Choosing horses for courses

Matching research design to the research question

Richard Midford BA, BPsysch, MPsysch (Clin), PhD
Professor of Health in Education
Charles Darwin University
Menzies School of Health Research
Adjunct Professor
National Drug Research Institute
The relationship between the question(s) a research project seeks to answer and the research design it employs are fundamental. If an inappropriate design is selected, the quality of the research process will be affected and the findings compromised.

It is important therefore that considerable thought is given to the selection of the design that best matches the question(s) the research seeks to answer.
Research Design

Research design is a comprehensive plan for data collection and analysis. It is a “blueprint” for empirical research aimed at answering specific research questions or testing specific hypotheses, and must specify at least four processes:

(1) the data collection process;
(2) the instrument choice/development process;
(3) the sampling process; and
(4) the method of analysis

Adapted From Bhattacherjee, 2012, Social Science Research: Principles, Methods, And Practices
Issues to consider when planning research

- **Relevance** Does it really matter whether the research takes place?
- **Feasibility** Can it be done?
- **Coverage** Are the right things included in the right amounts?
- **Accuracy** Will the research produce valid and reliable findings?
- **Objectivity** Will the research provide unbiased findings?
- **Limitations** What are the limitations of the research?
- **Ethics** Are the interests of participants properly protected?
- **Dissemination of Findings** How will you make your findings available?

Adapted from Denscombe, 2007 The Good Research Guide for Small-Scale Social Research Projects
Horses for Courses

**Positivist Research Designs** – usually quantitative
- Randomised or true experimental design
- Quasi-experimental design
- Non-experimental design e.g. surveys, correlational research

**Interpretive Research Designs** – usually qualitative
- Case studies
- Narrative
- Historical
- Phenomenology
- Grounded theory
- Ethnography
Hierarchy of research designs

1. Randomized controlled trial and meta-analysis
2. Nonrandomized trial, concurrent and historical controls
3. Cohort study, prospective and retrospective
4. Case-control study
5. Cross-sectional study
6. Case study
7. Case report
The randomized controlled trial (RCT) is generally considered the gold standard for measuring an intervention’s effect, because it best equalises biases and gives confidence that any differences between treatment and control are actually due to the intervention.
Strengths and limitations of the RCT

• Most appropriate when focusing on a single outcome of interest in a group of individual subjects
• Poor at measuring change in community settings because of community diversity and likely variability in intervention delivery
• Low generalisability because of narrow inclusion criteria and strict intervention protocols
• Can be expensive because of the need for large numbers
Other research designs

• Mixed methods

• Action research
A mixed methods approach, involves collecting, analysing and integrating quantitative and qualitative data in a single research study.

This combines the benefits of quantitative and qualitative approaches and counters the weaknesses of each when used separately.

The method is particularly applicable in community settings where understanding both the scale and context of the issue being investigated is important.
Action research

This involves the use of research techniques to identify problematic issues in a group or community, coupled with active participation of the investigators in group efforts to solve these problems.

Thus, there is a dual commitment in action research to study a problem, while at the same time collaborating with the people experiencing that problem to bring about agreed upon change.
The average adult has one testicle.
Bad research and good research: what’s the difference?

Good social research scientifically draws on evidence to investigate ideas and create knowledge that is useful and socially beneficial, but all social research is not necessarily good.

Research can be technically bad in terms of design, methodology and interpretation of findings.

It can also be deceptive by using accurate data, but manipulating and misrepresenting the information to support a particular conclusion. Questions can be constructed, and analysis structured to reach a desired outcome. Alternative perspectives and data can be ignored or distorted.
The fundamental basis for being both a producer and informed consumer of social research is to require **sound evidence**.

Scientists who evaluate research claims should behave like jury members who have to evaluate claims made by prosecuting attorneys. They should begin with the sceptical assumption that all claims are baseless (the defendant is innocent until proven guilty; smoking does not cause lung cancer; education does not improve health). Only after considering the merit of the evidence presented in relation to the claim being made should jurors and scientists decide whether to accept the claims of those doing the claiming (prosecuting attorneys, scientists).
Good research builds on earlier research

Good research is based on and builds upon previous research to create a body of knowledge. You can generate an issue to research off the top of your head, but almost always, research developed after an understanding of previous research and theory is much stronger and more relevant to science.
“The stuff is perfectly safe. We tested it on our animal subjects and none of them show any ill effects whatsoever!”
Is the research design robust and appropriate?

- Does the research ask the right questions?
- Can you generalise the findings from the study group to the population of interest – is the sample representative?
- Should you consider a design hierarchy, with randomised controlled trials at the top?
- Is the study consistent with what happens in the real world?
50% of graphic designers have red hair.

*Survey size: 2 Designers

Size Matters
Some other issues to consider in assessing the quality of research

• Who funded or conducted the research?
• Who published the research?
• Was it peer reviewed?
• Was it well referenced?
• The numbers in a quantitative study
• Be wary of a large number of measures
Be wary of simple descriptive statistics

The following statistics suggest that 16-year-olds are safer drivers than people in their twenties, and that octogenarians are very safe.
Be wary of simple descriptive statistics

The reason 16-year-olds and octogenarians appear to be safe drivers is that they don't drive nearly as much as people in other age groups.

Graph is based on data from this study: Williams, Allan F., Ph.D., and Oliver Carston, Ph.D., "Driver Age and Crash Involvement," Am J Public Health 1989; 79: 326-327.
Statistical significance and meaningful change

- Statistical tests help distinguish true differences from chance differences and result in a $P$ value which is an estimation of probability that the results are due to chance.

- Statistical significance relates to the question of whether or not the results of a statistical test meets an accepted criterion level. In social research this level is typically the value of $p < .05$ which indicates there is a less than 5% probability that the observed result occurred by chance.

- Meaningful change is about whether the magnitude of the observed result is large enough to be important.
Make it RAIN!!!

Correlation ≠ Causation

Observer

www.thegraphicrecorder.com
Correlation vs Causation

Correlation between two variables does not necessarily mean that one causes the other. Just because two events occur together does not mean there is a cause-effect relationship.

An illustrative example Numerous epidemiological studies have shown that women who were taking combined hormone replacement therapy (HRT) also had a lower than average incidence of coronary heart disease (CHD), leading some doctors to propose that HRT was protective against CHD. However, randomised controlled trials showed that HRT caused a small, but statistically significant increase in risk of CHD. Re-analysis of the data from the epidemiological studies showed that women undertaking HRT were more likely to be in higher socio-demographic groups, with better than average diet and exercise regimens. The use of HRT and decreased incidence of coronary heart disease were coincident effects of a common cause (i.e. the benefits associated with higher socioeconomic status), rather than cause and effect, as had been supposed.