Lecture 3: Approaches to Research

Qualitative and Quantitative methods

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Approaches to research

Doing research is an integral part of your training as a psychologist.

But before you can start thinking about doing research you need to be aware of the different approaches that are available to you.

In today's lecture, we'll cover approaches from the two traditional divisions:

- *qualitative* methods and
- *quantitative* methods

And we'll finish off by talking about how *computer simulation* can be used in psychology research.

Qualitative and Quantitative methods

We can split approaches to research into two broad categories

We can give some *simple* descriptions of these categories.

1. Quantitative methods collect numbers/numerical data and use statistical tools
2. Qualitative methods collect words, pictures, and artefacts

Some researchers also adopt both approaches (*mixed-methods*) or apply *quantitative methods* to *qualitative style* data.

Quantitative methods are probably easier to group together, because many different approaches can be grouped under qualitative methods.

This course focuses on quantitative methods but you'll learn more about qualitative methods in later years.

Outline of quantitative methods

Quantitative approaches take a phenomenon and try to condense it down into a few dimensions or variables that can be measured as *precisely and reliably* as possible.

It is very important to choose variables that are representative of the phenomenon you're studying.

Choosing variables that are representative of the phenomenon you're interested in involves operationalisation.

- Operationalisation means choosing a measurable proxy for the phenomenon you're interested in[1].

[1] *Operationalisation* will be an important part of your lab report

Outline of quantitative methods

Quantitative approaches often make use of statistical methods

- Using statistical methods means looking at lots of cases (for example, studying lots of people, not just one or two).

The goal with quantitative methods is often to develop generalisations, or theories that are generally applicable.

- Involves testing predictions that logically follow from theories (the *deductive* step[1])

[1] Refer back Lecture 2 if you're unsure what *deductive* means

Outline of qualitative methods

Qualitative methods are focused on meaning rather than measurement.

Instead of condensing a phenomenon down to a simple set of features or dimensions, qualitative research tries to examine many features.

Qualitative approaches try to look at all aspects of one or a few instances of a phenomenon.

Qualitative approaches view the context (*physical environment*, *social setting*, *cultural context*) as a central part of the phenomenon being studied.

Qualitative approaches—e.g., grounded theory and phenomenology—also emphasise the idea of following the data wherever it leads (that is, the *inductive* step).

Qualitative methods

Qualitative methods are extremely varie with many different methodologies, underlying theoretical assumptions, and intellectual histories

I can't do them all justice in one short lecture, so we'll only cover a few:

- Verbal protocol analysis
- Ethnographic methods
- Discourse analysis
- Phenomenology

However, there are many more, including Case Studies, Grounded Theory, Participatory Research, Focus Groups, and many more.

I'll try to draw out some of the contrasts between qualitative and quantitative methods more generally and highlight strengths and weaknesses of each approach.

Verbal protocol analysis

Also known as "*thinking aloud protocols*" (or "*talking aloud protocols*")

- Involves collecting and analysing verbal data on cognitive processing
- Participants are given a task (usually a task that involves multiple steps that are chained together) and are asked to verbalise (speak aloud) what they are thinking as they go about solving the task
- Data (i.e., recordings of what the participant said) are coded an analysed to infer the information processing steps involved in solving the problem

The approach was used in early *Cognitive Science* by *Simon* and *Newell* who were pioneering researchers in *Cognitive Science* and *Artificial Intelligence* (Computational Theory of Mind)

Carries certain assumptions about the nature of human cognition/thinking, e.g., that it involves *information processing in discrete sequential steps*.

Example Verbal Protocol Analysis

		Coding Framework	
Segment	Content	Plan level	Plan Type
1.	OK... the first thing I would do is to make a list of the shops that are quite close to each other	Executive	Generate plan
2.	and highlight the dance class remembering that it is at a specific time	Metaplan	Satisfy time constraints
3.	I would try to get to it first and get it over with...	Executive	Order messages
4.	probably, in reality I would drop it....	Executive	Evaluate plan Eliminate

Example data from a verbal protocol analysis (Ross, nd)

Ethnography

More a style of research than a method of data collection, ethnography involves studying people in "the field" (i.e., their naturally occurring setting), and requires the researcher to enter into the setting they are studying

- Attempts to understand how the socio-cultural practices and behaviours of people are shaped by their social, physical, and cultural contexts
- Tries to make sense of events from the perspective of their participants
- Could include data from *interviews*, or *participant observation*[1]

[1] In *auto-ethnography*, researchers engage in self-reflection and treat themselves as the participant.

Ethnography

In cognitive psychology, ethnographic approaches have been used to understand how people solve problems in real-world settings.

- E.g., How do technological artefacts (that is, the *context*) to support cognitive processing[1].

In critical psychology, ethnographic approaches have been used to understand the interplay between, race, class, gender, and education in shaping participants' life worlds.

[1] One famous study in cognitive ethnography involves studying how sailors use the technological artefacts (instruments etc) and layout of a ship to help them navigate

Discourse analysis

Discourse analysis is the *social* study of language as used in *talk*, *text*, and *other forms of communication*.

It involves a distinctive way of thinking about talk and text where language doesn't just represent the world but also constructs the world.

Some of the questions one might examine with this approach:

- How does language shape social relations? For example, how might certain kinds of talk establish professional distance in doctor-patient communication
- How might language construct or open up space for particular identities. For example, how might language enforce or break down the concept of binary gender

Discourse analysis

The strengths of this approach are that it allows you to examine how language constructs reality.

It can make use of primary data (interviews, talk in focus groups) or secondary data (books, newspaper articles).

But it can be difficult to use discourse analysis to develop the same kind of generalisations as you might develop with other approaches.

Phenomenology

Particularly associated with the philosophers *Husserl*, *Merleau-Ponty*, and *Sartre*

The phenomenological approach involves bracketing off any preconceived notions we might have about a phenomenon to achieve an understanding of that phenomenon that has not been influenced by our prior beliefs.

Phenomenology emphasises peoples first-hand experience and attempts to understand and describe subjective experience from the participant's point of view.

Phenomenology

Phenomenology has been used in fields like cognitive psychology to understand, for example, the nature of subjective sensory experiences, the nature of skilled actions, and the nature of cognition itself (e.g., been used to argue against the computational theory of mind).

A phenomenological approach to studying, for example, inclusive classroom settings might try to understand what it is like for a student with a disability to be in that classroom setting.

An ethnographic approach might look at how the classroom setting changes interactions between students with and without disabilities.

Issues in qualitative research

Unlike quantitative methods than might use printed questionnaires or computers to record and measure responses, in qualitative research, the researcher is the instrument

- important for researchers to reflect on their values, assumptions, biases, and beliefs to understand how these might impact the research
- the research instrument (i.e., the researcher) can change. For example, in *ethnographic research*, the changes in the *researchers experience* might alter how they record and observe behaviours.

There are parallels to validity (*internal* and *external*), reliability, and "objectivity" in in qualitative research[1]

These are Credibility, Transferability, Dependability, and Confirmability

[1] We'll touch on these topics today, but you'll also learn more about these concepts in coming lectures

Issues in qualitative research

- Credibility: Can the data support the claims. Can be established through *prolonged engagement*, discussions with other researchers/participants, and critical self-reflection
- Transferability: Can the findings be transferred to similar contexts. Requires extensive, detailed, and careful descriptions of the research context ("thick descriptions").
- Dependability: Ensuring that researchers maintain a record of changes in the research process or research instrument (i.e., themselves) over time.
- Confirmability: Concerned with ensuring that the data used to support the conclusions are *verifiable*.

Quantitative methods

As the name suggests, a key aspect of quantitative methods is quantification.

Quantification means putting numbers to the thing we're interested in studying so that it can be measured.

The motivation behind measuring phenomena is that measurements are publicly available and verifiable (e.g., scientists can check or verify your measurements).

Unlike *qualitative research* where researchers try to simultaneously study many aspects of a single phenomenon, quantitative research tries to condense a phenomenon down into a single (or a few) dimension(s).

The first step in quantitative research is often figuring out how to quantify the phenomenon of interest. This involves choosing a proxy (something measurable) that can stand-in for the phenomenon

Operationalisation

If you're interested in anxiety, you have to decide how to measure anxiety. You can't measure an abstract concept directly.

The process of choosing a proxy is known as operationalisation.

There are lots of ways to choose a measurable proxy that can stand in for anxiety.

1. Develop a scale or a questionnaire.
2. Measure physiological responses like *increased heart rate* or *galvanic skin response*.

Measurements have to be reliable (reproducible) and valid (actually measure what you think you're measuring).

- E.g., If we develop a scale for depression then the scale must produce similar numbers when applied to the same person or to different people who are similarly depressed.
- A treatment for depression, should not just reduce scores on our depression scale, but it must also result in people experiencing less depression.

Quantitative methods and causation

Unlike qualitative research, which studies phenomena *in the wild*, quantitative approaches try to exert a lot of control over phenomena.

Control allows researchers to make claims about causation and give causal explanations.

There are a few ways to understand causation, and thinking about what causation means will help us to think through ways to examine, study, or identify it.

What is a cause?

One view of causation can be summed up *as a difference that makes a difference*:

- If you take two situations, one in which the phenomenon occurs and another in which does not occur then whatever is different between those situations is the cause of the phenomenon.

For example, take one situation in which a *window is broken* and another in which a *window isn't broken*. If the only difference between the two is that in one *a boy has thrown a rock* and in the other *a boy has not thrown a rock* then a boy throwing a rock is the cause of the broken window.

What is a cause?

You can also understand causation *in terms of manipulation*:

- If you can manipulate one thing and observe a change in another, then the two things are may be causally connected.

For example, as I *put my foot down or lift it from the accelerator pedal in a car* I can observe *a change in the speed of the car*, so I know the accelerator pedal and the speed of the car are causally connected. By intervening and manipulating parts of a system you can identify how they work (you can identify mechanisms).

What is a cause?

Causation can also be understood *in terms of probability*:

- If the presence of one thing increases the probability of the other thing occurring, then there may be a causal relationship.

For example, the presence of *smoking* increases the probability of *developing cancer*, so *smoking* may be the cause of *cancer*.

Causation and confounds

In the examples above they are all examples of possible *causes*

To be justified in claiming a causal relationship other conditions must usually be met.

And causal claims are not always black and white. Sometimes we can only be more or less sure about causal relationships.

What are some of the other conditions that need to be met?

An example of Smoking and Cancer

- The presence of *smoking* increases the probability of *developing cancer*, so *smoking* may be the cause of *cancer*.
- *Having emphysema* also increases the probability of *developing cancer*. But is *emphysema* the cause of *cancer*?

There is a plausible mechanism of action between *smoking* and *cancer* but not between *emphysema* and *cancer*, so we can be more sure that *smoking* causes *cancer* than we can be about *emphysema* causing *cancer*.

A more likely explanation is that *emphysema* and *cancer* have a common cause—*smoking*.

Smoking and confounds

Let's say you are studying the relationship between *emphysema* and *cancer*, because you think *emphysema* might cause *cancer*

In this situation, *smoking* is a confound

If you wanted to see whether *emphysema** caused* cancer *then you'd have to *control for smoking*

- Only look at smokers and see if there's still a relationship between emphysema and cancer or whether cancer also occurs in the absence of emphysema
- Only look at non-smokers and see whether emphysema and cancer are still related or whether cancer develops in the absence of emphysema

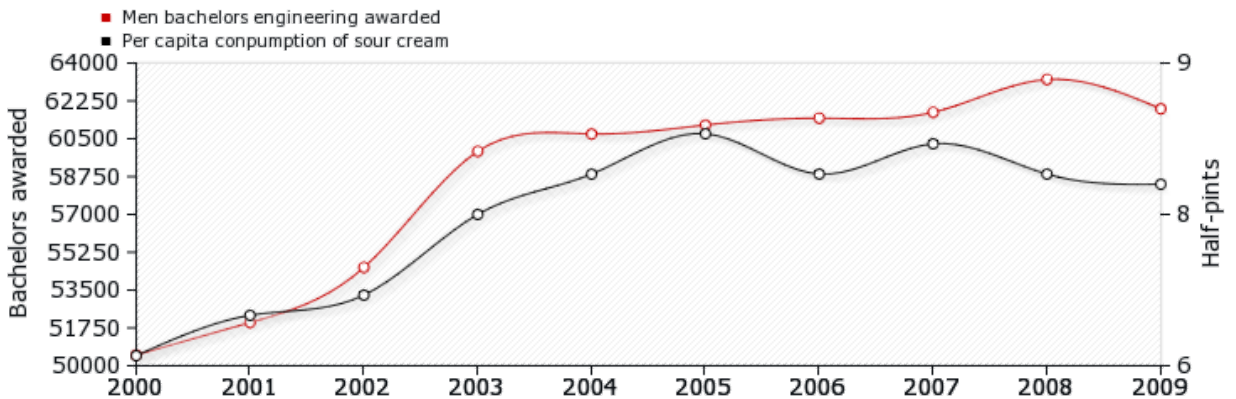
Emphysema and cancer are correlated (the increase in one leads to an increase in the other), but emphysema doesn't cause cancer because they have a common cause.

Correlation and causation

- Sometimes two correlated variables have a causal relationship: smoking and cancer
- Sometimes they have a common cause: emphysema and cancer

And sometimes they have neither:

- From 2000 to 2009, there was a strong relationship between the number of men getting engineering degrees and per capita consumption of sour cream.



Qualitative vs Quantitative methods

In qualitative research, you study phenomena in context while in quantitative research you aim for control.

But you can use either approach to study the same phenomena/psychological processes.

Let's say you're interested in memory:

How could you study memory from a qualitative and a quantitative perspective?

Qualitative vs Quantitative methods

Quantitative:

You could use experiments in a lab where you give people lists of words to remember. You could *manipulate* aspects of the words— for example, their emotional salience— and measure performance (accuracy scores) to try and understand something about memory and emotional salience.

Ensure that the only thing that differs between the words on each list is the emotional salience. Control for possible confounds like:

- word length: make sure that one list doesn't contain long words and the other short words)
- order: make sure some people get the lists in one order and some in the other order, because maybe people get tired by the end and that influences memory.

Qualitative vs Quantitative methods

Qualitative:

For a qualitative approach you don't want to study memory in the lab—you want to study it in the wild. This allows you to ask different kinds of questions.

You could use an *ethnographic* approach with, for example, bartenders. You might do fieldwork in a bar observing bartenders. Through this, you might see that bartenders structure their environment in a particular way—e.g., put certain types of glasses or bottles in particular places.

- This might lead you to form the hypothesis that bartenders structure their environment to support their memory—i.e., placing certain bottles and glasses together helps them remember what goes in what kinds of cocktails.
- Follow-up interviews or discussions with bartenders or observing the training of bartenders might provide further evidence for this hypothesis.
- You might also engage in bartending and critically reflect on your own experience to understand how this environmental structuring supports memory.

Computer simulation and formal methods

Qualitative and quantitative methods try and understand phenomena by studying the phenomena themselves. The data they use comes from the phenomena.

In approaches like computer simulation and formal/mathematical modelling researchers instead generate the data.

Researchers try to build systems that *replicate* or *reproduce* some aspects of systems or phenomena they are studying.

- This might allow them to gain new insights into these systems.
- Comparing the behaviour of their artificial systems with the natural system allows researchers to test theories about the processes that produce phenomena

Computer simulation

Computer simulation has been used to study a lot of different phenomena in psychology, but here are some examples of approaches I find particularly interesting.

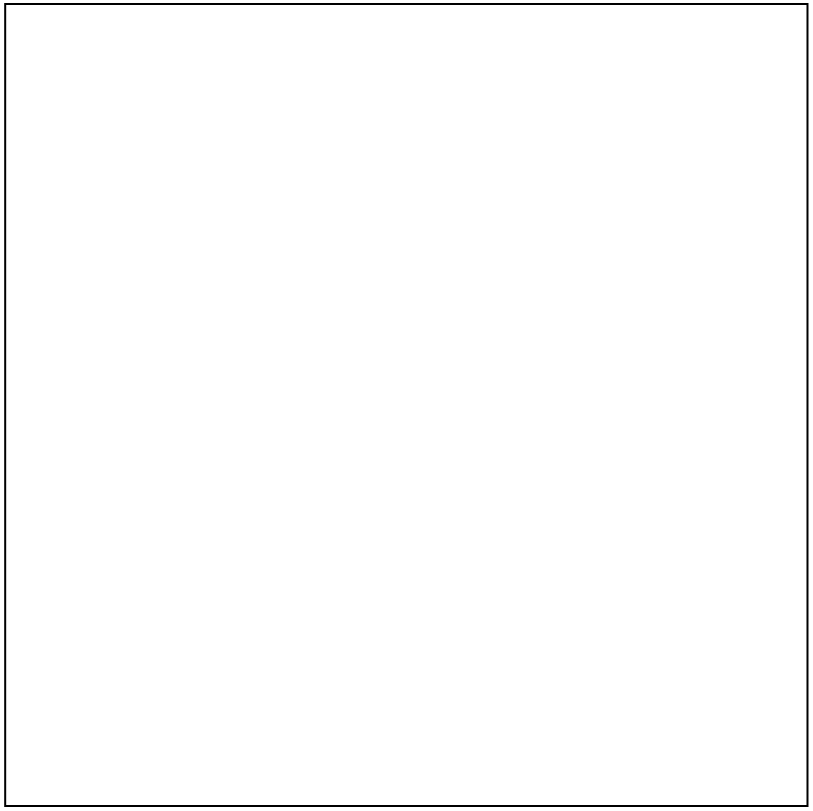
Simulation has been used to show how seemingly complex behaviour can arise from very simple processes.

Flocking behaviour in birds seems very complex, and it looks as if there must be something very complex going on inside their brains.

But you can simulate this behaviour with only three simple rules:

1. avoid collisions with other birds
2. align direction with nearby birds
3. approach distant birds

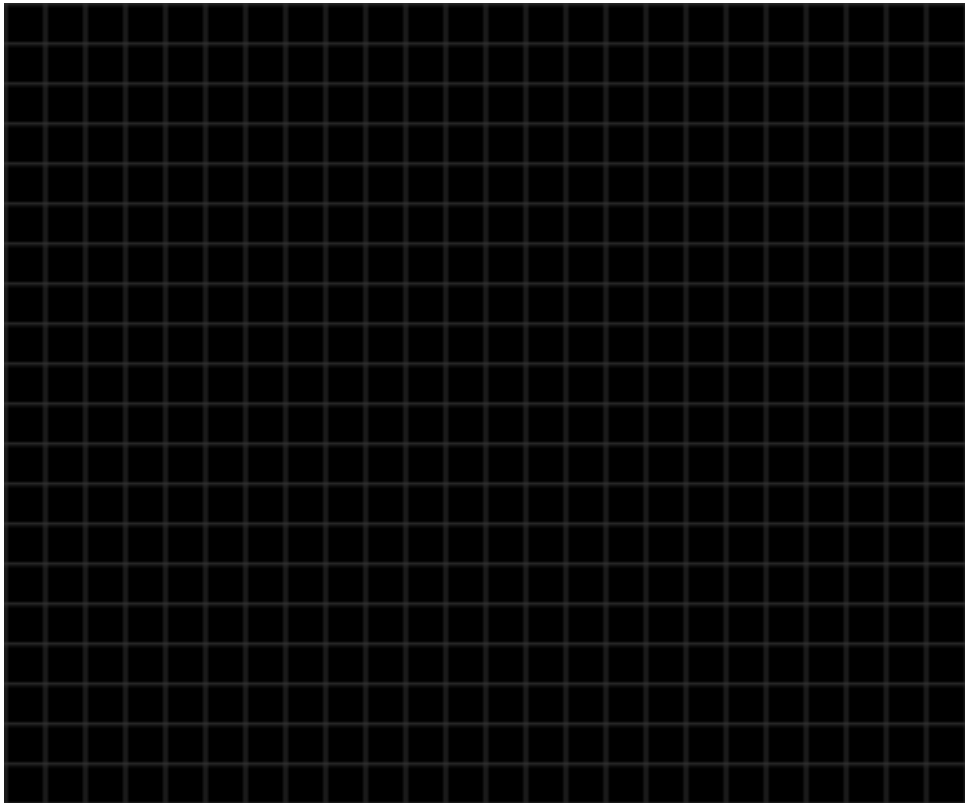
Example simulation of flocking birds[1]



Run/reset simulation

[1] Adapted from http://www.harmendeweerd.nl/boids/

Conway's game of life[1]



Run | Random | Clear | Example 1 | Example 2

[1] Read more about Conway' Game of Life

Agent-based modelling (ABM)

Agent-based modelling takes a cue from approaches like those used to model bird flocking and Conway's Game of Life.

In an agent-based model, the research simulates a group of 'agents'.

- The 'agents' will typically have some memory, a set of goals, and some rules.
- The memory allows them to store their current state or consequences of their previous actions.
- The goals usually represent some state they're trying to achieve.
- And rules govern their interactions.

By allowing these agents to interact, and by manipulating aspects of the agents (their memory, goals, and rules) is it possible to see how social phenomena can arise.

Agent-based modelling (ABM)

For example, if you're interested in how misinformation is spread through a social group, you could use an agent-based modelling approach.

- If you thought that misinformation was more likely to spread if passed on by particularly influential individuals (e.g., celebrities or politicians), then you could include these in your simulation.
- Or if you thought that misinformation was more likely to spread inside socially isolated groups, then you could modify your simulation to create socially isolated groups to test this hypothesis.

You could still go and check the real world to see if it behaves like your simulation.