Research Methods, 18 Oct

• handbook knows almost everything, including questions asked last time about practicals.

  – In handbook
  – In Blackwell’s bookstore
  – Very expensive £62

  – Text is identical, although layout and colors are uglier
  – Chapter numbers are different
  – In Blackwell’s bookstore in the next several days, £32
  – In library in a few weeks

• One chapter in Lynn’s office (Ch. 5 from new book = Ch. 6 from old book)
• Chapter 1 of old book = Chapter 1 of new book
• Chapter 2 of old book = Chapter 2 of new book

Research Methods, 18 Oct

• Finish acquiring knowledge: anecdotal evidence, correlation vs. causation

• DV, IV

• Sampling, generalizing

• Validity

• Reliability
Acquiring knowledge: Anecdotal Evidence

- Descriptive
  - Just describe what you see, without interacting with people/animals you are studying
- Anecdotal
  - Joe says, “I saw a talking pig once”.
  - Therefore it is possible for pigs to talk?
- Correlation
- Experimental

Evidence: correlation

- Still descriptive or observational
- Correlation
  - Go beyond verbal description and look for quantitative associations
    - Digits span and speech rate
• www.venganza.org “As you can see, there is a statistically significant inverse relationship between pirates and global temperature.”

Correlation does not imply causation

• If it did, we would conclude
  – Breeding pirates could prevent global warming
  – Having African blood causes low IQ

• Still, can figure things out
  – Almost all astronomy uses description or correlation- NO EXPERIMENTS!
Correlation vs. Causation

- Correlation
  - When things tend to vary together (more detail in Simon’s lecture)
  - Not necessarily cause-effect relationship
- Causation
  - Cause-effect relationship
  - Direct intervention to change only the putative cause AKA experiment!

![Diagram showing correlation and causation between Race, IQ score, Household income, and K-12 education.]

Correlation vs. Causation

- Low-income children more often retarded

![Diagram showing correlation and causation between low income, retardation, Old houses, and Lead paint.]

- How do an experiment on this?
Living together before marriage causes divorce?

Disentangling causation and correlation

• Experiment!
Acquiring knowledge: Experiments

- Experimental
  - A natural law regulates the advance of science. Where only observation can be made, the growth of knowledge creeps; where laboratory experiments can be carried on, knowledge leaps forward. Michael Faraday
  - Allows causal inference
  - Maximum amount of manipulation
  - Introduce factor and observe result
    - Can be subjective or objective measures

Stereotypical scientific method

- Form hypothesis from theory or observations
- Design study to test hypothesis
- Conduct study and test predictions
- Confirm or revise hypothesis
- Modify theoretical concepts
Things to decide

• Hypothesis
• Independent, dependent variables
  – Narrow your hypothesis into specific prediction
• Empirical strategy
  – Experiment, observation, survey...
• Design
  – Between or within subjects? Control group? Pretest? How are extraneous variables controlled?
• Participants
• Task
• Apparatus, materials, procedure
• Main analysis
  – Compare means? Compute correlation?

Designing the perfect experiment- not easy!

• Usually there is no perfect experiment
• But an experiment can be various distances from perfect
• You don’t want to believe the crummy ones

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Why Most Published Research Findings Are False

Author: P. A. Ioannidis

Summary

There is a growing concern that most current published research findings are false. The probability that a research claim is true increases as the number of other studies on the same question and as the magnitude of the effect size increases. Because the number of studies conducted in a field is limited, an effect size and its significance level have a positive and linear relationship with the number of studies conducted on them. Moreover, financial and other conflicts of interest in the published reports add a serious bias to the published findings. Sensitivity analysis (eg, when the same data are reanalyzed for the opposite conclusion) can help identify the problem of false findings. Mainly, a very weak signal size is often the hallmark of a false finding. But, how to classify the results of the research findings for scientific and practical research? It is crucial that the research findings are not mistaken for the true results. The findings of the Ioannidis et al. study confirm the importance of the publication bias in research.
**Independent variables**: manipulated

-> the one that should have an effect on the measurements

**Dependent variables**: measured

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**Experimental methods**

- *Independent Variable* (IV) experimental manipulation
  - “Alcohol’s effect on sexual arousal” - alcohol
    - Condition or IV level 1: alcohol
    - Condition or IV level 2: no alcohol
  - *Manipulation check* - is the I.V. working?
    - Measure BAL, motor coordination, etc.

- *Dependent variable* (DV) - what specifically are you going to measure?
  - “sexual arousal”
  - Called “dependent” because hoping it depends on IV
Sample

• Usually small subset of population, the group of interest
• How were these people chosen?
  – random sampling
  – How might they sample the UK’s population completely randomly?

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  – random sampling
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• Sampling bias
  • Persons without telephones

• Sampling error
  – Error even if have truly random sample
  – If pick 10 names out of a hat, possible that all 10 will believe in God, even in UK
  – If pick 100,
Not an experiment!

• Nationality is a *participant characteristic*
• pseudoexperiment

One-minute quiz

• Clarity
  – 1 = didn’t understand much
  – 5 = very clear
• Speed
  – 1 = way too slow
  – 3 = just right
  – 5 = way too fast
• Something didn’t understand