Lecture 3: The Scientific Process

Your Teaching Fellows:

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Monday, September 11, 2023

Lectures: MWF 12:00 PM – 1:00 PM (003); 1:00 PM – 2:00 PM (004); 2:00 PM – 3:00 PM (010)

Office hours: Tuesdays 2:00 PM – 4:00 PM

Hope to learn:

- I hope that I learn how to do precise, ethical, and quality research.

- How to properly and ethically conduct research.

- If I truly enjoy psychology or not

- I hope to learn how to refute the (mostly) pseudoscience filled articles my Chinese parents send me on WeChat.

Questions/Expectations:

▫ I expect that there will be enough in-class support during the research project portion of the class to not leave students panicked and lost.

▫ To pass this class :)

▫ I want to learn, but not be judged for asking questions, or be afraid to think outside the box

▫ How will our groups be decided for the labs/group work?

▫ Is there anyway for students to know which page(s) of the textbook to read and by which date?

Most excited about 217:

- Conducting research/doing the labs/presenting at the end of the term (times 15)
- Meeting people/seeing people/in-person class (times, like, 20)
- Better understanding research methods
- CLASSES!!!!!!

- Me

- Worries about 217:
  - THE GROUP PART (basically all of you)
  - THE MATH PART (next most frequent)
  - THE MEMORIZING PART (next most frequent) ⟶ Zoom event: Thursday, Sept 14, 12:30
  - Not understanding anything/Grades/Hard course/exams/rumours

  - The readings. Some of these chapters are looong.

Learning objectives

- By the end of this lesson, you will be able to:
  - Understand the fundamental tenets of science
  - Explain, differentiate between, and generate examples for various forms of logical reasoning
  - Properly interpret relations between data and hypotheses
  - Explain how the scientific method relates to critical thinking

Using the science method to understand the world

How do we know what we know?

Ways of Knowing

Scientific method	"Unscientific" (non-data-driven) methods			
Logic	Experience	Folk wisdom/ common sense	Authority	Intuition

Can✕ons of Science

Canons of Science

- **D**eterminism
- **E**mpiricism
- **P**arsimony
- **T**estability
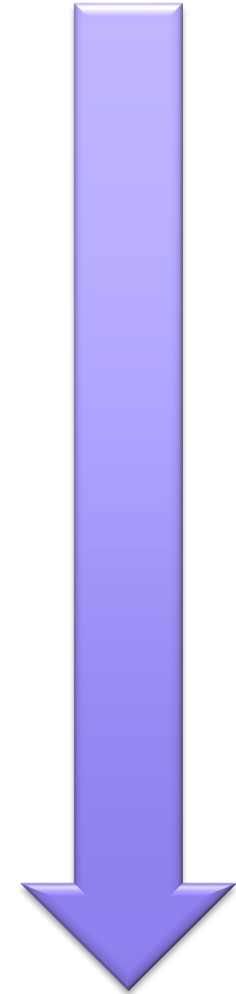
Determinism

- The assumption that the universe is orderly

- Events occur due to some meaningful and systematic cause

- Foundation of research

Empiricism

- We understand the world by making structured, systematic observations
- Making such observations is best way to figure out orderly principles

Chart 1
Police-reported Crime Severity Indexes, Canada, 1998 to 2021
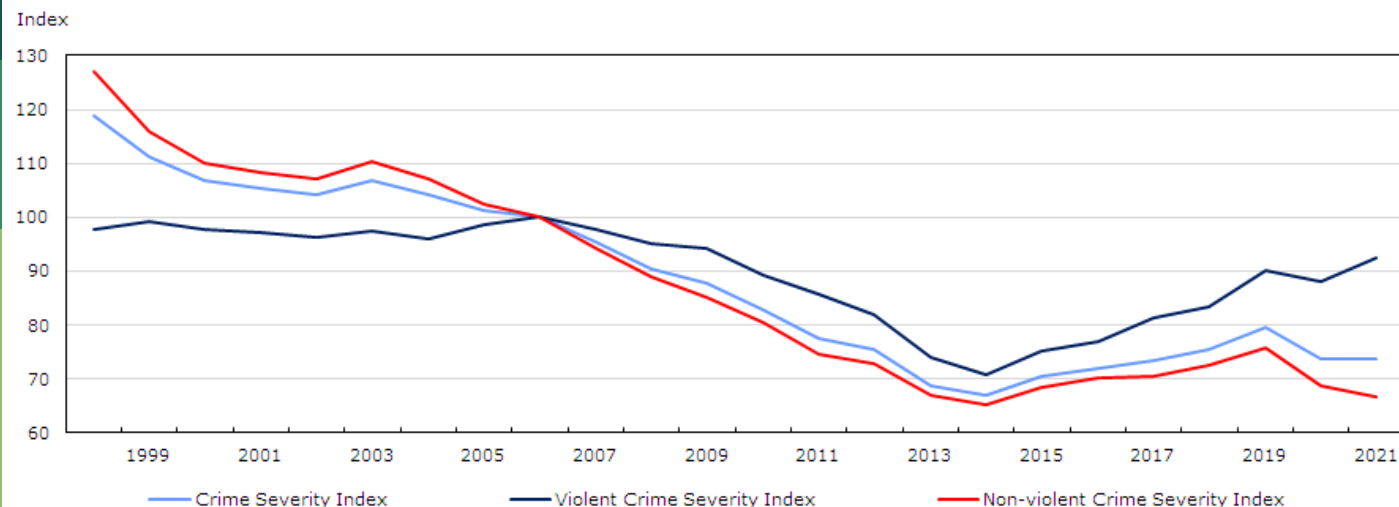
Note: Crime Severity Indexes are based on *Criminal Code* incidents, including traffic offences, as well as other federal statute violations. The base index was set at 100 for 2006 for Canada. Populations are based upon July 1st estimates from Statistics Canada, Centre for Demography.
Source: Statistics Canada, Canadian Centre for Justice and Community Safety Statistics, Uniform Crime Reporting Survey.
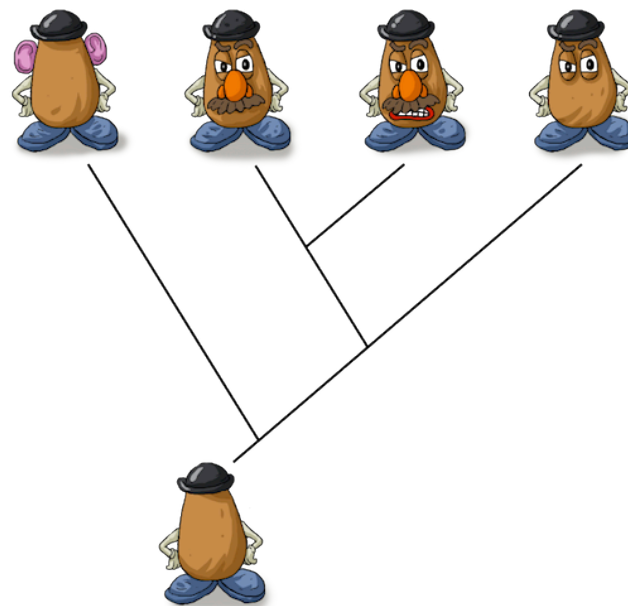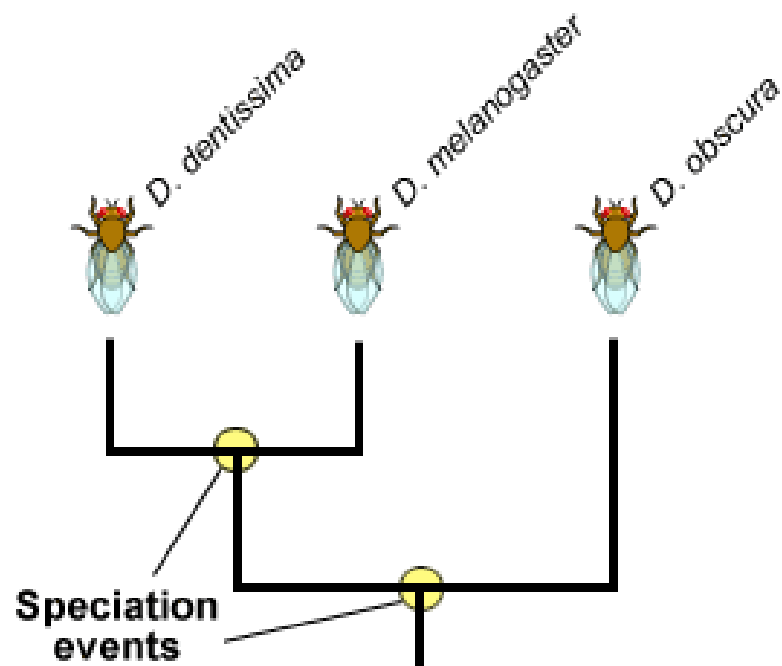
Parsimony

- When two theories can explain the same set of empirical observations, preference → simpler

- Forces scientists to make as few assumptions as possible
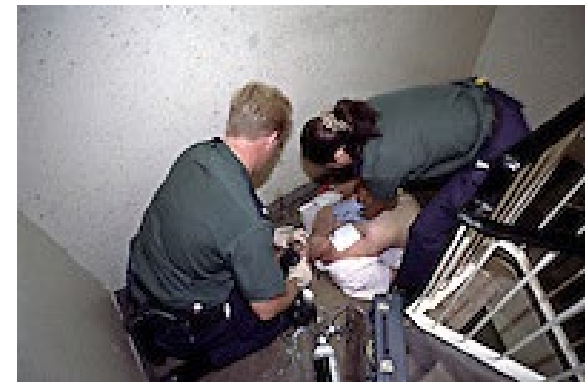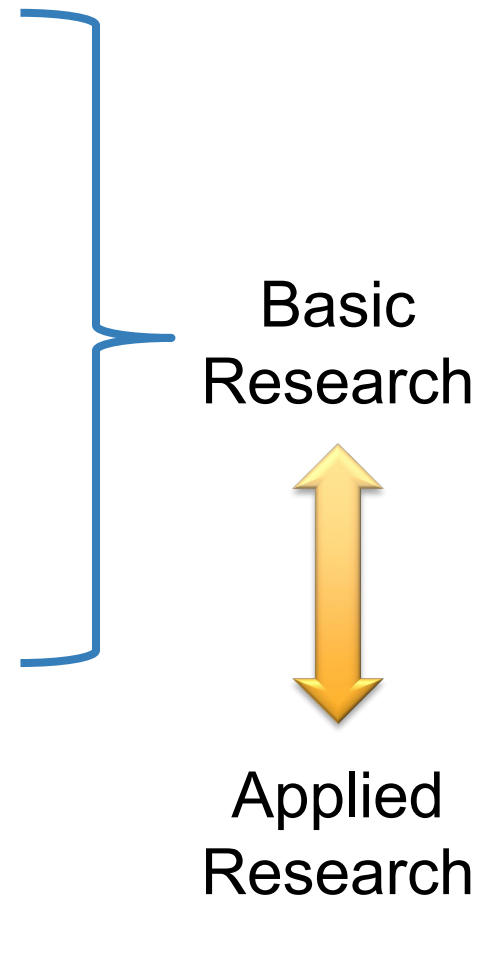
- aka Occam's Razor
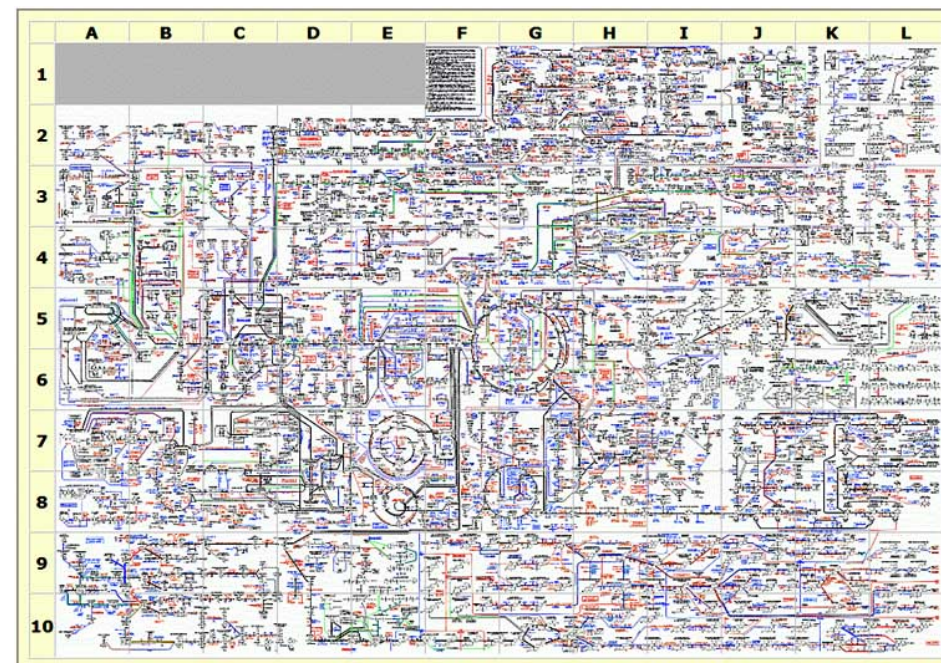
Testability

- Researchers should be able to put scientific theories to empirical tests

- It is particularly important that theories are <u>falsifiable</u>

Goals of Psychological Science

- Describe behaviour

- Predict behaviour

- Determine causes of behaviour

- Understand/Explain behaviour
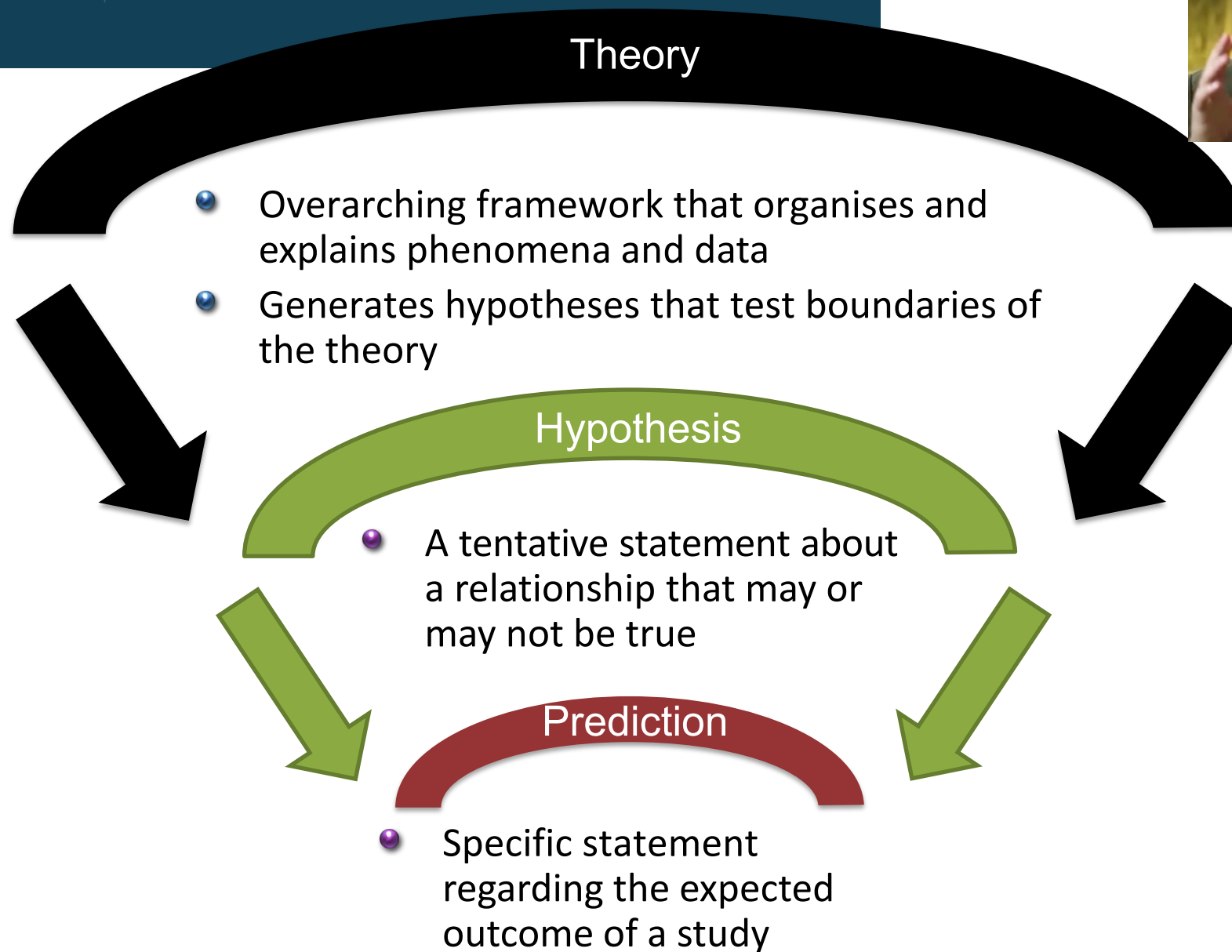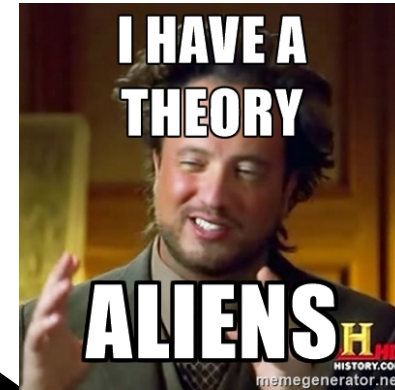
- Apply knowledge to solve problems

Basic Research

Applied Research

When "Science"ing…

- We examine theories, hypotheses, and predictions

Terms defined

Theory

- Overarching framework that organises and explains phenomena and data
- Generates hypotheses that test boundaries of the theory

Hypothesis

- A tentative statement about a relationship that may or may not be true

Prediction

- Specific statement regarding the expected outcome of a study

General

Specific

If P → Q
P therefore Q

Deduction

Terms defined

Theory/General expectation

- Every time anyone eats peanuts, their throats will swell up

Hypothesis

- The next time I eat peanuts, my throat will continue to swell up

Observation

- Every time I eat peanuts, my throat swells up (Note: Noticing a *series* of events)

General

Specific

Induction
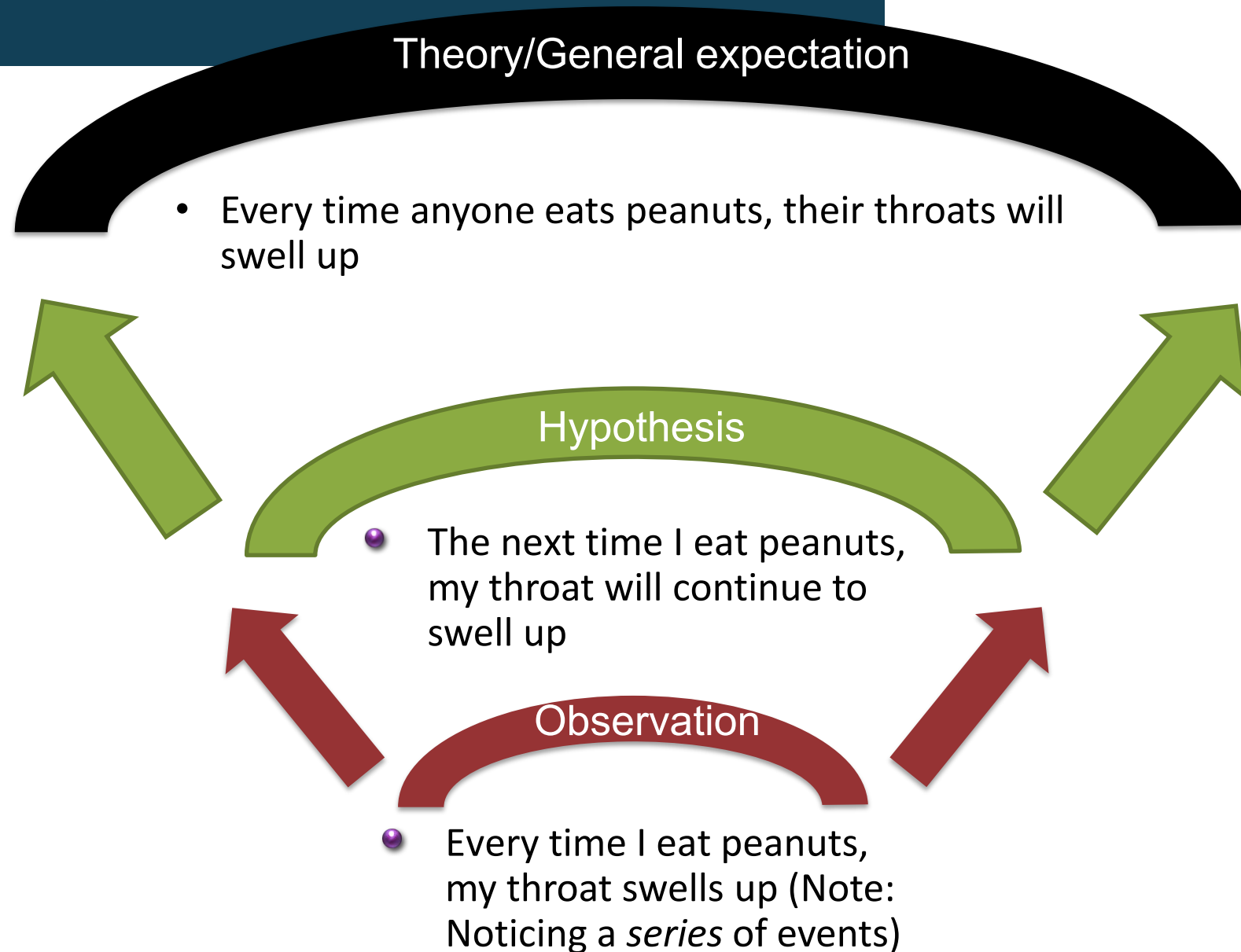
Terms defined

Not trying to create theory

General

What the heck happened?

- Anemia
- Lung cancer
- Vitamin B12 deficiency
- COVID
- Acute stress

Observation

- Patient presents with shortness of breath, headache, fatigue

Specific

If P → Q
**Q therefore P**

Abduction
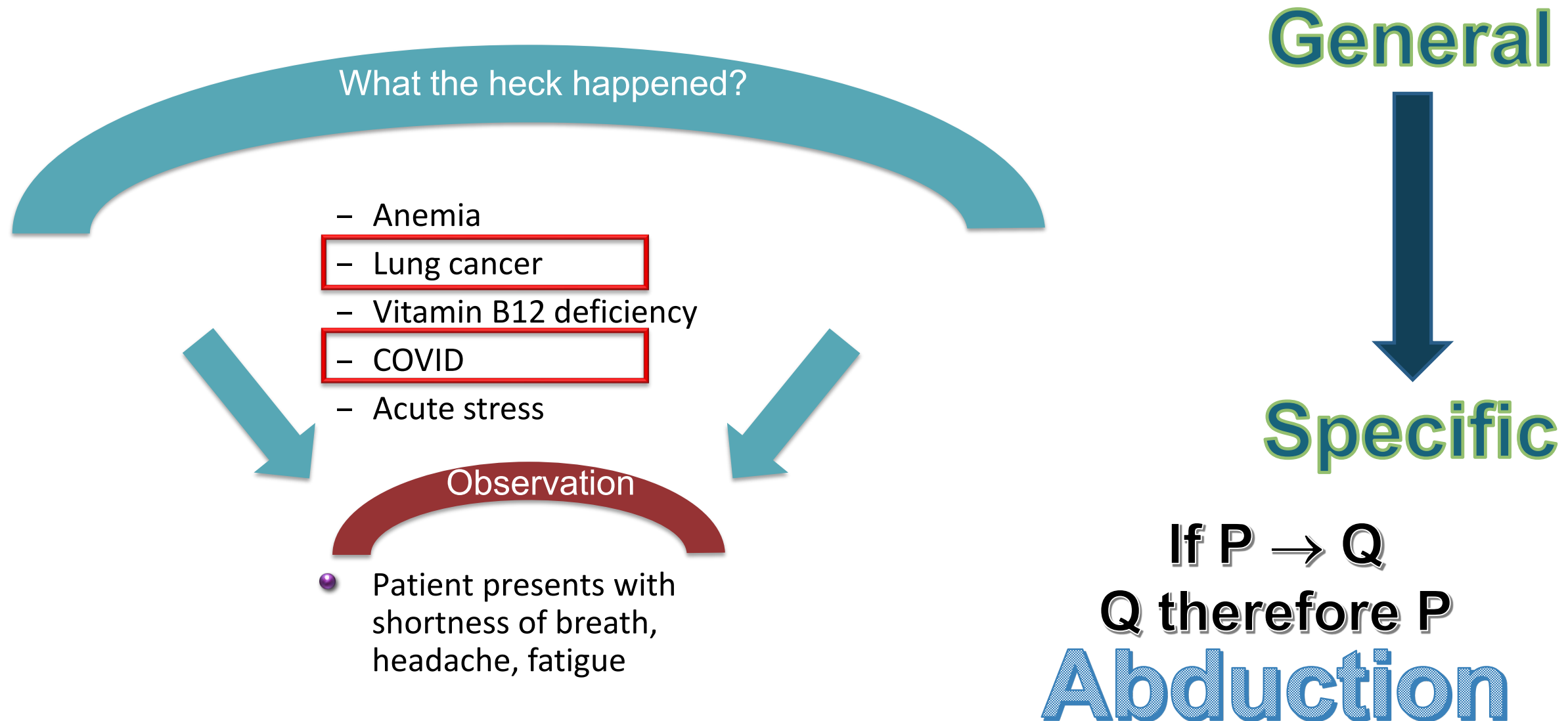
Example study

- Theory:
  - Human behaviour is a function of their life experience and exposure to stimuli in their environment
    - Builds on previous research

- Hypothesis:
  - After playing violent games rather than non-violent games, one will become more aggressive even long after the game is over

Video games study

- Basic study design
  - Methods

Participants

45.24   54.76

N = 169

18   19   20

Bushman & Gibson, 2010
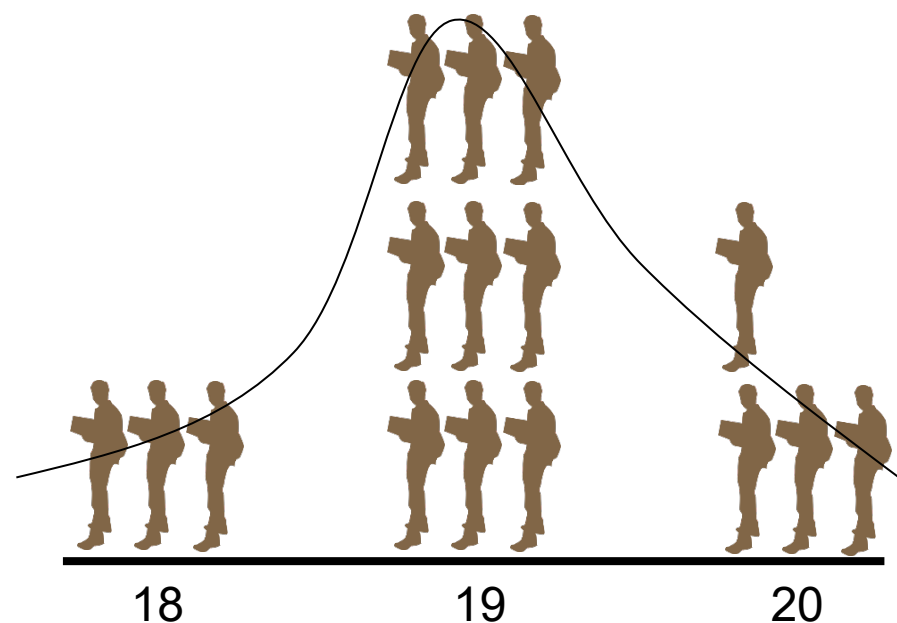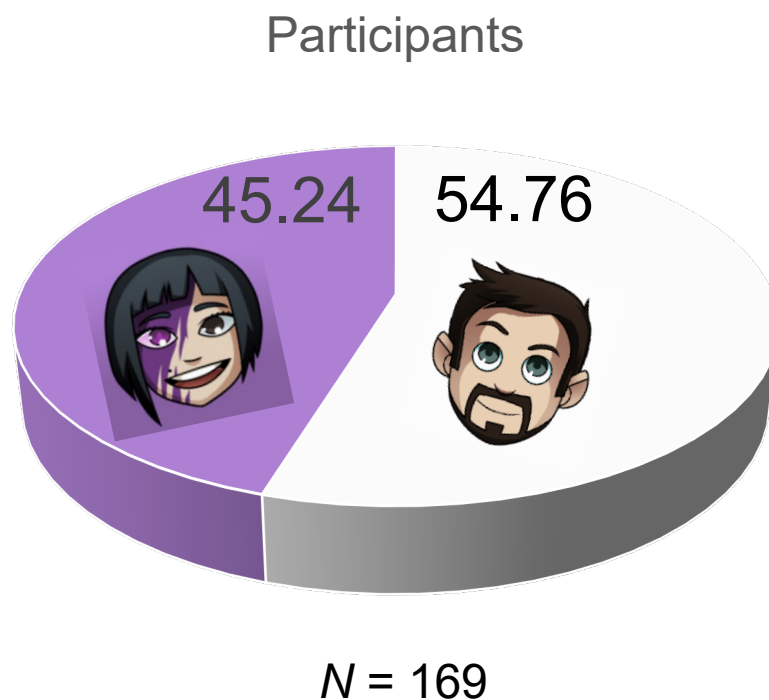
Video game study

Basic study design
- Violent games:

- Non-violent games

Bushman & Gibson, 2010