Dissertation Module
Research Skills Program

LECTURE 3

THE RESEARCH HYPOTHESIS - REVISITED

LEARNING OBJECTIVES

- **Understand the differences between a conceptual and an operational research hypothesis.**
- **Understand the central importance of the operational research hypothesis to quantitative studies.**
- **Develop an operational research hypothesis for your project proposal.**

From Research Idea to Research Hypothesis

- A quantitative study requires an operational research hypothesis.
- Qualitative studies work with research ideas – which may even change during the conduct of the study. Qualitative studies do not have a pre-stated research hypothesis.
- An operational research hypothesis is a research question rewritten as a **statement** in which all important concepts are clearly **defined** and in which the **expected outcome** is stated in **numerical** terms. The latter makes the hypothesis **falsifiable**.

Research Hypothesis

The operational research hypothesis is the precise statement about the question, the research will be designed to answer. It must be plausible and *falsifiable*.

The *operational hypothesis* contains precise details about:

- **inclusion and exclusion criteria**
- **the variables considered**
- **the initial status of the people being studied**
- **the treatments, interventions, and changes being made if there are any to be made**
- **the expected result of the study**

Example: Research Hypothesis

Conceptual research hypothesis (research idea):

"There is an association between diet and disease"

What disease? **What diet?**

"There is an association between average daily fat intake and breast cancer."

What association?

"The average daily fat intake of women with breast cancer is higher than of women without breast cancer."

Expected difference?

Example: Research Hypothesis

Conceptual research hypothesis (research idea):

"There is an association between exercise and the ageing process"

What association?

"People who exercise more experience a slower ageing process."

How is exercise assessed?

"People with a slower ageing process have an increased average daily habitual activity as assessed by the diary method in 15 minutes intervals."

How is the ageing process assessed? Expected difference? What is the target population? …….

PICOT Format

“P” = Population

“I” = Intervention (if applicable)

“C” = Comparison

“O” = Outcome measure

“T” = Time frame

Research idea:

Investigate and improve dental health in Indigenous Australians.

What could be PICOT?

Example: PICOT Question

In 2015 in children in cardiac arrest

T ↑ P ↑

does administration of high-dose epinephrine

I ↑

instead of standard dose epinephrine

C ↑

improve survival to hospital discharge?

O ↑

PICOT Format helps to state an Operational Hypothesis

In 2015 in children in cardiac arrest

T P

~~does~~ administration of high-dose epinephrine

I

instead of standard dose epinephrine

C

improves survival to hospital discharge by 10%.

O Expected outcome

Some Bad Words in Hypotheses

- AND
- OR
- BECAUSE

Example: Research Hypothesis

You have the idea (= conceptual research hypothesis) that:
"Exercise helps to prevent falls in elderly people"

To reach the *operational research hypothesis* one has to decide on:

- **Inclusion and exclusion criteria ("P")**
  e.g. age, resident status, location, prior history of falls, disabilities …
- **Where and when to conduct the study? ("T")**
- **The definition of the intervention ("I")**
  e.g. what exercise ? how often ? how long ? ….
- **The definition of "fall" ("O" & "C")**
- **The expected outcome: a reduction in falls by .. % ("O" & "C")**

Example: Research Hypothesis

You have the idea (= conceptual research hypothesis) that:
"Exercise helps to prevent falls in elderly people"

To reach the *operational research hypothesis* one has to decide on:

- **Inclusion and exclusion criteria P**
  e.g. age, resident status, location, prior history of falls, disabilities …
- **Where to conduct the study?**
- **The definition of the intervention I**
  e.g. what exercise ? how often ? how long ? ….
- **The definition of "fall" O**
- **The expected outcome: a reduction in falls by .. % O**

Example: Research Hypothesis

Conceptual research hypothesis (research idea):

“Exercise helps to prevent falls in elderly people”

A resulting operational research hypothesis could be:

“Twice weekly half-hour balance exercises (as defined by Klam et al.) will reduce the yearly incidence of falls that need medical attention in people aged 65+ who live in aged care nursing homes in Townsville by 30% .“

The Expected Outcome in Quantitative Research

- The outcome measure has to be clearly defined.
- An estimation of the expected outcome has to be stated in the hypothesis in numerical terms.
- The expected outcome should be clinically relevant and ideally backed up by previously conducted similar studies.

Example:

"Twice weekly half-hour balance exercises (as defined by Klam et al 2010) will reduce the yearly incidence of falls that need medical attention in people aged 65+ who live in aged care nursing homes in Townsville by 30% (Diodem et al 2014)."

Research Hypothesis

CLEARLY DEFINE ALL RELEVANT PARTS OF YOUR RESEARCH HYPOTHESIS!

Be as SPECIFIC as possible

QUANTIFY as much as possible (if appropriate)

PICOT: may be helpful

A clear and specific operational research hypothesis is necessary for a quantitative research project (assignment 2)

A clear conceptual research hypothesis (research idea) is necessary for a qualitative research project (assignment 2)

Operational Research Hypothesis for quantitative studies

- Is the centre of every quantitative study
- Is the statement that a study can falsify; that is, either confirm or reject with statistical confidence
- The operational research hypothesis is linked to your study design
- The operational research hypothesis is linked to the required sample size
- The operational research hypothesis is linked to the required statistical analysis

SUMMARY

- When conducting quantitative research you need to state an operational research hypothesis. PICOT format may be helpful.
- Qualitative studies do not state an operational research hypothesis.
- An operational research hypothesis includes a quantified precise statements of the expected outcome. This renders the hypothesis falsifiable.
- The stated expected outcome should be relevant and ideally backed up by previous research.
- The operational research hypothesis is the “heart” of a quantitative study. This hypothesis is linked to the required sample size. This hypothesis is the research question that the study will be able to answer with statistical confidence.