

# Research Approaches

There are three basic approaches to doing behavioral research:

Naturalistic Observation  
Relational & Survey Designs  
Experimental Designs

Each has its advantages and disadvantages. However, they all have a few key elements in common. *All involve measuring behavior and relating the observations to explanations.*

In order to do this, and make the process of observation “public” – communicate it accurately to other scientists, there are certain “rules” for how we conduct studies.

# I. Some Terminology

## A) Operational definition

In order to make our observations *reliable* (repeatable), we must make the nature of our observations clear. This means we provide a precise description of what behavior we measure and how we measure it.

We also relate this definition to the concept that we are examining. So, for example, an operational definition of reading ability is the score on the SAT reading (verbal) test.

A second issue is whether the definition is *valid*. That is, does the definition and measurement really capture what we mean by our concept? Is the SAT Verbal score a real measure of reading ability? This is an issue of validity.

## **B) Dependent variable**

The dependent variable(s) in a study is/are the behavior(s) that we measure. It is codified (defined) by an operational definition.

## **C) Independent variable**

In an *experiment*, this is a quality of the environment that is manipulated by the researcher to investigate what influence it has on behavior. There is no independent variable in studies that are not experiments.

## **D) Subject (Participant) variable**

A quality of the individual participants (subjects) that the researcher measures to see what relation it has to behavior (age, gender, intelligence, etc).

Note: The term *variable* means anything that can take on more than one value.

## **II. Science as the study of relations between variables**

If we are interested in whether a new curriculum for reading is working, we want to determine the relationship between two variables: reading curriculum and reading ability.

To do this study, we need to precisely specify what we mean by reading curriculum and reading ability. We operationalize these two concepts. We would specify the two or more reading curricula that we wish to study and we would specify how and when we will measure reading ability. These are the *operational definitions* of reading curricula and reading ability.

If we design the study properly, we will be able to determine if one curriculum works better than the other(s) for the types of participants that we used.

### **III. The Three Methods of Investigation**

A) In **Naturalistic Observation**, we would observe our participants' behavior in it's normal setting. This is the typical first step taken in an area of research. The purpose is to catalog behavior and the circumstances (when & where) each behavior occurs. This approach also has real-life relevance since we are observing “real-life”.

Since we observe events as they normally happen, we have *little or no control*. This means that it is difficult (or impossible) to determine precisely which aspects of the environment are producing or influencing our participants' behavior.

How would we do this with our example of looking at two reading curricula?

**B) Relational** research measures two or more aspects of our participants (their environment, individual characteristics – subject variables, behaviors) and attempts to establish the relationship(s) among them.

For example, how well can we predict college grades from grades in high school or from the scores on the SAT. Does the LSAT predict success in law school or success in passing the bar exam?

Establishing a relationship leads to theories about behavior and to the ability to predict future behavior.

This approach gives us more control than naturalistic observation, but is also more artificial (we are no longer observing the participants in their natural environment). This approach still lacks sufficient control to determine cause and effect.

C) **Experimental** designs involve manipulating the environment (one or more independent variables) to investigate the influence of the manipulation (independent variable) on behavior.

The basic logic is simple. Control the environment to hold *everything* constant. Alter (manipulate) *only* those qualities that we *wish to investigate*. Observe the effects of these alterations on behavior.

Since the *only* thing varying is what we are manipulating (the *independent variable*), then if we observe changes in behavior (the *dependent variable*), **these changes must have been produced by the independent variable.**

The experiment allows us to determine cause and effect. However, it does so by exerting control and reducing the variation that occurs naturally. That is, we lose (some) naturalness.

## **IV. Cause, Effect and the Three Research Approaches.**

A) Naturalistic observation and relational designs *can not* determine cause and effect.

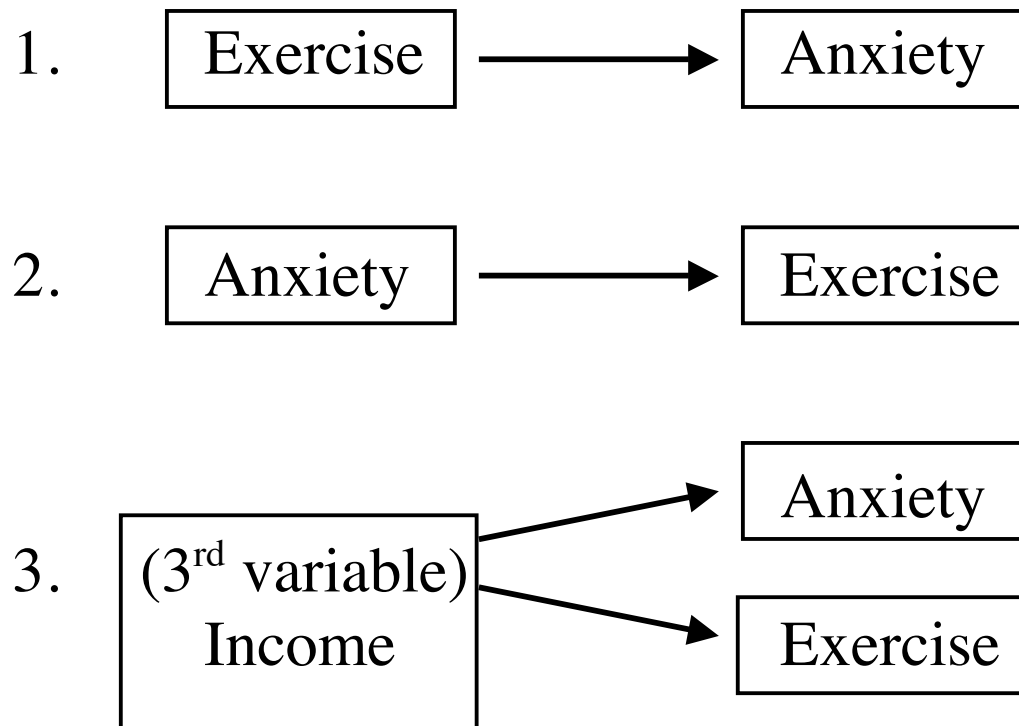
Why? - There may be some unobserved factor that is causing the behavior and the direction of any relationship between observed variables is unknown.

Example : We measure exercise habits and anxiety levels and find that individuals who exercise more typically have lower anxiety levels.

1. Does exercise lead to (cause) lower anxiety?
2. Does greater anxiety lead to (cause) people to exercise less?
3. Is there some other variable that causes both?



Graphically, these are the three possible causal relations.



There are more sophisticated variations on relational designs that can help us to examine cause and effect. However, the major disadvantage of natural observation and relational designs is their inability to determine causal relationships.

B) An experiment *can* be used to sort these out because it controls the environment so that we can eliminate alternative interpretations.

We do this via experimental control and randomization.

1. Anything that we can hold constant, we hold constant. *If something is not varying, it can not produce variation in behavior.*

2. Things that we can not hold constant, we distribute randomly or equally so that they do not vary with the independent variable.

In this way, we eliminate alternative explanations for our data.

Example: How would we construct an experiment to determine if our new curriculum for reading is better than the “old” or current curriculum?

We would want to take two groups of students. Form the groups to make them as similar as possible. One group goes through the old reading curriculum, one goes through the new curriculum. At the end of the reading curricula, test both groups for reading skill. The group with the new curriculum should score higher if the new curriculum is working better.

Note the key elements:

1. Form two *equivalent* groups.
2. *Treat them identically* except for the reading curriculum.
3. Compare the two groups on a reading measure after the curriculum.

For this to work, we need to make the groups equivalent. The typical way to do this is random assignment. That is, if we have 50 students, for each one we would let chance determine which group they are assigned to.

We need to treat the students identically except for the reading curriculum. All other aspects of their school, classes, etc are to be the same. What are some of the variables that we would have to deal with?

Reading ability is represented by their score on our reading test. We need to make this test a reasonable (valid, reliable) assessment of the skill of reading.

If we do all of this, then there is only one systematic (non-random) difference between our two groups of students at the end of the experiment. That is the reading curriculum. Consequently, any difference in reading score must be due to the curriculum. If the new curriculum students have a higher reading score at the end of the study, then it is the curriculum that caused this.

Doing this ideal experiment would be difficult. Does the same person teach both classes? Are there problems with this? What would be the potential problems of having different teachers? How do we equate the time of day that reading is taught? (alertness, learning vary with the time of day)

## **V. Choosing a Method**

### **A) Control versus Naturalness**

The high degree of control in the laboratory can also lead to somewhat artificial behavior. However, it is possible to do experimental research in a natural setting. This is called field research and could involve experimental or relational designs.

The thing that makes naturalistic observation “realistic” and “natural” is not that it is done in the real world. It is that the “normal” behavior of participants is measured with no or minimal intrusion.

*Example 1:* In an effort to improve the accuracy of voting, we could set up different ballot designs or voting procedures and use them in different precincts. Then, we could compare the number of ballots that had to be rejected because of “voter error”. Running the study in an actual election with real voters would ensure that our results “generalize” to the real world. (But might not be ethical, why?)

*Example 2:* Research on whether a high, center mounted brake light on a car would reduce the incidence of rear-end collisions was done using taxis in New York City. Cabs were randomly assigned to have different configurations of rear brake lights and the incidence of rear end collisions was monitored.

Both are examples of field experiments. The use of the experimental method does not require that the work be done in the laboratory.

## B) Ethical and Practical Considerations

Naturalistic observation and relational studies are often done because an experiment is either impractical or unethical.

The influence of traumatic events on people is studied using individuals who have experienced these events (combat for soldiers, rape victims, accident victims, natural disasters). Their experience and behavior is compared to other, similar individuals who have not had the traumatic experience. Creating these experiences would be unethical.

To study the influence of maternal employment on child development, we would examine children in families where the mother works and compare them to families where the mother does not. Again, maternal employment here is occurring “naturally”.



In both of these cases, the situations that occur in the real world are used to form groups of subjects and we look for differences in behavior. However, cause and effect conclusions are not justified since any factor that co-varied between the groups could be the real cause.

### C) Converging operations and generalization.

Since both field and laboratory have advantages, it is often worth doing both laboratory and field research. In this way, we provide a more complete description and should have a more complete understanding of the factors that influence behavior.

Similarly, if a topic can be studied experimentally in the lab and with naturalistic observation in the real world, combining the results of these gives us a more complete picture.

## VI. Validity

When we do research, we are concerned with the types of conclusions that we can draw and how general our results are. These are questions of validity.

We distinguish three types of validity.

Construct validity

Internal validity

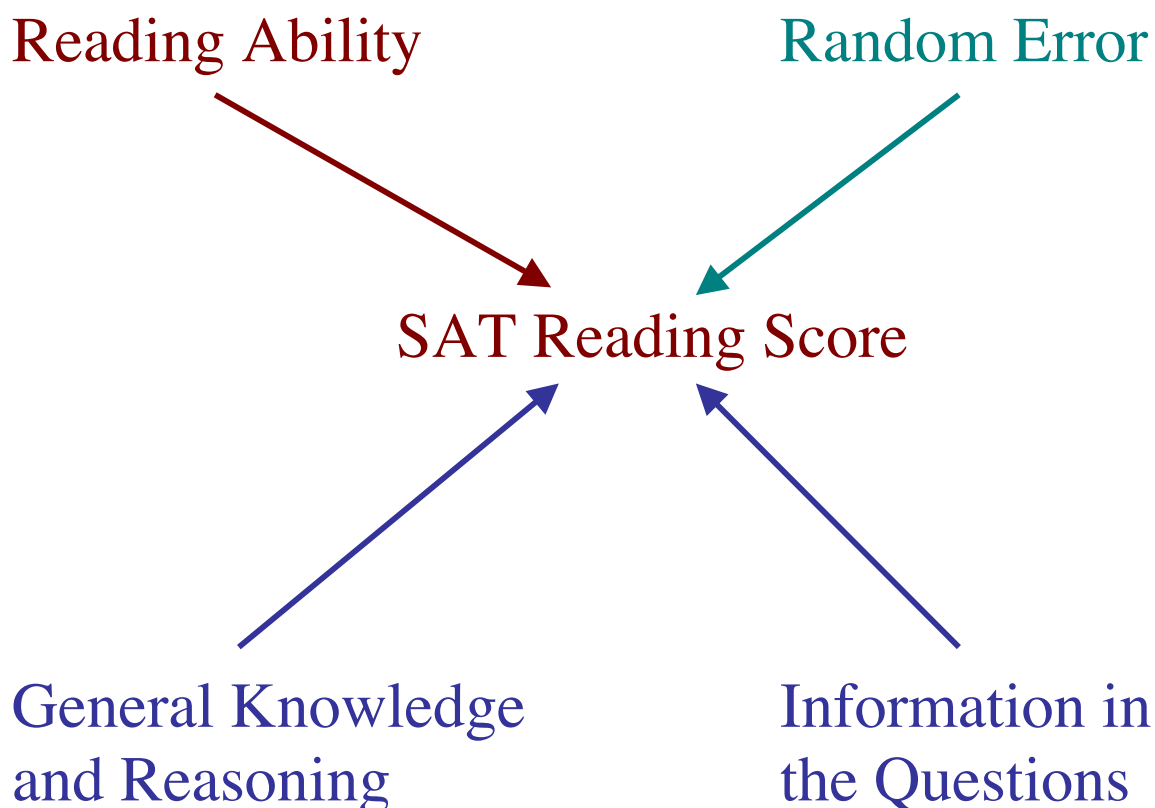
External validity

### A) Construct Validity

Does an dependent (or independent) variable reflect the concept that it is supposed to? (Do we have a *valid* operational definition?)

Consider, for example, the SAT verbal as a measurement of reading ability. Chance on an SAT questions is 1 in 5 (20%). Katz, Lautenschlager, Blackburn & Harris (1990) found that people score better than chance on these questions without reading the passages.

How could people do this?



Research also shows that the content of the passages does influence the percentage of correct responses. Thus, the construct validity of this section of the SAT as a measure of reading ability is, at best, partial.

How do we deal with measures and their limited validity?

1. By providing operational definitions of concepts and following a precise protocol for making our measurements. This makes the process repeatable and facilitates comparison with other operational definitions. –then–

2. By comparing results with those using other measurements (other operational definitions). This helps us to choose measures that best represent the concepts that we are interested in.

## B) Internal Validity

What types of cause and effect conclusions are justified by the study and the data that we obtained?

Properly done experiments have high internal validity because they permit us to determine cause and effect. Naturalistic observation generally has low internal validity and cause-effect conclusions are not justified.

## C) External Validity

Will the same results be found for other groups of participants? For other cultures, ages, etc?

Will the results replicate with other operational definitions and when run in a different setting?

In general, field studies and naturalistic observation can have higher external validity. However, this depends upon the measurements used.

Validity summary – No one design is inherently superior. Used in combination, they provide a more complete picture of behavior.

## Answers to Chapter 3 Questions

Can deception be used in a study with greater than minimal risk?

Based on the Federal Regulations – No. The key issue is informed consent. All of the pertinent details of the procedures and risks must be disclosed to a participant. If the risk is greater than minimal, then this can not be done if deception is used. In essence, the deception disguises the risk.

Alternatively, you might argue yes. As long as all of the factors that produce the risks are described as a part of the informed consent, then participants can make their own decision for a study with greater than minimal risk. As long as the deception does not hide risks from the participant, and does not give them a false sense of security, then maybe deception could be used with greater than minimal risk studies. (Note

that this view is contrary to the Federal Regulations).

With respect to the question about drug testing, the fundamental issue is about using animals. If you believe that animals should not be used in testing, then you face a dilemma about minimizing risk to humans when you do human trials. Without data from animals, how do you even know what the risks to humans are? If you do not know the risks and their likelihood, how can you collect informed consent?



## Chapter 3 Sample Question Answers

1. – d; 2. – d; 3. – c

## Conceptual Review for Chapter 4

The basis for experimental designs is control. The example above of testing a new curriculum for teaching reading assumed that a school system would allow us to use random assignment to form equivalent groups of students.

Contrast this with a relational design. Two teachers have decided to examine the new curriculum. One chooses to use it while the other chooses to use the existing curriculum in their classes. At the end of the year, both use the same standardized test to assess student reading ability.

How are the two designs similar and/or different? How would this limit conclusions? In considering this, it may be helpful to consider what is varying in one situation (relational) but is controlled in the other (experimental).

## Sample Exam Questions for Chapter 4

1. In an experiment, the behavior that is observed or measured is called the: a) independent variable b) control variable c) dependent variable d) a & b above

2. A psychologist investigating depression found that, as scores on depression scales increased (indicating more depression), the number of hours that the subject reported sleeping each day increased. From this information, you could reasonably say that: a) depression causes people to sleep more b) there is a positive relation between the level of depression and the number of hours spent sleeping c) as people sleep more they become more depressed d) all of the above

3. If a study of the effectiveness of a drug to treat the common cold were to test only 45 year-old female subjects, then age and gender are: a) independent variables b) subject variables c) held constant d) a & b above

4. If an experimenter manipulated the amount or type of frustration that subjects were exposed to and measured aggressive behavior, then frustration is the: a) control variable b) independent variable c) dependent variable d) none of the above