## Correlation RHs & Comparisons

- correlation questions/hypotheses and related statistical analyses
  - simple correlation
  - differences between correlations in a group
  - difference between correlations in different groups

## Simple or Bivariate Correlation

Are two variables correlated, within a single population/group?

Common versions of this question include...

- "Is practice correlated with performance?"
- "Is performance correlated with confidence?"
- H0: There is no linear relationship (correlation) between practice and performance.

H0:  $r_{perf, prac} = 0.0$ 

## Comparing "Correlated Correlations"

Are two correlations (that share a variable) different, within a single population/group?

Common versions of this question include...

- "Which is better correlated with performance, practice or prior skill?"
- "Which is better correlated with practice, performance or confidence?"
- H0: The correlation between practice and performance is the same as between prior skill and performance.

H0: r<sub>perf, prac</sub> = r<sub>perf, pskill</sub>

Tested using Hotelling's t-test, Steiger's Z-test, or one of several variations...

Comparing Correlations across Populations/Groups

Is a correlation different in one pop/group than in another?

Common versions of this question include...

• "Is performance better correlated with practice for novices or for experts?"

• ""Is pracice better correlated with confidence for novices or for experts?"

H0: The correlation between practice and performance is the same for novice and for experienced participants

H0:  $r_{perf, prac}$  for novices =  $r_{perf, pract}$  for experts

Tested using Fisher's Z-test

Identify the kinds of "correlation question" for each ... Is age a better predictor of social skills for children than adults?

"Is a correlation different across two populations?" Is age or SES a better predictor of social skills?

"Are two correlations different, within a single population?" Does age predict social skills?

"Are two variables correlated, within a specific population?"

Does IQ predict school performance?

"Are two variables correlated, within a specific population?"

Does IQ predict school performance better than does SES?

"Are two correlations different, within a single population?"

Does SES predict IQ better for children or adults? "Is a correlation different across two populations?"

1st moment of caution when comparing correlations!

You have to decide if you are going to compare .... the "correlations" of the two predictors (including sign + or -) or the "strength", r<sup>2</sup>, |r|, or "predictive utility" of the two predictors (ignoring the sign) For example:

r(98) = .35 for # correct and confidence ratings r(98) = -.25 for # correct and time to complete the task

(r = -.45 for confidence and time to complete)

Comparing .35 & -.25 yields Z = 3.55, p < .01  $\rightarrow$  different r Comparing .35 & .25 yields Z = .63, p > .05  $\rightarrow$  same r<sup>2</sup>

Notice that these questions are equivalent if the signs of the two correlations are the same!

2nd moment of caution when comparing correlations! Don't confuse asking...

• if each variable is significantly correlated with the criterion vs.

• if the variables are differentially correlated with the criterion

## Example...

r(28) = .37, p < .05 for # correct and time to complete the task r(28) = .33, p > .05 for confidence and time to complete the task

Although # correct is significantly correlated with time to complete the task and confidence is not significantly correlated with time to complete, it is a different question to ask if the two correlations are significantly different!

Said differently → There may not be a significant difference between a significant correlation and a non-significant correlation.

An important variation of comparing correlations...

While it is most common to apply these models to ask which of two variables is the better predictor of a given criterion...

... it is possible to apply them to ask for which criterion a given variable is the better predictor.

Often we collect multiple variables that are considered "outcome" or criterion variables. If so, when we talk about how good a predictor is, it is important to know if the effectiveness of the predictor depends upon the criterion we are using.

Remember - like in the other applications of these models ...

• it is different to say that a predictor is correlated with one criterion and not correlated with another, than to say it is differentially correlated with the two!

 $\bullet$  it is different to ask if two correlations are significantly different than to ask if the two r^2 or |r| are different