


Designing Quantitative Studies


Seeking Depth in Understanding



Restrict the scope of the topic

Provide boundaries for the following:

- The target population
- The variables that will be utilized
- The settings (e.g. school, classroom)



Operationalize the independent and dependent variables

You need to understand three concepts:

- Scales of measurement
 - Nominal
 - Ordinal
 - Interval
 - Ratio
- What is a variable?
 - independent vs dependent variable?
- What does the term 'operationalize' entail?

Scales of Measurement

- Nominal
 - Classification of variables based on a name or label
 - Political party
 - Values: Dem, Rep, Ind, Grn
 - Gender → female/male
 - Any label term to describe a group or thing
 - These cannot be ordered in any particular way or given numerical or quantitative value

Scales of Measurement

- Ordinal
 - Variables for which the values can be ordered on some dimension, but that are not equally spaced on a scale
 - Grade for a class
 - A, B, C, D, F
 - Differences between A and B may not be the same as B to C
 - Ratings of Above Avg., Avg, Below Avg.
 - Rankings
 - Top Ten Schools
- There is a logical order in which one is higher/lower than the other, but the values are not equal

Scales of Measurement

- Interval
 - Variables that have values and that can be equally spaced
 - Although a real Zero Point (absence of) is not present, these variables can be subjected to calculation (addition/subtraction)
 - Think of temperature measurement
 - 0c is not the absence of temp; rather, it is an arbitrarily set zero point
 - Temperature as measured on Centigrade or Fahrenheit scales are interval scales

Scales of Measurement

- Ratio
 - Variables with values that are equally spaced and have a real zero point
 - Age, weight, height
 - A 55 year old is 5 years older than a 50 year old and this is the same difference as that of a 10 year old to a 15 year old.
 - Allows for ratio comparisons
 - 50yo is 5X older than a 10yo
- Statistically, Ratio and Interval are equally valuable
- Continuous vs Discrete
 - Number of kids in family = Discrete
 - Weight/age = continuous

Operationalize the key variables: What is a variable?

A variable is any attribute or property that differs between people or varies across time

Examples

- Age, grade, level, weight, height.
- Rate of change (e.g. observed behavior).
- Test scores, performance scores.
- Degree of enthusiasm, engagement, parent involvement.

Operationalize the key variables: Independent vs dependent variables

Definition of independent and dependent variables

- In research, we often examine the relationship between two variables
- Example - Food intake and number of chins
- One is an independent variable; the other is a dependent variable - which is which?

Operationalize the key variables: Independent vs dependent variables

How to remember which is the dependent variable

- The independent variable is the cause; the dependent variable is the effect
- The independent variable is thought to influence the dependent variable
- The dependent variable is so-called because it is *dependent* on the independent variable

Operationalize the key variables: Two classes of independent variables

- Dependant Variables
 - Variables that are manipulated by the researcher
 - Examples - teaching method, counseling technique
- Independent Variables
 - Variables that naturally differ between people
 - Examples - gender, age, socio-economic-status, ethnicity, etc.

Specify hypotheses or possible outcomes

What is a hypothesis?

- Prediction that concerns the relation between two variables

Every hypothesis should:

- Be derived from theory or logic
 - If X, then Y
- Entail variables that can be measured
- Specify the direction of any relationship
- Not predict that no relationship exists

Specify hypotheses or possible outcomes

You do not always need to include hypotheses

- Sometimes, insufficient information is available to form valid hypotheses
- You should instead state the possible outcomes and their implications
- All research should contain hypotheses or a list of the possible outcomes.

Choose a study model

➤ Experimental

➤ Pretest-posttest control group design

➤ $R O_1 X O_2; R O_1 O_2$

➤ Posttest-only control group design

➤ $R X O; R O$

➤ Quasi-experimental

➤ Pretest-posttest non-equivalent group design

➤ $O_1 X O_2; O_1 O_2$

➤ Posttest-only non-equivalent group design

➤ $X O; O$

➤ Single case
