

# INTRODUCTION TO RESEARCH

Module 4

# Issues...



- Why are we interested in research?
- What is research?
- Key concepts and issues
- Introduction to validity

# Why must we understand research?



- help make informed decisions
- need to produce research in career
- evaluating research in the media
- assist in classes

# Why is research a valued source of knowledge?

- Common ways of knowing...
  - personal experience/intuition
  - experts/traditions/authority
  - scientific method

# What is Science, the Scientific Method, and Research?

- Science...
  - a body of established knowledge
  - the observation, identification, investigation, and theoretical explanation of natural phenomenon

usually the ultimate goal is theory  
generation and verification

# What is Science, the Scientific Method, and Research?

- Theory...
  - a set of inter-related constructs and propositions that specify relations among variables to explain and predict phenomena
  - should be simple, consistent with observed relationships, tentative and verifiable

# What is Science, the Scientific Method, and Research?

- Scientific Method...
  - involves the principles and processes regarded as characteristic of or necessary for scientific investigation
  - process or approach to generating valid and trustworthy knowledge

# What is Science, the Scientific Method, and Research?

- Research...
  - the application of the scientific method
  - a systematic process of collecting and logically analyzing information (data)
- Research Methods (Methodology)...
  - the ways one collects and analyzes data
  - methods developed for acquiring trustworthy knowledge via reliable and valid procedures



# Characteristics of Research

- objective
- precise
- verifiable
- parsimonious
- empirical
- logical
- probabilistic

# Types of Research

- Trochim's Classifications...
  - descriptive
    - e.g., percentage of regular exercisers
  - relational
    - e.g., link between age and exercise
  - causal
    - e.g., effect of behavior change intervention on exercise participation

# Types of Research

- Other Common Classifications...
  - basic vs. applied vs. evaluation
  - experimental vs. non-experimental
  - analytical vs. descriptive vs. experimental vs. qualitative

# Key Concepts and Issues

- time in research
- variables
- types of relationships
- hypotheses
- types of data
- fallacies
- structure of research
- deduction and induction
- ethics
- validity

# Time in Research



cross-sectional vs. longitudinal



```
graph TD; A[cross-sectional vs. longitudinal] --> B[repeated measures]; A --> C[time series]
```

repeated measures

time series

# Variables

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- variable...
  - any observation that can take on different values
- attribute...
  - a specific value on a variable

# Examples

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**Variable**

age

**Attribute**

# Examples

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## Variable

age

## Attribute

18, 19, 20, etc...



# Examples

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**Variable**

**Attribute**

Gender or sex

# Examples

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## Variable

Gender or sex

## Attribute

Male, female

# Examples

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**Variable**

satisfaction

**Attribute**

# Examples

## Variable

satisfaction

## Attribute

1 = very satisfied

2 = satisfied

3 = somewhat satisfied

4 = not satisfied

5 = not satisfied at all

# Types of Variables

- independent variable (IV)...
  - what you (or nature) manipulates in some way
- dependent variable (DV)...
  - what you presume to be influenced by the IV

# Examples

**IV**

health status

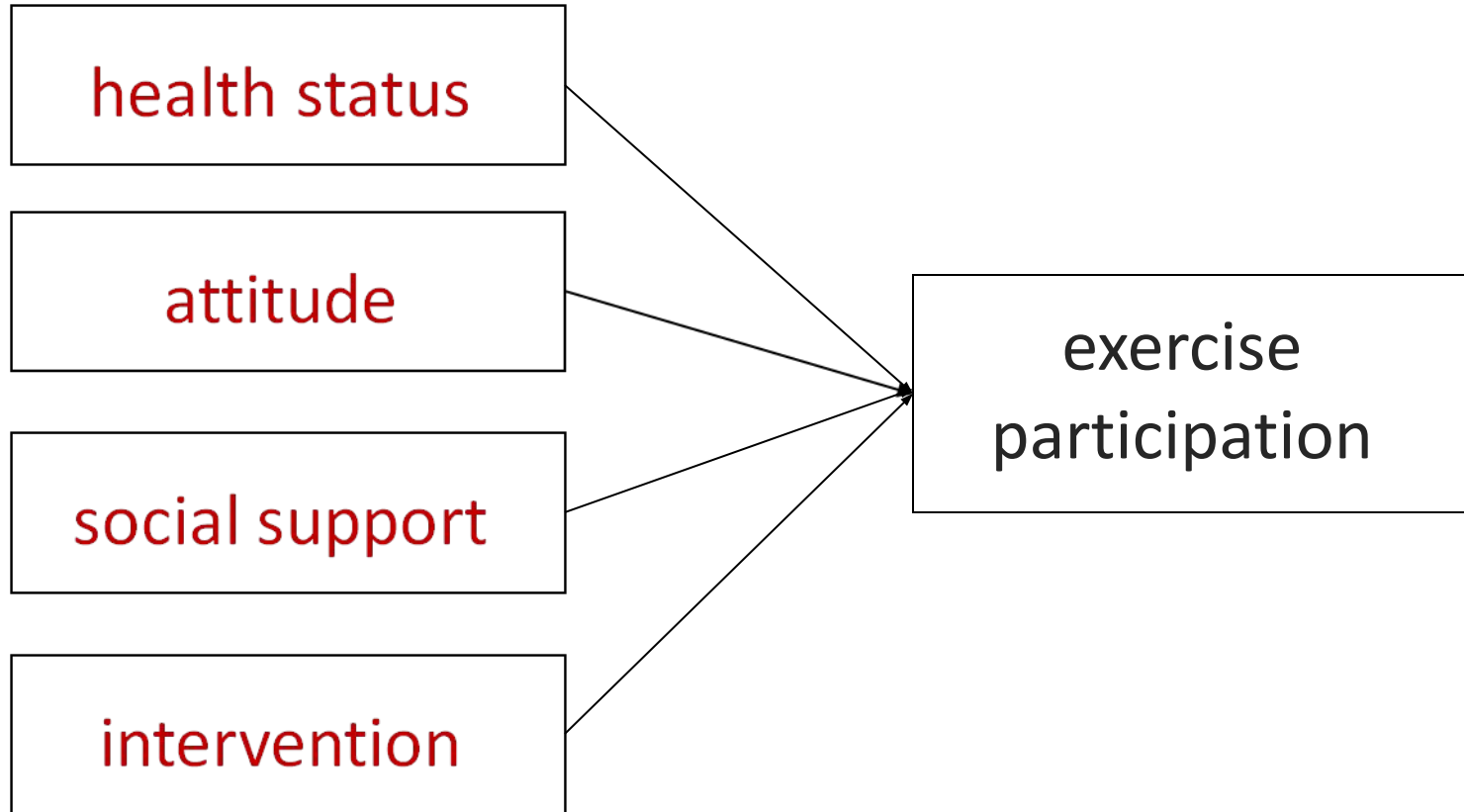
attitude

social support

intervention

**DV**

exercise  
participation



# The purpose of the study was to...

- test whether the “Fair Play for Sport” curriculum is effective in promoting moral development in youth
- examine the relationship between age and VO2max.
- test whether there are gender differences the value placed on sport participation
- determine whether students’ perceptions of the amount of positive, negative, and informational feedback provided by their teachers is predictive of their self-esteem and level of achievement

IV, DV?

# Types of Relationships

- correlational vs. causal relationships

variables perform in a  
synchronized manner

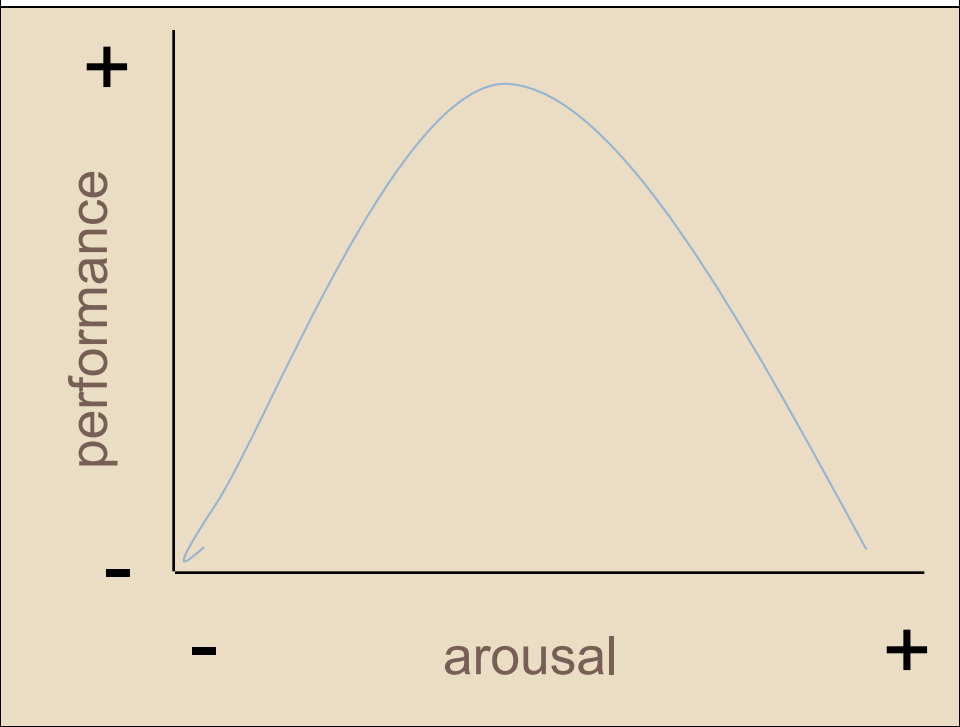
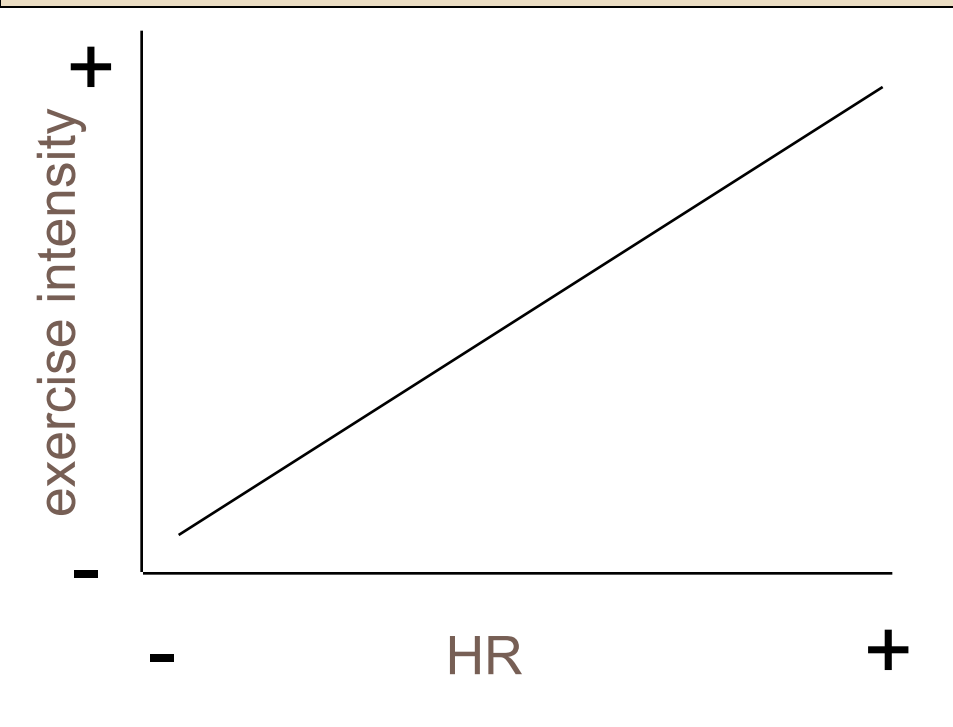
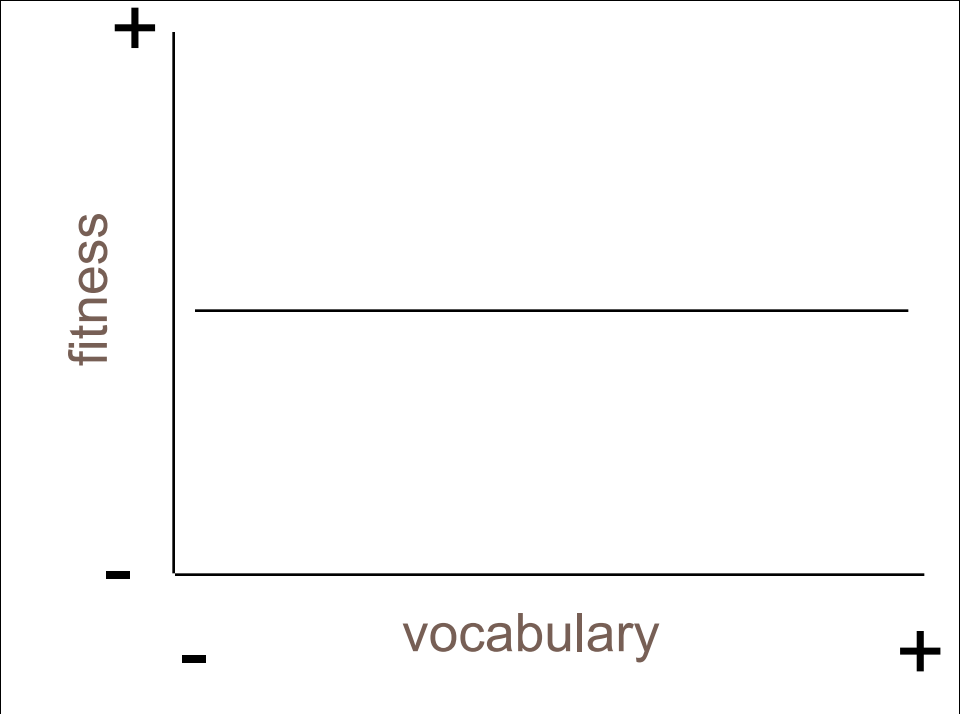
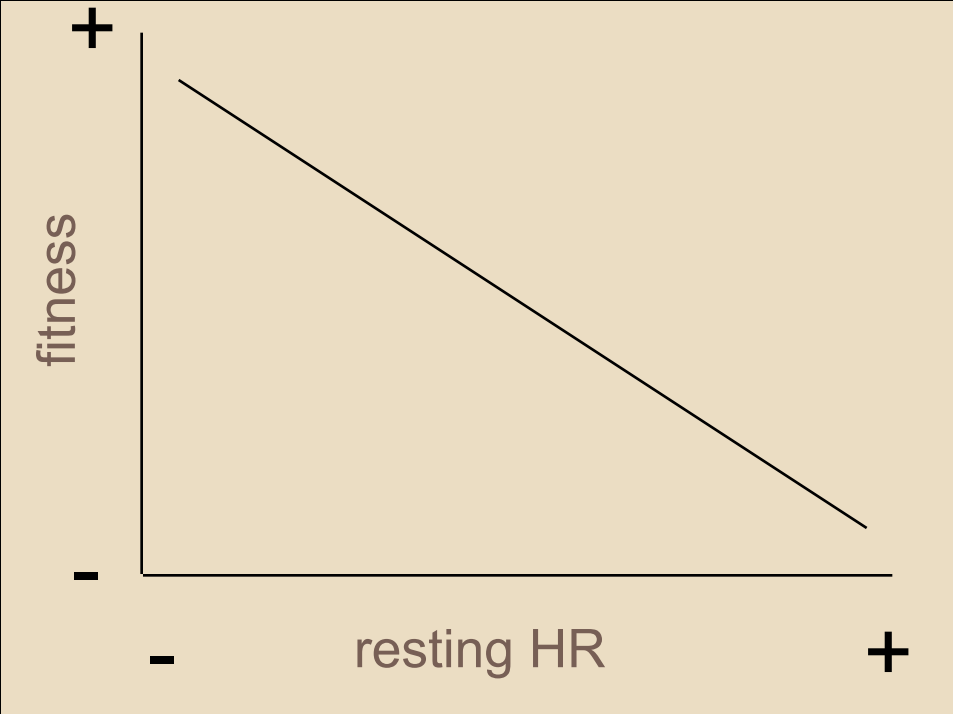
one variable causes the other  
variable

**correlation does not imply causation!**  
**(it's necessary but not sufficient)**



# Types of Relationships

- patterns of relationships...
  - no relationship
  - positive relationship
  - negative relationship
  - curvilinear relationship



# Hypotheses

- hypothesis...
  - a specific statement of prediction
- types of hypotheses
  - alternative vs. null
  - one-tailed vs. two-tailed

# Hypotheses

- alternative hypothesis ( $H_A$ )...
  - An effect (that you predict)
- null hypothesis ( $H_0$ ) ...
  - Null effect

# Hypotheses

**hypothesis**      there is a relationship between age  
and exercise participation

$H_A$       there is a relationship

$H_0$       there is not a relationship

this is a two-tailed hypothesis as no  
direction is predicted

# Hypotheses

**hypothesis**      an incentive program will increase exercise participation

$H_A$       participation will increase

$H_0$       participation will not increase or will decrease

this is a one-tailed hypothesis as a specific direction is predicted

# Types of Data

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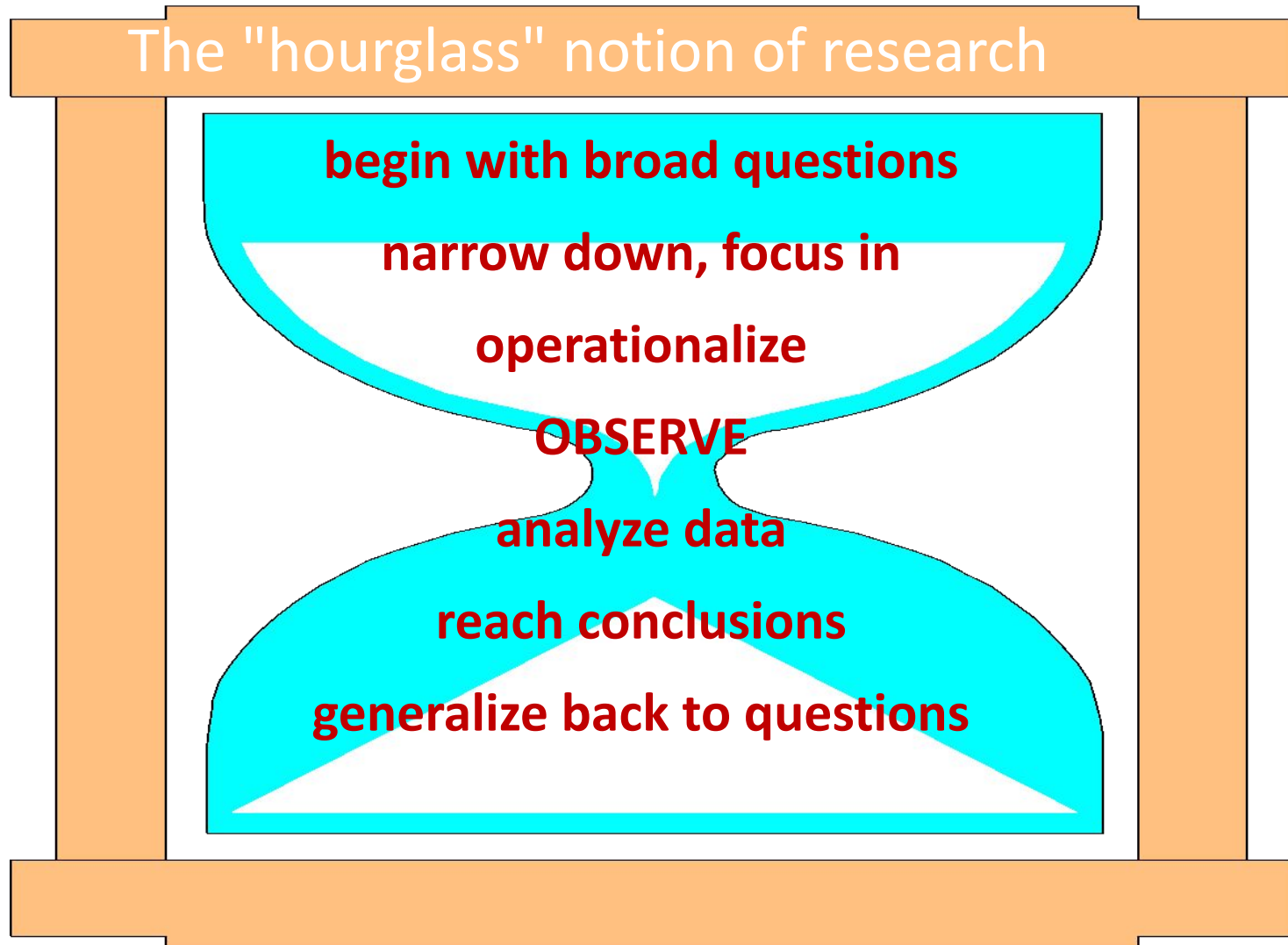
- quantitative vs. qualitative

# Research Fallacies

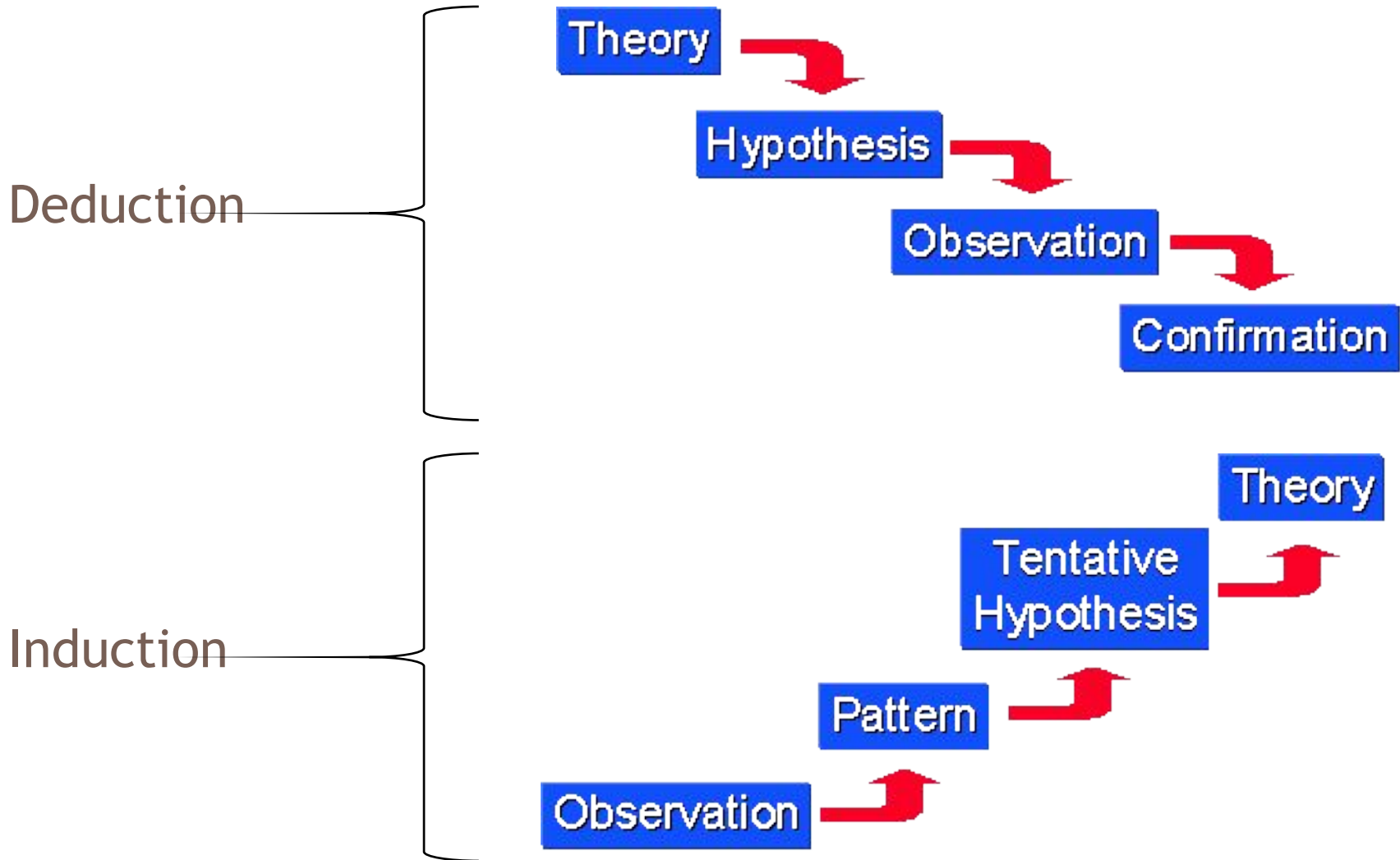
- fallacy...
  - an error in reasoning (logic or premise)
- types of fallacies described by Trochim
  - ecological
  - exception



# Structure of Research



# Deduction and Induction



# Ethics in Research

- balance between protecting participants vs. quest for knowledge
- IRB provides one mechanism
  - informed consent/assent
  - confidentiality and anonymity
  - justification of procedures
  - right to services
  - [http://www.rsp.ilstu.edu/policy/IRB/IRB\\_policy.pdf](http://www.rsp.ilstu.edu/policy/IRB/IRB_policy.pdf)

# Practice Questions

1. Is the study descriptive, relational, or causal?
2. Is the study cross-sectional or longitudinal?
3. What is (are) the IV (IVs)?
4. What is (are) the DV (DVs)?
5. What are the alternative and null hypotheses?

# Practice Questions

A. The purpose of the study was to examine the link between age and physical fitness levels in terms of muscular strength and endurance. It was hypothesized that older and younger adults would demonstrate significantly different fitness levels.

# Practice Questions

B. The purpose of the study was to determine whether track athletes trained to use mental imagery performed superior to athletes who did not receive the mental imagery training. We expected those athletes receiving the training would perform significantly better than the untrained athletes.

# Practice Questions

C. The study examined the effects of an acute bout of resistance training on participants' mood and cognitive functioning at 1, 6 and 12 hours post exercise. It was expected that the positive effects on mood and cognitive function would decline over time.

# Practice Questions

D. Participants at the 2009 Chicago Marathon were polled to determine their satisfaction with the course. The race officials hoped for positive reactions on the part of the runners.



# Practice Questions

E. A researcher was interested in the role of caffeine in sports performance. In cooperation with her University's baseball team, she randomly assigned players to one of two conditions: (1) no caffeine or (2) low dose (100mg). She then used performance on a batting machine as a test. She speculated that caffeine would positively affect performance.

# Introduction to Validity

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- validity...
  - the best available approximation to the truth of a given proposition, inference, or conclusion

# Introduction to Validity

- types of validity...
  - conclusion
  - internal
  - construct
  - external

types of validity are cumulative

# Introduction to Validity

- for each type of validity there are typical threats, and ways to reduce them
- this provides our framework for critiquing the overall validity (= worth) of studies

# Additional Information



- Describing Refereed Articles
- Sharing Research Findings with Clients

Theory

What you *think*

Cause  
Construct

cause-effect construct

Effect  
Construct

operationalize

operationalize

Program

program-outcome relationship

Observations

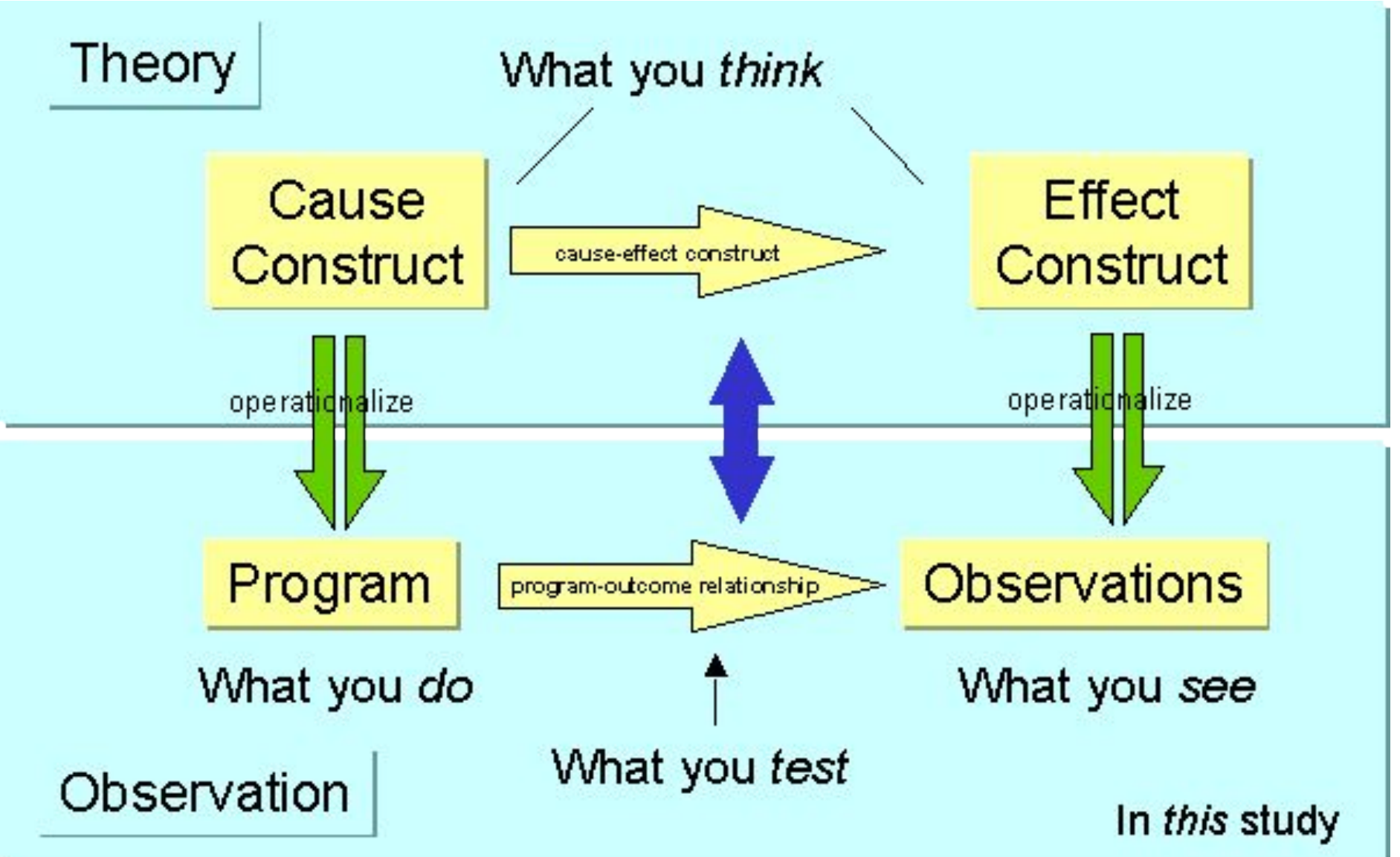
What you *do*

What you *see*

Observation

What you *test*

In *this* study



# The Validity Questions Are *Cumulative*...



# The Validity Questions Are *Cumulative*...



In this study

**Is there a relationship between the cause and effect?**



# The Validity Questions Are Cumulative...



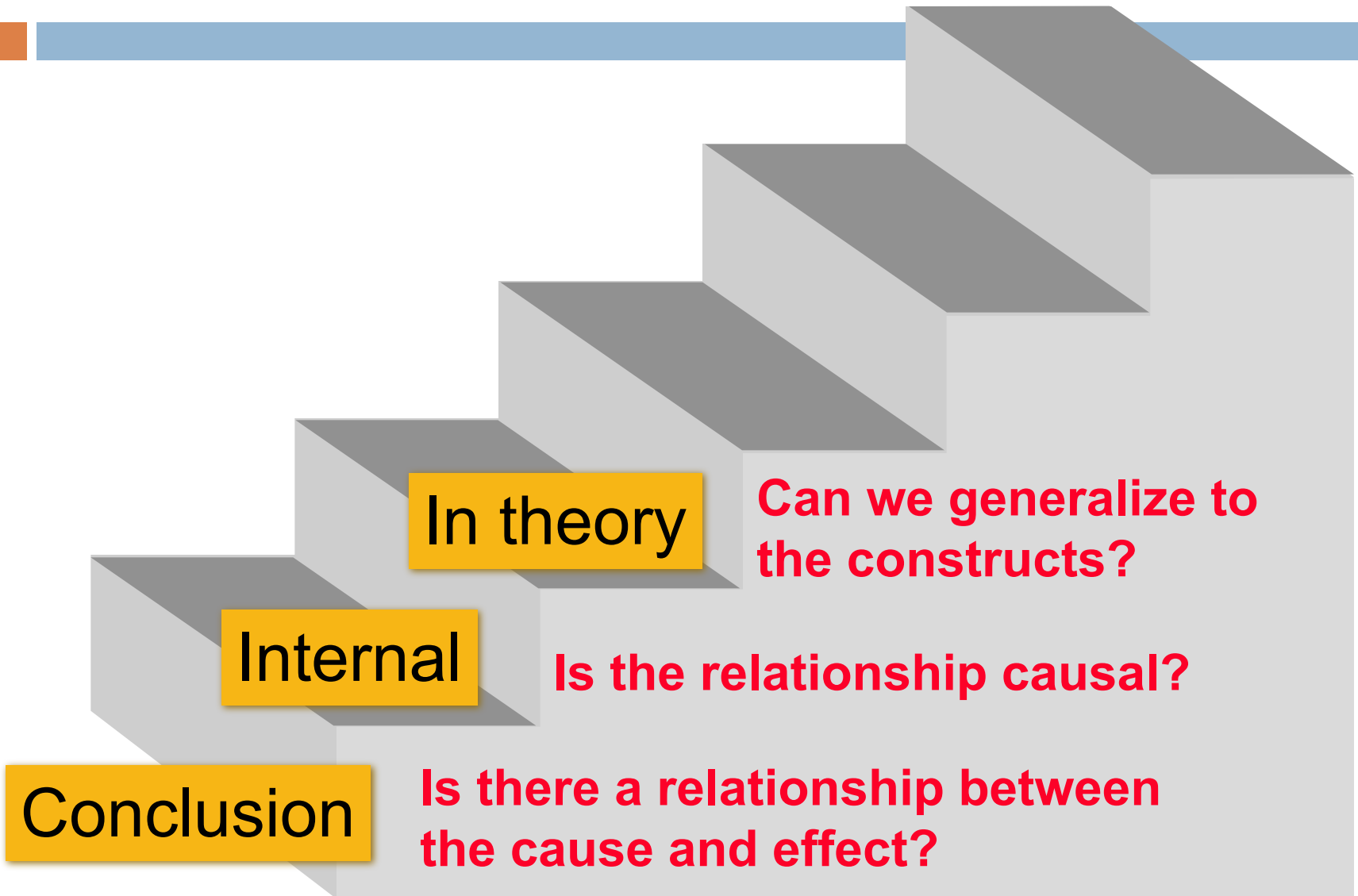
In this study

Is the relationship causal?

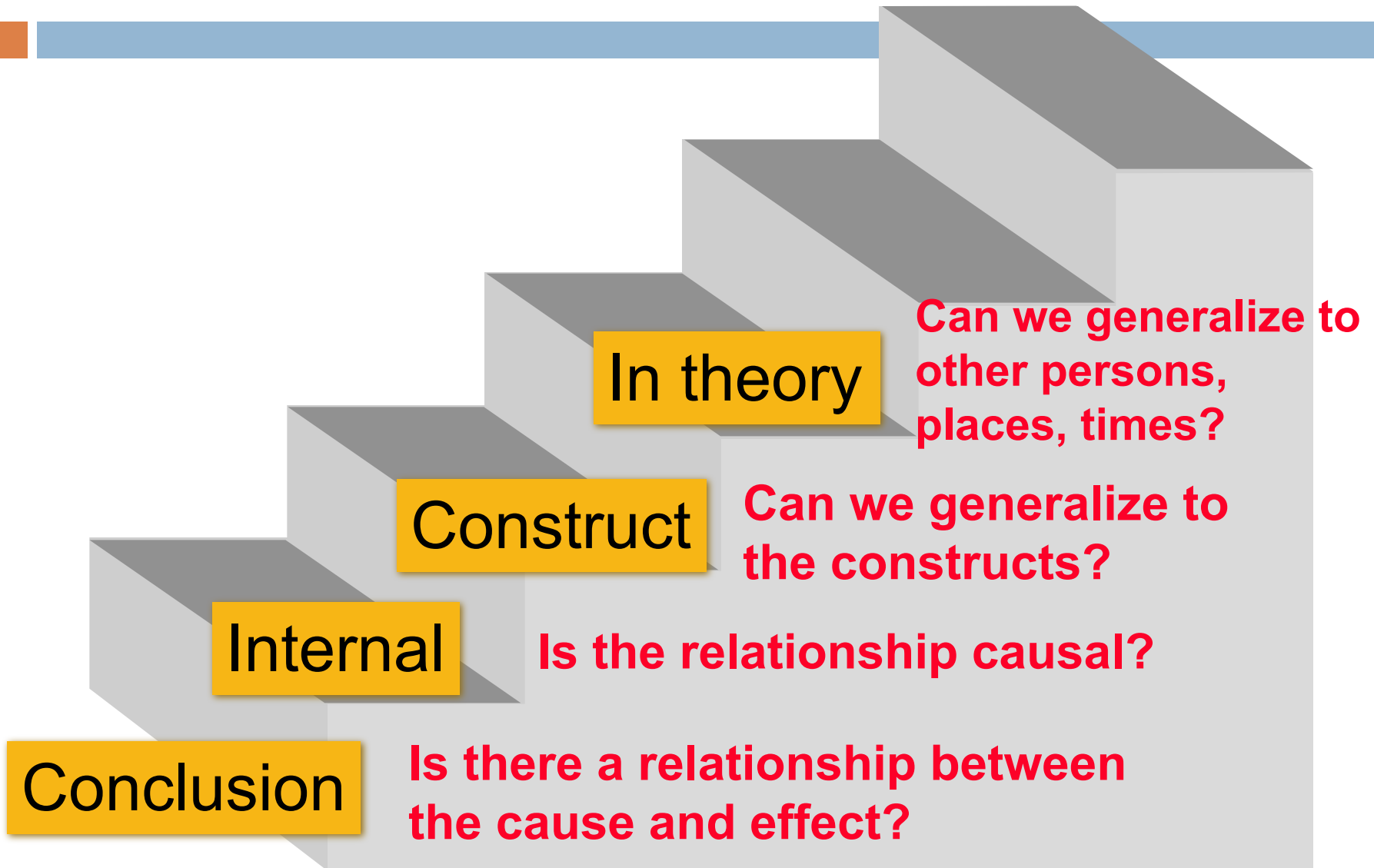
Conclusion

Is there a relationship between the cause and effect?

# The Validity Questions Are Cumulative...



# The Validity Questions Are Cumulative...



Can we generalize to other persons, places, times?

In theory

Can we generalize to the constructs?

Construct

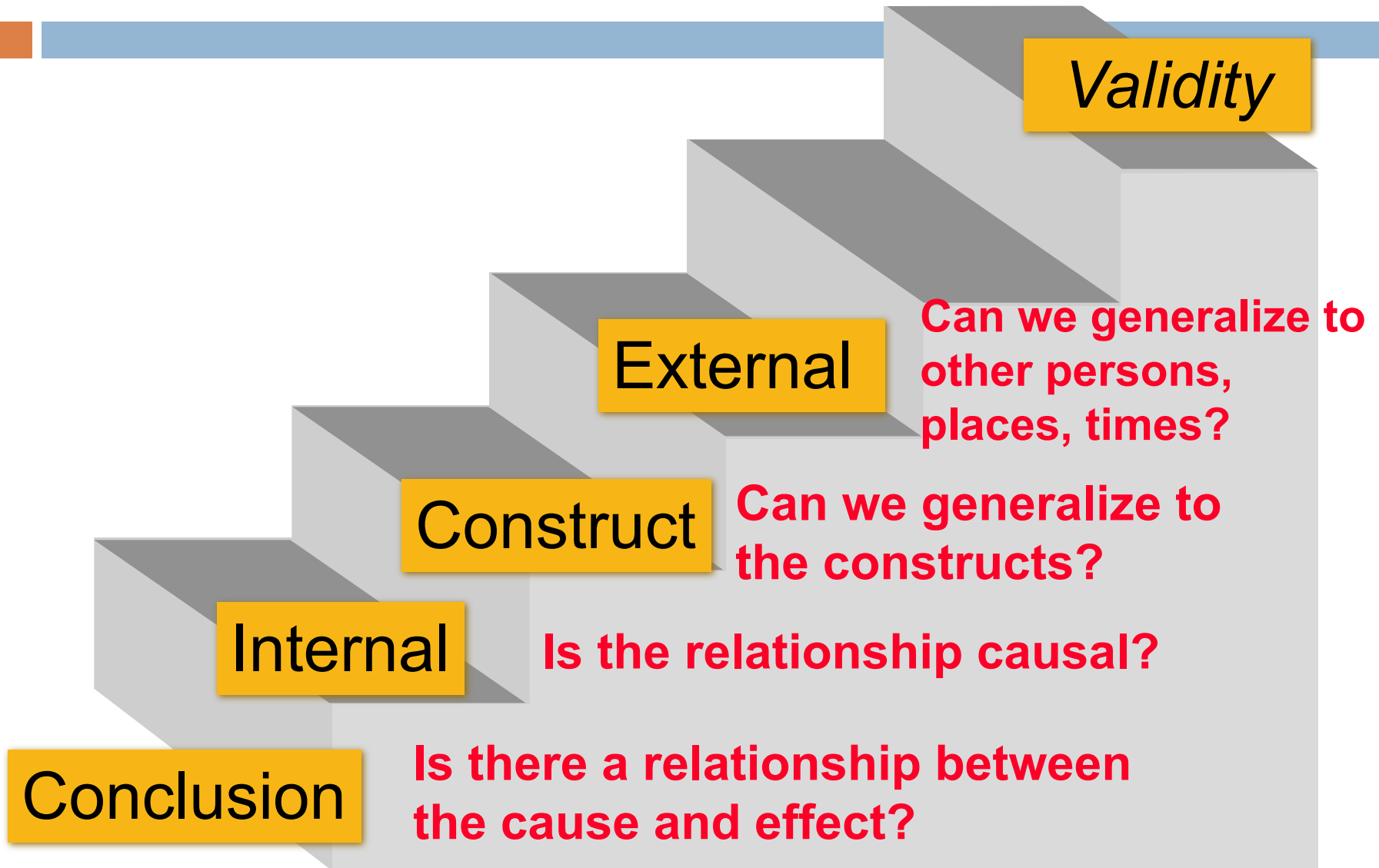
Is the relationship causal?

Internal

Is there a relationship between the cause and effect?

Conclusion

# The Validity Questions are *cumulative*...



# Validity Questions are *Cumulative*

