

# Clinical Research Methods

Gordon C. Nagayama Hall

355 Straub

Phone: 346-4969

E-mail:

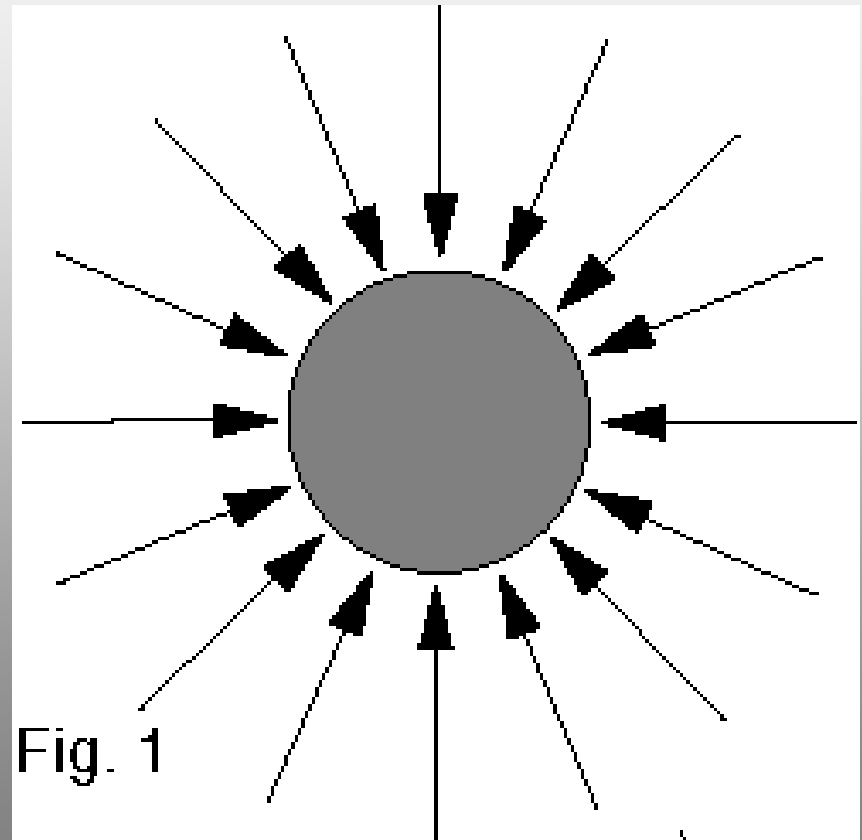
[gnhall@darkwing.uoregon.edu](mailto:gnhall@darkwing.uoregon.edu)

# Unity/Disunity of Psychology

- Is psychology a single field that can encompass subfields? (Kimble, 1989)
- What are commonalities across subfields?
  - Sciences of behavior
  - Genetic and environmental influences
  - Concepts are observable and analyzable
  - Laws are idiographic and nomothetic
- Is psychology splintering into various incompatible subfields?

# Unified Psychology (Sternberg & Grigorenko, 2001)

- Unified psychology – the multiparadigmatic, multidisciplinary, and integrated study of psychological phenomena through converging operations



# Bad Habits

## (Sternberg & Grigorenko, 2001)

- Exclusive or almost exclusive reliance on a single methodology (e.g., fMRI, behavioral coding)
  - Rather than multiple converging methodologies for studying psychological phenomena
- Identification of scholars in psychology in terms of psychological subdisciplines (e.g., social, clinical, developmental)
  - Rather than in terms of the psychological phenomena they study (e.g., emotion, aggression, cognition)
- Adherence to single underlying paradigms for the investigation of psychological phenomena (e.g., behaviorism, cognitivism, psychoanalysis)

# Hedgehogs and Foxes

## (Sternberg & Grigorenko, 2001)

**Hedgehogs** try to relate everything to a single system

- “The fox knows many things, but the hedgehog knows one big thing” - Archilocus

**Foxes** pursue many different paths without trying to fit them together

- Foxes who think they are hedgehogs



# Is Disunity in Psychology a Sign of Psychology's Health? (McNally, 1992)



# Unified Psychology

## (Sternberg & Grigorenko, 2001)

- Converging operations
  - Use of multiple methodologies for studying a single psychological phenomenon or problem
- Why do psychologists rely largely or exclusively on a single method?
  - Training
  - Panaceas
  - Norms

# Reasons to Change

(Sternberg & Grigorenko, 2001)

- The field could be organized better to understand psychological phenomena
- Organizing by subfields can isolate individuals who study the same phenomena
- The current organization may create false oppositions between individuals or groups studying phenomena from different vantage points

# Reasons to Change

(Sternberg & Grigorenko, 2001)

- The current system tends to marginalize psychological phenomena that fall outside the boundaries of a specific field (e.g., emotion)
- Research may tilt toward issues to which a limited set of tools may be applied
- The current system can discourage new ways of studying problems

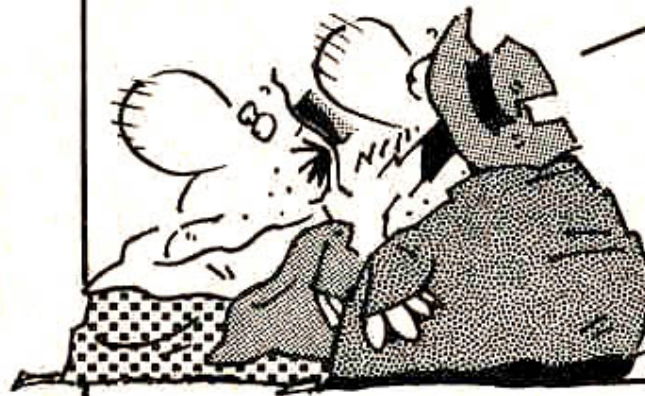
# Reasons to Change

(Sternberg & Grigorenko, 2001)

- Aspects of phenomena may be confused with the phenomena as a whole
  - IQ test or brain function = intelligence

FRANK & ERNEST

TONIGHT'S  
TOPIC:  
—  
WHAT IS  
REALITY?



I THINK  
REALITY IS  
JUST A GOOD  
GUESS.

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7-8  
THAVES

# Research Principles

- Objectivity
- Tasks of Research
  - Hypothesis: “if-then”
  - Experimental Group
  - Control Group
- Group Differences
- Experimental Confounds

# Research Principles

- Key Concepts Underlying Methodology
  - Parsimony
  - Plausible rival hypotheses
  - Conclusions

# Internal Validity

- The degree to which your design tests what it was intended to test
- In an experiment, **internal validity** means showing that variation in the dependent variable is caused only by variation in the independent variable
- In correlational research, **internal validity** means that changes in the value of the criterion variable are solely due to changes in the value of the predictor variable

# Threats to Internal Validity

Sampling

Selection bias

Attrition

# Threats to Internal Validity

## Social context

- History – external events

- Maturation – internal events

## Research context

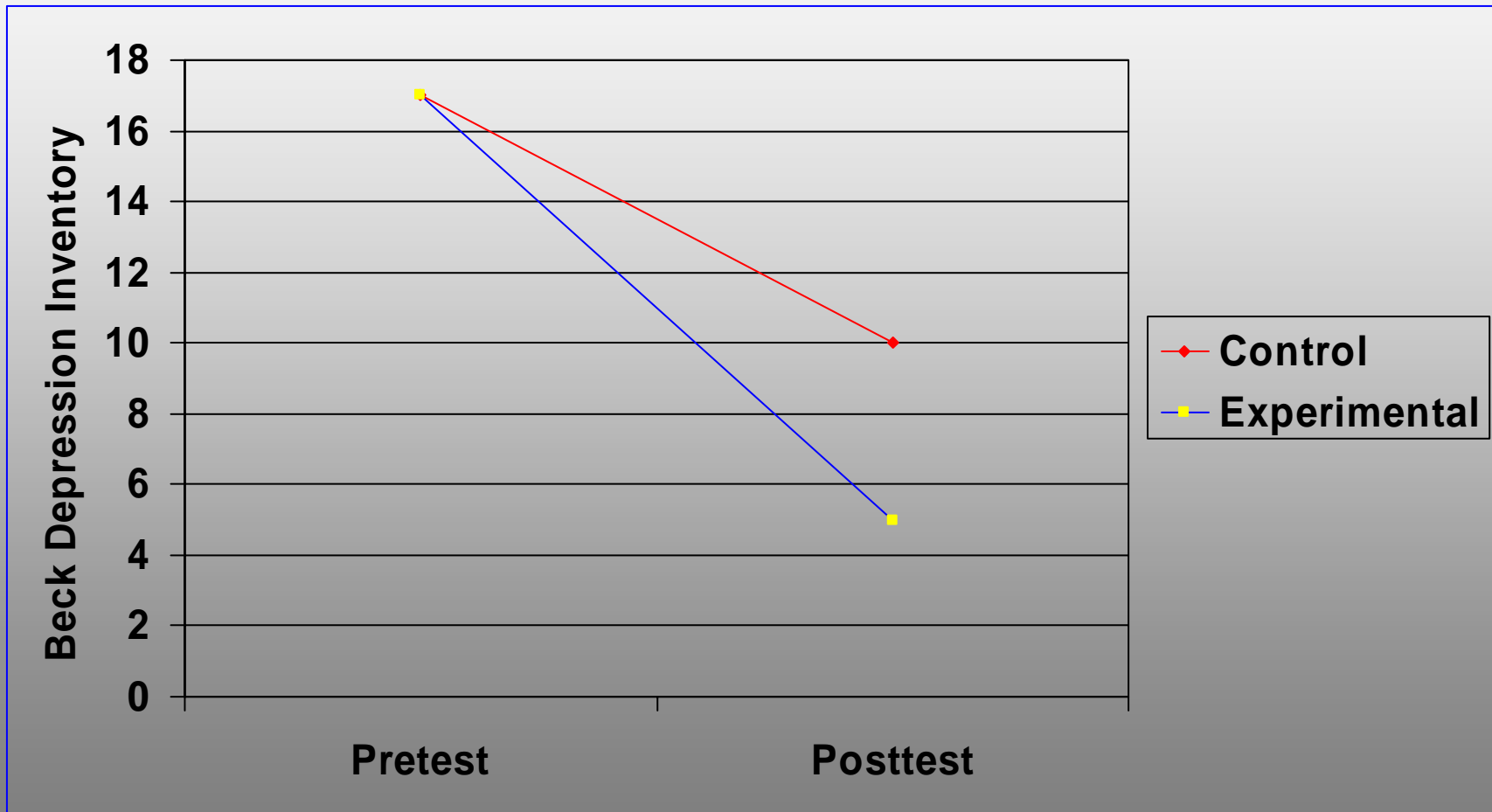
- Familiarity

- Repeated assessments

- Treatment integrity

- Awareness of being in the control group

# Threats to Internal Validity: Statistical regression



# External Validity

- The degree to which results generalize beyond your sample and research setting
- Increasing **internal validity** may decrease **external validity**, and vice versa
- **Internal validity** may be more important in basic research, **external validity** in applied research
  - Efficacy vs. effectiveness research

# Threats to External Validity

Threats to external validity

Sample characteristics

Setting characteristics

Reactivity to experiment

Test sensitization

Timing of measurement

# Construct Validity – Causal basis of an effect

Construct = interpretation or explanation  
e.g., CBT reduces depression via  
modifying cognitions

Threats to construct validity

Attention and contact with clients

Therapist characteristics

Experimenter expectancies

Participant expectancies

# Statistical Conclusion Validity

- Accurate quantitative evaluation
- Error
  - Type I (alpha bias)
  - Type II (beta bias)

# Statistical Errors

True State of Affairs

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	$H_0$ True	$H_0$ False
Decision Reject $H_0$	Type I Error	Correct Decision
Do Not Reject $H_0$	Correct Decision	Type II Error

# Statistical Conclusion Validity

- Statistical power
  - Likelihood of detecting differences between conditions when differences actually exist
  - Larger  $N$  = Greater power
    - However, a large  $N$  may produce statistically significant differences that are trivial

# Statistical Conclusion Validity

- Effect size =  $m_1 - m_2 / SD$
- Effect size from a correlational perspective (Cohen, 1992)
  - $r = .1$  = small effect size
  - $r = .3$  = medium effect size
  - $r = .5$  = large effect size

# Statistical Conclusion Validity

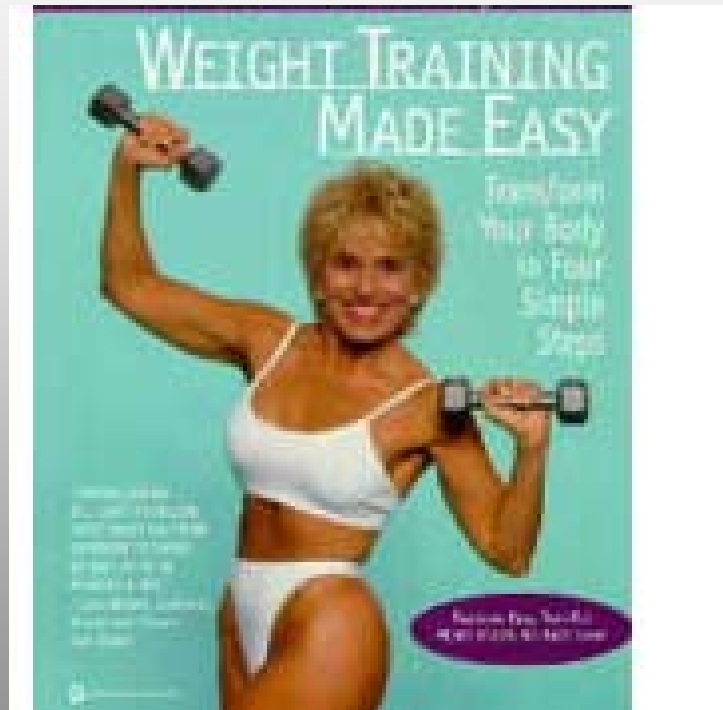
## Threats to statistical conclusion validity

- Variability in the procedures
- Participant heterogeneity
- Unreliability of measures
- Multiple comparisons and error rates
  - The more tests performed, the more likely a chance difference will be found (Type I error)

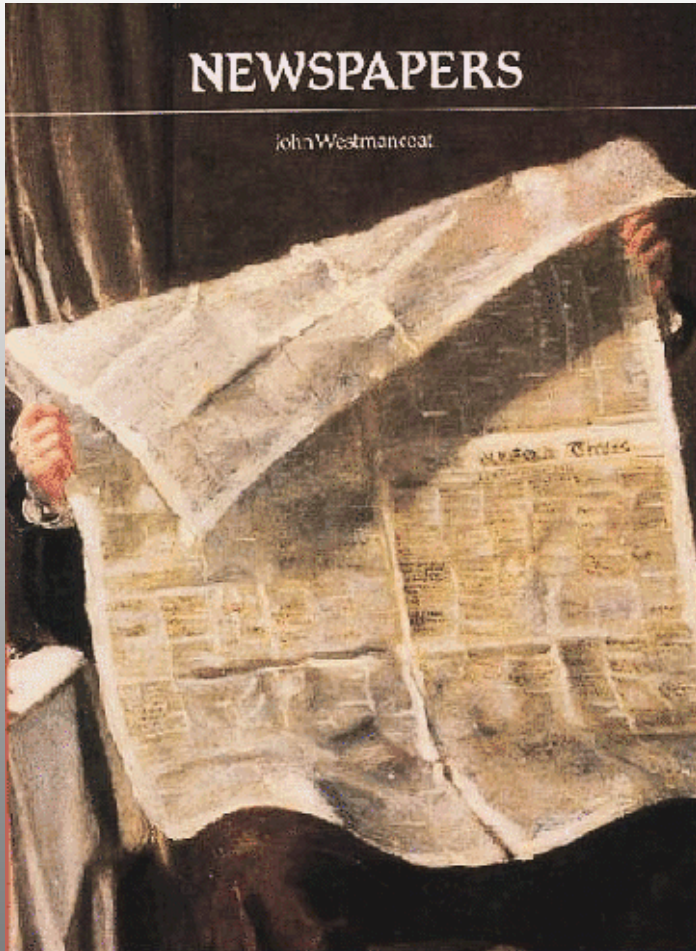
# Methodology Case Study

# Methodology Case Study

- Dr. X. R. Sizemore is an exercise physiologist who hypothesizes that the release of endorphins during weight lifting reduces depression.



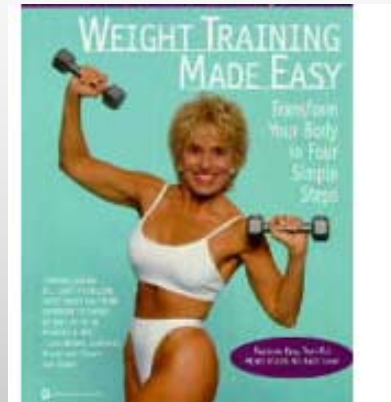
# Methodology Case Study



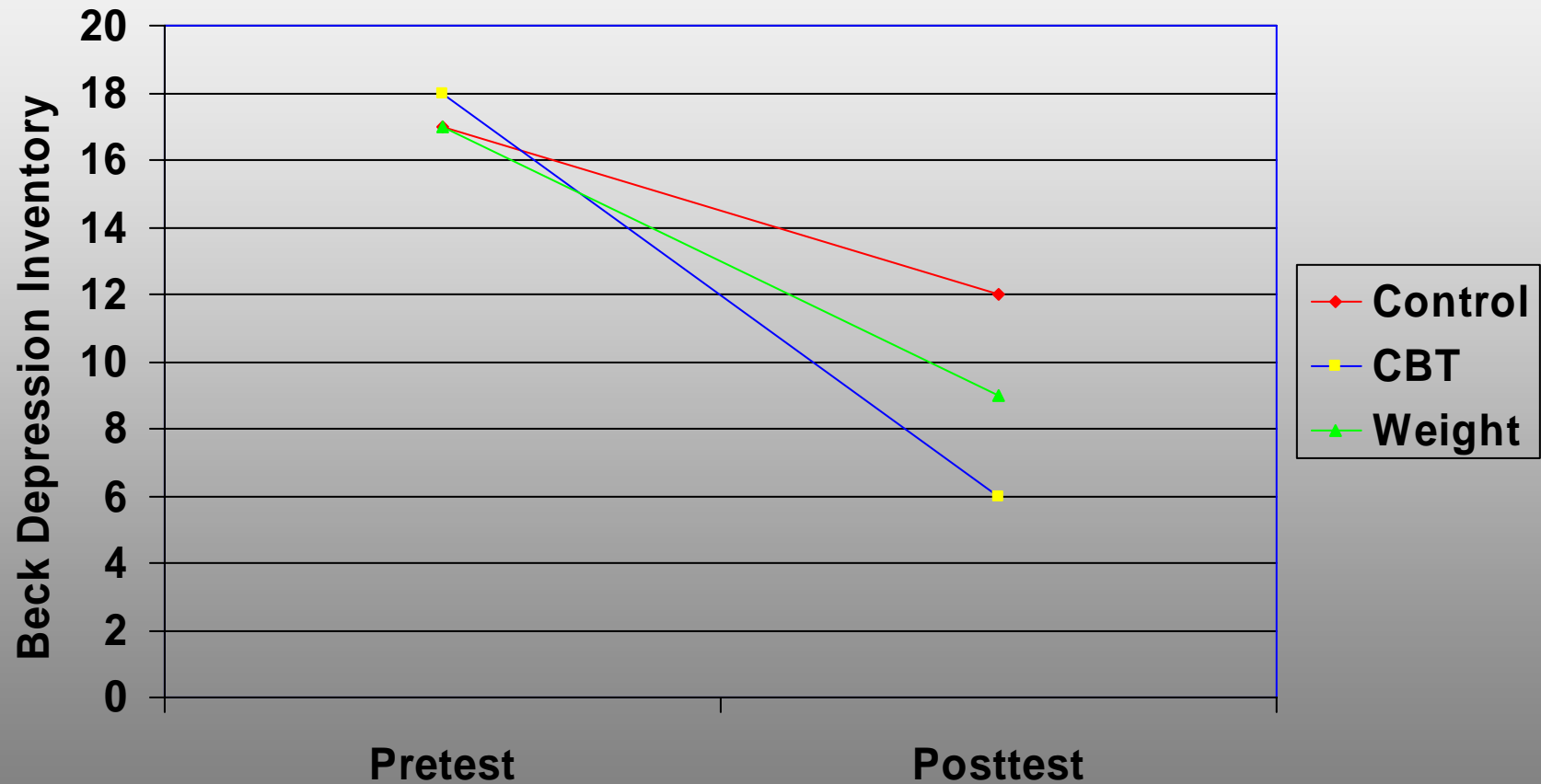
- Dr. Sizemore advertises in a local newspaper for women to participate in an 8-week study on the effects of weight training on depression

# Methodology Case Study

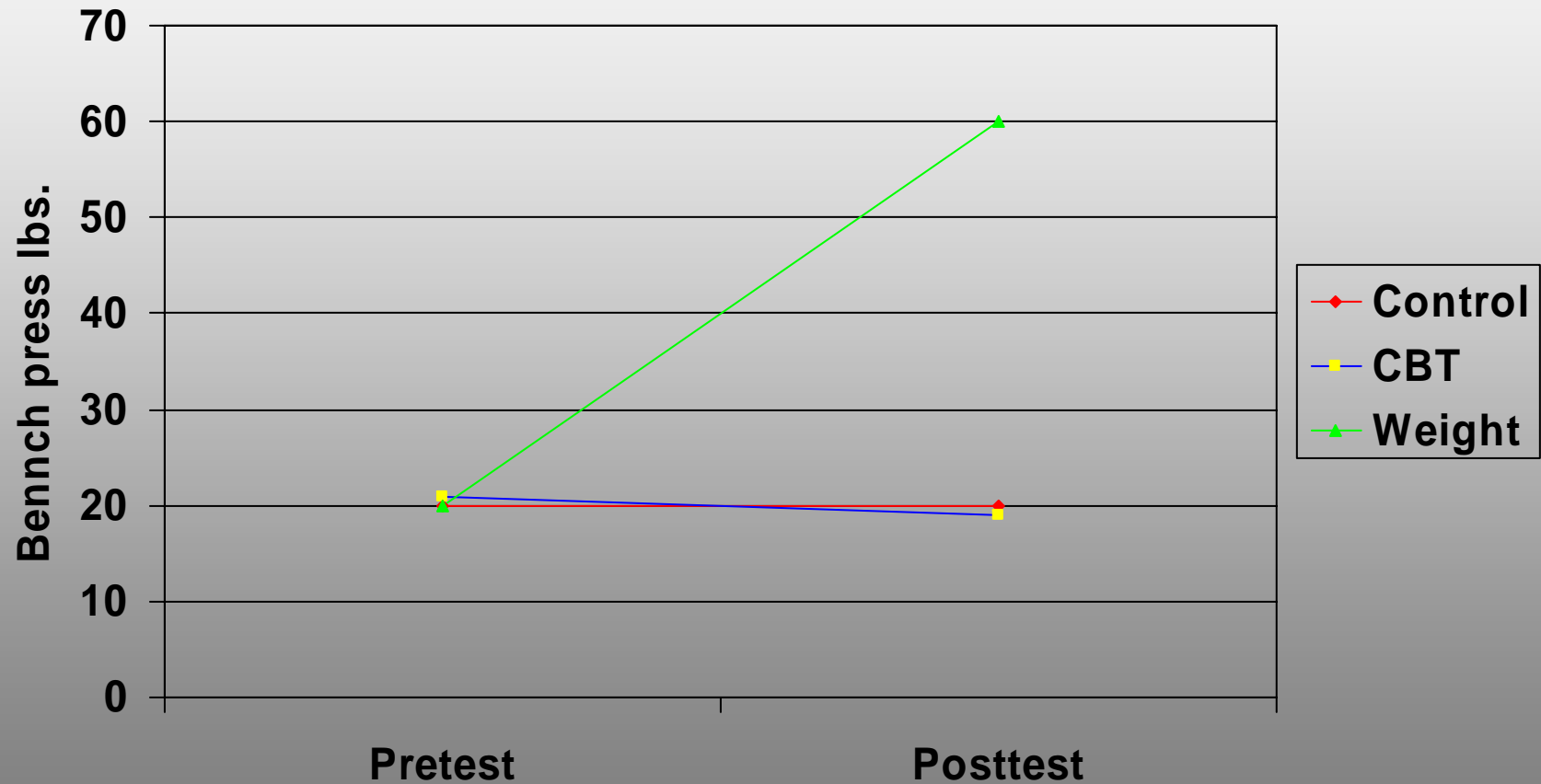
- 60 volunteers who have a BDI score of 15+ are randomly assigned to:
  - Weekly 1-hr. weight training conducted by the very enthusiastic Dr. Sizemore
  - Weekly 1-hr. CBT conducted by the very enthusiastic psychologist Dr. X. Pert
  - A no treatment condition in which participants are paid \$50 to complete assessments



# Methodology Case Study

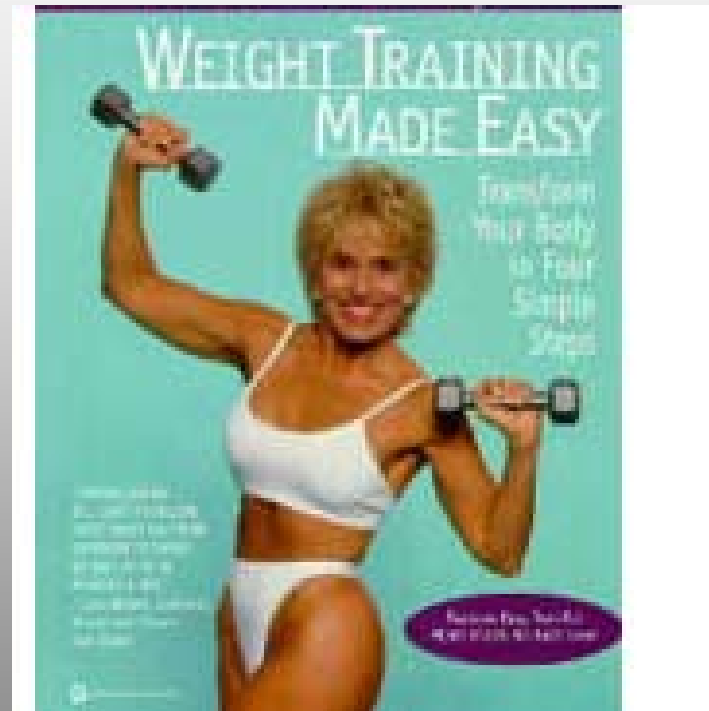


# Methodology Case Study



# Methodology Case Study

- What can Dr. Sizemore conclude from the findings of her study?



# Cognitive Therapy for Depression (Castonguay et al., 1996)

- 30 clients requested therapy
- All met Research Diagnostic Criteria for Depression
  - All had BDI scores of 20+
- Clients 78% female



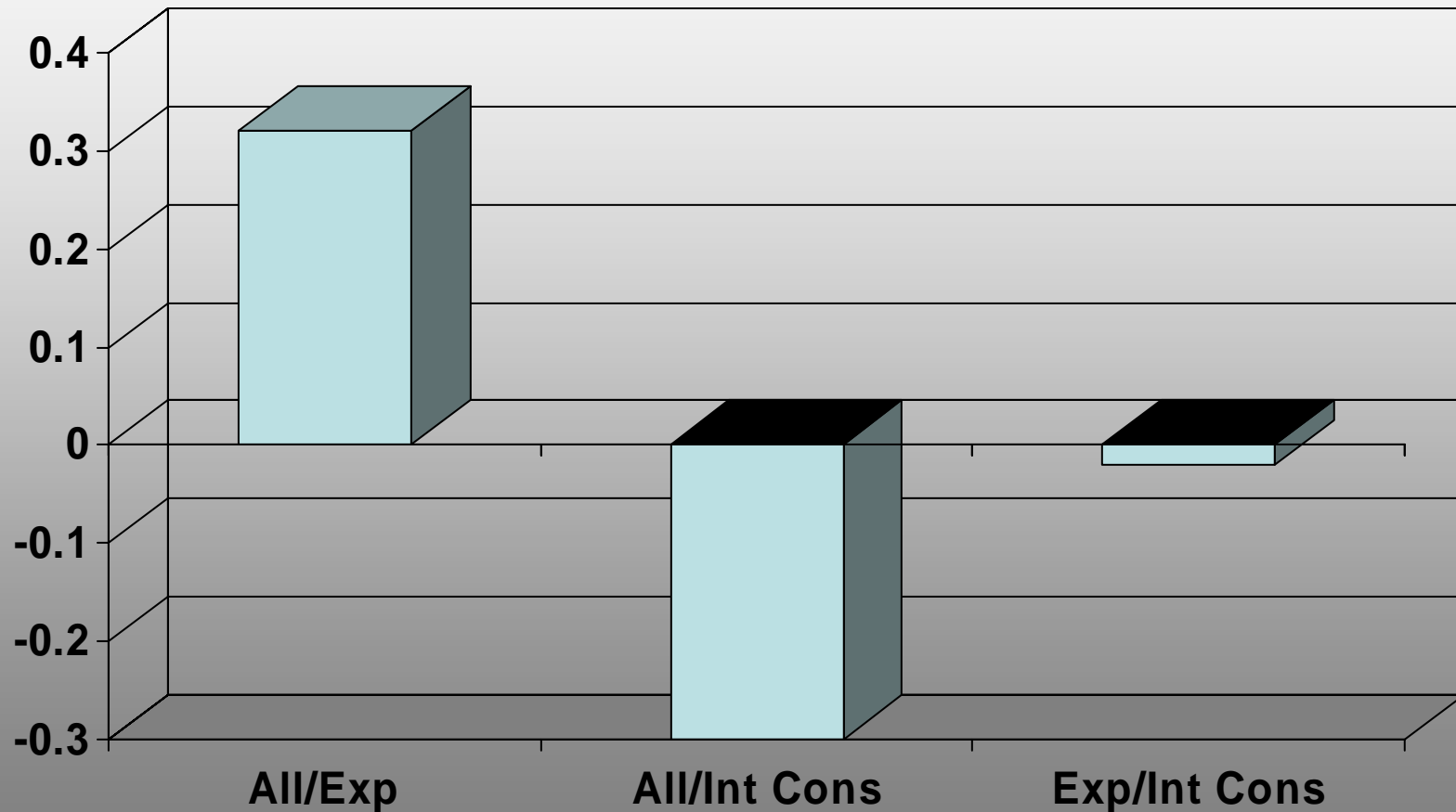
# Cognitive Therapy for Depression: Therapy

- Therapists were one male clinical psychologist, 2 male social workers and one female social worker
- Therapy = cognitive therapy (N = 15) or cognitive therapy + imipramine (N = 15)

# Cognitive Therapy for Depression: Independent Measures

- Working Alliance Inventory
  - Therapy audiotapes, transcripts coded by 3 grad students on client-therapist:
    - Agreement on goals
    - Agreement on therapy tasks
    - Therapeutic bond
- Experiencing Scale
  - Therapy audiotapes, transcripts coded by 2 undergrads on client's emotional and cognitive involvement in therapy
- Coding System of Therapist Feedback
  - Therapy audiotapes, transcripts coded by 3 grad students for therapist's making connections between distorted cognitions and client's intrapersonal consequences

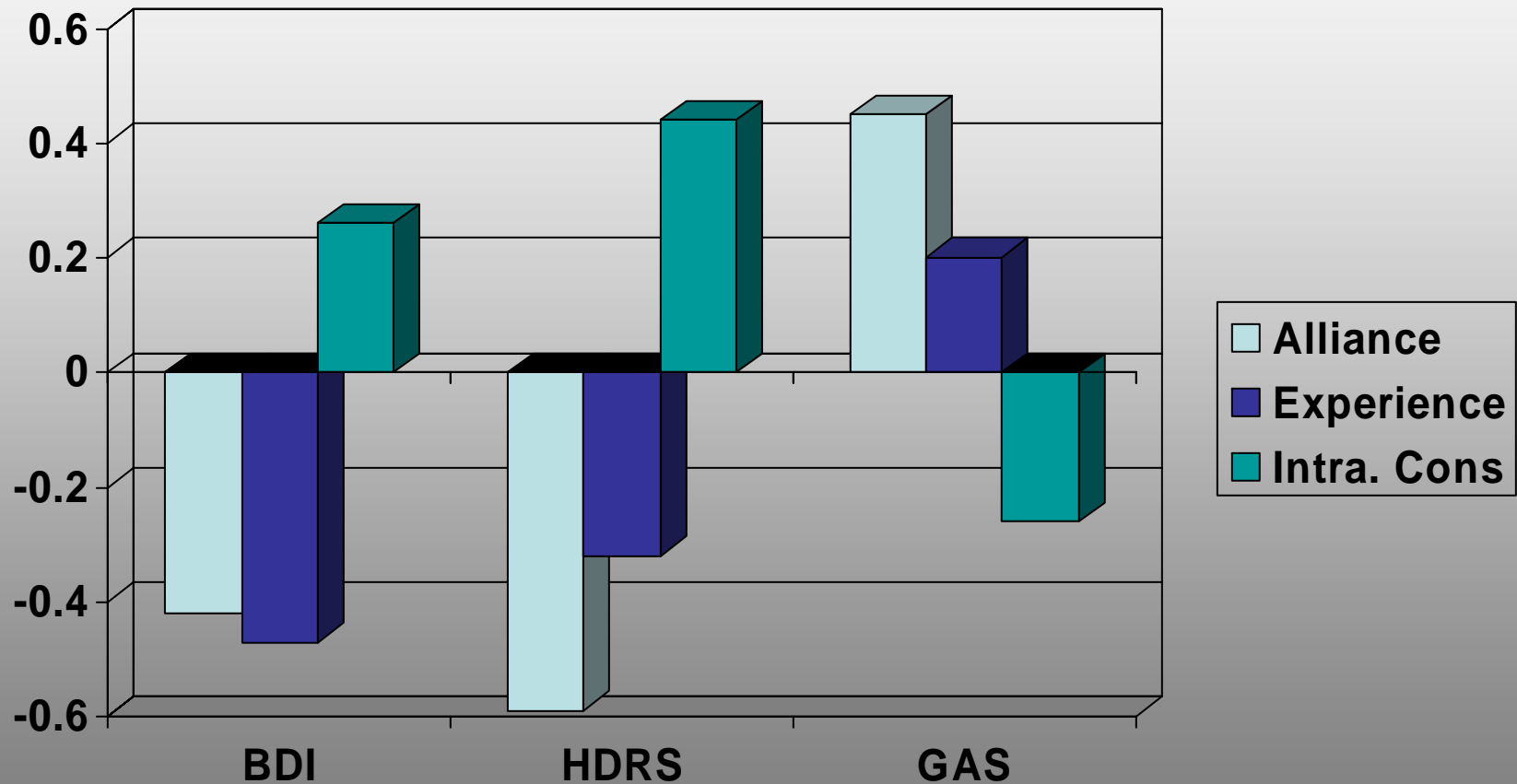
# Cognitive Therapy for Depression: Correlations Among IVs



# Cognitive Therapy for Depression: Dependent Measures

- Beck Depression Inventory – self-report
- Hamilton Depression Rating Scale – clients interviewed by independent evaluator
- Global Assessment Scale – client interviewed by independent evaluator

# Cognitive Therapy for Depression: Posttreatment Correlations



# Cognitive Therapy for Depression

- What can Castonguay and colleagues conclude about how cognitive therapy for depression works?

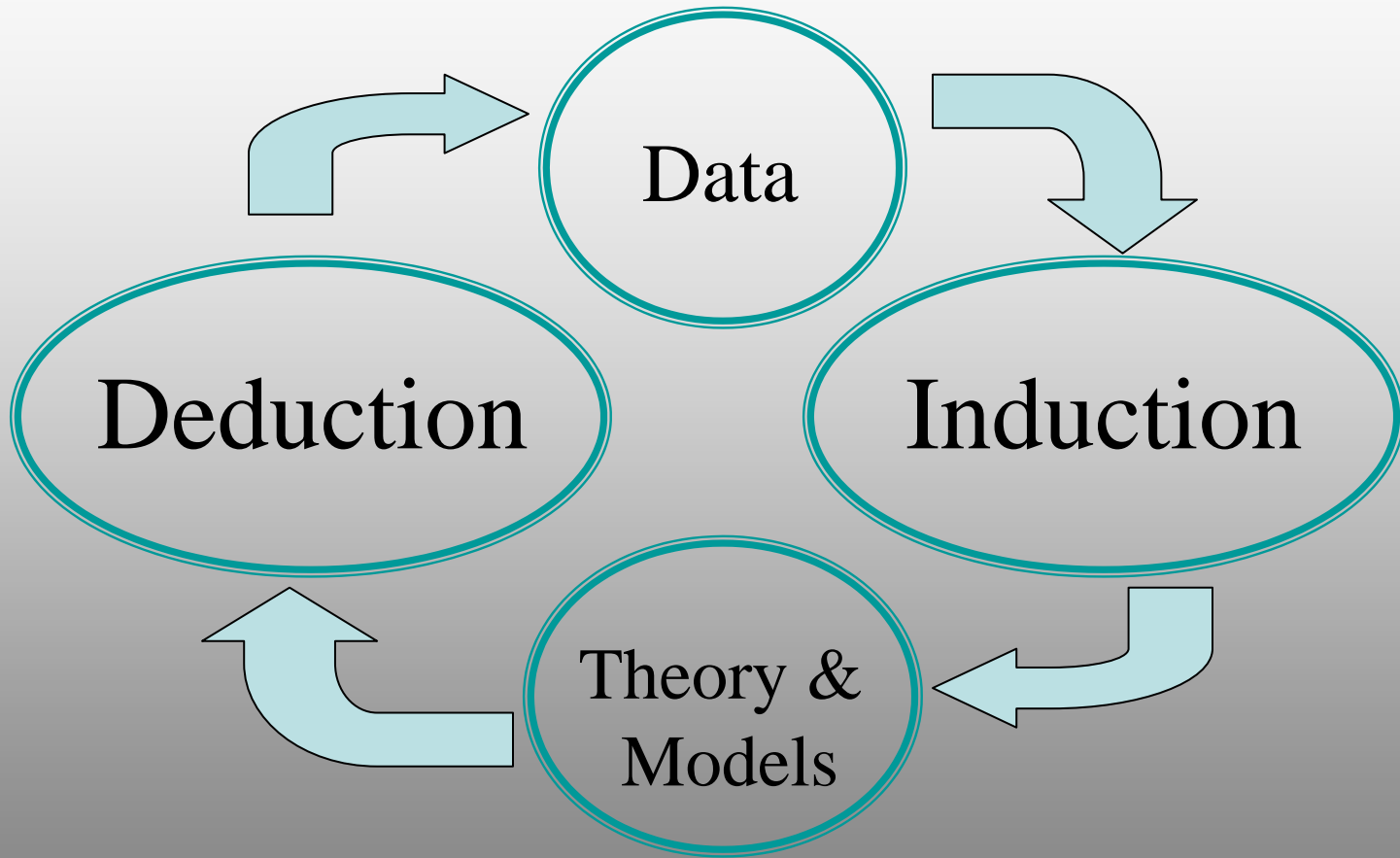
# Scientific Theory

## The Goals of Psychological Science:

- (1) *Description* of behavior and of the mind
- (2) *Prediction* of behavior and thought
- (3) *Explanation* or formulation of models of the mind



***Scientific theory:*** A set of statements that *summarizes and organizes* existing information about some phenomenon, *provides an explanation* for the phenomenon, and serves as a basis for *making predictions* to be *tested empirically*.



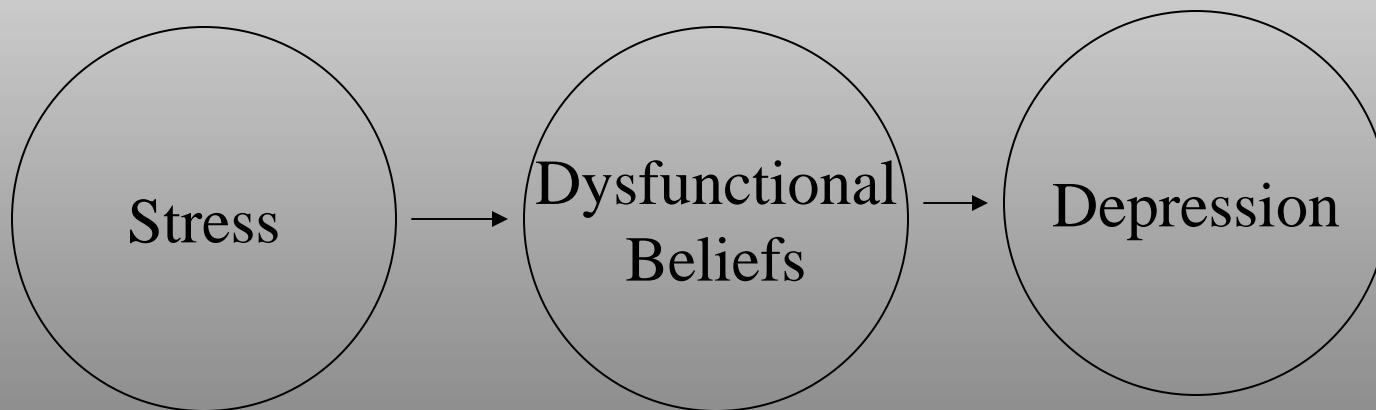
# Characteristics of a Good Theory

- **Ability to Account for Data**
  - Theory must account for existing data and well-established facts within its domain
- **Explanatory Relevance**
  - Theoretical explanation must offer good grounds for believing that the phenomenon would occur under specified conditions
- **Testability**
  - A theory must be capable of being put to empirical test

# Characteristics of a Good Theory

- **Prediction of Novel Events**
  - A theory should predict phenomena the theory was not specifically designed to account for, but which are within its domain
- **Parsimony**
  - A theory should explain phenomena within its domain with the fewest possible assumptions

# Cognitive Theory of Depression



Homework: Develop with a partner a theory of some aspect of human behavior

# Developing a Theory

- Step 1: Define the scope (domain)
- Step 2: Know the research literature
- Step 3: Formulate your theory
- Step 4: Test your theory empirically
  - Successful postdiction
  - Successful prediction

# Recasting Theoretical Statements

What something seems to be

- Disorganized
- Heterogeneous
- Property of persons
- Local
- Stable, unchanging
- Ineffective

What it is in reality (or vice versa)

- Organized
- Single element
- Property of system
- General
- Unstable, changing
- Effective

# Recasting Theoretical Statements

- Bad
- Unrelated
- Coexisting
- Positively correlated
- Similar
- Cause
- Good
- Correlated
- Incompatible
- Negatively correlated
- Opposite
- Effect

# Selection of the Research Problem and Design

Operational definitions

# *Operational Definitions*

An *operational definition* is a clearly defined set of procedures for obtaining a measure of the construct of interest.

It would not be possible to use *objective methods* that are essential to scientific inquiry without operational definitions.

In some sciences such as physics, the exact same procedure is agreed upon by all for all experiments involving a particular construct, but in psychology things are not as rigidly defined.

The key to an acceptable operational definition is that the procedure is specified precisely enough to allow replication by others.

## *Examples:*

*quality of memory* -- accuracy of recall in a certain task

*depression* -- Beck Depression Inventory (survey) score

*arousal* -- galvanic skin response (conductivity of the surface of the skin)

- *Theoretical Variable* -- This is what we are *really* interested in. The actual thing that we would like to study. Examples: love, depression, memory, aggression.
- It is very important to keep in mind that the *operational definition is NOT the theoretical variable.*

- Instead, an operational definition offers only an imperfect, indirect measure of the theoretical variable of interest.

## Operational Definitions: Example



Verbal Statement

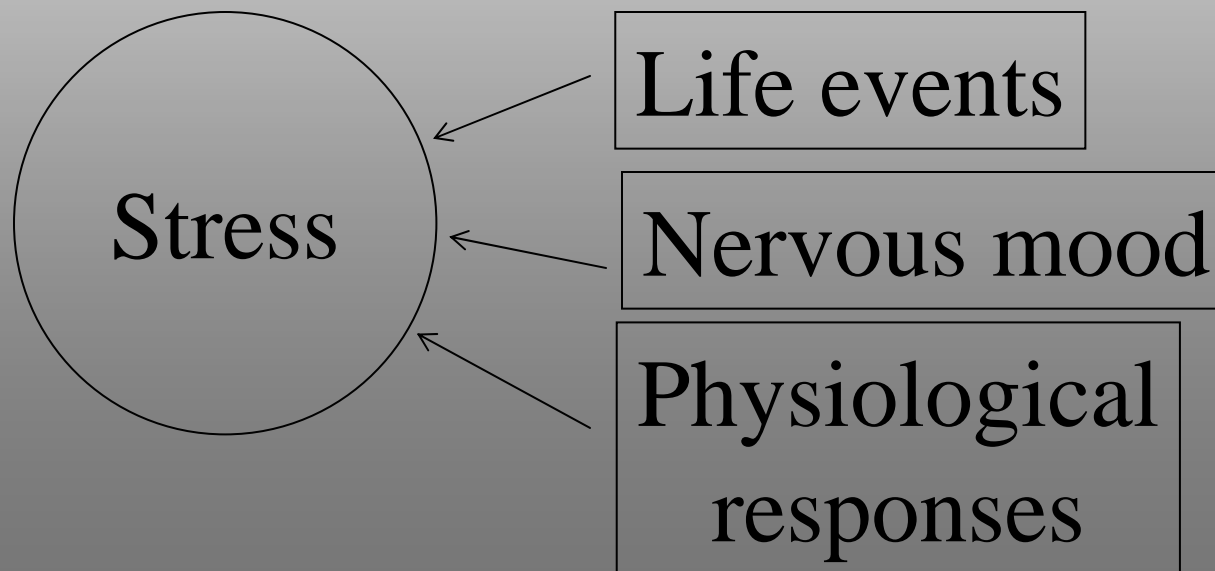


Operational Definition  
(empirical referents)

# Selection of the Research Problem and Design: Types of Variables

Variable – single measure (e.g., self report)

Construct – latent variable

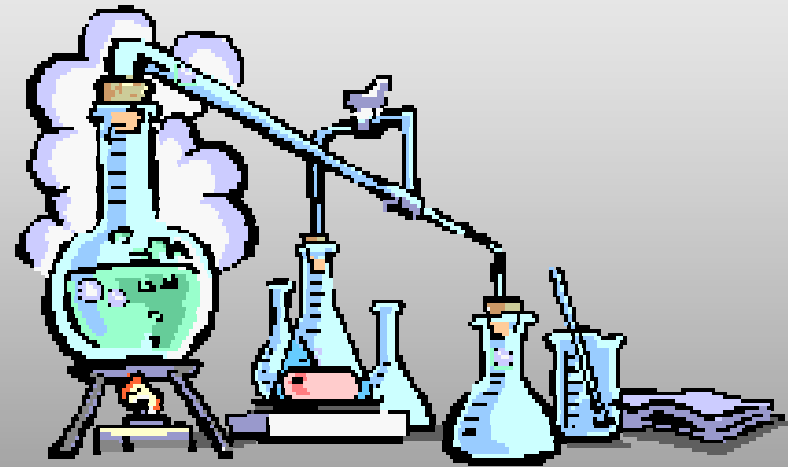


# Types of Variables

- Manipulated variables - Conditions or instructions (e.g., treatments)
- Participant or individual variables
  - Usually cannot be manipulated (e.g., age)

# Selection of the Research Problem and Design: True Experiment

- Random assignment
- Maximum control over variables
- Control over sources of bias
- Randomized controlled clinical trials (RCTs)



# Empirically Supported Treatments



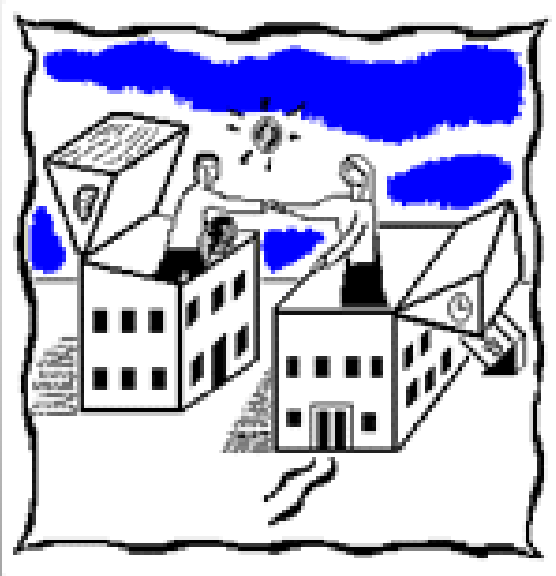
- Well-established
  - 2 RCTs or 10 single-case design expts by at least 2 independent investigators, demonstrating superiority to pill, placebo, or other tx
- Probably efficacious
  - 2 expts demonstrating tx > control, 1 RCT, or 4 single-case design
- Possibly efficacious
  - 1 study w/out conflicting evidence

# Empirically Supported Treatments



- Treatment manual
- Inclusion criteria for sample
- Reliable, valid outcome measures
- Appropriate data analyses

# Selection of the Research Problem and Design: Quasi-Experiments

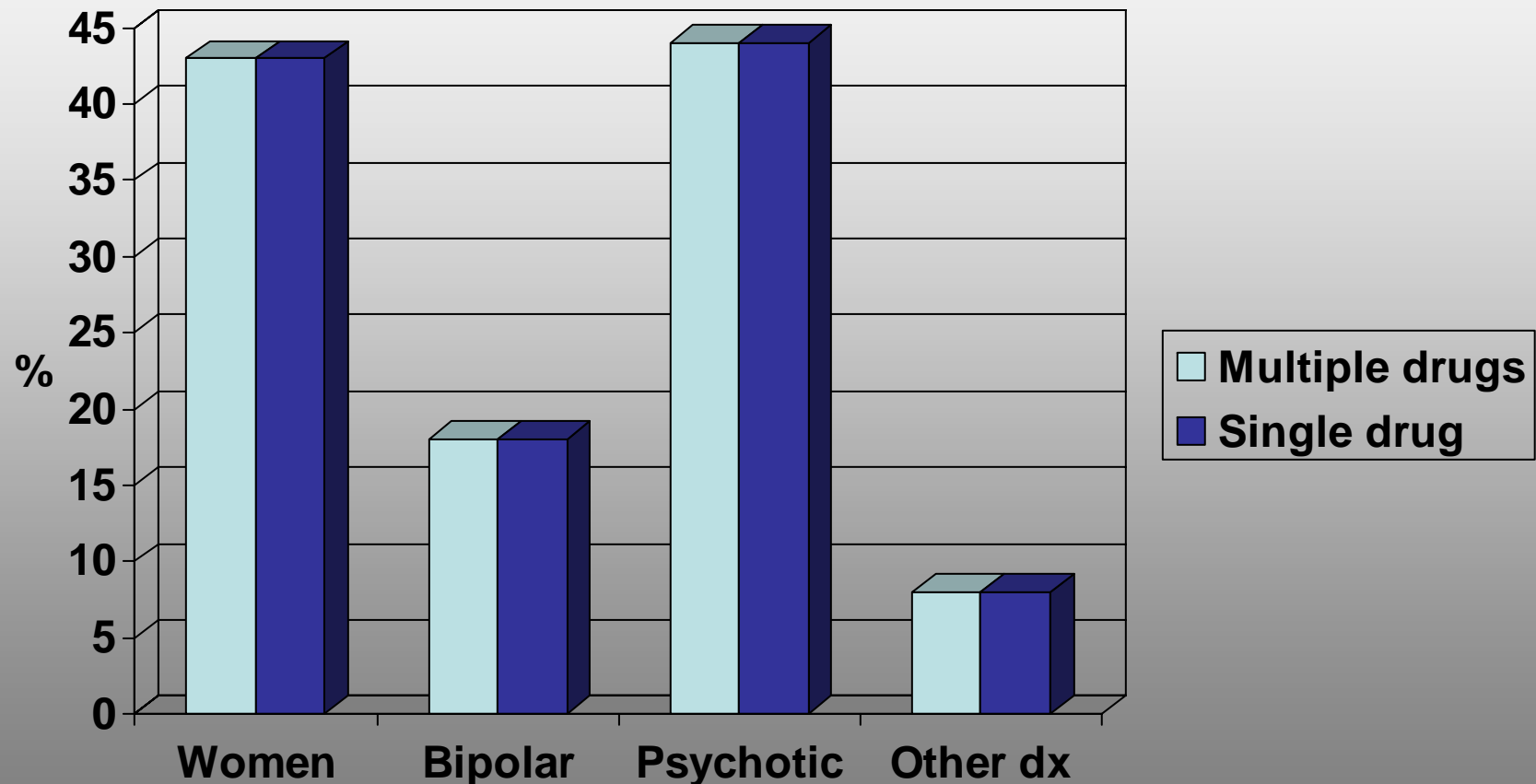


- All features of an experiment cannot be controlled (e.g., nonrandom assignment)

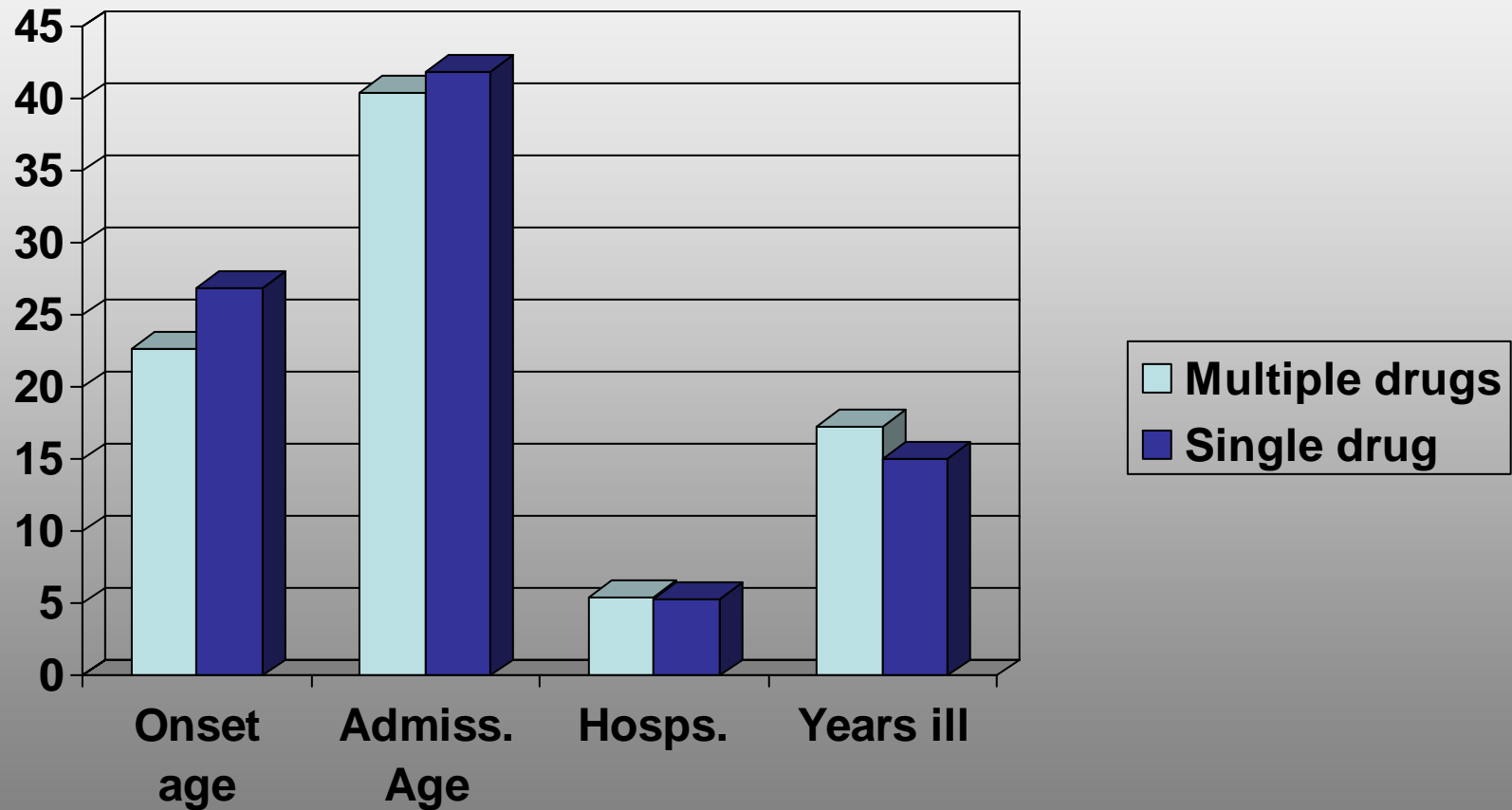
# Selection of the Research Problem and Design: Types of Research

- Case control designs
  - Selection of participants who vary on a characteristic of interest
    - Schizophrenics and non-schizophrenics matched on gender, age, and academic attainment
  - Cross-sectional

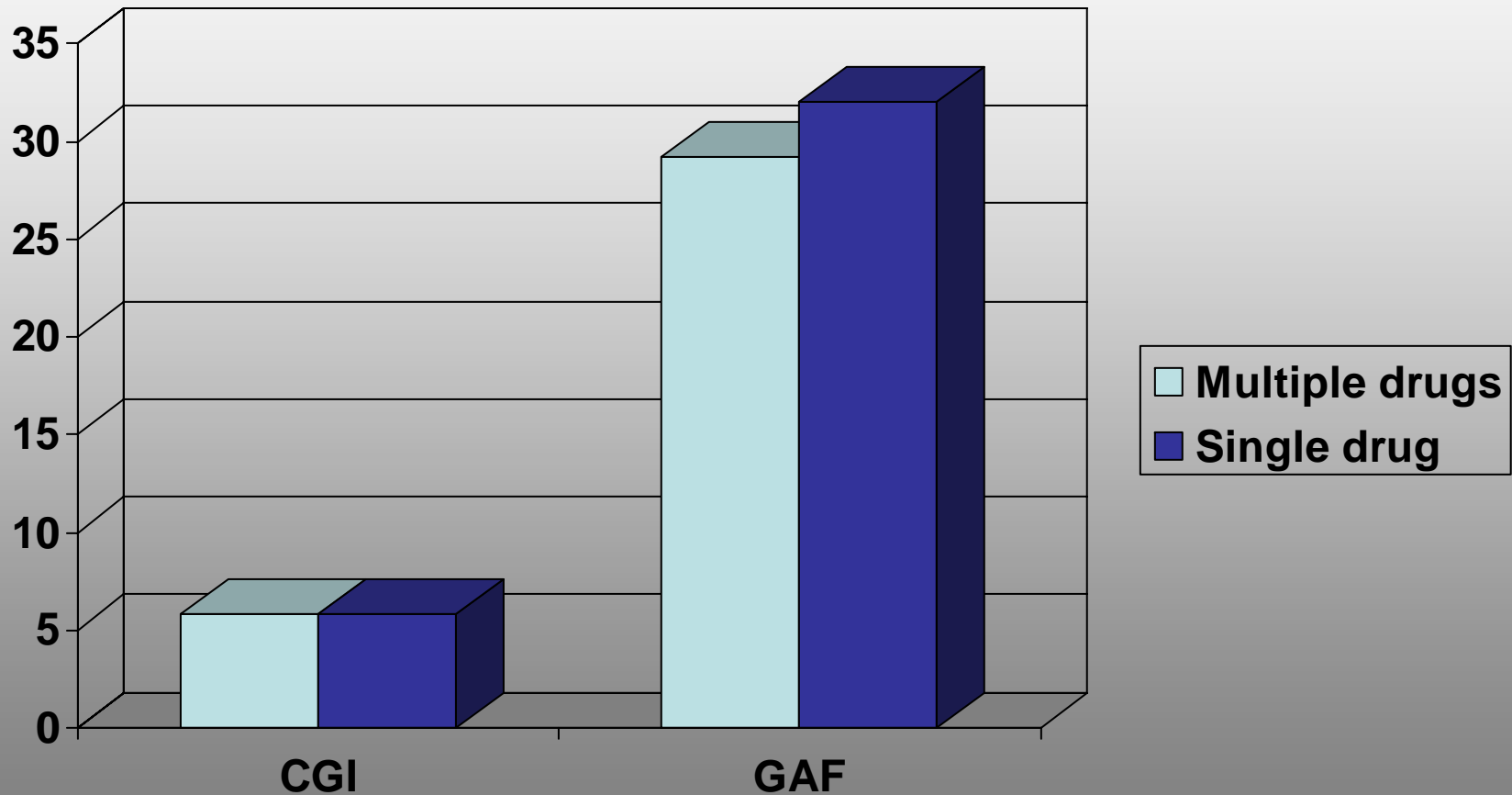
# Case Control Study of Psychiatric Patients Receiving Multiple (N = 70) vs. Single Antipsychotic Drugs (N = 70; Centorrino et al., 2004)



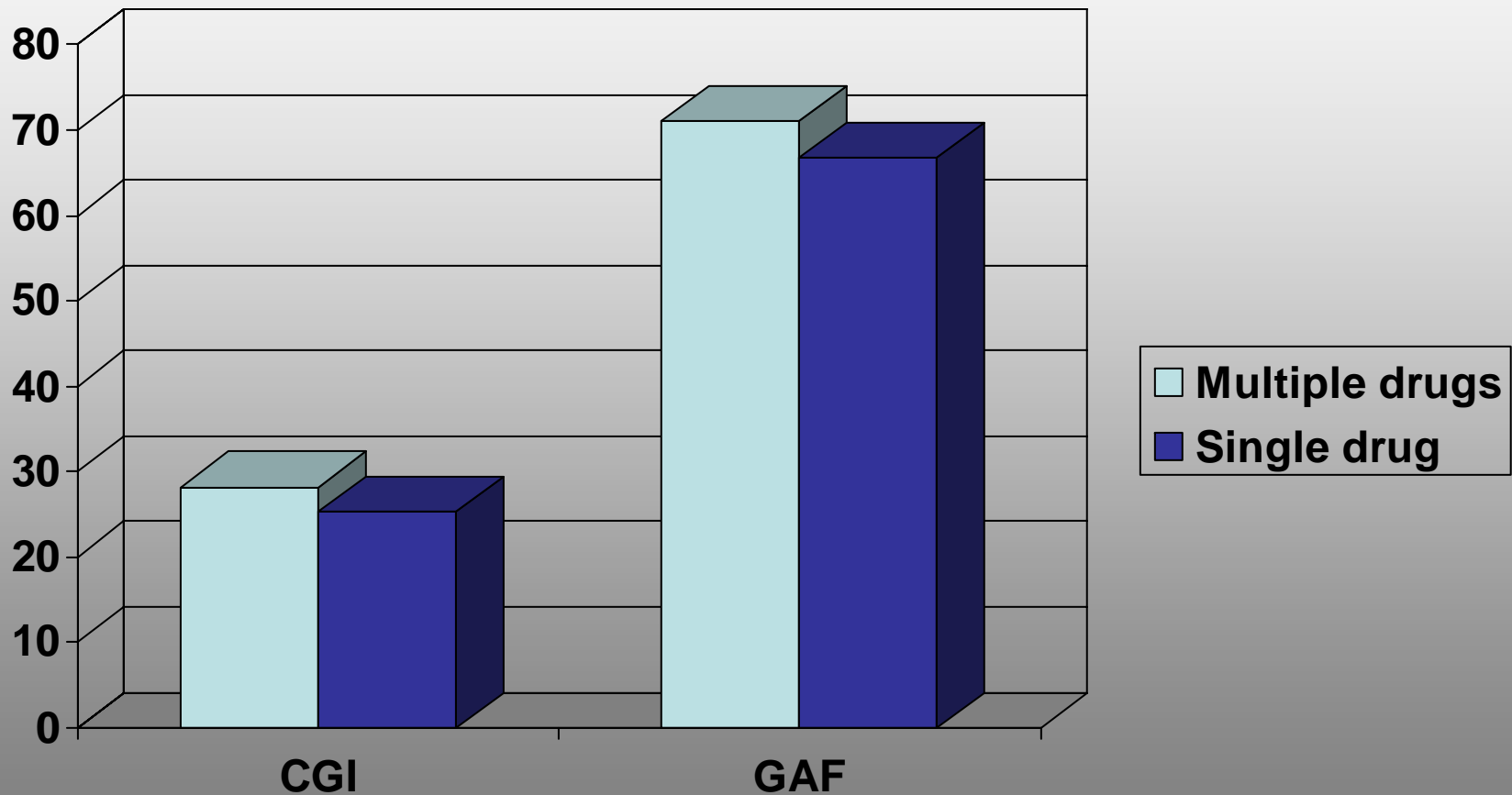
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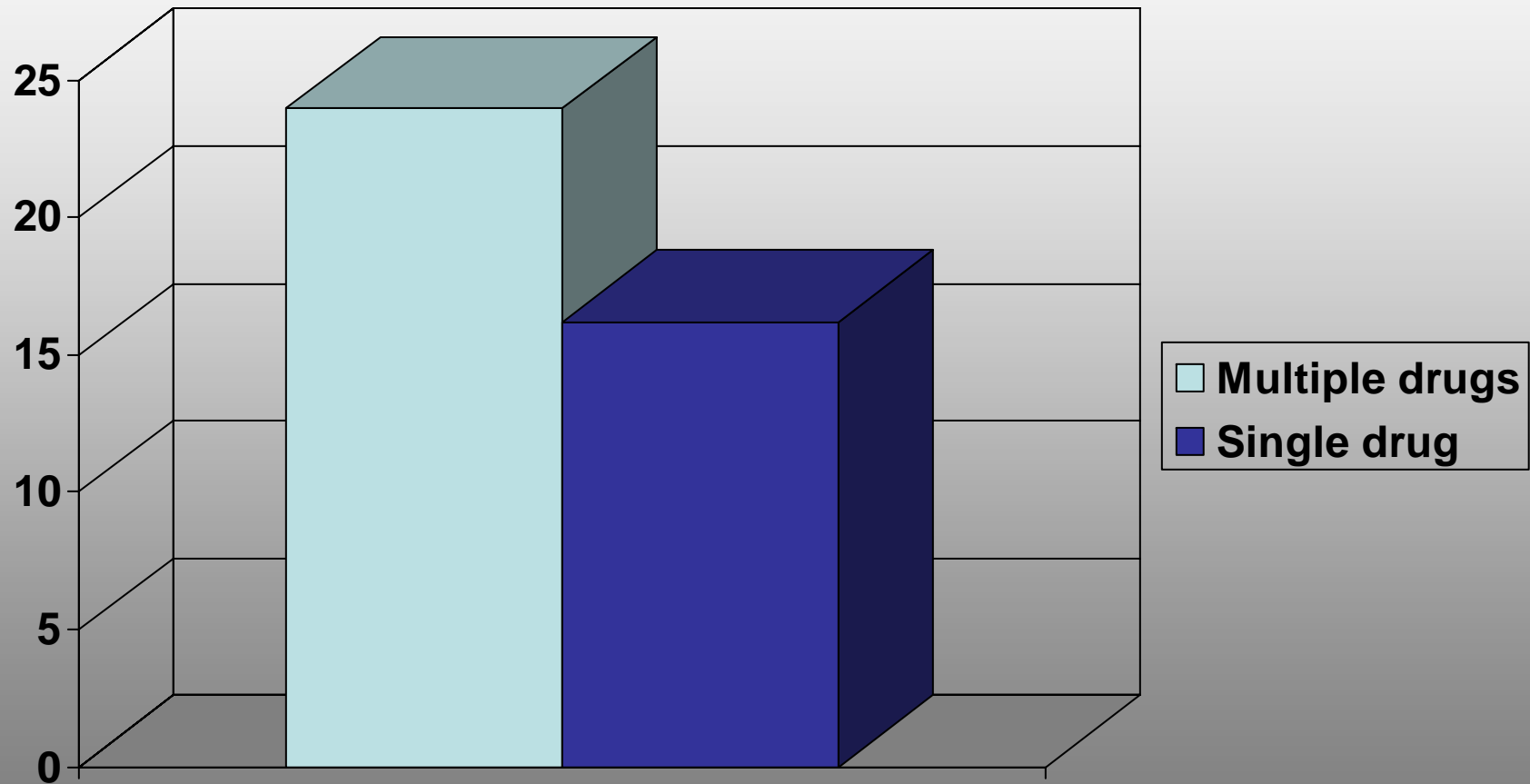
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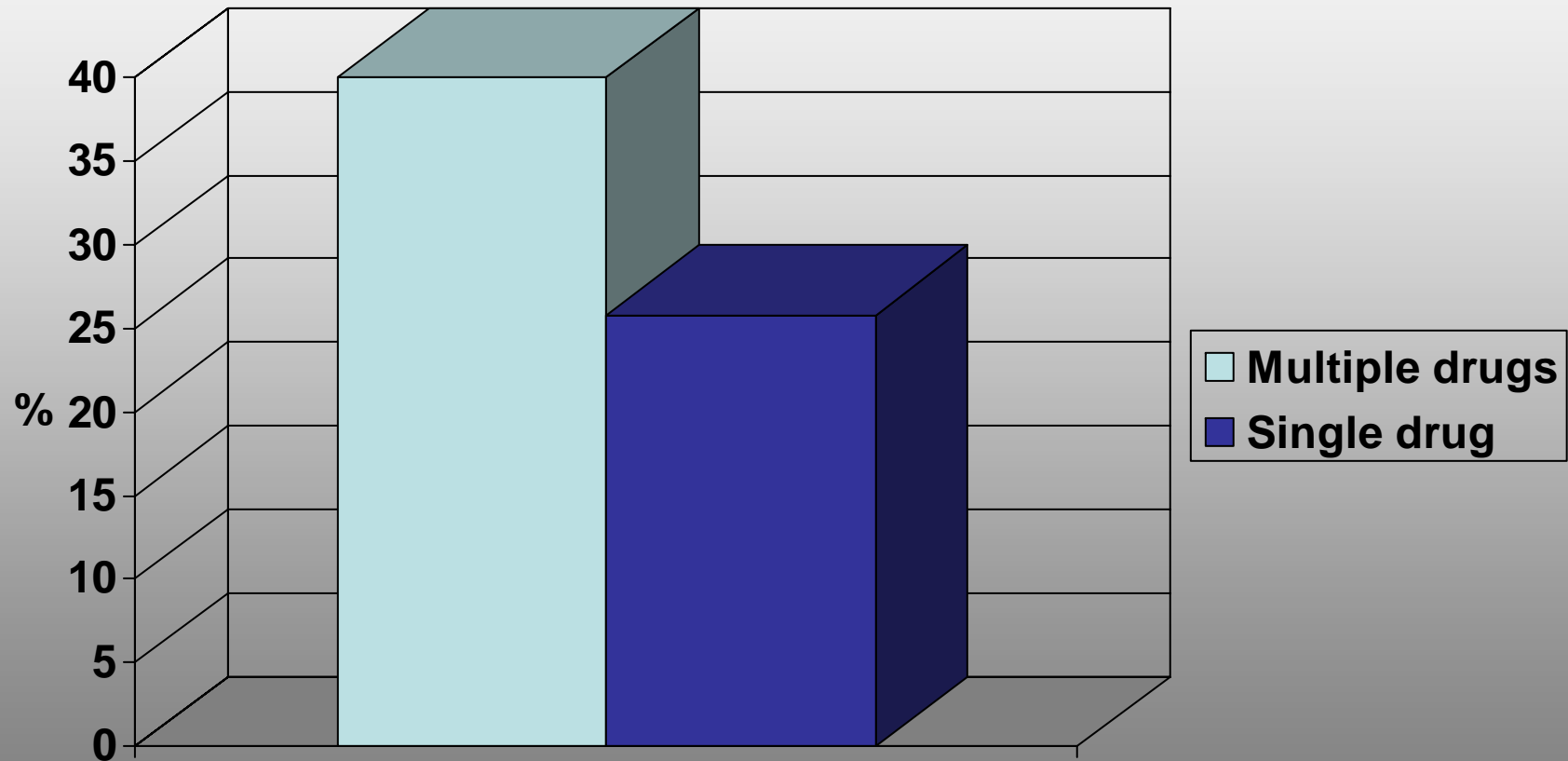
# Case Control Study of Psychiatric Patients Receiving Multiple vs. Single Antipsychotic Drugs: Clinicians' Perceptions of Treatment Effects



# Case Control Study of Psychiatric Patients Receiving Multiple vs. Single Antipsychotic Drugs: Days Hospitalized



# Case Control Study of Psychiatric Patients Receiving Multiple vs. Single Antipsychotic Drugs: Adverse Side Effects (Primarily Movement Disorders)



What Can Be Concluded About  
the Effects of Multiple vs. Single  
Antipsychotic Drugs?

# Data Analyses

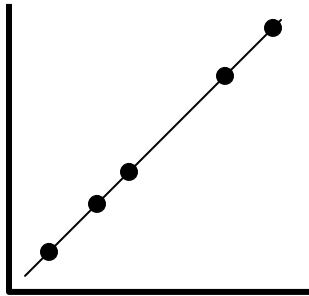
Correlation

# Correlational Research

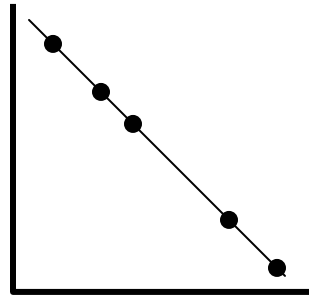
## Major Features

- No independent variables are manipulated
- Two or more variables are measured and a relationship established
- Correlational relationships can be used for predictive purposes
  - predictor variables
  - criterion variables
- “Silent” about causality

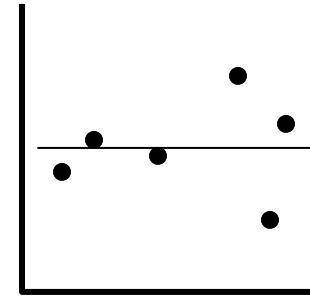
A *coefficient of correlation* is a number that indicates the strength and direction of the correlation between two variables. *Pearson's r* is a kind of coefficient of correlation. Its values range from -1.00 to +1.00.



Pearson's  $r = 1.0$



Pearson's  $r = -1.0$



Pearson's  $r = 0.0$

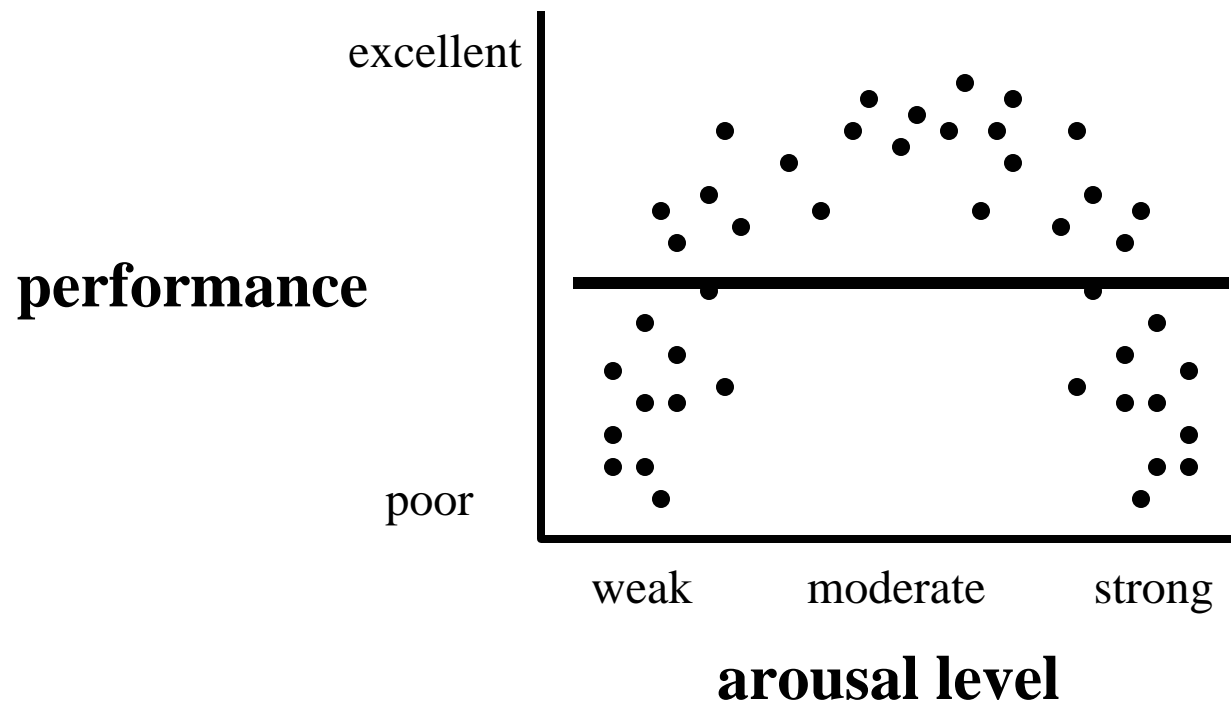
--*Negative* Pearson  $r$  values indicate a *negative or inverse relationship* between the variables.

--*Positive* Pearson  $r$  values indicate a *positive relationship* between the variables.

--A Pearson  $r$  value of *zero* indicates that there is *no relationship* between the variables.

Notice that *both* positive and negative Pearson  $r$  values suggest a *predictive relationship* between the two variables.

Is there a predictive relationship between  
arousal level and performance?  
(Pearson's  $r = 0.0$ )



While it is clear that arousal level influences performance, the effect is *nonlinear*. Pearson's  $r$  is only useful for revealing *linear* relationships between variables. In this case, the Pearson's  $r$  value of 0.0 is a poor indicator of whether arousal level and performance are truly related.

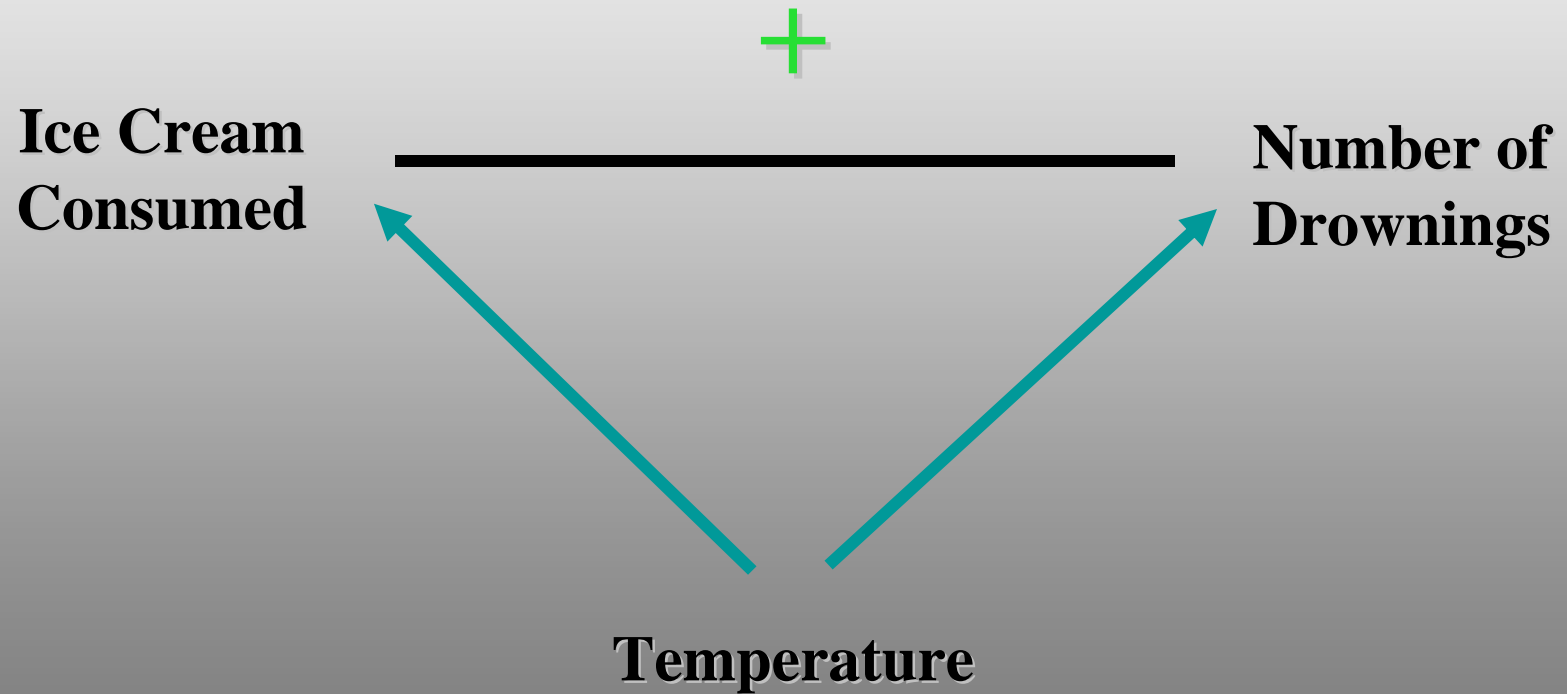
The *third variable problem*: A correlation between two variables might be explained by yet another variable that has an effect on both of the observed variables.

*Examples:*

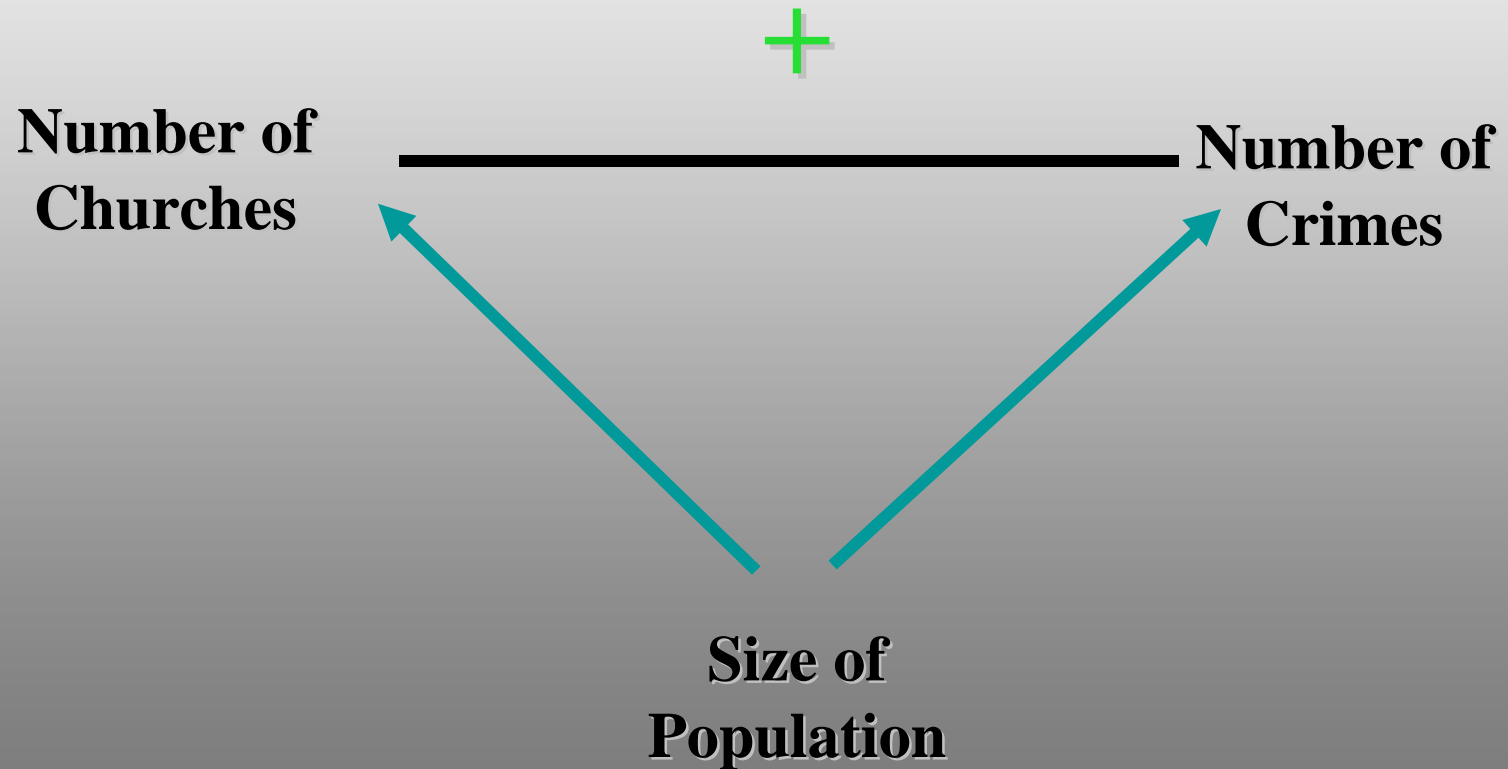
- (1) Sales of ice cream and drowning rates are correlated.
- (2) The number of crimes and the number of churches in a city are correlated.

In the cases above, a 3rd variable is probably influencing both of the measured variables. The common influence of the 3rd variable might explain why the measured variables seem to move together.

# Third Variable Problem



# Third Variable Problem



# Data Analyses

Mediation and Moderation

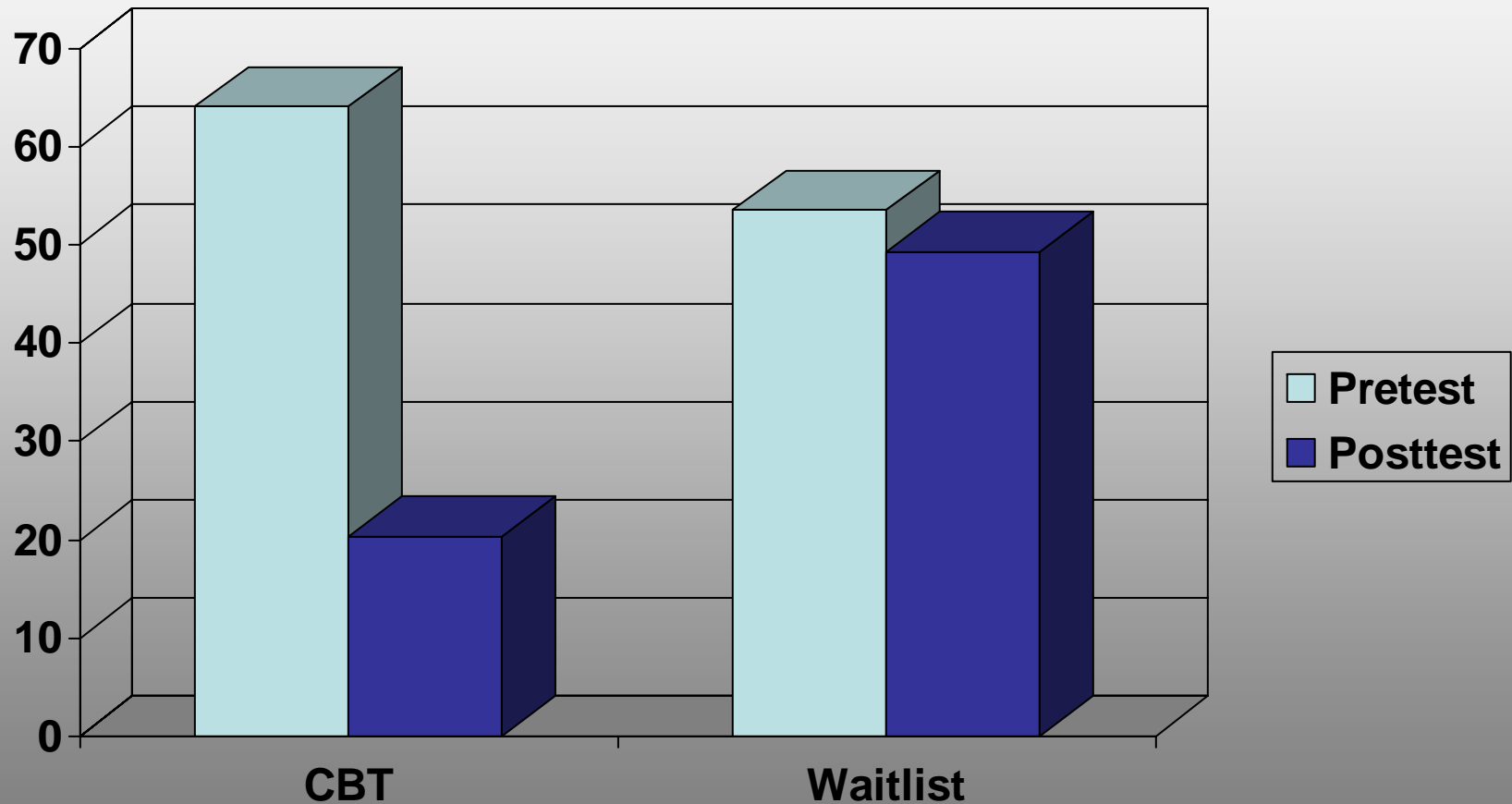
# Mediation: CBT for Anxiety and Fear of Fear (Smits et al., 2004)



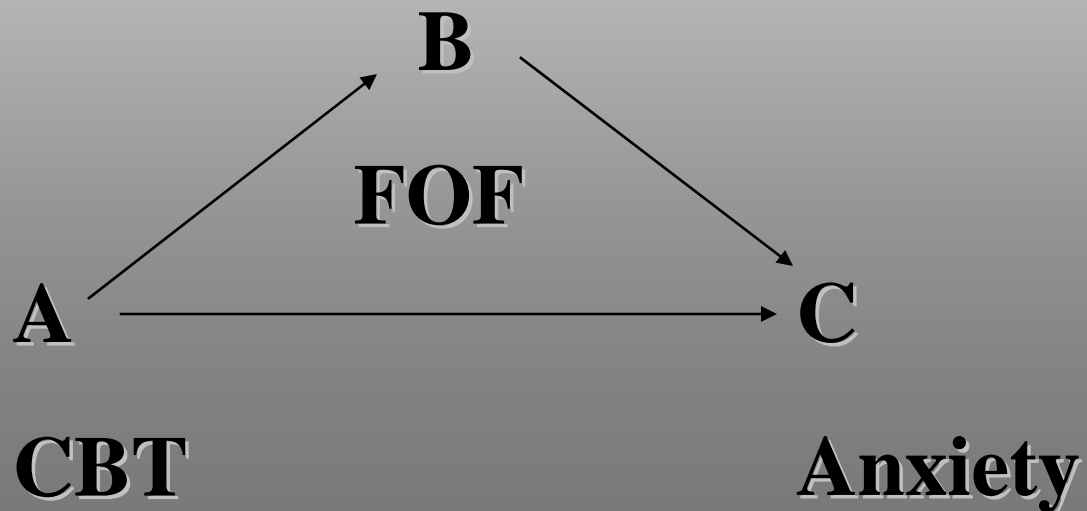
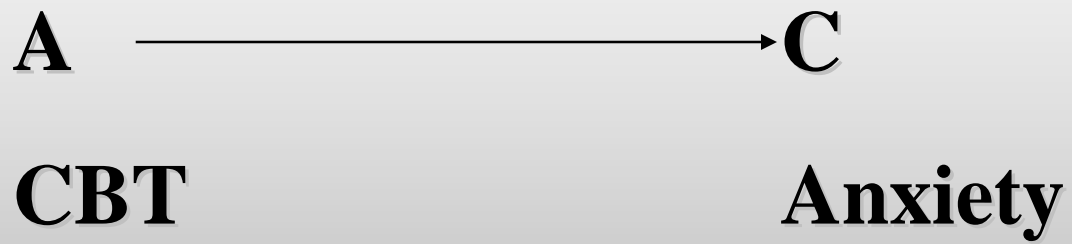
# Mediation: CBT for Anxiety and Fear of Fear

- CBT for anxiety includes
  - Education about panic and anxiety
  - Breathing retraining
  - Identification of faulty and correct threat perceptions
  - Interoceptive exposure
  - Changing maladaptive defensive behaviors, such as avoidance
- Fear of fear involves a fearful response to benign bodily sensations
  - “When I am nervous, I worry that I might be mentally ill”

# Treatment Effects: Changes in Anxiety



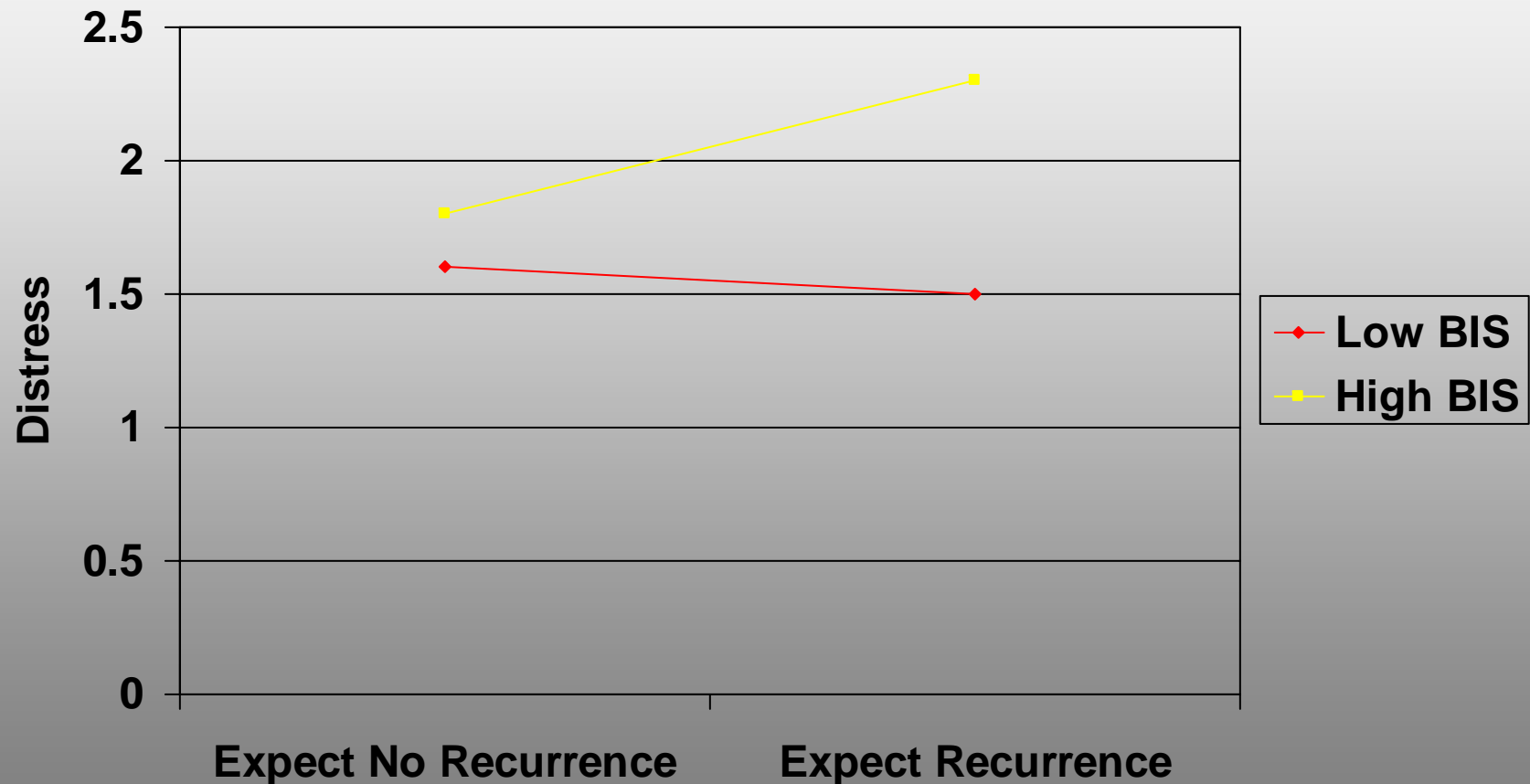
# Mediation



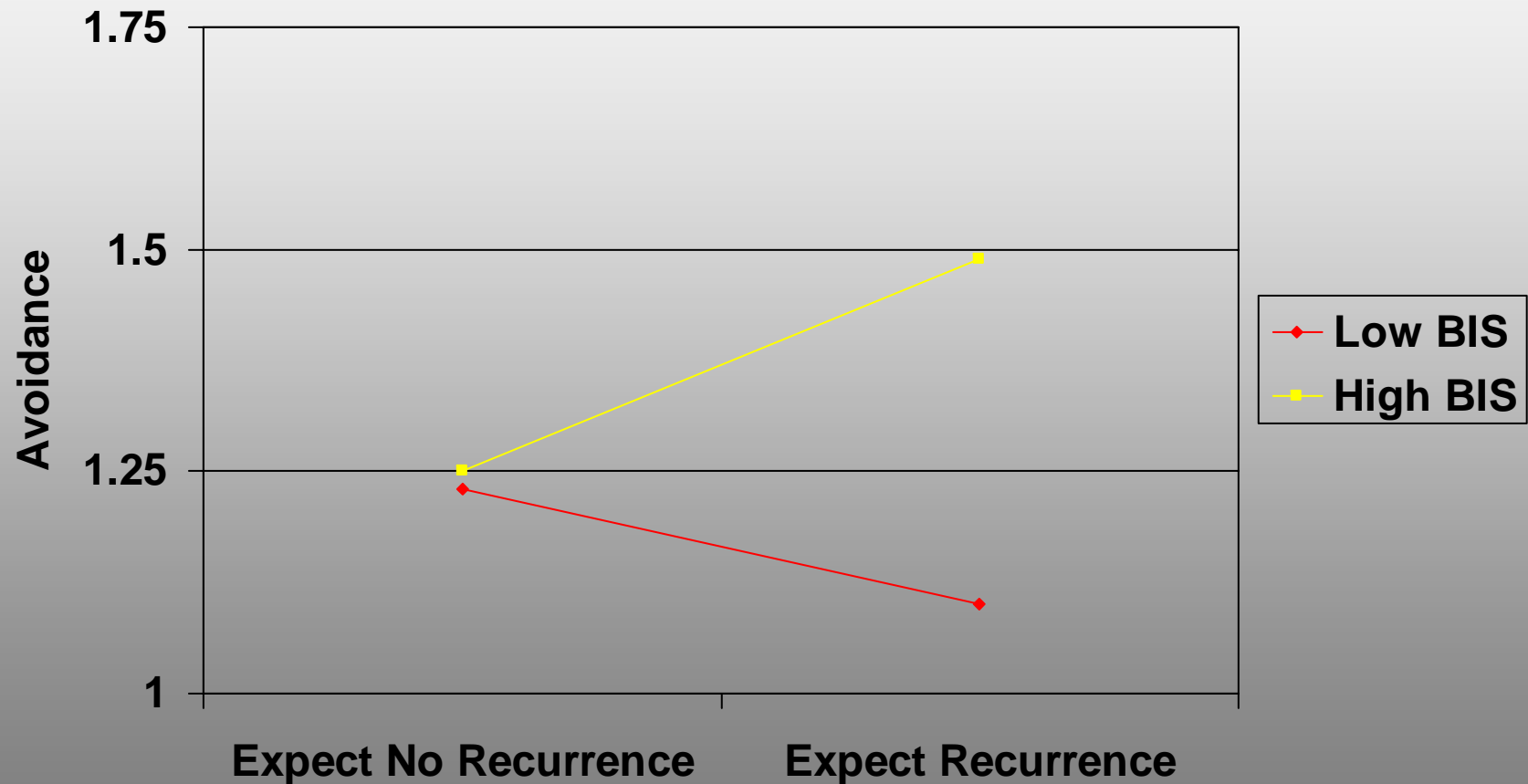
# Moderator Effects in Women With Early Stage Breast Cancer (Carver et al., 2000)

- Behavioral Inhibition System (BIS)
  - Response to threat
    - Distress
    - Avoidance

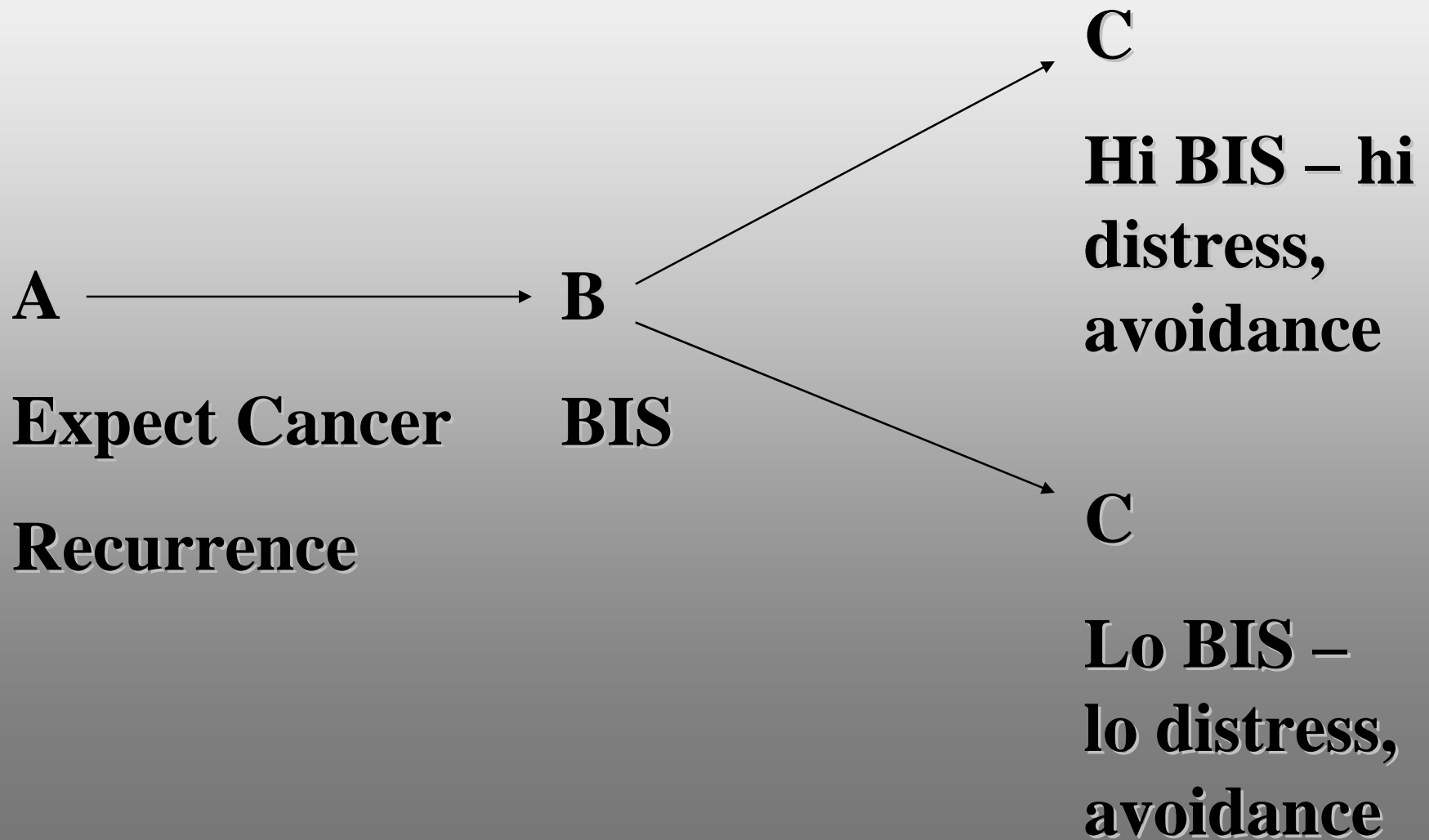
# BIS Sensitivity and Expectancy of Breast Cancer Recurrence



# BIS Sensitivity and Expectancy of Breast Cancer Recurrence



# Moderation



# Data Analyses

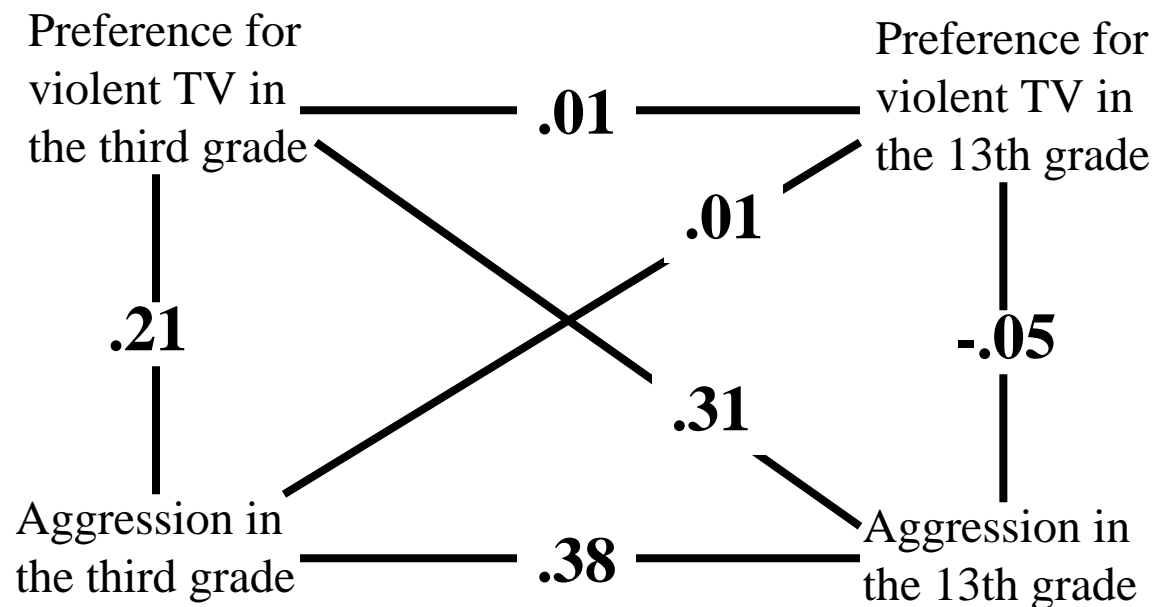
Paths to a Particular Outcome

# Directionality of Effect Problem



The ***directionality problem***: If there is a real relationship between two variables, what is the ***direction*** of the causal relationship?

Example: What is the relationship between (1) a preference for violent T.V. and (2) overt aggressive behavior? ( from Eron et al., 1972)



These data suggest that preference for violent TV might have a real causal effect on later aggression, because 3rd grade TV preference predicts later aggression.

However, 3rd grade aggression does ***not*** predict later TV preferences, suggesting that aggression may ***not*** have a causal effect on TV preference.

# Data Analyses

Subtypes

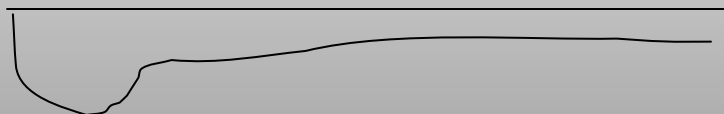
# Subtypes of Depression



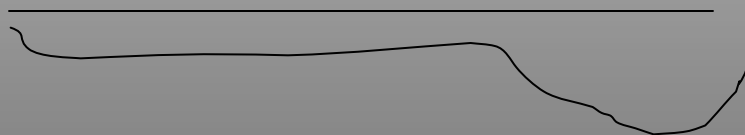
Major Depression, Recurrent



Dysthymic Disorder



Major Depression in partial remission



Major Depression superimposed on  
Dysthymic Disorder