TOPIC 12: CORRELATION AND EXPERIMENTS

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CORRELATIONAL RESEARCH

↓

ASSOCIATION CLAIMS = not supported by a specific kind of statistical test or a graph.

↳ supported by research design in which variables are already measured and manipulated.

they just show that there is a correlation between two or more variables.

=

NO CAUSAL CONCLUSION

Example:
"People who often watch violence on TV are more violent than others"

Correlation coefficient (r)

$-1 \leq r \leq 1$

quantify relationship as it is a measure for the degree of linear relation between two variables.

- absolute value that indicates the strength of the relation
- sign = direction of the relation

→ to represent it: scatter diagram

the presence of correlation is important 'cause it allows us to make predictions on variable observing the other one.

BUT

STATISTICAL VALIDITY: Do the data support the claim?

↳ first ask: (I) what is the strength of the coordination (effect size)?

more correlated the variables are → the more accurate predictions can be

(II) Could outliers be affecting the correlation?

outlier → greater correlation!

(III) Is the correlation statistically significant?

claims → population of interest.
correlation → results got from a sample

depends on strength of correlation and sample size
↳ how many observations you made

→ in general, for Associative Claims

- UNKNOWN DIRECTION OF CAUSATION
  DIRECTIONALITY PROBLEM
- THIRD VARIABLE PROBLEM:
  there is another variable that leads to the coordination of the two

SPURIOUS CORRELATIONS:
- Ages of Miss America and murders by steam

⇒ Correlation = association
≠ causality!

↓

What are the criteria required to establish causation?

A = causing variable

B = effect variable

(I) Is there a correlation when you report something in correlational research?

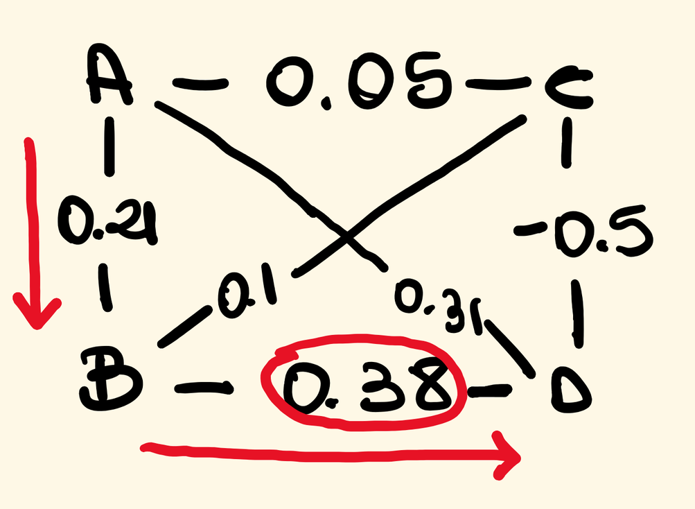
COVARIANCE   A ⟷ B

(II) TEMPORAL PRECEDENCE → directionality problem
which variable comes first? The cause variable

(III) INTERNAL VALIDITY → third variable problem
Is there a third variable that is associated with A and B together?
↳ generally unknown!

Sometimes researchers attempt to establish temporal precedence on the basis of correlational research.

← by using the CROSS-LAGGED-PANEL procedure



$A \rightarrow B$ if $r(A_{t1} - B_{t2}) > r(A_{t1} - B_{t1})$

sometimes researchers attempt to establish some internal validity on the basis of correlational research.

→ by separating the participants into subgroups on the basis of a reasonable 3rd variable

↓

Possible 3rd variable:

(I) no positive correlation between 1 group and another
positive correlation given by 3rd variable

(II) positive correlation between each group
positive correlation not given by 3rd variable

What if correlation is zero?

could be because of:

- measurement where done in a restricted range. (truncated range)
- non-linear relationship
- no association

TO SUM UP:

(I) correlation ≠ causality
= association

(II) internal validity of association = low

(III) how well...
- each variable was measured? (construct validity)
- the results generalize (external validity)
- the numbers support the conclusions (statistical validity)

EXPERIMENTING

EXPERIMENT = occurs when a particular comparison is produced while all other aspects of the situation are held constant.

↓

Hypothetical experiment

NULL results -
- independent variable did not affect the dependent variable.
- manipulation was to weak (time = too short)
- insensitive measures
  tiny changes in the dependent variable might not have been detectable in a simple test.
- CEILING EFFECT
  the test was to easy
- FLOOR EFFECT
  test too difficult
- UNRELIABLE MEASURES
  (high variability)
- NOT ENOUGH POWER (small n)

EXPERIMENT 1

Brady and colleagues 1958

hypothesis: people who are in charge have more stress and so they have more stomach ache.

monkeys - pre-test
- active group
- passive group

electrical shocks that can be stopped by active monkey (button).

active = passive = same shocks of same duration

BUT

active monkeys = more aches.

CONCLUSION = stress management can lead to aches.

↳ not valid

↓ why?

the assignment of monkeys to the 2 groups was not random but based on pre-test performance.

↳ responding time variable confounded the indep. variable of being in charge or not.

JARRAD (1963): LSD and Rats

confounding variable:
time sequence of drug administration

→ IN A GOOD EXPERIMENTAL DESIGN EXTERNAL AND UNCONTROLLED VARIATIONS ARE MINIMIZED.

HOW TO ASSIGN SUBJECTS TO THE DIFFERENT LEVELS OF THE INDEPENDENT VARIABLES?

(I) Between-subjects design:
separate groups of subjects receive different levels of the independent variables.

(II) Within subjects design:
All subjects receive all levels of the independent variables.