the Definitive Difference

between experiments and correlational studies

- Experiment (strict)
  *must have at least one **manipulated** variable (IV)*
- Correlational Study
  *all of the variables are **measured***
  - although one is treated as the "predicted" variable
  - the others are treated as the "predictor" variables
- the difference is important for two reasons
  - different methods of analysis
  - **different issues for interpretation**

Directionality (of correlations)

- assume there's a correlation between X and Y

  e.g.,

- it could be that X causes Y

  $X \rightarrow Y$

- but it could also be that Y causes X

  $Y \rightarrow X$

- this is the "directionality problem"

  the opposite explanation to the "preferred" causal story is often called "reversed causation"

Third Variables (causing correlations)

- assume there's a correlation between X and Y

  e.g.,

- it could be that X causes Y $X \rightarrow Y$
- it could be that Y causes X $Y \rightarrow X$
- but it could also be that some third variable, Z …

  e.g.,

  … causes both X and Y

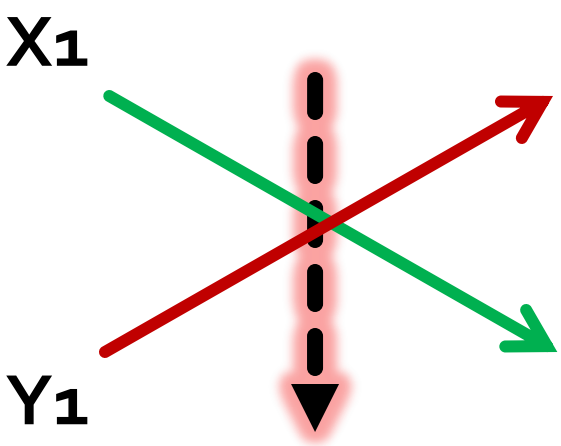
Directionality (of correlations)

- If X causes Y ….

  then X1 should predict Y2 better than Y1 predicts X2

  which means $r^2_{X_1Y_2} > r^2_{Y_1X_2}$

time 1 time 2



(watching violence)

(being violent)

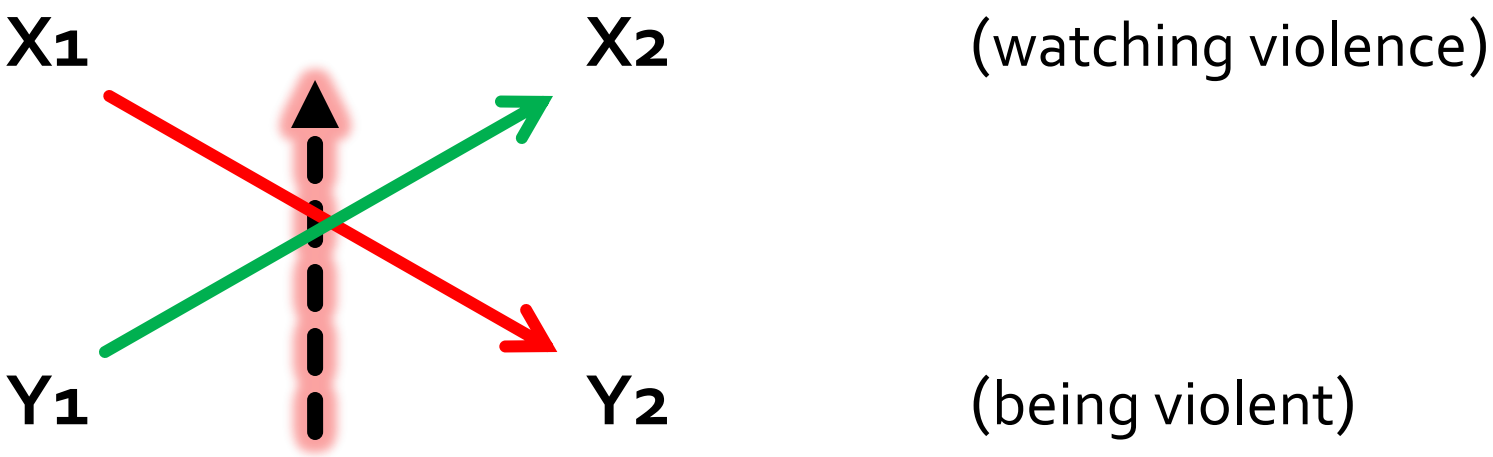
Directionality (of correlations)

- If Y causes X ….

  then Y_1 should predict X_2 better than X_1 predicts Y_2

  which means $r^2_{Y_1X_2} > r^2_{X_1Y_2}$

time 1 time 2



Third Variables (causing correlations)

- How do you test whether a correlation is caused by a third variable?

  answer:

- OK, how do you test whether a correlation is caused by a *particular* third variable?

  answer:

  note: the new value is called a "partial correlation"
  (partial correlation between X & Y with respect to Z)

Third Variables (causing correlations)

- If the partial correlation (btwn X and Y with respect to Z) is as strong as the original correlation,

  then the third variable is not the cause of the XY correl

- If the partial correlation is smaller than the original but still different from zero,

  then the third variable is not the *only* cause

- If the partial correlation is now zero,

  then the third variable (or something related to it) is likely the entire cause of the original correlation

  and the correlation between X and Y is spurious