The Scientific Method

Philosophy of Science

- ***Epistemology****:* the philosophy of knowledge
- ***Methodology:*** the specific approach we use to try to understand our world

Philosophy of Science

- Positivism: the goal of knowledge is simply to describe the phenomena that we experience
- Post-positivism: Scientific and common sense reasoning are not all that different
  - Critical Realism: reality independent of our thinking about it that science can study. Observation is fallible and has error and that all theory is revisable. In other words, the critical realist is *critical* of our ability to know reality with certainty.

Philosophy of Science

- Post-positivism
  - ***Constructivists:*** We each construct our view of the world based on our perceptions of it.
  - Complete objectivity cannot exist: We are all biased and our observations are affected by theories we hold.
  - Aggregate across people, approaches, measures

Scientific Method

- Theory: a broad, organizing set of principles about a phenomenon.
- Theories provide:
  - 1. systematic rationale for decision
  - 2. Systematic framework through which to organize results
  - 3. feedback and, therefore, systematic advance of science

Scientific Method

- Generate testable hypotheses. In clinical psychology, three typical goals:
  - Understanding the relationship between two phenomenon
  - Understanding factors that influence the nature of a relationship between two variables
  - Understand the mechanism(s) underlying the association between two variables

1) Understanding Associations Between Variables

- Correlation – cross-sectional association
- Risk Factors – temporal association
- Causal Factors – demonstrate through experimentation

Criteria necessary to demonstrate causation

- Temporal ordering between variables
- Strong relationship between variables
- Consistent (i.e., reliable) relationship between variables
- Elimination of alternative hypotheses
- Presence of a plausible mechanisms

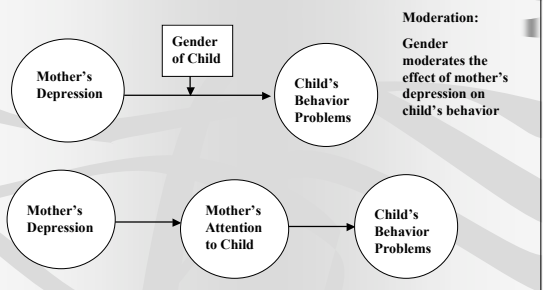
2) Understand variables that influence relationship between other variables

- Moderators
- Protective Factors
- Synergistic Associations

3) What is the mechanism underlying the association between two variables?

- Mediation
  - one variable explains the association between two variables
  - without that variable the association between the others would be smaller or negligible

Mediation Versus Moderation



Mediation: Mother's depression affects child's behavior, through reduction of her attentive behaviors toward child

Define Constructs For Study

- Operational Definitions: Defining a construct by the procedures with which we measure it.
- Multiple Operational Definitions

Decide on the Unit of Analysis

- individuals
- groups
  - class, neighborhood, workforce
- artifacts
  - books, photos, newspapers
- geographical units
  - town, census tract, state
- Social interactions
  - dyadic relations, divorces, arrests

Choose a Sample

- Goal of sample generation:
  - sample should be testable, and that the results should be generalizable to the entire population of interest
- Sample should be representative of the population.
- Sample is biased if characteristics are not the same as those of the population to which we wish to generalize
  - Types of characteristics of interest may include SES, race, gender, ethnicity, religion, age, etc.

Probability Sampling

- All forms use random sampling
- Every potential subject has an equal chance of being included in the study
- The selection of any one member does not influence the chances of any other member being selected

Methods of Probability Sampling

- Simple Random Sampling
- Stratified-Random Sampling
- Cluster-Sampling

Non-probability Sampling

- Accidental Sampling
- Quota Sampling

Classes of Research Designs

- Experimental Designs
  - Experimenter manipulates something
  - Random assignment to groups (or matched-random)
  - Maximum control
  - Types include
    - Pre-test post-test control group design
    - Post-test only control group design
    - Factorial Design
    - Single-subjects design

2 x 2 Factorial Design

	CBT	IPT
Experience High		
Experience Low		

Classes of Research Designs

- Quasi-Experimental Designs
- Correlational (Observational Designs)

Settings for Research

- Laboratory
- Naturalistic

Time-Frame for Research

- Cross-sectional
- Longitudinal
  - Repeated Measures
  - Time-Series

Summary: Steps in Study Design

1. Use theory to generate testable hypotheses
2. Define constructs using operational definitions
3. Decide on unit of analysis
4. Decide on sampling strategy
5. Choose design and if experimental, use random assignment
6. Decide on setting for research
7. Decide on time-frame for research