

## Lecture Notes – The Scientific Method

### Learning Objectives

- At the conclusion of this lecture, you will be able to:
  - 1. Define what is meant by 'research methods', and explain why they are important to all psychology and speech pathology students.
  - 2. Outline the 'scientific method', and explain how it differs from other methods of knowledge acquisition.
  - 3. Describe the basic steps involved in conducting scientific research, and illustrate them with an example.

### Why Research Methods

- **Research methods:** the ways in which psychologists, speech pathologists, and other behavioural and health scientists find out about human behaviour.
- The scientific method.
- To conduct good research.
- To be good consumers of research.
  - Evidence-based practice.

### Why Research Methods (Psychology)?

- This is an APAC accredited course.
  - Only graduates of APAC accredited courses are eligible for registration and APS membership.
  - 2 of the 6 APAC graduate attributes are explicitly about research methods and thinking like a scientist.
- Thinking like a scientist leads to ethical and sound practice.
- Not thinking like a scientist is damaging to the reputation of psychology and harmful to clients.

### An Illustration

- "Gilles de la Tourette's syndrome is a disorder in which afflicted persons display an array of sudden, rapid, recurrent, non-rhythmic, and stereotyped motor and vocal tics. The motor tics...generally involve head and neck jerking, eye blinking, tongue protrusions, shoulder shrugs, and various torso and limb movements. Vocalisations may include, barks, grunts, yelps, coughs, repetition of one's own or other's words (echolalia), uttering obscenities (coprolalia), and blurting out inappropriate remarks."
- Psychoanalytic explanations:
  - Tics result from repressed masturbatory desires and are "stereotyped equivalents of masturbation"...eruptive cursing is a symbolic and linguistic substitute for masturbation.
  - A conversion symptom at the anal-sadistic level.
  - A consequence of unresolved psychosexual conflicts and hence maladjusted parenting.
- We now know that Tourette's syndrome is a neurological disorder, and most effectively treated with medication.

### The Point of the Story

- Scientifically unsupported mental health theories and practices:
  - Undermine the general public's confidence in our profession.
  - Can lead to individuals to forgo effective treatments.
  - Can be harmful.
  - Eat away at the scientific foundations of our profession.

### The Scientist's Passion

- The passion not to be fooled and not to fool anybody else.
- If we do not have that passion and do not ask 'how do you know?' we are little more than be-doctored, well-paid soothsayers.

### Acquiring Knowledge

- Ways of knowing:
  - Tenacity (e.g. opposites attract; the earth is the centre of the universe).
    - Superstition (e.g. breaking a mirror = 7 years of bad luck).

- Intuition (e.g. gut feelings).
- Authority (The MMR vaccine causes autism (see Goldacre, 2008)).
- Reasoning/logic (All humans are mortal; I am human; Therefore, I am mortal).
- Empiricism (Based on observation).

### The Scientific Method

- A set of techniques and approaches that scientists use to accumulate knowledge.
- Elements of rationalism and empiricism.
  - I.e. some logic and some observation.
- Empirical reasoning.

### The Scientific Process

- Identify problem/topic of interest.
  - Why don't bystanders respond in some types of emergencies?
- Gathering background information.
  - Prosocial behaviour, social influence theories, helping, cooperation, etc.
- Generating hypothesis.
  - As bystanders increase, the willingness of individuals to step in and help will decrease.
- Testing the hypothesis.
  - Artificial emergency; variable number of bystanders; observed participant responses. Stats.
- Drawing conclusions.
  - Diffusion of responsibility.

### The Scientific Method: Other Features

- Science is systematic.
- Science is sceptical but curious.
- Science is open to public scrutiny.
- Scientific research is replicable, and findings are verifiable.
- Scientific propositions & theories are parsimonious (simple), testable and falsifiable.

### Falsifiability

- All swans are white.
- An invisible and undetected Flying Spaghetti Monster created the universe after drinking heavily.
- All evidence for evolution was planted by "his noodly appendage".

### Summary

- The scientific method underpins everything we know and everything we do in psychology and speech pathology.
- The research methods we will explore in these units can be thought of as "tools" of the scientific method.
- These tools provide us with access to a set of "truths" that is superior to those available via other ways of knowing (e.g., tenacity, authority).

### Tutorial Notes

#### Types of Data

	Attribute			Example
	Magnitude	Equal Intervals	Absolute zero	
<b>Nominal</b>	NO	NO	NO	Gender; eye colour; psychiatric diagnosis
<b>Ordinal</b>	YES	NO	NO	Finishing position in running race; ATAR
<b>Interval</b>	YES	YES	NO	°C; scores on most psychological scales
<b>Ratio</b>	YES	YES	YES	Height; °K; No. of peanuts in a jar

- Nominal variables always need values labels.
- Ordinal variables will sometimes need value labels.
- Scale variables (interval and ratio) generally will not require value labels.