

# A Quick Guide to Research Methods

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In a hurry to understand that piece of research? Can't remember your undergraduate statistics lectures? Don't worry! Refer to this handy-dandy quick reference for making sense of research design! Seriously. Too often when I am reading a research paper, terms are used which are either unfamiliar or ring only faint bells of recognition. I would like to have the capacity to remember everything I was taught, but apart from having a very bad memory, I am also beginning to suspect that it is actually better practice to check terms out even if I think that I remember what they mean.

## Forms of Research

In today's research-reporting monoculture, you could be forgiven for thinking that there is only one research design that provides any 'real' information in the development of science. Hopefully a quick scan through the list of possible approaches to research design will let you know that there are many different roads to the same destination. I can only describe each of these in brief but I hope that you will be left with the clear, and intentional, message that you fit your research design to the question being asked. To fit the question to a single research design is to insert a screw with a hammer ...

## Randomised Controlled Trials

This is the most familiar research design these days. Many consider it to be the 'sine qua non' of research design. If you are familiar with my writing, you'll know I disagree. But, today I am out to describe not deride so — hush my mouth!

Randomised control trials were originally developed to investigate the effects of drugs by controlling for other possible influences. In an RCT, the subjects are randomly allocated to either an intervention or a non-intervention control group. The intervention group receives the 'active ingredient' (a drug, a particular form of therapy, etc.) while the control group receives either no intervention or treatment as usual.

Randomisation is the key factor in this approach, as it is designed to minimise bias in sample selection. The idea is that by randomly allocating subjects, any selection effects due to experimenter actions, whether conscious or not, will be reduced. It is common with RCTs to use

'double blind' trials where neither the subjects nor the researchers know which subjects are allocated to which group. Blind trials are designed to particularly reduce the possibility of 'experimenter effects' where the researcher's prior knowledge of group membership leads him/her to act differently towards each group, which might in turn influence differences in outcome.

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Very often a placebo treatment is used in combination with double blind trials, so that subjects in the control group, and the researchers, too, remain unaware of which group has received the placebo, and which the 'real' drug. A placebo is basically defined as an inactive ingredient which in all other ways resembles the treatment. Placebo effects are worthy of study in their own right as placebos have often been found to be as effective as the active ingredient! However, there is considerable debate as to what this actually means. In some situations it is difficult to find placebos for treatments and this may be particularly true for the 'talk' therapies, as it is difficult to design a placebo when the active ingredients are inherent in the process of relating to the subjects.

The larger a sample of subjects in a RCT, the more significant the results, in the sense that they are more able to be generalised. However, the biggest weakness for RCTs is that what they make up for by controlling as many factors as possible (internal validity) they lose in being actually applicable in the real world (external reliability).



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## Cohort Studies

These sorts of studies are designed to examine the characteristics of an identified group of subjects over time. Often referred to as 'longitudinal', they can be conducted prospectively or retrospectively. In a prospective study the group of subjects is recruited based on a range of criteria, and then periodically examined over time. A famous example is the Grant Study of a cohort of young Harvard undergraduates from the classes of 1939–44 to the present. Retrospective studies use existing data sets which go back in time, to examine the past characteristics of the recruited subjects. Prospective trials are generally more accurate than retrospective ones as there is more control over what data is collected and how. But prospective trials are also significantly more expensive and there is a major problem with loss of data due to subject drop out.

Cohort studies can be large or small, though with the loss of data due to attrition, they generally require very large sample sizes depending on the length of time that they will run for. The major strength of a cohort study is that it captures details about subjects over considerable time periods and with fairly large amounts of detail. However, this can also be a problem as the theories and techniques for measuring things may have changed radically, rendering the data obsolete or less critical than at the time the study began.

## Case Control Studies

Case control studies are often used to evaluate the causal factors in relation to disease or disorders. They involve comparing samples of people who have a particular condition or disease to a sample of people, matched on particular characteristics, who do not have the condition. These sorts of studies are primarily useful for evaluating the causal factors as the matching of cases with controls can be done on a range of features thought to be related to the development of a condition. Case control studies are often useful when investigating rare conditions or when a quicker answer is required than can be achieved through a cohort study.

The strength of case control studies is that they can be used to explore relatively quickly a broad range of factors relating to a particular condition in which we are interested (e.g. ADHD) but they are also quite narrow in their focus. The aim of these designs is to generalise about the condition under investigation, and they have limited utility in generalising about classes of conditions. An example of case control would be some of the studies looking at causes for cancer. People with cancers are matched with people who don't have cancer, on sociodemographic factors (i.e. age, gender, socio-economic status, years of education, occupation, and so on). Differences on other factors between the groups are then identified and evaluated for plausibility as possible causal agents in the development of the disease.

## Cross-sectional

A cross-sectional study is one which captures information on subjects at one point in time. Many research designs use variations of a cross-sectional design, so it is a bit misleading to refer to it as a research design in and of itself. In epidemiology, cross-sectional studies may be used to assess prevalence or exposure to risk factors in a population. Cross sectional designs are often used in the social sciences to evaluate the psychometrics of instruments or in social surveys. A recent Australian example was the National Survey of Mental Health and Wellbeing. A representative sample of 10,000 plus adults were evaluated on measures of mental health and a range of other instruments. Because of the sampling process, this survey provided data which could be generalised to the mental health of all adult Australians.

The major weakness of the cross-sectional design is that it does not allow for any evaluation of causality, as it is a design that only allows for correlational or associative evaluations between measures. One reason that cross-sectional designs are most prevalent in research, however, is that they are the cheapest and organisationally simplest to use.

## Case Studies

Case studies are generally not considered valid research by most commentators. These are the so-called 'anecdotal' evidences much maligned in our current scientific paradigm. Nonetheless, I include them as they form the basis, in my opinion, of any proper science of therapeutic practice.

A case study involves the description and analysis of a case which represents some key features of a disorder or condition, in order to identify the distinguishing characteristics for diagnosis or to highlight some response to treatment. The case study may be conceptually part of a series where a number of such cases are described and their similarities and differences explored.

The case study necessarily cannot be generalised, and this is considered its major failing. However, case studies represent the perfect vehicle for the articulation of tacit knowledge — what we know from our experience and our practice. I contrast tacit with explicit knowledge, which is knowledge that can be codified and transmitted in formal language. Case studies form the basis of scientific enquiry, always have and always will in all the sciences, as it is the practitioner who begins to ask questions about a specific case who ultimately generates the research questions that are applied to bigger populations.

Case studies can be rendered formal and quantifiable by utilising other methods such as single case designs or qualitative methods. I won't say anything of this, as it will form the basis for another Research into Practice essay.

## Systematic Reviews

Systematic reviews are not research designs per se. They are an approach to a meta-view of research about a particular area. Essentially, a systematic review involves a team of

people in collecting and analysing all of the available information on a particular issue, using a rigorous and pre-determined methodology.

Perhaps the best known example of this approach is the Cochrane Collaboration, an international non-profit organisation which reviews and promotes the best available evidence on the effects of interventions and treatment in relation to medical science. It should be noted that the Cochrane

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Collaboration essentially reviews only studies which have used RCT methodology.

Other forms of systematic review use rigorous criteria for evaluating the evidence available but do not exclude non-RCT studies. These sorts of reviews rely less on quantitative summation of studies under review and may use more narrative and qualitative analysis of the area of interest.

The strength of reviews like the Cochrane Collaboration is that they quantitatively summarise the evidence and provide good overviews of the current situation. However, the rigid focus on RCTs limits the type of information that can be summarised and these reviews often discard large amounts of evidence. It is well worth knowing what criteria a systematic review has used to be able to evaluate how applicable its summaries really are.

## Meta-analyses

The term meta-analysis generally refers to a particular procedure for summarising the quantitative data from a number of studies and using the pooled sample sizes to test for overall significance of results. Meta-analytic procedures tend to underlie most quantitative systematic reviews of a research area. The approach allows the researcher to pull together different studies and add results together to make a statistically more robust sample. But the requirements that different studies use the same or similar methodologies with the same or similar measures are rarely met, so most meta-analyses suffer from the problem of squeezing oranges to compare them to apples.

Despite the limitations, meta-analyses and systematic reviews can be a really useful place to start reading about a research area, as the authors will have exhaustively searched the literature and provide good summaries of the main issues.

## Conclusion

If you are interested in research, the best place to start is with a question. Once you have a question, you then need to think about how you can get answers. The main point of research design is to provide a way of answering questions that leaves you, and your colleagues, more certain than not that the answer is a valid one. The more alternative explanations you can measure or control, the more certain you can be that the answers you have reflect what is actually going on. But this business of asking and answering questions is always a process of approximations. Personally I like the fuzzy edges. ©

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