

Variables and Hypotheses

The keys to studying relationships.

Relationships

Descriptive studies allow us to better understand questions of what, where, when, and sometimes how. They don't help us answer questions of *why*, however. To understand why things occur, we need to look at patterns of behavior and events, and delve into how different factors interact with one another.

Variables

- A relationship is a statement about variables. A variable is a concept and refers to the variation found within a class of objects. Height, weight, age, education level, hair color, the type of automobile one drives, number of hours of sleep one requires, are all variables.

Constants

- Characteristics that do not vary are known as constants. Examples of constants may be gender, when members of only one sex are studied; people attending one school as opposed to subjects from different schools; only left-handed people; only people of Japanese ancestry.

Different types of variables

- Quantitative variables
- Categorical variables

Quantitative Variables

- Exist on a continuum of “less” to “more”.
- Examples would be age, height, weight, income, net worth, level of formal education, level of interest in a topic, frequency of church attendance, air temperature.

Categorical variables

- These variables do not vary in degree, amount, or quantity, but are qualitatively different. Examples are eye color, gender, religious preference, occupation, hobbies.

Categorical variables

- Most research “treatments” or “methods” are also classified as categorical variables. For example, if a researcher were to study ways teachers teach reading, the variable used would be “reading methods”.

Quantitative or categorical variable?

1. Make of automobile
2. Learning ability
3. Ethnicity
4. Cohesiveness
5. Heartbeat rate
6. Gender
7. Brand of shoyu

Studying relationships

- Researchers often look at relationships between or among two or more:
 - Quantitative variables
 - One categorical and one quantitative variable
 - Two or more categorical variables

Two quantitative variables

- Age and amount of interest in school
- Reading achievement v. math achievement
- Classroom climate and student motivation
- Amount of time watching television and aggressive behavior

One categorical and one quantitative variable

- Method used to teach reading and reading achievement
- Counseling approach and level of anxiety
- Nationality and liking of school
- Student gender and amount of attention given by teachers.
- Student gender and amount of praise given by teachers

Two categorical variables

Ethnicity and father's occupation

Gender of student and college major

Administrative style and subject or grade level
taught

Religious affiliation and political party
membership

Which are these?

- Ethnicity and rate of skin cancer
- Level of exercise and incidence of heart disease
- Type of books read and membership in a book club
- Graduation rate and socio-economic status

Collapsing variables

A researcher might treat a variable, such as income, as a categorical rather than a quantitative variable. Instead of looking at graduated income levels, income might be classified as “high” and “medium” or “medium” and “low”. This can pose some problems.

Collapsing variables: Problems

- First, income is generally considered on a continuum among people, not an either/or.
- Second, collapsing the variable ignores many differences and limits the possibility of looking at more detailed nuances in the information
- Third, the dividing line among the groups is almost always arbitrary, opening the door for criticism of the rationale for the decision.

Independent and dependent variables

- *Independent* variables are those that the researcher chooses to study in order to examine their effect on one or more other variables.
- *Dependent* variables are the variables that the independent variables are presumed to affect.

Can you identify the variables?

Will students of teachers who graduated with a subject area major in addition to elementary education have higher test scores than students of education majors?

Independent variable:

Dependent variable:

Conditions of the independent and dependent variables

- Independent: Teachers with subject area major and teachers with only an education major.
- Dependent: Performance on tests

Independent variables: Manipulated

Independent variables may be manipulated or selected. A manipulated variable is one that the researcher creates. These variables are most often used in experimental studies where, in order to study differing effects, the researcher alters the treatment in the study. Manipulated variables are also known as treatment variables or experimental variables.

Independent variables: Selected

In education studies, primarily for ethical and human subject reasons, independent variables are identified and selected. That is, conditions that already exist are used in the study, as opposed to creating new ones or altering existing ones.

Outcome variables

- In studies with a categorical independent variable, the term “outcome variable” is used to describe the dependent variable that is affected. It is generally quantitative. For example, if a researcher were to study the question “Will students like history more if taught by the inquiry method than by the case study method?”, the outcome variable would be “liking of history”, a quantitative variable.

Extraneous variables

- These are independent variables that have not been controlled in a study. Yet, they represent factors that may affect the outcome, thus must be accounted for in any study. One way is to hold them constant. Another is to limit the parameter of the study.

Hypotheses

A hypothesis is a prediction regarding the possible outcome of a study.

Question/Hypothesis

- Question: Will students who are taught history by a teacher of the same gender like the subject more than students taught by a teacher of the opposite gender?
- Hypothesis: Students taught history by a teacher of the same gender will like the subject more than students taught by a teacher of the opposite gender.

Question/Hypothesis

- Question: Is rapport with clients different with counselors using client-centered therapy than with those using behavior-modification therapy?
- Hypothesis: Counselors who use client-centered therapy with have a greater rapport with their clients than those who use a behavior-modification approach.

Advantages of using hypotheses

Forces us to think about outcomes

Philosophy of science

Helps us see relationships

Disadvantages of hypotheses

- Bias (toward outcome)
- Unnecessary or inappropriate
- May unwittingly limit study

Significance

- This is a statistical term that relates to information that may lead to more useful knowledge.

Directional v. non-directional hypotheses

- Directional hypotheses identifies a specific direction (more, less, higher, lower) in a relationship, whereas non-directional hypotheses do not.

Ethics

- This simply refers to questions of right and wrong. It is a very important consideration in research. The University has an Institutional Review Board, and any study involving human subjects must be approved by that board.

Definition of ethics

- *Webster's New World Dictionary* defines ethical behavior as “conforming to the standards of conduct of a given profession or group”.

Ethical Studies

- On pp. 56-57 of our text, there is a detailed list of ethical considerations and expectations as outlined by the American Psychological Association's Committee on Scientific and Professional Ethics.

Protect subjects from harm

- It is of utmost importance that researchers not only not cause harm to their subjects, but that they protect them from harm. If this means aborting a study before its conclusion, this must be done.

Confidentiality

- Confidentiality must be honored in all studies. This means keeping data secure, not discussing confidential information with anyone who does not have a legitimate reason to have it, and removing as many identifiers as possible to protect participants' anonymity.

Deception

- Whenever possible, a researcher should try not to deceive participants in a study.
- If deception is necessary, it must not harm the participant.

Research with children

- Parental approval must be obtained for research with minors.
- Researchers must not present themselves as diagnosticians or counselors to parents, nor do they report information given to them in confidence.
- No coercion to participate must occur.
- Any form of remuneration does not affect these conditions.