

## CHAPTER 2

### *Research Methods in Industrial/Organizational Psychology*

## BRIEF CHAPTER OUTLINE

### **Social Scientific Research Methods**

Goals of Social Scientific Research Methods

Steps in the Research Process

*Formulation of the problem or issue*

*Generation of hypotheses*

*Selecting the research design*

*Collection of data*

*Analyses of research data*

*Interpretation of research results*

### **Major Research Designs**

The Experimental Method

*Two examples of the experimental method: A laboratory and a field experiment*

Quasi-Experiments

The Correlational Method

*Two examples of the correlational method*

Meta-Analysis

The Case Study Method

### **Measurement of Variables**

Observational Techniques

Self-Report Techniques

### **Key Issues in Measuring Variables: Reliability and Validity**

### **Measuring Work Outcomes: The Bottom Line**

### **Interpreting and Using Research Results**

### **Ethical Issues in Research and Practice in I/O Psychology**

### **Summary**

### **Appendix: Statistical Analyses of Research Data**

Descriptive Statistics

Inferential Statistics

Statistical Analysis of Experimental Method Data

Statistical Analysis of Correlational Method Data

Appendix Summary

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## CHAPTER SUMMARY

The goals of I/O psychology are to describe, explain, predict and then alter work behavior. Research methods are important tools for I/O psychologists because they provide a systematic means for investigating and changing work behavior. *Objectivity* is the overriding theme of the social scientific method used to study work behavior.

The first step in conducting research involves the formulation of the problem or issue. The second step is the generation of *hypotheses*, which are simply statements about the supposed relationships among variables. It is through the systematic collection of observations of behavior that a researcher may develop a set of hypotheses into a more general *theory*, or *model*, which are ways of representing the complex relationships among a number of variables related to actual work behavior. The third step in conducting research is choosing a particular design to guide the actual collection of data (the fourth step). The data collection stage includes sampling, the methods by which participants are selected for study. The final steps in the process are the analyses of research data and the interpretation of research results.

I/O psychologists use two basic types of research designs. In the *experimental method*, the researcher manipulates one variable, labeled the *independent variable*, and measures its effect on the *dependent variable*. In an experimental design, any change in the dependent variable is presumed to be caused by the manipulation of the independent variable. Typically, the experimental method involves the use of a *treatment group* and a *control group*. The treatment group is subjected to the manipulation of the independent variable, while the control group serves as a comparison by not receiving the treatment. Variables that are not of principal concern to the researchers, but which may affect the results of the research are termed *extraneous variables*. In the experimental method, the researcher attempts to control for extraneous variables through the *random assignment* of participants to the treatment and control groups, in order to ensure that any extraneous variables will be distributed evenly between the groups. The strength of the experimental method is the high level of control that the researcher has over the setting, which allows the investigator to determine cause-and-effect relationships. The weakness of the method is that the controlled conditions may be artificial and may not generalize to actual, uncontrolled work settings. Quasi-experiments are often conducted when the researcher does not have the ability to randomly assign participants to different conditions. The other type of research method, the *correlational method* (sometimes called the observational method), looks at the relationships among measured variables as they naturally occur, without the intervention of the experimenter and without strict experimental controls. The strength of this design is that it may be more easily conducted in actual settings. However, the correlational method does not allow the specification of cause-and-effect relationships.

*Meta-analysis* is a method that allows the results of a number of studies to be combined and analyzed together to draw an overall summary or conclusion. Meta-analysis may also be used to determine if the results of different studies of the same factors are significantly different from each other.

The *case study* is a commonly used descriptive investigation that lacks the controls and repeated observations of the experimental and correlational methodologies. The case study can provide important information, but does not allow the testing of hypotheses.

An important part of the research process involves the measurement of variables. The term *operationalization* refers to the process of defining variables so that they can be measured for research purposes. A variety of measurement techniques are used by I/O psychology researchers. Researchers may measure variables through the direct *obtrusive* or *unobtrusive* observation of behavior. In obtrusive observation, the researcher is visible to the research participants, who know that they are being studied. Unobtrusive observation involves observing participants' behavior without their knowledge. Another measurement strategy is *self-report techniques*, which yield information about participants' behavior from their own reports. One of the most widely used self-report techniques is the *survey*.

When interpreting research results, a researcher should consider the limitations of the findings. One concern is the extent to which the researcher is confident that changes in the dependent variable were actually caused by the independent variable, as opposed to extraneous variables. This is called *internal validity*. Attention must also be given to the *external validity* of the findings, that is, whether they will generalize to other settings. A critical concern to I/O psychologists is the interrelation of the science and practice of industrial/organizational psychology.

The American Psychological Association lists several core principles that should guide the ethical conduct of research in psychology, including I/O psychology. One key element in working with human participants is obtaining *informed consent*. With informed consent, a research participant is fully informed of the nature of the experiment and has the right to not participate in the research.

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## LEARNING OBJECTIVES

After reading and studying Chapter 2, students should be able to:

Explain why social scientific research methods are important, and describe the four goals of this method in I/O Psychology.

Describe the six steps in the research process.

Explain the role of a dependent variable in I/O research, and give examples of dependent variables commonly examined in I/O.

Explain and distinguish between the major research designs, and give examples of when each is appropriate or desirable.

Explain the usefulness of meta-analysis in social science research.

Define operationalization of variables, and describe various ways to measure variables.

Explain why external validity is important in the interpretation and use of research results.

After reading and studying the Appendix in Chapter 2, students should be able to:

Understand the difference between descriptive and inferential statistics and be able to give examples of each.

Understand the different statistical analyses involved in the experimental and correlational methods.

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## SUGGESTIONS FOR LECTURE

### Definitions

1. **Objectivity** is the unbiased approach to observation and interpretations of behavior.
2. **Variables** are the elements measured in research investigations.
3. **Hypotheses** are statements about the supposed relationships between or among variables.
4. A **theory** or **model** is an organization of beliefs into a representation of the factors that affect behavior.
5. **Sampling** is the selection of a representative group from a larger population for study. **Random sampling** refers to the selection of research participants from a population so that each individual has an equal probability of being chosen. **Stratified sampling** is the selection of research participants based on categories representing important distinguishing characteristics of a population.
6. The **experimental method** is a research design characterized by a high degree of control over the research setting to allow for the determination of cause-and-effect relationships among variables.
7. **Independent variables** are variables that are manipulated by the researcher using the experimental method, while **dependent variables** are the variables that are acted upon by the independent variable(s) (also known as the **outcome variable**).
8. The **treatment group** is the group in an experimental investigation that is subjected to the change in the independent variable, while the **control group** is the group that receives no treatment.
9. **Extraneous variables** are variables other than the independent variable that may influence the dependent variable.
10. **Random assignment** is a method of assigning subjects to groups to control for the effects of extraneous variables.
11. **Quasi-experiment** follows the experimental design but lacks random assignment and/or manipulation of the independent variable.

12. The **correlational method** is a research method that examines the relationship among or between variables as they occur naturally.
13. **Multiple regression design** examines the relationship between a particular outcome variable and multiple predictors.
14. **Meta-analysis** is a technique that allows results from several different research studies to be combined and summarized. Meta-analyses typically rely on indicators of **effect size**, or estimates of the magnitude of the relationship or effect found in a research investigation.
15. The **case study** is a descriptive investigation that involves a one-time assessment of behavior.
16. Research variables that are **operationalized** are clearly defined so that they may be concretely measured.
17. **Obtrusive observation** is research observation in which the presence of the observer is known to the participants. In contrast, **unobtrusive observation** is observation in which the presence of the observer is not known to the participants.
18. **Self-report techniques** are measurement methods that rely on research participants' reports of their own behaviors or attitudes. **Surveys** are a common self-report measure in which participants are asked to report on their attitudes, beliefs, and/or behaviors.
19. **Reliability** refers to the stability or consistency of a measurement over time.
20. **Validity** refers to the accuracy of inferences drawn from a measurement.
21. **Internal validity** is the extent to which extraneous or confounding variables are removed.
22. **External validity** refers to whether research results obtained in one setting will apply to another setting.
23. **Informed consent** refers to when a research participant is fully informed of the nature of the experiment and has the right to no participate.

### **Social Scientific Research Methods**

1. Define **objectivity** as the unbiased approach to observation and interpretations of behavior. Ask students why objectivity is necessary in the study of human behavior.
2. Discuss the various steps in the research process.

## **Major Research Designs**

1. Describe the experimental method in detail, including the importance of experimental control.
2. Define independent and dependent variables. Ask students to think about what factors or behaviors may be examined as independent and dependent variables in the study of work behavior.
3. Discuss why correlational methods must be used in the examination of certain variables.
4. Compare and contrast the two main research designs, including their respective advantages and disadvantages.
5. Ask students how the two methods may be used in the study of work behavior.
6. Discuss meta-analyses, their particular purposes, and their usefulness in integrating research.
7. Discuss the case study method. Ask students why the case study is not a preferred method. Ask students how the case study could be used in the study of work behavior.

## **Measurement of Variables**

1. Discuss the operationalization of variables. Ask students how work-related variables of interest could be operationalized, including worker stress, motivation, job satisfaction, and productivity.
2. Discuss the different observational techniques and when they are necessary. Include discussion of the Hawthorne effect.
3. Discuss self-report techniques. Ask students why self-report techniques may not be completely accurate measurement tools.

### **Key Issues in Measuring Variables: Reliability and Validity**

1. Discuss how measurement instruments used in I/O psychology different from others (e.g., a thermometer).
2. Compare reliability to validity. Ask students to come up with examples of measures that might be highly reliable but only valid in certain contexts.

### **Measuring Work Outcomes: The Bottom Line**

1. Discuss the measurement of dependent variables in the study of work behavior. Ask students what variables are most important to workers and to organizations.

### **Interpreting and Using Research Results**

1. Discuss external validity. Ask students why it is important. Involve students in a discussion of how to achieve high generalizability of research results.

### **Ethical Issues in Research and Practice in I/O Psychology**

1. Discuss the steps I/O psychologists take to protect human subjects.

### **Appendix: Statistical Analyses of Research Data**

1. Define descriptive statistics, including measures of central tendency and variability. Describe what these measures tell us about a group of scores.
2. Define inferential statistics, and how they are used to draw conclusions about groups of scores.
3. Discuss statistical significance.
4. Discuss the normal distribution and how it is used in various inferential statistical tests.
5. Discuss differences in the analyses of experimental method and correlational method data.
6. Define the correlation coefficient, including the implications of direction and strength. Involve students in a discussion of correlation and causality.

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## ADDITIONAL LECTURE TOPICS

### **Steps in the Research Process**

Dwyer and Ganster (1991) conducted a study to determine the effects of workload and control over one's job on employee attendance and satisfaction. The article published as a result of this study is used to demonstrate important concepts in research methods. The concepts and terminology from the chapter in the text are used to explain this study and are italicized.

One goal of this study was to describe some characteristics of jobs that may be associated with important work behaviors (attendance) and attitudes (work job satisfaction). A second goal was to test a descriptive model that proposes a relationship between job stress and employee attendance.

The *problem was formulated (Step 1)* based on previous research findings as well as actual problems faced by employers. One *hypothesis formed (Step 2)* by these researchers was that employees who work under heavy job demands and have little control over their jobs have higher rates of absenteeism and tardiness and lower job satisfaction than employees who work under heavy job demands but who have a high degree of control over their jobs.

The *research design selected (Step 3)* was the *correlational method*. The researchers measured and determined the relationships between five variables (degree of control, job demands, absenteeism, tardiness, and job satisfaction). The participants in the study were actual employees of a manufacturing company. Therefore, the research setting was the work place.

*Data were collected (Step 4)* in two ways. First, the researchers asked participants to complete questionnaires (self-report measures). Secondly, they collected data from the attendance records maintained by the employer. This data was collected from 90 male workers who represented a wide range of ages (19 to 6) over a wide range of jobs (25) from three work shifts.

The sampling technique was not random. Since all employees who were given the questionnaire did not return them, each individual did not have an equal probability of being selected to participate. Neither was the sampling technique stratified since the number of participants of each gender, in each job, on each shift, and at each age did not mirror the actual breakdown of these groups in the total population of the company. On the other hand, the sample was representative of male workers of all ages over all shifts in 25 different jobs in the company.

The data were *analyzed (Step 5)* by computing correlation coefficients that showed the relationship between the variables measured in the study. (Please note that in the actual study there were several interaction effects between the variables measured that are not mentioned here for the sake of simplifying the material for introductory-level students.)

In their *interpretation of the results (Step 6)*, the researchers concluded that a heavy work load was apparently related to higher absenteeism and tardiness when workers have low control over their jobs. However, heavy work load was apparently not related to higher absenteeism and tardiness when workers had a high degree of control over their jobs. The researchers further concluded that the stress that accompanies a heavy work load and low control is linked to increased costs to employers (in time lost from work).

The external validity of these findings may not be automatically assumed. For example, since this study was conducted in only one company, and with only male employees in certain jobs, these findings may not hold true for (or generalize to) female employees who do different types of jobs or for workers in other companies. To determine the external validity of these findings, this study should be replicated using different workers in different companies.

Dwyer, D. J., & Ganster, D. C. (1991). The effects of job demands and control on employee attendance and satisfaction. *Journal of Organizational Behavior*, 12, 595-608.

### **The Relationship Between Grades and Job Performance: A Meta-Analysis**

Employers and academics often have differing views on the value of grades for predicting job performance. Students also tend to be particularly interested in how meaningful grades are for future work performance. Roth, BeVier, Switzer, and Schippman (1996) examined the relationship between undergraduate and graduate grades (GPA) and job performance in a meta-analysis of 71 studies. After correcting for research artifacts, a correlation of .30 between grades and performance was found. However, the relationship between GPA and performance appeared to be moderated by several factors. For example, grades were found to be more strongly predictive of job performance for workers on the job for more than one year. In addition, undergraduate GPA was found to be more predictive of job performance than graduate school GPAs, including those of individuals who completed Ph.D. and M.D. programs. This study nicely illustrates procedures involved in meta-analyses, as well as the valid prediction of job performance through the use of GPA.

Roth, P. L., BeVier, C. A., Switzer, F. S., & Schippmann, J. S. (1996). Meta-analyzing the relationship between grades and job performance. *Journal of Applied Psychology*, 81(5), 548-556.

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## DISCUSSION QUESTIONS AND EXERCISES

**Instructor tip: Any one of the following exercises may be adapted for use as a classroom or group activity. Interesting variations in group discussions occur when different groups are assigned a task with regard to particular occupations, especially the students' own jobs.**

1. Consider and describe how you could scientifically examine the effects of worker training on work performance using the experimental method. Describe how you would complete each step of the research process and define the independent and dependent variables. Discuss any extraneous factors which may affect the results of your research.
2. Consider and describe how you could scientifically examine the relationship between the amount of work experience and work performance in an actual work setting. Describe how you would complete each step of the research process and define the variables of interest. Discuss any extraneous factors that may influence the results of your research.
3. Construct a list of at least five variables of interest which may be examined in actual work settings, including such factors as worker job satisfaction, worker productivity, work conditions, and so on. Determine how these variables could be specified, operationalized, and measured. Delineate which factors could be used in an experimental research design, and which would require a correlational research design.

### **Exercise 4: Classroom Activity**

Assign particular research articles to 3 to 4 groups of students (group formation and article assignment may be accomplished in a previous class session). During class, allow groups to discuss principle variables, methods, and steps in the research process described in their respective articles. Ask each group to select a representative to orally present their article information to the class.

### **Exercise 5: Reciprocal Peer Tutoring Exercise** Using Research Methods to Study Work Behavior

1. Together with your peer tutor, describe specific features of your respective jobs, including work duties and tasks, the physical work environment, and relationships with coworkers and supervisors.
2. Discuss your respective levels of satisfaction with your jobs, including your levels of work motivation. Consider and discuss how the various features of your respective jobs influence your levels of job satisfaction and work motivation.

3. Discuss how each of you could examine these relationships using scientific research methods, including the operationalization of the variables of interest and the accomplishment of the various steps in the research process. Indicate which type of research design each of you would use.

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## FILM AND VIDEO REFERENCES

#### “Measuring Up: An Introduction to Research Methods”

Featuring illustrative classroom vignettes, this program shows how to gather, organize, summarize, and analyze data using such graphical representations as line graphs, bar graphs, and histograms. It covers such topics as surveys, samples, populations, qualitative and quantitative data, and variables.

Insight Media #41TS3691 22 minutes

#### “The Bigger Picture: Distributions, Variation, and Experiments”

This program shows how to gather data, present data on graphs, and summarize data using measures of central tendency and variation. It explains frequency distributions; variability; correlation; and such experimental concepts as variables, experimental and control groups, hypotheses, and random assignment.

Insight Media #41TS3454 12 minutes

#### “Inferential Statistics”

Who said statistics were boring? Using magic and circus motifs, this program demonstrates the significance of probability theory and the importance of using the correct test to analyze research data. Host Amy and her friend Matt the Magician guide viewers through the need to make probability statements, and along with a team of students, use juggling skills to explore choice of test. Setting significance levels, tests of difference, the sign test, degrees of freedom, Yates correction, expected frequencies, parametric tests, and plastic interval scales are explored. Supporting graphics and animation enliven each discussion point and set up questions posed to viewers.

Films for the Humanities and Sciences #BVL36201 36 minutes