

BASIC ELEMENTS OF QUANTITATIVE RESEARCH

Quantitative research relates to theories. Its basic elements are theories, concepts, constructs, problems, and hypotheses.

A **theory** is:

an explanation of natural phenomena (Kerlinger, 1986)

A set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting phenomena. (Kerlinger, 1986, p. 6)

A **concept**

“expresses an abstraction formed by a generalization from particulars” (Kerlinger, 1986, p. 26). Examples are difficulty and strength.

A **construct**

“is a concept. It has the added meaning, however, of having been deliberately and consciously invented or adopted for a special scientific purpose” (Kerlinger, 1986, p. 27). Examples are intelligence, motivation, and stress.

A **problem** is:

“an interrogative sentence that asks: What relationship exists between two or more variables?” (Kerlinger, 1986, p. 16)

A **hypothesis** is:

“a conjectural statement of the relation between two or more variables” (Kerlinger, 1986, p. 17).

RESEARCH HYPOTHESES and RESEARCH QUESTIONS

The following discussion has been developed to assist you in understanding and developing hypotheses.

In this area, it is important to note that authors of research texts often differ on the definition and criteria for these terms. **It is suggested that you follow these (lecture note) sections on hypotheses when you complete your exams and when you critique articles.**

Research problems are broad, stated in question form, and not readily testable. Hypotheses, on the other hand are specific, stated in declarative sentence form, and readily testable. Problems are usually reduced to one or more hypotheses for testing (Kerlinger, 1986).

Research Hypotheses

Hypotheses or research questions are the foundational elements of quantitative research.

There are two types of hypotheses: research hypotheses and statistical hypotheses. On occasion, they may be the same. Research hypotheses, which are more general, are stated in direct, statement form and use the name of the variable of interest. Statistical hypothesis are often stated in the null form and frequently use the operational definitions of the variable rather than the variable name itself.

After you develop your research problem, then proceed first to the development of the research hypotheses. The statistical hypotheses come later after various theoretical orientations and operational definitions of the variables have been explored.

Criteria of good research hypotheses are:

1. They are statements about relations between or among variables.
2. They carry “clear implications for testing the stated relations” (Kerlinger, 1986, p. 17).
3. The variables are measurable or potentially measurable, and ... they specify how the variables are related” (Kerlinger, 1986, p. 17).

Examples of hypotheses for a quantitative study are:

1. Weather impacts on study habits.
2. Professor's absent mindedness is related to the time of the semester.
3. Exams cause stress.

It is important to note that not all research studies have hypotheses. While some qualitative studies start with research questions, other qualitative studies do not start with defined statements, rather the hypotheses are generated “in situ” as the problem unfolds (Spindler & Spindler, 1987). Similarly, descriptive studies often have research questions related to description rather than research hypotheses. Studies that are experimental, quasi-experimental, ex post facto, or time-series/single subject must have hypotheses.

Quantitative Research Questions

Quantitative research questions are like research hypotheses. However, they guide descriptive studies. When researchers know exactly what they want to ask and they want to quantify a phenomenon, they may ask a research question. Examples of research questions are

1. What are the training needs of rehabilitation counselors who work in school settings?

Note that this question assumes a pre-established list of training needs.

2. What are the factors that underlie these training needs?

Research questions are common in needs assessments.

A study is quantitative and descriptive when the researcher knows the universe of training needs (e.g., has a questionnaire based on predetermined knowledge standards). It is qualitative when the researcher is open to discovering training needs from a variety of perspectives (e.g., plans to use unstructured or semi-structured interviews to uncover needs).

Qualitative studies might be guided by the following questions:

1. How is inclusion practiced in X middle school?
2. What is the culture of rehabilitation counselors in school settings?

Examples of Research Hypotheses (Variables are in italics.)

Training needs are related to *length of experience*.

Leadership style influences *performance*.

Rehabilitation counselor education is related to *client outcome*.

Rewards increase *punctuality*.

Career education increases *career maturity*.

Type of instruction affects *math gain*.

Examples of Research Questions for Quantitative and Qualitative Studies

What are the factors of *career maturity*? (*quantitative*)

What is the *meaning of being a first year teacher*? (*qualitative*)

What are the *transition-related concerns* of families of students with disabilities? (*quantitative*)

How do families of students with disabilities *view transition*? (*qualitative*)

Note: Although the APA manual requires a clear statement of hypotheses, many authors unfortunately do not provide such statements. You can deduce the hypotheses from examining the purpose of the article, which is usually found in the abstract or right before the method section, and the variables, which may be described in the method section.

Sample Problems, Questions, and Hypotheses

Research questions and hypotheses are often confusing.

First, it should be noted that one study could have more than one design. For example, it is quite common for studies to have both descriptive and ex post facto designs.

Second, it is important to note that studies do not need to have both research questions and research hypotheses. The following examples are presented to clarify this issue.

Study 1: (One way to look at it)

Research Problem

- What is the effect of a brief career intervention on vocational behavior?

Note: This is an example of an experimental or quasi-experimental study.

Research Hypotheses

- A brief career training intervention will improve vocational identity.
- A brief career training intervention will increase career decision-making self-efficacy.
- A brief career training intervention will decrease career indecision.

Statistical Hypotheses (using two tailed tests)

- There will be no significant difference in the mean post intervention scores of the Vocational Identity Scale for the experimental and control groups. ($M_e = M_c$).
- There will be no significant difference in the mean post intervention scores of the Career Decision Making Self-Efficacy Scale for the experimental and control groups. ($M_e = M_c$).
- There will be no significant difference in the mean post intervention scores of the Career Decision Scale for the experimental and control groups. ($M_e = M_c$).

Study 2:

Research Problem

- What training needs do state agency rehabilitation counselors have regarding serving consumers with HIV?

Note: This is a descriptive study.

Research Questions

- What are the means, standard deviations, and ranges of HIV related training needs?
- Can these training needs be grouped into categories?

Note: The second research question would be added if we were interested in doing some form of data reduction (e.g., factor analysis, cluster analysis) to group the needs into categories by similar responses.

Study 3:

Research Problem

- What are transition-related training needs of rehabilitation counselors and can they be lessened through instruction?

Note: This is an example of a combination descriptive and either experimental or quasi-experimental study.

Research Questions

- What are the magnitudes of specific transition-related training needs?
- What groupings or categories summarize transition-related training needs?

Research Hypotheses

- Instruction decreases reported levels of transition-related training needs.

Statistical Hypotheses

- The post-intervention mean scores of the experimental and control groups will not differ significantly on Factor 1 of the training needs inventory ($MF1_e = MF1_c$).
- The post-intervention mean scores of the experimental and control groups will not differ significantly on Factor 2 of the training needs inventory ($MF2_e = MF2_c$). (and so on through Factor N)