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MONASH
School of
Psychological
Sciences

Psychological Discovery 1: Psychology and the Scientific Method

Psychology 1B (PSY1022)

GROUP OF EIGHT AUSTRALIA

Psychological Discovery 1 Summary

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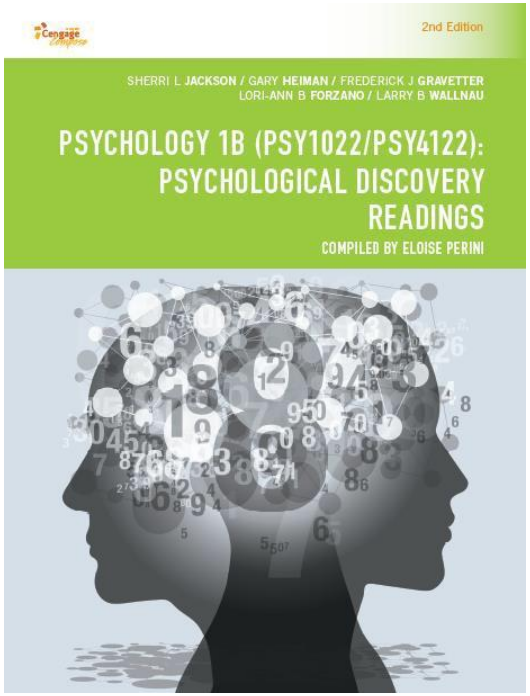
Please post your content-related questions on Moodle so that everyone can benefit from the answers

This Week's Learning Outcomes

1. Explain the importance of studying research design, methods, and analysis.
2. Differentiate the scientific method from other sources of knowledge, and describe the goals of science.
3. Provide an outline of the steps involved in the research process.
4. Give examples of possible sources of research ideas.
5. Generate research hypotheses, and distinguish between hypotheses and theories.

Prescribed Textbook

Jackson, S. L., Heiman, G., Gravetter, F. J., Forzano, L. B., & Wallnau, L. B. (2016). *PSYCHOLOGY 1B (PSY1022): Psychological Discovery Readings* (2nd ed.). South Melbourne, VIC, Australia: Cengage Learning. Compiled by Eloise Perini.



This Week's Prescribed Reading

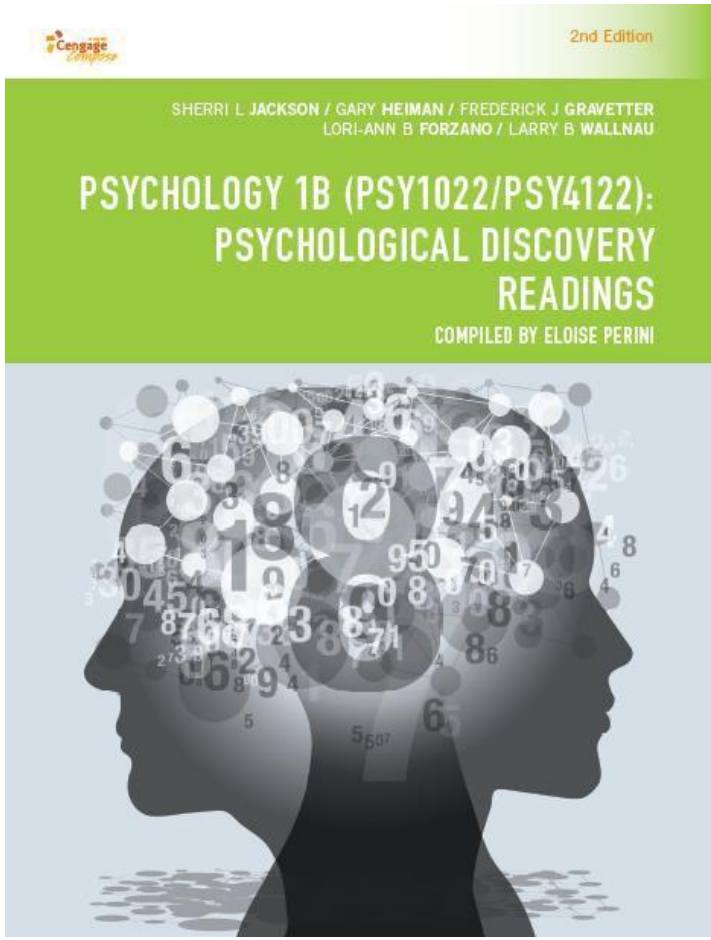
Chapter 1:

Psychology and the

Scientific Method

Your Prescribed Textbook for Psychological Discovery

1. You can get a better grade by using this course resource
2. You will be assigned reading from this textbook
3. You will be tested on content from this textbook and digital readings



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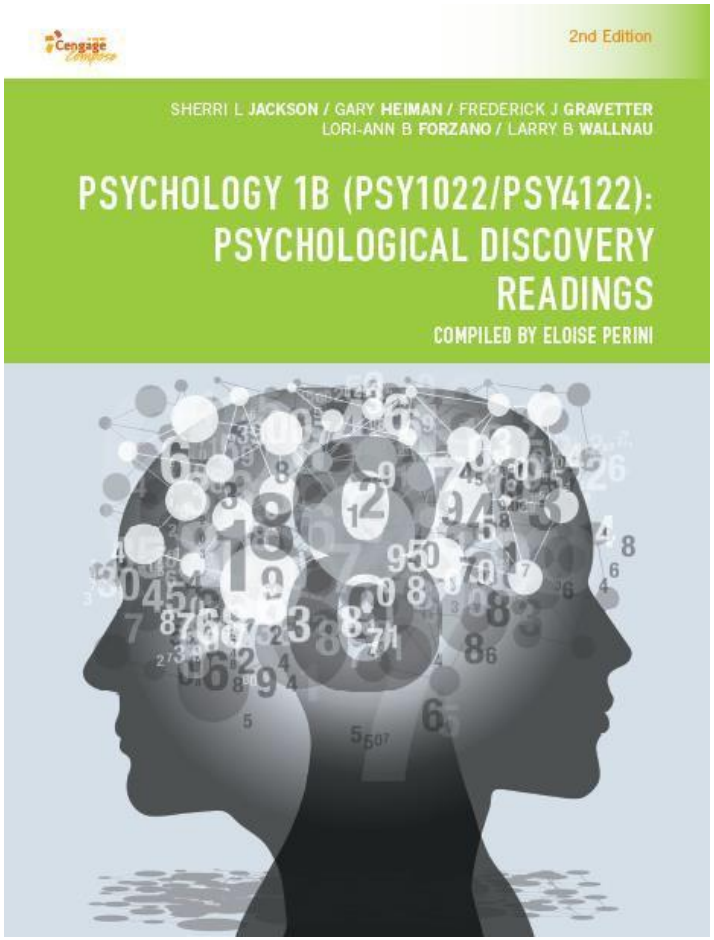

Psychological Discovery is…

The process by which professionals in psychology and other behavioural sciences gather and interpret information to provide an understanding of how and why people think, feel, and behave the way they do.

At its core it is the study of **Research Methods and Statistics** or **Research Design and Analysis (RDA)**

Applies beyond psychology: biological sciences, market research, etc. all rely on similar principles

Why study Research Design & Analysis?

RDA is part of scientific practice

- If you go into psychology research (or any other field of research), practicing good research design will help you answer questions about how/why things work
- Interpret findings from journal articles

Why study Research Design & Analysis?

RDA is part of scientific literacy

- This is a valuable skill for any science-consuming and voting member of the public
- Understanding how studies are designed and how the data were analysed to reach conclusions is necessary to
  - Understand studies
  - Critically analyse their findings to avoid being misled or scammed

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RDA is part of clinical practice

- If you go into clinical practice, your work impacts peoples' lives. Studying research design & analysis will help you to read, understand, and critically evaluate current research so that you can use the latest evidence to provide the best possible care and treatment for your patients.
  - When people's lives and well-being are at stake is not the time to 'guess' or 'go with your gut' or 'explore something fun and unique'

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Analysis skills are highly transferable

- Research happens outside of universities too formally and informally
  - In an HR department, you get annual employee satisfaction numbers. This year, satisfaction is down compared to last year. Is that a meaningful drop or within the expected year-to-year variation?
  - In a marketing department, you try out three campaigns using different colors and layouts. One costs more than the other two and performs slightly better. Is it worth changing or was your sample too small to reliably infer what would happen if you used one design throughout the whole company?

Why Study RDA?

The overarching goal of psychology, is to understand how and why people think, feel, and behave the way they do.

- Clinicians and Researchers try to:
  - use that knowledge in clinical or research settings to aid the mental and physical well-being of individuals and/or communities, and
  - continually add to their knowledge of human behaviour (i.e., make psychological discoveries)
- This requires that all psychologists understand the principles of research methods and statistics
- But how do we acquire knowledge?

Ways of Acquiring Knowledge

- Seven commonly used approaches:
  - **Superstition:** drawing upon belief in supernatural causes
  - **Intuition:** drawing upon instincts and hunches
  - **Authority**: drawing upon experts/authority figures
  - **Tenacity:** drawing upon long-accepted facts or traditions
  - **Rationalism:** drawing on logical reasoning
  - **Empiricism:** drawing on observations directly experienced by the senses
  - **Science:** drawing upon empirical methods and logical reasoning

Problems with Non-Scientific Approaches

Each of the first six approaches may appear sound (for certain purposes, at least), but taken individually, each approach has pitfalls deriving from issues such as:

- Erroneous beliefs
- Inaccurate information
- Flaws in logical reasoning (which are extremely common)
- Perceptions biased by prior experiences

For further information about biases and fallacies which affect our perceptions, see:

- Chapter 1 of compiled text
- Or for an interesting read, check out Thomas Gilovich's (1991) *How We Know What Isn't So*

The Scientific Method

- The scientific method is special because it allows ideas (hypotheses) to be **critically tested**
- The scientific method helps us to overcome problems associated with overgeneralisation, illogical reasoning, selective and inaccurate observations (Babbie, 2013).
- "[A]n approach to acquiring knowledge that involves formulating specific questions and then systematically finding answers" (Gravetter & Forzano, 2016).
- The scientific method draws mainly upon the methods of rationalism and empiricism. By using them in conjunction, it minimises the drawbacks of using any one method on its own.
- Scientific knowledge is gathered through empirical, systematic, objective, and controlled explorations of nature, using relatively precise measures to test predictions and draw inferences. Such knowledge should also be made public.

The Scientific Method (continued)

There are five steps involved in the scientific method approach to acquiring knowledge (Gravetter & Forzano, 2016):

1. Observe behaviour or other phenomena
2. Form a tentative answer or explanation (a hypothesis)
3. Use your hypothesis to generate a testable prediction
4. Evaluate the prediction by making systematic, planned observations
5. Use the observations to support, refute, or refine the original hypothesis

Why Study RDA? (Conclusion)

To understand how and why people think, feel, and behave the way they do, we need to draw upon the scientific method in order to gain accurate knowledge

Therefore, scientific research is integral to acquiring psychological insights

By studying RDA, you will develop scientific literacy to:

- Read, understand, and evaluate information
- Make informed decisions
- Conduct research of your own to further the knowledgebase of psychology

The Goals of Science

The goal of all scientific research is to either describe, predict, and explain or understand nature / events

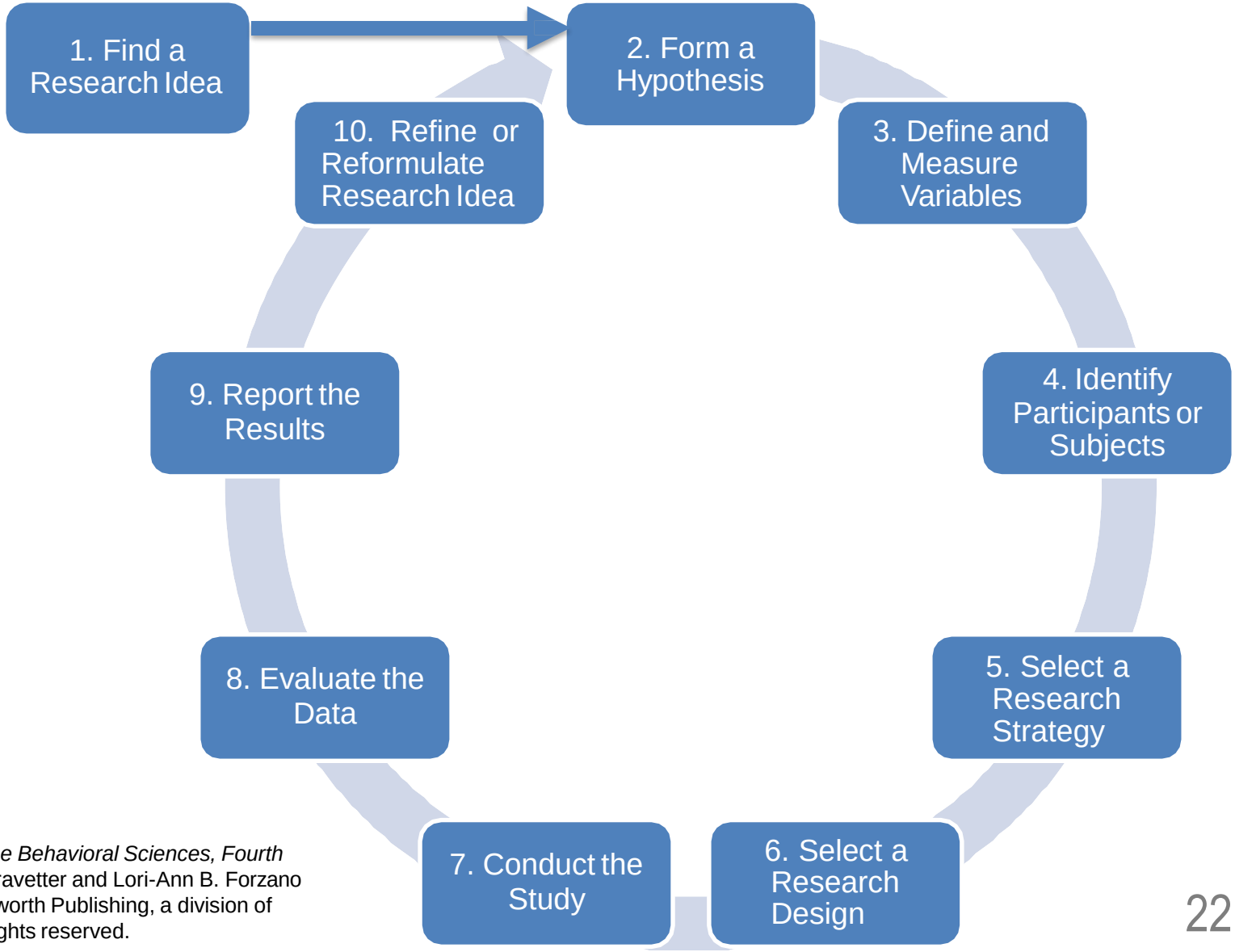
- Description: Researchers seek to define or classify phenomena or events and their relationships.
- Prediction: Description often provides the basis for predicting behavior; adding to our knowledge of a particular phenomenon and also helpful in the prevention and treatment of psychological disorders.
- Explanation or Understanding: Description and prediction lead to explanation/understanding or understanding the causal factors involved in behavior.

Explanation / Understanding

Explanation / understanding can be sought by:

- Examining covariation of events
  - i.e., a change in one event is associated with a change in another event
- Examining time-order relationships
  - i.e., see how an event changes over time
- Elimination of possible alternative causes
  - i.e., when you have ruled out all but one cause for an event

The Research Process



RDA is not only Statistics

- Research design and analysis is about a lot more than just statistics
- RDA is a method of logical thought
- Notice from the previous slide that far more emphasis is placed on using constructs and logic to plan, design, and conduct the research, than on statistics (which only appear in steps 8 and 9)
- Without good research design, statistics are useless

Step 1 of the Research Process: Find a Research Idea

- Select a topic and find a question
  - Identify a general topic that you would like to explore and review the background literature to find a specific research idea or unanswered question
- When getting started with research, it is important that you (Gravetter & Forzano, 2016):
  - Choose a topic that interests you
  - Invest a fair amount of time in gathering background information
  - Maintain objectivity
  - Take it one step at a time

Sources of Research Ideas

Common sense: a valuable way to start out

- e.g., why do some people think it is safe to eat food that's been dropped on the floor as long as they pick it up within five seconds?

Observation: curiosity aroused by one's own observation of an event, or something one has read about

- e.g., you've observed that pressure points can be used to treat anxiety and wonder if it really works, and if so, how?

Sources of Research Ideas

Practical problems: the need to find solutions to immediate problems often stimulates research

- e.g., how can we increase job satisfaction without increasing pay?

Past research: information and ideas derived from published research

- e.g., I wonder what would happen if I replicated Asch's conformity experiment with children instead of adults?

Sources of Research Ideas

Theories: systematic ideas about how the world works

– e.g., which theory best explains bystander nonintervention – pluralistic ignorance or diffusion of responsibility?

Research may be either BASIC (i.e., aimed at gathering knowledge or addressing theoretical questions) or APPLIED (i.e., aimed at solving practical problems or addressing a practical questions), but both are ultimately grounded in theory.

What is a Theory?

- A framework within which seemingly related knowledge is brought together in a logical way to provide an explanation for something (e.g., why people think, feel, or behave a certain way)
- A theory is an interconnected set of statements, not a single statement
- Theories are also organising frameworks, and mechanisms by which research is guided and developed
- Theories can be used to form hypotheses testable through experimentation

Properties of a Good Theory

The quality of a theory is often evaluated on the basis of certain characteristics:

- **Parsimony** – the preferred theory is the one which contains the least assumptions. Simple explanations are preferred over complex.
- **Precision of predictions** – predictions of behaviour are more valuable if they are precise rather than general.
- **Rigorous testing** – a good theory will survive testing of its propositions; rigorous testing will seek to falsify the propositions rather than to confirm them.

Step 2 of the Research Process: Form a Hypothesis

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Hypotheses are:

- Operationalised concise statements about what the researcher expects to find – that is statements that describe or explain relationships between variables
- Statements specifying a research idea in terms of a clear prediction about how each variable will be measured and is expected to behave in relation to the specific participants you have chosen for your study
- Proposals/predictions to be tested and evaluated
- Often derived from theory, but can also be intuitive

Step 2 of the Research Process: Form a Hypothesis

A good hypothesis is one that is:

- Logical
  - The logical conclusion of a logical argument that is grounded in established theory or previous research
  - Usually derived via deductive reasoning
- Testable
  - All the variables, events, and individuals involved must be really and can be defined and observed/measured
- Refutable
  - Can be demonstrated to be false or (i.e., it is possible for the outcome to differ from the prediction)
- Positive
  - Must make a positive statement about the existence of something (e.g., existence of a relationship, or difference)

Step 2 of the Research Process: Form a Hypothesis

The hypothesis then leads to the design of a study in which it (the hypothesis) is tested

- If the findings of the study are consistent with the hypothesis, the theory from which the hypothesis is derived is supported; if not, the validity of the theory may be questioned.
- The more research that comes out in support of a theory the more confidence scientists have in the theory.
- Note that we do not talk about proving a theory. Logically we can never prove a theory, but we can disprove it.

Examples of Good Hypotheses

A child's ability to produce rhymes is positively associated with their reading skill.

- Predicts a relationship between two variables

Alcohol consumption increases drivers' reaction times in emergency situations.

- Predicts causal relationship of alcohol on driver's reaction time

Step 3 of the Research Process: Define and Measure Variables

- A variable is any characteristic or condition that can have more than one value, or that can vary across organisms, situations, or environments (e.g., age, intelligence, stress level, extroversion, performance)

- An empirical study involves observing, manipulating, and measuring variables in various conditions, and under varying degrees of control

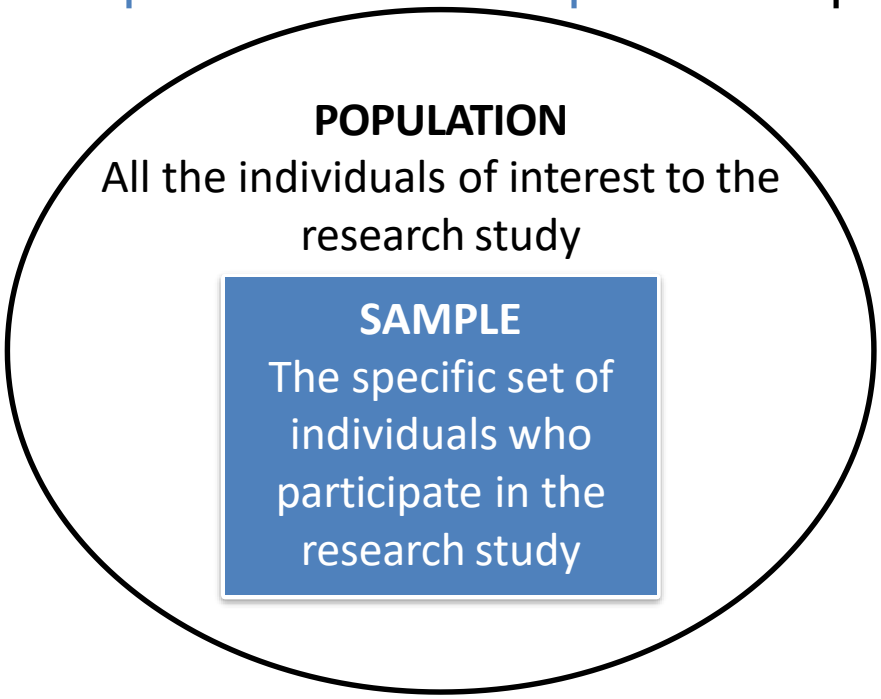
  – These variables need to be precisely defined

- The nature of the variables of interest plays an important role in research design

Step 4 of the Research Process: Identify Participants or Subjects

Statistical inference refers to the process by which we derive generalisations about populations on the basis of sample data

- The key to statistical inference is sampling theory
  - **Sampling or sampling theory** refers to the techniques we use to draw representative samples from populations



Step 5 of the Research Process: Selecting a Research Strategy

- A research strategy refers to the general research approach you will use to address your research question
  - strategy choice largely depends upon whether the research goal is description, prediction, or explanation
  - e.g., experimental, quasi-experimental, non-experimental, correlational, or descriptive
- Research participants must be treated in an ethical manner, and therefore, ethics also plays a crucial role in determining the appropriate research strategy to use

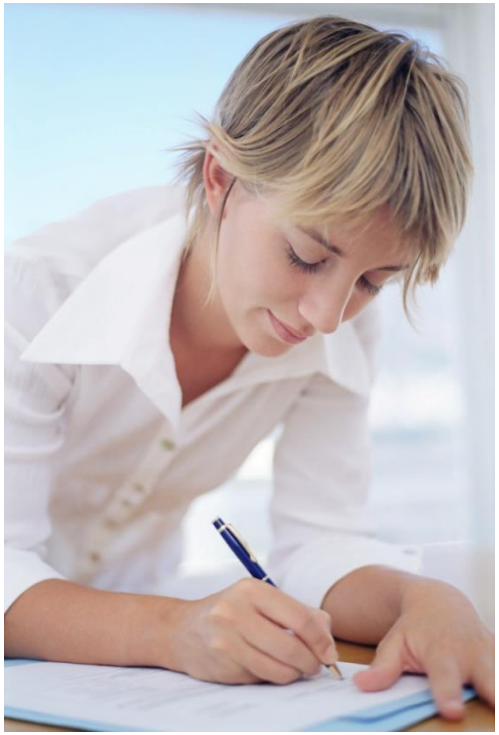
Step 6 of the Research Process: Research Design

Research design refers to formulating "a general plan for implementing a research strategy" (Gravetter & Forzano, 2016)

- Research design involves making decisions about (Gravetter & Forzano, 2016):
  - whether to examine groups or an individual,
  - whether to use the same individuals or different individuals in each group, and
  - how many variables to include in the study

Step 7 of the Research Process: Conduct the Study

- Recruit participants
- Implement your research design
- Collect your data!



Steps 8 and 9 of the Research Process: Evaluate the Data & Report the Results

Evaluate the Data
and
Report the Results

Write a Report

Descriptive Statistics: Methods for organising, simplifying, and summarising raw data

Inferential Statistics: Methods for using sample data to draw conclusions (inferences) about populations

Step 10 of the Research Process: Refine or Reformulate Your Research Idea

- If your hypothesis is supported:
  - What are the practical the theoretical implications?
  - Can the idea be generalised to other situations / contexts / populations?

- If your hypothesis is not supported:
  - What are some possible reasons why not?
  - Can these be investigated by further research?

- Refine or reformulate your research idea, and re-start the research process!

Beginning Research:
Ethics, Variables and Measurement

Reading

Jackson et al., (2016) Chapter 2