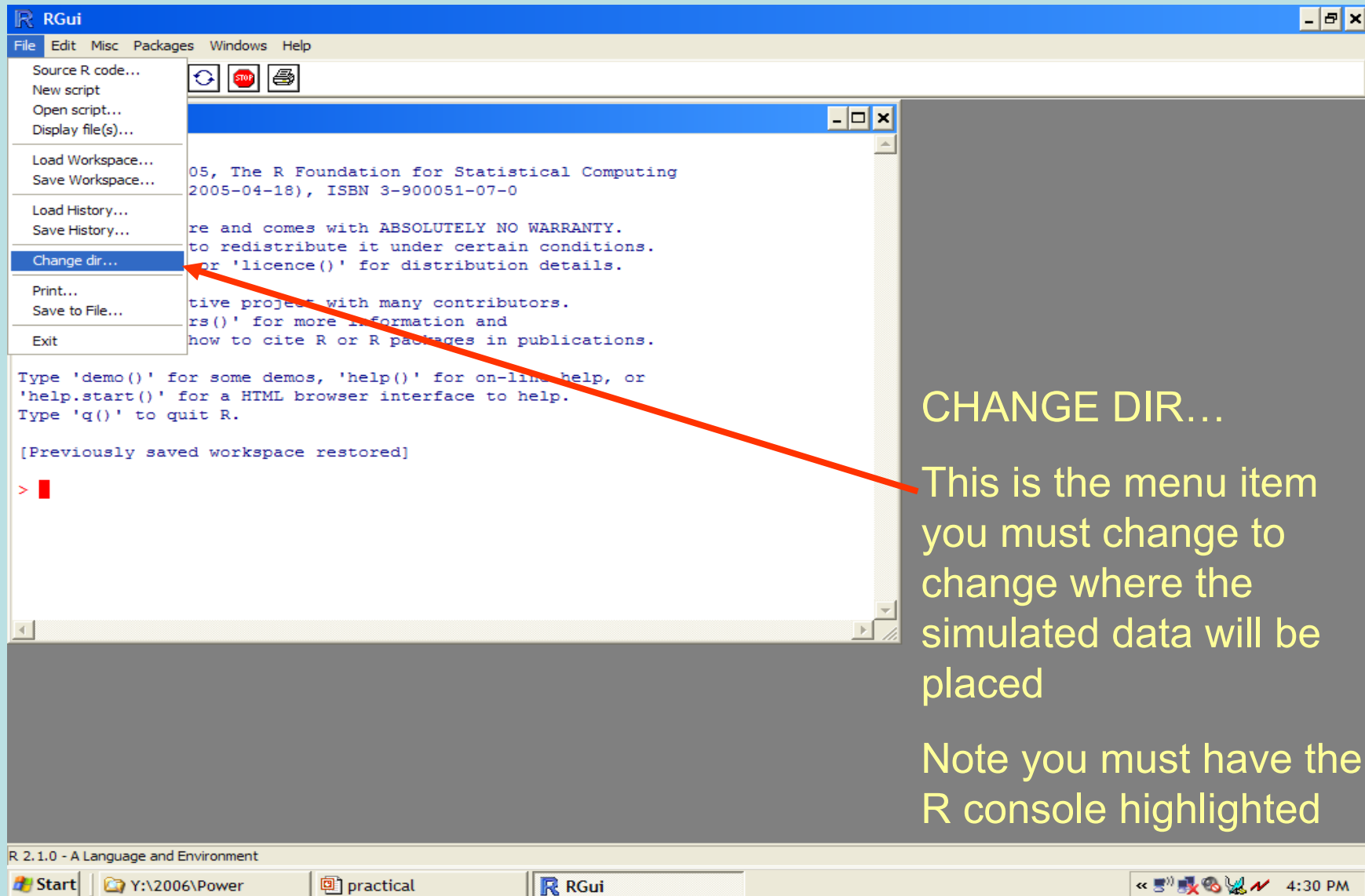
Simulation conditions

- 50% additive genetic variance
- 30% common environment variance
- 20% specific environment variance

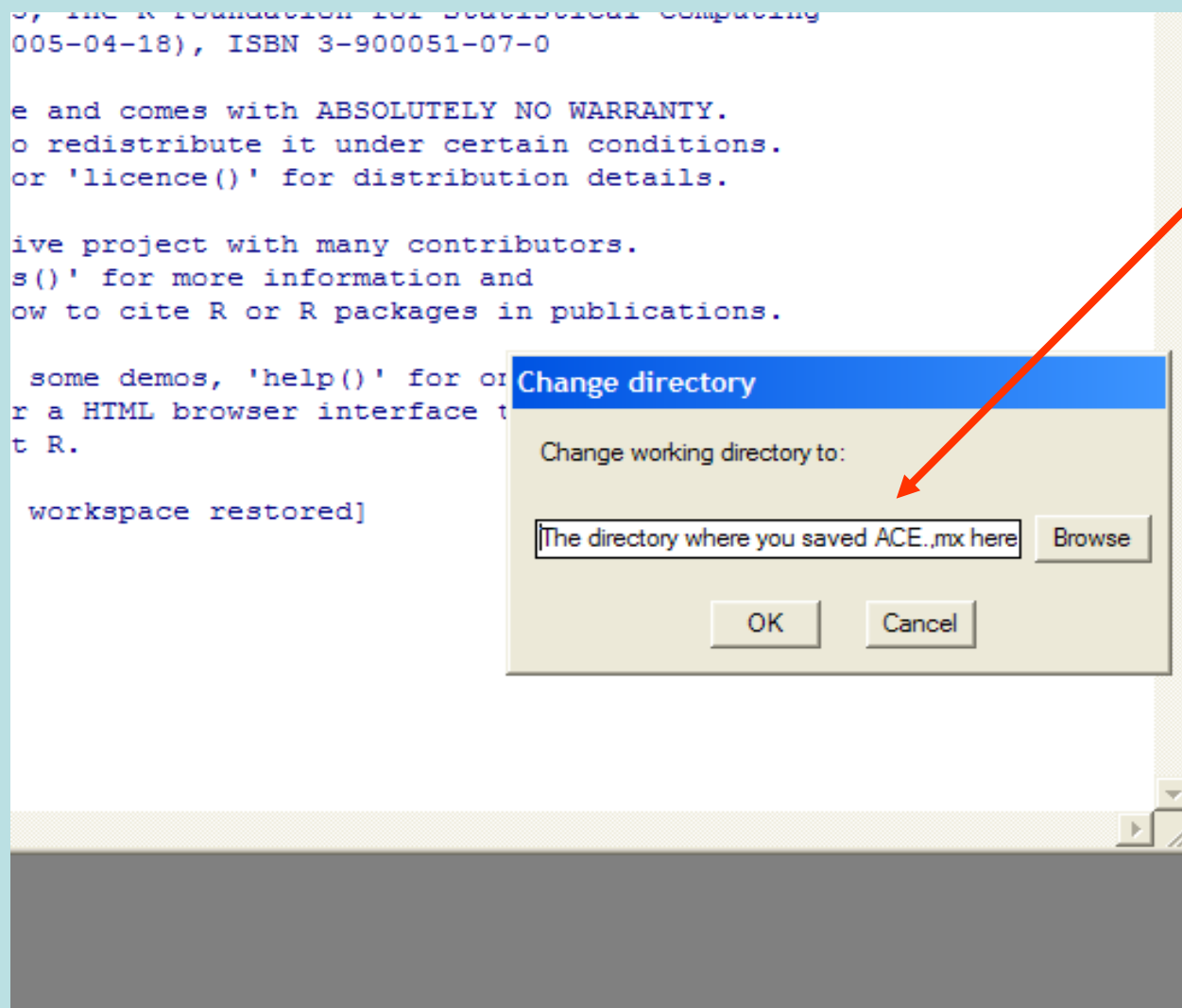
Notes on the R program

- When you run the R program it is essential that you change your working directory to where you saved the Mx script.
- File menu then Change dir...
- After changing directory, load the R program.
- A visual guide to this follows this slide

Picture of the menu

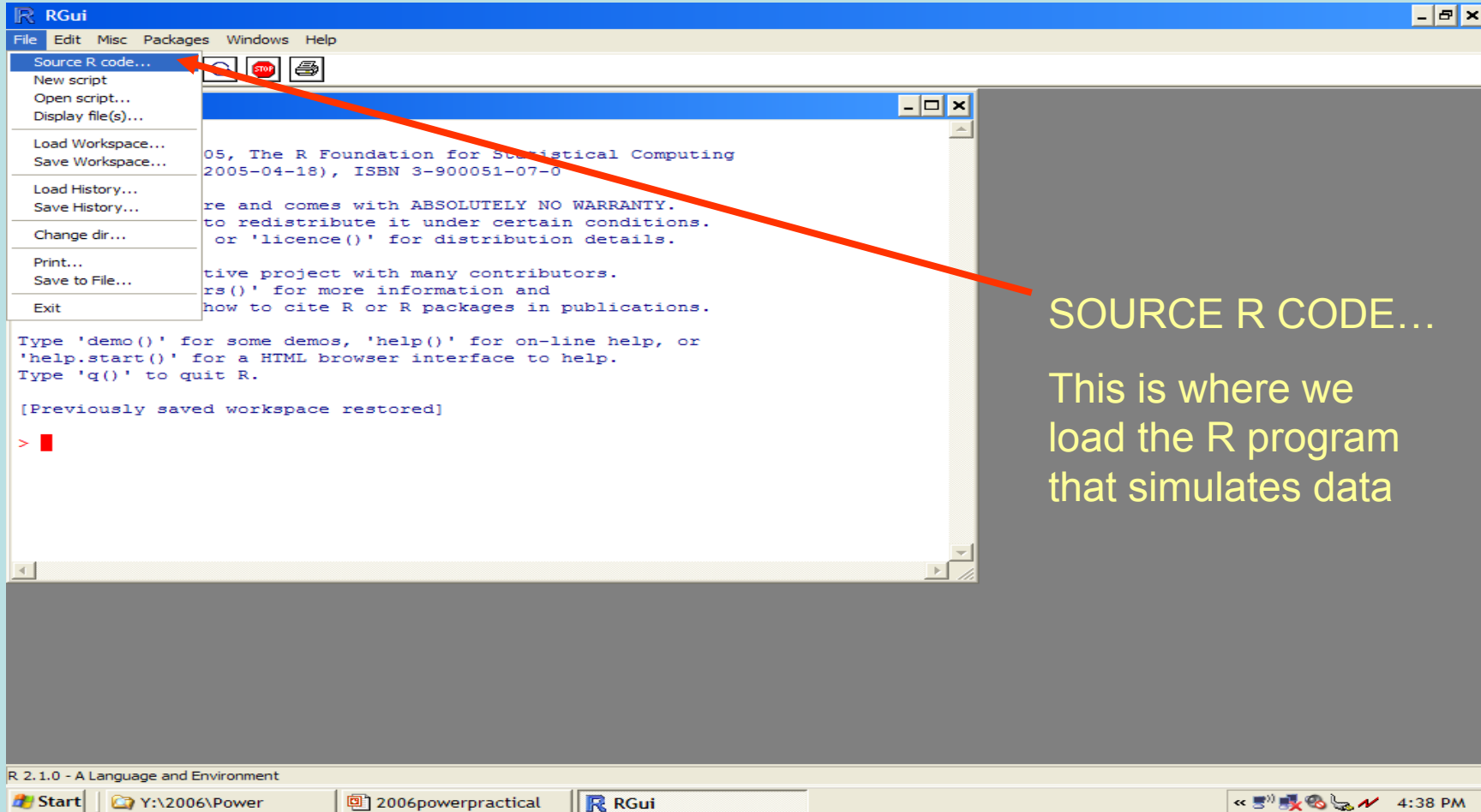


Picture of the dialog box



Either type the path name or browse to where you saved ACE.mx

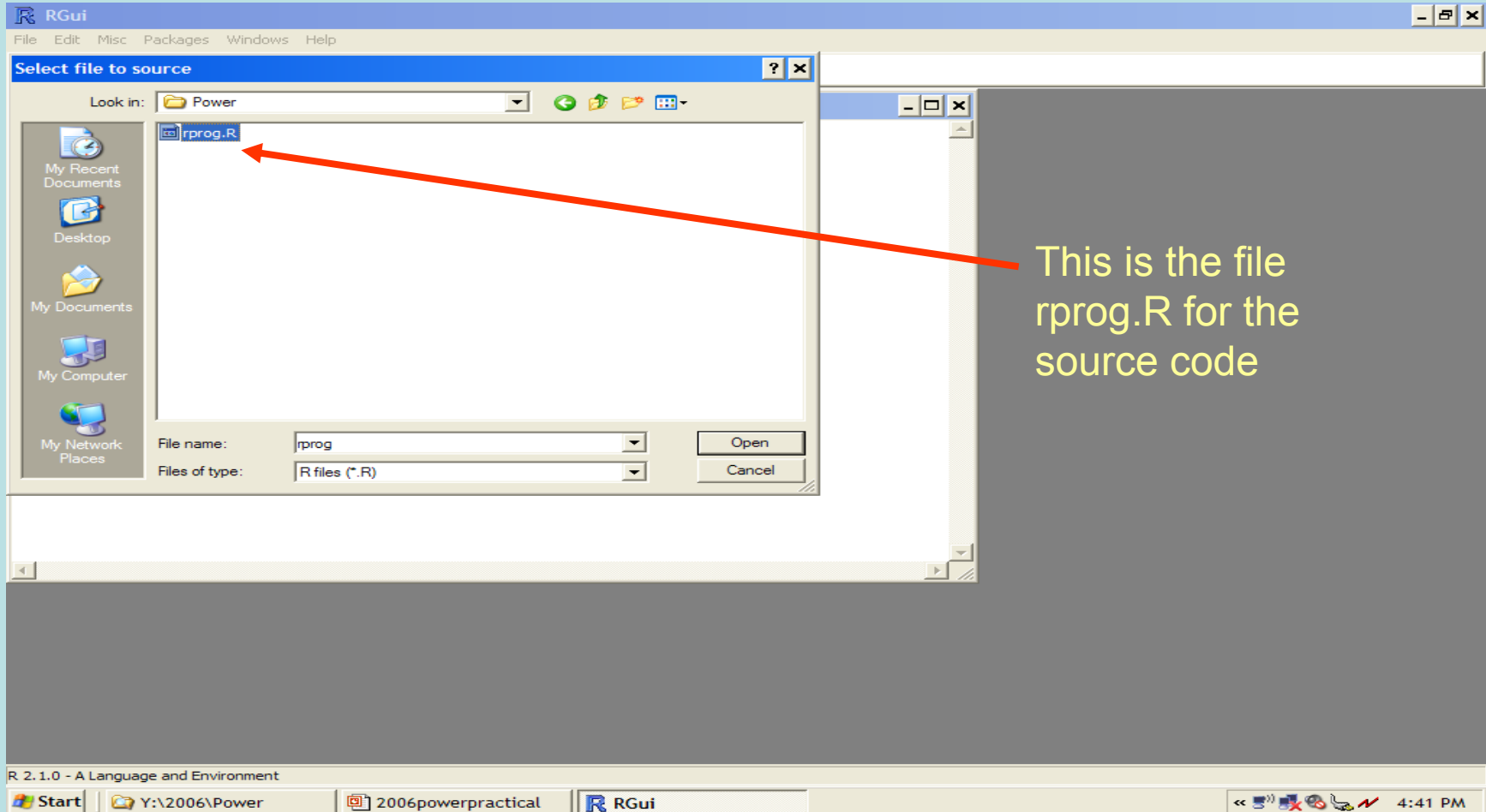
Running the R script



SOURCE R CODE...

This is where we
load the R program
that simulates data

Screenshot of source code selection



How do I know if it has worked?

- If you have run the R program correctly, then the file `sim.fun` ought to be in the directory where your `rprog.R` and `ACE.mx` is.
- If not, try again or raise your hand.

When you have finished

- Record your A^2 , C^2 , and E^2 from the full model [1st part of the script]
- Note the chi square test from dropping C^2
- Report these online to Jeff, and he'll make some pretty pictures:
- <https://ibgwww.colorado.edu/limesurvey/index.php?sid=98196&newtest=Y>

Theoretical power calculations

- Either derive the power solutions by hand (though this requires lots of time and more IQ points than I have)
- Use Mx to setup the variance covariance structure and use option power to generate power levels

Quick note on the power calculations for Mx

- Total sample size is reported at the end of the script
- The sample size proportions for your groups are maintained.
- For example if we say 50 MZ pairs and 100 DZ pairs, then Mx will assume 1/3 of your sample is MZ and 2/3 is DZ

Time to look at a script

- Open power.mx, and we'll chat about it.
- Quick overview of what the script does:
 - Generates the variance covariance structure under the full model (1st half)
 - Intentionally fits the wrong model (by dropping the parameter of interest for power calculations) (2nd half)
 - Based on the number of observations that you supply generates power estimates.

Theoretical script

- Following chatting, depending on time, here are some suggestions:
 - Change ratio of MZ and DZ keeping same total sample size
 - Drop A rather than C
 - Change effect sizes for A, C, or E