

Week 5

Hypothesis, Conceptualization and operationalization of Variables

PowerPoint presentation is modified based on Allen Rubin

Overview

- Conceptualization
 - in Quantitative Inquiry
 - in Qualitative Inquiry
- Developing a Proper Hypothesis
- Variable Terminology
- Operational Definitions
- Levels of Measurement

Conceptualization in Quantitative Inquiry: Key Terms

- Concept

- A mental image that symbolizes an idea, an object, an event, a behavior, a person, etc.

- Attributes

- Concepts that make up a broader concept are called attributes, e.g. male/female vs. gender

- Variables

- Broader concepts that vary (include more than one attribute or level of a concept) and that researchers investigate, e.g. age, gender, level of self-esteem, number of abusive incidents, etc.

Conceptualization in Quantitative Inquiry: Key Terms

- Relationship
 - Variables that change together in a consistent, predictable fashion, e.g., height and weight
- Hypothesis
 - Tentative and testable statement about a presumed relationship between variables
- Independent Variable
 - The variable in a hypothesis that is postulated to explain or cause another variable
- Dependent Variable
 - The variable in a hypothesis that is thought to be explained or caused by the independent variable

Illustration of a Hypothesis and its Components

ILLUSTRATION OF A HYPOTHESIS AND ITS COMPONENTS

Concepts	Hypothesis	Variables	Attributes
Student	Praise by teacher	Independent:	
Teacher		Whether teacher praises student	Praised Not praised
School	will increase		
Praise	↓	Dependent:	↑ High level of confidence
Confidence	Student confidence at school	Student's level of confidence at school	↓ Low level of confidence

Developing a Proper Hypothesis

- Hypotheses should:
 - be clear and specific
 - have more than one possible outcome
 - be value free
 - testable

Hypothesis Example

- If skin cancer is **related** to ultraviolet light, **then** people with a high exposure to uv light will have a higher frequency of skin cancer.
- If leaf color change is **related** to temperature, then exposing plants to low temperatures will result in changes in leaf color.
- If the rate of photosynthesis is **related** to wave lengths of light, **then** exposing a plant to different colors of light will produce different amounts of oxygen.
- Children who eat a breakfast high in protein perform academically better in school than children who eat cereal for breakfast.
- Providing high quality, intensive training for in-home day care providers will help to create more affordable day care options.

Extraneous (control) Variables

- Extraneous variables- variables are not independent variable, but could affect the results (outcome variable) of the experiment or outcome of statistical model.
- 1) Socio-demographic factors
- 2) Mediating variables
- 3) Moderating variables

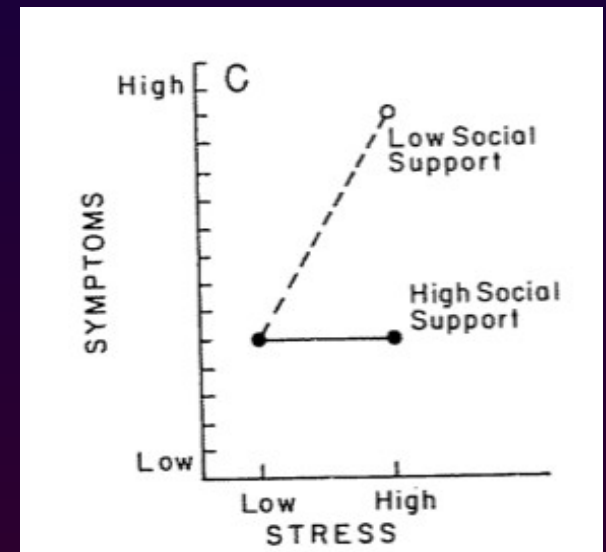
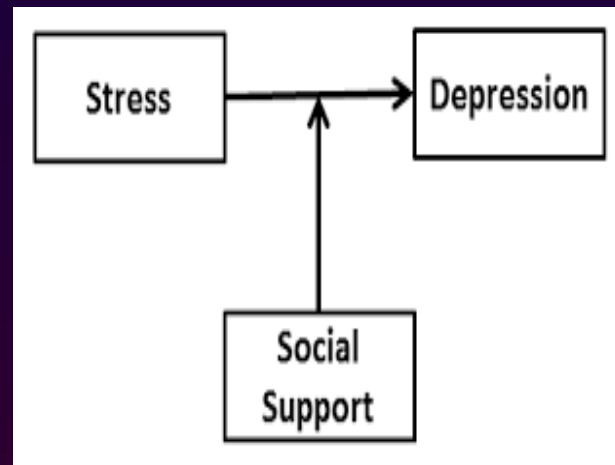
Mediating Variables

- Mechanisms by which independent variables can affect dependent variables
- Example:

Independent variable	Mediating variable	Dependent variable
Type of Intervention	Level of empathy	Re-arrested?

Moderating Variables

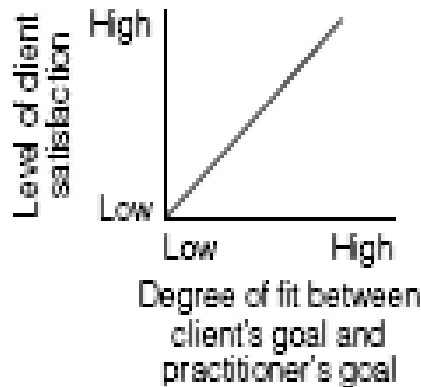
- A third variable that can influence the strength and **direction** of relationships between independent and dependent variables
- Sometimes called *Extraneous (Control or Cofound) variables*
- A third variable (factor) that should be controlled to find a true relationship between IV and DV- Sometimes could be socio-demographic variable



Types of Relationships between Variables

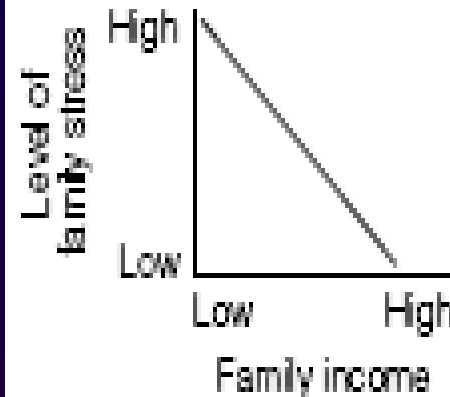
- Relationships between variables can be positive, negative, or curvilinear

1. POSITIVE RELATIONSHIP



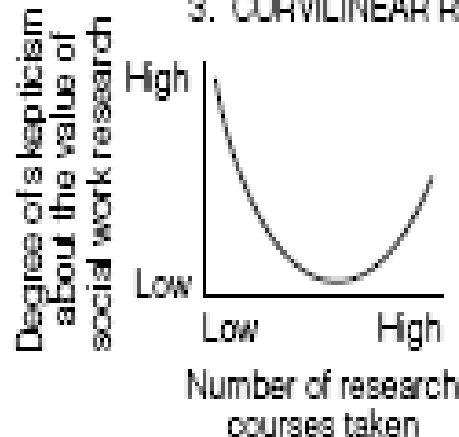
The better the fit between the client's reason for seeking help and the service goal formulated by practitioner, the more the client satisfaction.

2. NEGATIVE RELATIONSHIP



The lower the family income, the higher the level of family stress.

3. CURVILINEAR RELATIONSHIP



Skepticism decreases as students take more research courses up to a point, but after that skepticism increases as more research courses are taken.

Operational Definitions

- In quantitative research we must first translate variables into operational definitions (observable terms) before a study is implemented
- Operational definitions differ from nominal definitions. For example, consider the concept *level of social adjustment*:
 - *Nominal definition*: “How well people perform their major roles in life”
 - *Operational definition*: “Score on a scale that measures social adjustment”

Influence and Categories of Operational Definitions: Positive Parenting/Direct Observation

- Operational Definition: You might begin by making a list of positive parenting behaviors. Then you might directly observe the parents or foster parents in a challenging parenting situation (such as getting children to put away their toys) and count the number of times the parents show positive and negative behaviors. Perhaps you will give them +1 for every positive behavior and –1 for every negative behavior; tally up the points to get a parenting skill score.
- Testing the hypothesis: See if the average scores of parents in the counties receiving the innovative program are higher (better) than the average scores of parents in the counties receiving the traditional program.
- Advantages: Behaviors are observed first-hand.
- Disadvantages:
 - Time-consuming.
 - Parents will know they are being observed and may not behave the same as when they are not being observed.
 - Possibility of observer bias.

Influence and Categories of Operational Definitions: Positive Parenting/Self Report

- Operational Definition: Ask the parents to complete an existing self-report scale that purports to measure knowledge or attitudes about parenting. Such a scale might ask parents questions about what they would do in various child-rearing situations or how they perceive various normal childhood behaviors that some parents misperceive as provocative.
- Testing the hypothesis: See if the average scale scores of parents in the counties receiving the innovative program are better than the average scale scores of parents in the counties receiving the traditional program.
- Advantages:
 - Less costly and less time-consuming than direct observation.
 - If scales are completed anonymously, parents might be more likely to reveal undesirable attitudes.
- Disadvantages:
 - Parents might distort their true attitudes to convey a more socially desirable impression.
 - The scale might not be valid.
 - Knowledge and attitudes may not reflect actual behaviors.

Influence and Categories of Operational Definitions: Positive Parenting/Available Records

- Operational Definition: Examine county records of the number of documented incidents of child abuse and neglect .
- Testing the hypothesis: See if the number of documented incidents of child abuse and neglect in the counties receiving the innovative program is lower than the number in the counties receiving the traditional program.
- Advantages:
 - Less costly and time-consuming than either direct observation or self-report.
 - You don't have to assume that positive parenting knowledge and skills translate into less abuse; you measure abuse per se.
- **Disadvantages:**
 - Reliance on adequacy of county records.
 - Won't show whether the parents who received your intervention improved their parenting.
 - Possibility of biased reporting.

Nominal Level of Measurement

- Describes a variable in terms of the number of cases in each category of that variable.
- Examples
 - gender
 - ethnicity
 - religious affiliation

Ordinal Level of Measurement

- Describes a variable whose categories can be rank-ordered according to how much of that variable they are.
 - We know only whether one case has more or less of something than another case, but we don't know precisely *how much* more.

- Examples

level of client satisfaction

brief rating scale:

Amount of anxiety you feel:				
1	2	3	4	5
Little or none	Some	Moderate amount	Strong	Intense

Interval and Ratio Levels of Measurement

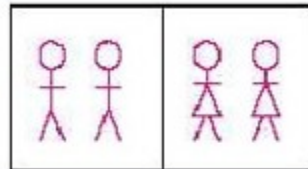
- **Interval:** differences between different levels have the same meanings.
 - Example: IQ. The difference between an IQ score of 95 and 100 is the same in magnitude as the difference between 100 and 105.
- **Ratio:** have the same attribute as interval measures, but in addition have a true zero point.
 - Example: # of arrests- possible to have no arrests, one arrest... Because there is a true zero point, we know that the persons with 4 arrests has been arrested exactly twice as many time as person with 2 arrests.
 - Zero of IQ test differ across the types of test: Stanford-Binet Intelligence Scale, Universal Nonverbal Intelligence, Differential Ability Scales. (Not true 0)

Illustration of levels of Measurement

SCALE

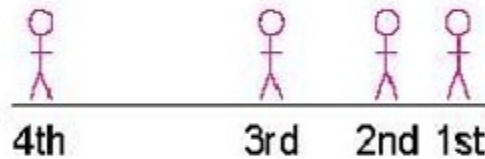
EXAMPLE

Nominal:



Gender

Ordinal:



Happiness

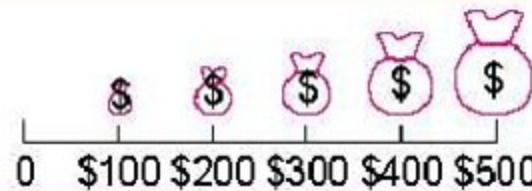
Interval:



Temperature
(in Fahrenheit)

Ordered, Equal differences

Ratio:



Money

Zero

Existing Scales

- Existing scales spare researchers the costs in time and money
- Practical concerns:
 - The length of the scale
 - Time required to complete the scale
 - Compensation
 - The level of difficulty
 - Sensitivity to changes
 - Reliability and validity

Conceptualization in Qualitative Inquiry

- Observations are not restricted to predetermined operational indicators
- Researchers let meanings of little understood phenomena emerge from the observations
- Deeper meanings are the purview of qualitative studies

Qualitative Perspective on Operational Definitions

- We may not know in advance what all the most salient variables are
- Limited understanding of the variables may keep us from anticipating the best way to operationally define those variables
- Even the best operational definitions are necessarily superficial