SIXTH EDITION

CONDUCTING & READING RESEARCH IN KINESIOLOGY

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Recommended Resource

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Brief Contents

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Preface

Kinesiology, the study of human movement (or physical activity), includes many subdisciplines (e.g., sport pedagogy, motor development, motor learning, motor behavior, coaching, athletic training, sports psychology, exercise and health psychology, sports sociology, biomechanics, sports administration, movement epidemiology, sports medicine, sports philosophy, physical therapy, physical activity history, physical activity culture, and many others). Newell (1990a, 1990b, 1990b) and Twietmeyer (2012) provide excellent reviews of the field of kinesiology. Twietmeyer has suggested that kinesiology, as a human discipline, embodies the rational, curious and political nature of humans. Physical activity is examined with various scholarly lenses as it is used to describe culturally meaningful and creative types of movement. The field relies on ethics as much as biology since movement is a part of what we all do. Studying kinesiology is an art and a science and kinesiology is a social science and a science (Twietmeyer, 2012). Additionally, as the health benefits of physical activity continue to be recognized (Welk, 2015), discussions in the field have recently centered on creating health-optimizing physical education (Sallis et al., 2012) to promote public health, as well as increasing the visibility of the field of kinesiology in both the public health and medical spheres.

Due to the dynamic nature and duality of this topic, this text provides suggestions for maximizing research experiences in kinesiology. Employing an approach such as field-of-study rather than a generic research perspective allows for increased applicability and understanding. A professional in physical activity promotion, sport history, motor learning, sport pedagogy, or any one of the fields within kinesiology is constantly faced with challenging situations or problems that require new and innovative solutions. In order to solve problems, we often turn to research or the scientific method to search for solutions. While not everyone will receive a Nobel Prize for her or his research, we can all benefit from a better understanding of the process. Although these methodologies may be unfamiliar to many beginning graduate students, the exhilaration and satisfaction of completing a research study is often the highlight of their academic experience. This text, and a good course in research methods and data analyses, can lay the groundwork for attaining the knowledge and skills necessary to be a competent researcher and an informed kinesiology professional.

This text was developed based on the methods its authors have used to teach the master's-level introductory research course at their universities for many years. Most of the authors have also taught upper-level undergraduate courses on many occasions. It is assumed that students come to all of these courses with varied backgrounds in areas related to kinesiology. This text is specifically designed for students studying exercise science, physical education, sport management, pre-medical fields, and related areas. The two major objectives of our courses are to teach students how to read and understand the research that others have done and how to conduct their own research. The book is comprehensive yet practical and understandable. Examples of the application of various research methods and techniques commonly used in kinesiology are presented in order to increase students' grasp of the research process.

Many students begin the introductory research course with little research background, little interest in research, and considerable fear about their ability to succeed in the course. These students may not write a master's thesis. However, it is still important that they develop an appreciation for research and an understanding of how different types of research are conducted so that they will become informed consumers and readers of the research of others. The book is written with this type of student in mind.

Other students begin the introductory research course knowing they will write a master's thesis or complete a master's project. These students need to be aware of the many possible research approaches and the procedures that are basic to many types of research. This book will also serve the needs of this type of student.

Doctoral students and beginning researchers who want an overview of the research process should find this book helpful. However, the procedures and techniques specific to a certain type of research in a specialized area are generally not covered in this book.

Organization of This Text

The chapters in this text are organized into four parts. Part One, "The Nature and Type of Research," introduces the reader to the common research approaches in kinesiology, including descriptive research (Chapter 2), experimental research (Chapter 3), and qualitative and mixed-methods research (Chapter 4). In Part Two, "The Research Process," we suggest that a research project begins with the identification of a research topic and progresses through a series of steps until the research is conducted and a report describing the research project is written. Part Three, "Data Analysis," discusses measurement concepts and techniques regularly used in research. Finally, the process of writing research proposals and reports and preparing a scientific manuscript is covered in Part Four, "Writing and Reporting."

Part Two is essential to cover since it discusses the steps of conducting research, whereas portions of Part One may be covered quickly if only certain types of research are of interest to the student. Likewise, some of the content in Part Three could be omitted depending on the particular interests and needs of the students. The three chapters in Part Three pertaining to data analysis (Chapters 14, 15, and 16) are inclusive but are presented with an orientation toward practical use and without emphasis on calculational ability. These chapters also feature considerable explanation of computer programs that aid in data analysis and incorporate many examples. Even the emphasis on doing and understanding research is somewhat unique in this text.

Features of This Text

Throughout the *Sixth Edition*, the authors have retained key pedagogical features, such as *Chapter Objectives,* end-of-chapter *Summaries of the Objectives,* integrated *Examples,* and the end-of-text *Glossary* that were included in previous editions of the text.

New to the *Sixth Edition*

The sixth edition of *Conducting and Reading Research in Kinesiology* builds upon the strengths of previous editions, with updated material and pedagogical changes designed to increase accuracy in content and clarity in presentation.

Revised Organization

In revising this text, the authors' goal was to provide an overview of the types of research prior to discussing the specifics of the research process. Thus, Part One introduces the reader to the various types of research in kinesiology, and Part Two proceeds by describing the steps involved in conducting and reading research.

Updated and Expanded Content

The authors have replaced examples of many dated studies with newer, up-to-date studies. All chapters have been revised and modernized, and discussions and integrated examples have been updated.

The focus of Chapters 4 and 16 has changed from qualitative research to qualitative and mixed-methods research, analysis, and interpretation. Chapter 9 presents new information on systematic review and coverage of meta-analysis has been added. The discussion of data analysis in Chapters 14 and 15 has been updated to match the newest version of SPSS software. Chapters 17 and 18 have been updated with more recent examples from student theses or published articles.

As mentioned, the table of contents has been significantly reorganized, leading to the inclusion of the following new chapters:

- Epidemiological Research (Chapter 6)
- Qualitative and Mixed-Methods Data Analysis and Interpretation (Chapter 16)

Appendices for the *Sixth Edition*

Examples of external and internal grant proposals have been incorporated into this text as Appendices A and B, respectively, and are completely new to this edition. These are available on the Navigate 2 Companion Website along with all of the appendices previously included in the *Fifth Edition*.

Instructor Resources

Qualified instructors can also request access to a full suite of instructor resources, which include:

- Test Bank
- Slides in PowerPoint format
- Weblinks

Online Resources

Each new print copy of this text is accompanied by the Navigate 2 Companion Website, which includes the following items:

- Practice Quizzes
- Appendices
- Weblinks
- Interactive Glossary
- Flashcards

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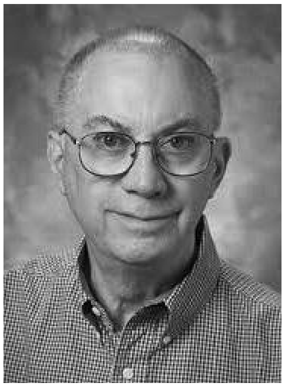
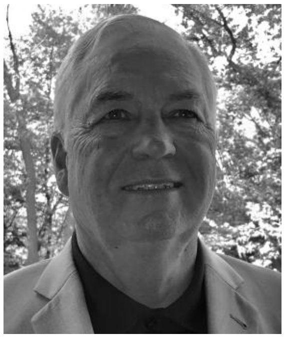
—T.A.B. L.D.H. W.Z. P.H.K.

About the Authors



Ted A. Baumgartner, PhD, earned his undergraduate degree in physical education from Oklahoma State University, his master's degree in physical education from Southern Illinois University–Carbondale, and his doctorate from the University of Iowa. He was on the faculty at Indiana University from 1967 to 1977, teaching measurement courses and statistics courses. Since 1977, he has been a professor at the University of Georgia teaching measurement courses, statistics courses, and introduction to research courses. Dr. Baumgartner is a co-author of the book *Measurement for Evaluation in Physical Education and Exercise Science, Eighth Edition,* also from Jones & Bartlett Learning. He started the journal *Measurement in Physical Education and Exercise Science* and was the first editor of the journal. Dr. Baumgartner is a member of the National Academy of Kinesiology.



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Weimo Zhu, PhD, is a professor in the Department of Kinesiology and Community Health at the University of Illinois at Urbana-Champaign. An internationally known scholar in kinesmetrics (measurement and evaluation in kinesiology), Dr. Zhu's primary research interests are in the study and application of new measurement theories and statistical models/methods within the field of kinesiology, especially in youth physical fitness; the impact of body-mind exercises on health; and physical activity, inactivity, and public health. He has published more than 100 journal articles included in the Science Citation Index (SCI) and Social Science Citation Index (SSCI) and his research was well supported by external grants, including NIH and RWJF. He was the editor-in-chief of the *Research Quarterly for Exercise and Sport*, one of the most respected research journals in kinesiology, and was the associate editor of the *Journal of Physical Activity and Health* and *Frontiers in Physiology*. He is an active fellow of the U.S. National Academy of Kinesiology, American College of Sports Medicine, and Research Consortium of SHAPE America. He was a member of the Scientific Board of the President's Council on Physical Fitness and Sports between 2005 and 2008, and was appointed as a panel member of the committee on "Fitness Measures and Health Outcomes in Youth," Institute of Medicine of the U.S. National Academies in 2011. Dr. Zhu has served on the FITNESSGRAM/ACTIVITYGRAM Advisory Committee since 2002.

Pamela Hodges Kulinna, PhD, holds degrees from the University of Oregon and the University of Illinois at Urbana-Champaign. Dr. Kulinna worked at Wayne State University for 6 years prior to joining the faculty at Arizona State University in the fall of 2003. Pamela Hodges Kulinna's research focuses on changing the culture of schools to healthy and active. She studies teaching, teacher education, and curriculum as they relate to student learning outcomes. Pam has shared her research in over 145 refereed professional presentations to international and national audiences, and published over 100 refereed research articles, 13 articles in refereed professional journals, and several book chapters. She has been the principal investigator on 20 research projects. Pam has served as the co-editor of the *Journal of Teaching in Physical Education* and also reviews for several other physical education-, education- and kinesiology-focused journals.

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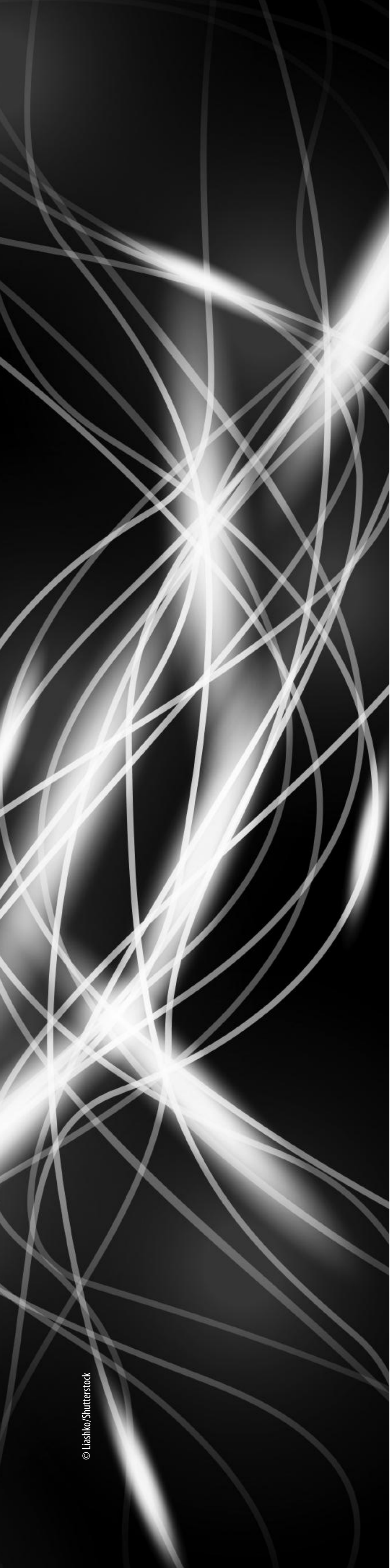


PART ONE

The Nature and Type of Research

In Part One of this text, the nature, purpose, and overall process of research are described in six chapters.

Chapter 1, "The Nature, Purpose, and Overall Process of Research," describes (a) the importance of research in the acquisition of knowledge by Kinesiology professions, (b) how the scientific method of solving problems fits into the research process, (c) various types of research, and (d) the significance of research in kinesiology.

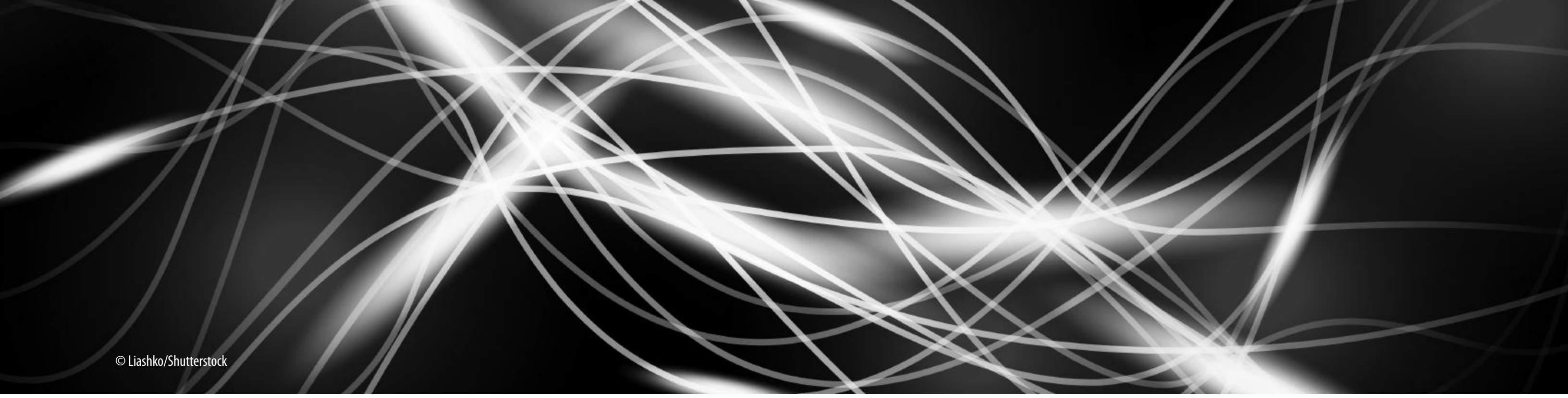
In Chapter 2, "Descriptive Research," we cover many different research approaches. These are traditional and commonly conducted types of research to describe the present situation.

In Chapter 3, "Experimental Research," we deal with a type of research that endeavors to find new ways of doing things in the future.

In Chapter 4, "Qualitative and Mixed-Methods Research," we describe a type of research that is commonly utilized in the social sciences. The methods in qualitative and mixed methods research (e.g., interviews and field notes and combining methodologies) differ considerably from the methods commonly found in experimental research.

In Chapter 5, "Historical Research and Action Research," we consider two other approaches to conducting research. Historical research describes research conducted to show what happened in the past. It is not a common type of research in kinesiology but is slowly becoming more prevalent. Action research is a type of applied research that is conducted to try to find an answer to a problem that exists in a particular setting (e.g., schools). It is conducted in the setting where it will be applied.

Finally, Chapter 6 describes "Epidemiological Research." Using this method, researchers study phenomena on a large scale. They often investigate how many people have a disease/disorder/condition, if this number of people changes, and how it affects society and, possibly, the economy.



CHAPTER 1

The Nature, Purpose, and Overall Process of Research

Members of the kinesiology profession have a wealth of information upon which they base decisions. Quite frequently, this information is passed down to us, rather than discovered through direct observation or experiences. Many times, we do not bother to examine the source of the information prior to using it; however, when members of a profession engage in various aspects of the research process, current information can be validated—and new information acquired.

OBJECTIVES

After reading Chapter 1, you will be able to:

1. Explain the relationship between research and a profession.
2. Explain the scientific method.
3. Describe the nature of research.
4. Understand the various types of research classifications and how they are applied.

KEY TERMS

Action research
Applied research
Basic research
Causal-comparative research
Correlational research
Deductive reasoning
Descriptive research
Experimental research
Hypothesis
Imperfect induction
Induction
Mixed-methods research
Perfect induction
Qualitative research
Quantitative research
Research
Research question
Scientific method
Syllogism
Theory

To begin, why should you take a research methods course? For most of you, the answer is that it is probably required in your program of study. Maybe the more appropriate question is: Why is research methods a required course? The simple answer is that the knowledge learned and skills developed in a research methods course are considered essential qualities of being well educated. Each of us is a consumer of research on a daily basis. We cannot read the news, scroll through social media, watch television, explore topics on the Internet, or even read signs along the highway without being exposed to the results of research. But what are we to do with this information? The choices we make and products we buy frequently are based on the results of product research and the marketing of those results. For example, we choose one brand of toothpaste over another because it is more effective in preventing cavities, tastes better, or whitens our teeth more effectively (or for all of these reasons). The sunscreen we select is often based on the fact that research has shown it to be effective in reducing the harmful effects of the sun's rays.

Professionals in all disciplines, including kinesiology, rely on **research** to build the foundational body of knowledge and inform evidence-based practice. This means utilizing research evidence, along with professional expertise and knowledge of clients/participants' needs, when making decisions. Professionals in the various kinesiology fields—coaches, teachers, exercise or rehabilitation specialists, biomechanists, motor behaviorists, physical activity professionals, therapists, physician assistants, and the like—are all greatly influenced by the results of research in our field.

Since the publication of the landmark report *Physical Activity and Health: A Report of the Surgeon General* (U.S. Department of Health and Human Services, 1996), numerous research studies have sought to explain why individuals choose to be physically active. A better understanding of these factors will undoubtedly lead to the development of programs designed to promote physical activity more effectively. The growing population of overweight and obese individuals in the United States, as well as other countries, has led to a plethora of research studies by kinesiology professionals that are designed to identify causes as well as solutions to the problem. In effect, almost everything we do is influenced by research in one way or another. As professionals, many of you will also be producers of research, either as part of your formal educational experience or as an expectation of your employment. A research methods course will provide you the basic knowledge and skills required to actually conduct a research study. And, in the end, all of you are certainly consumers of research information in one way or another. The information presented in this book will help you become a wiser consumer of research information and help you make educated decisions about research claims you encounter in both your daily and professional lives.

The Essence of a Profession: Knowledge

An essential quality that differentiates a profession from other vocations is the continuous pursuit and dissemination of new knowledge. All disciplines produce a variety of monthly, quarterly, and annual publications. The creation, reading, and interpretation of articles, books, theses, and dissertations are integral parts of the formal education and in-service education process. Moreover, the quality and quantity of such publications are an index of the vitality and viability of a profession as a whole. As such, they also identify the professional stature of individual members. In the dynamic pursuit of knowledge, a continuous flow of new facts and ideas must come from the laboratory and classroom, and this new information must be passed along. For growth, a profession's body of knowledge expands, and professional practices must adapt to new findings. For example, if new knowledge suggests that an accepted practice is unsatisfactory, obsolete, or hazardous, then that practice must be modified or eliminated. Research tells us, for example, that the use of straight-leg sit-ups and windmills pose problems for the lower back and, therefore, are not recommended for exercise programs.

In addition, the body of knowledge that characterizes a profession must be advanced for a profession to continue to contribute to the constituency it serves. The major vehicle by which a field advances its knowledge base is the process of research. Building a profession's body of knowledge can be likened to building a cobblestone road, where the road grows incrementally as stone after stone is laid. The stones represent individual pieces of knowledge that may be produced through research. The road is of infinite length and does not follow a linear path, thus depicting the unlimited nature and uneven manner of building a body of knowledge. The stones are irregular in shape and do not contribute equally to the complete road. This analogy serves to illustrate that pieces of knowledge are not of uniform importance to the body of knowledge being built but all aspects are necessary.

Research is exciting and challenging, and it makes an essential contribution to the development of those who engage in it. Research accomplished by professionals in kinesiology is exciting because the results frequently contribute to and guide professional practice. It is challenging because the exploration of research ideas demands critical thinking and requires that judgment be exercised on both procedural and conceptual questions. Research contributes to the professional's development because the process builds a new set of skills that can be used to better comprehend the existing literature and to recognize new questions that need to be explored.

Research: The Knowledge Pipeline

Research is a greatly misunderstood activity. For many people, the term conjures up the image of a person in a white laboratory coat wearing black-framed glasses pouring the contents of a beaker into another beaker standing in front of a laboratory centrifuge. Others see a person sifting through volumes and volumes of numbers or statistics. And yet others may think of a person standing at an amusement park holding a tablet poised to interview a guest. As soon as the word "research" is spoken, a barrier is raised as one's preconceived image of a researcher and what they are doing may come to mind.

In its simplest context, research is nothing more or less than finding answers to a question in a logical, orderly, systematic fashion. Although there is not a single, universally accepted definition of research, we see many similarities in the diverse options that exist. Foremost, perhaps, is the fact that research is usually *systematic* in nature and focuses on a *question* of interest. Consider the following descriptions of research:

- The systematic process of collecting and logically analyzing data (i.e., evidence-based) for some purpose (McMillan & Schumacher, 2010, p. 8).
- A systematic attempt to provide answers to questions (Tuckman, 2012, p. 3).
- A careful, objective, systematic, and structured process for solving programs or answering questions (Hall & Getchell, 2014, p. 4).
- A systematic investigation designed to develop or contribute to generalizable knowledge (National Institutes of Health, 2018).
- A systematic attempt to find solutions to a problem or to answer a question (Authors).

Virtually all definitions of research speak to its systematic nature and to the fact that it represents a process for acquiring information that may be used to posit answers to questions and to generally advance a body of knowledge. Professional practice in virtually every field, including kinesiology, involves many problems and questions that can be investigated through these structured inquiries. Answers to these research questions should be based on evidence that is as free of bias as possible. This objectivity is a key element of research and a primary reason why researchers employ the scientific method (see upcoming section) in their quest for knowledge. Essentially, research is the application of the scientific method to the study of questions which, in turn, offers researchers a structured means of finding the answers to the questions. Scientific solutions shape the body of knowledge for a profession, which can subsequently be used to help synthesize, validate, or change philosophies, theoretical relationships, and, ultimately, the practices of a profession.

The Search for Knowledge

Humans have been searching for knowledge since the beginning of time. In doing so they have relied, in general, upon five sources of evidence: (a) tenacity, more commonly referred to as custom or tradition; (b) authority; (c) personal experience; (d) deductive reasoning; and (e) scientific inquiry. The earliest search for knowledge was characterized by the first three sources and each provided a modicum of truth. Tradition or custom involves believing something because it has always been believed or accepted. While there is something secure, serene, and peaceful about customs and traditions, the information thus acquired might not be accurate. For example, there is no credibility to the notion that "getting chilled" (e.g., going outside with wet hair) will cause a cold. Reliance on an authority served people well in the past but fell short as a complete source of truth. Many authorities have been wrong. There was a time when the word of a coach, a teacher, or even the president was considered unimpeachable, but now we are reluctant to accept the word of authorities merely because of the position they hold. In the past, relying on authority was also used as individuals accessed printed resources such as encyclopedias (e.g., *Encyclopedia Britannica*—250 years old) and textbooks. Today, this has widely been replaced by Internet sources. Most people rely on the Internet for quick and accurate information; however, much of the information on Internet websites has not been empirically studied. Thus, a great deal of caution must be exercised as the information learned via the Internet may not be accurate, or worse, it could be "fake news" (a relatively new phenomenon where people post inaccurate information on purpose), which exists alongside validated content on the Internet.

Similarly, value in personal experience is important but it, too, has inadequacies as a source of truth. First of all, the depth of an individual's experiences can be a limiting factor. Moreover, one's response to a given situation is likely to be quite different when compared to the response of another, especially as it depends on previous experience, personal values, and beliefs. Siblings grow up differently because they are affected uniquely by experiences within the same situations. Nevertheless, the use of personal experience is relatively high on the continuum of methods of acquiring knowledge. As humans have considered problems over the ages, each of these sources of evidence has played an important role. The shortcomings of each source, however, produce inadequacies in the search for truth. Thus, the appeal of gathering other sources of new knowledge arose.

To begin, **deductive reasoning** (logic) was the first major contribution to the process of seeking truth systematically. In this method, thinking proceeds from a general assumption to a specific application. We begin with a set of known facts or assumptions and then use logic to answer a question or reach a conclusion. Phrases such as "It figures" or "That figures" also imply a conclusion based on deductive reasoning. Early philosophers ushered in the era of logic through statements referred to as a categorical **syllogism**. Here is an example of such a statement:

> All presidents are mortal. Donald Trump is a president. Therefore, Donald Trump is mortal.

In this, two ideas, or premises, form the basis for the conclusion. If the relationship between the two is true, then the conclusion is true. However, if either premise is false, the conclusion is also false. Overall, this represents the major weakness of deductive reasoning; that is, we have to accept the information contained in the premises as being true without really knowing whether it is true. Here is another example:

> All heavy alcohol drinkers die from cancer, liver disease, or cardiovascular disease. As a working adult, Isaiah consumes an average of six alcoholic beverages per day. Therefore, Isaiah will die of cancer, liver disease, or cardiovascular disease.

The ultimate validity of the conclusion concerning Isaiah's demise depends on the truth of the first two statements. Do all heavy drinkers die from cancer, liver disease, or cardiovascular disease? Are six alcoholic beverages per day enough to cause Isaiah to develop cancer, liver disease, or heart disease? At any rate, the causality of the statements may or may not be true.

Even given the obvious potential for misinterpretation, deduction is a valuable part of almost every research project. Reasoning of this kind enables researchers to organize the information already known to exist concerning the research problem, to theorize about the relationship of this information to the problem, and then to form various hypotheses to be tested by the research. In general, the process of deduction moves backward from the general to the specific. Despite the inherent value of deductive reasoning as a source of knowledge, information acquired in this manner should not be readily accepted as true without verification that the original premises were accurate.

When deductive reasoning falls short, the human thought process then turns to inductive reasoning in an attempt to get at the elusive truth. **Induction**, where thinking proceeds from the specific to the general, is considered to be the basic principle of scientific inquiry. Conclusions about events are based on information generated through many individual and direct observations. In this process, the researcher observes an individual or group of individuals from a larger population of others who are similar. Then, based on observations of the smaller group, inferences, conclusions, or generalizations are made back to the larger population. Hence, thinking moves forward from the specific to the general. Using a fictional example to illustrate these reasoning types, a study could be done on teachers' perceptions of the Society of Health and Physical Educators National Standards for K-12 Physical Education (SHAPE America, 2018).

> *Deductive.* A national study (general) is conducted, and 80% of physical educators indicate that the national standards are beneficial for students and 20% indicate that the national standards are not useful (specific findings).
>
> *Inductive.* Observations are made of teachers' use of standards in one school in the United States (limited observations), and conclusions are made about teachers' use of standards (teachers are using the standards in their daily teaching) (generalized findings).

Induction, then, is based on seeking facts, and this is a primary goal of science. Additionally, two kinds of induction, *perfect* and *imperfect*, exist. The former, **perfect induction**, results in conclusions based on observations of selected characteristics of all members of a group or population. This frequently is not possible, especially when groups are large. The latter, **imperfect induction**, results in conclusions based on the observations of a small, specific number of members of a population. Most research is based on imperfect induction. The information obtained may not be absolutely true under every circumstance but is sufficient to make fairly reliable generalizations.

It is generally conceded that Charles Darwin was responsible for integrating both deduction and induction in his research on evolution in the nineteenth century. This integrated process became known as the scientific method.

The Scientific Method

In the past, the **scientific method** of solving problems and acquiring knowledge has been delineated in many different ways. It is an approach, however, that is usually accomplished in a series of logical stages that define a pathway for the acquisition of knowledge. Although the number of steps may vary, authorities are in general agreement as to the overall process, type, and progression of activities undertaken. As a result, it is generally agreed that the scientific method represents a sound means of acquiring knowledge. This is not to suggest, however, that the scientific method is governed by a strict adherence to a set of prescribed actions that must be followed faithfully during each stage in the process. Whereas the specific actions or steps undertaken within each stage may vary depending on the research approach and participants, the general method for acquiring knowledge remains much the same logical progression that is indicative of the systematic nature of the scientific method. **FIGURE 1.1** displays the various stages of the scientific method and illustrates the cyclic nature of the process. Although, in subsequent chapters, a more thorough discussion of each stage of the scientific method will be presented, a brief summary follows:

1. **Identifying the Question**
   The first, and arguably the most important, stage in the scientific method is the identification of a **research question**. This is really an acknowledgment that at this time, there is an insufficient knowledge base from which to provide an answer. The research question may arise from several sources. It may have a theoretical underpinning, it may derive from professional practice or personal experience, or it may simply be based on the curiosity of the researcher. While the choice of a suitable question may be difficult, particularly for the beginning researcher, once identified and properly delineated, the research question becomes the central focus of the research effort. Consequently, considerable thought and serious reflection should go into the identification of the research question. The research question is inevitably broad in nature and must be narrowed or distilled into a potentially researchable problem. This will lead to the specification of the problem statement that, in turn, should provide direction for the research process.
2. **Formulating a Hypothesis**
   A **hypothesis** is a belief, hunch, or prediction of the eventual outcome of the research. It is a concrete, specific statement about the relationships between phenomena. Typically, it is based on deductive reasoning that has followed a thorough review of previous research related to the problem and considers the researcher's own past experience. For example, suppose a researcher wanted to study the effects of two different nutritional plans on selected physiological indices. Evidence from previous research suggests that a vegetarian nutritional plan may lead to greater health. If this theory holds true, what observable consequences could be expected? The deduced hypotheses, presented in a series of separate statements, would predict that individuals on the vegetarian nutritional plan would display (a) lower cholesterol levels, (b) lower blood pressure, (c) greater energy, (d) a decreased risk for certain types of cancer, (e) less body fat, and so on, depending on the number of physiological indices observed. However, not all studies have hypotheses. If the research is exploratory or simply descriptive in nature (not making comparisons between groups), no formal hypothesis is required. Qualitative methodologies, for example, fall into this category. In such instances, the investigator would carefully delineate the research questions that serve to provide focus for the analysis. The outcome of qualitative study often allows for the specification of a hypothesis that may, in turn, guide subsequent research efforts.
3. **Developing the Research Plan**
   In this stage, a strategy is developed for gathering and analyzing the information that is required to test the hypotheses or answer the research questions. Essentially, this becomes the "blueprint" or a "step-by-step plan" for conducting the research. The researcher will design a plan to test, measure, weigh, experiment, or observe the phenomena of interest. Typically, this plan consists of four parts: (a) selection of a relevant research methodology, (b) identification of the participants, (c) description of the data-gathering procedures, and (d) specification of the data analysis techniques. First, the choice of the research method is largely influenced by the questions being investigated—certain types require strategies that use quantitative methods, while others lend themselves to qualitative methods, and still others, to both. Moreover, the research method selected then influences specific details of the study, such as the participants, the instrumentation, and the actual procedures undertaken. In the previously mentioned nutrition study example, the researcher might select two groups of people and place one group on a vegetarian nutritional plan and the other on a nonvegetarian nutritional plan and a third group with no changes in their nutritonal plan (comparison group). The protocol requires each group to be tested on selected physiological indices, adhere to their respective nutritional plans for a preset period of time, and then be tested on the same indices again at the end of the experimental period. Finally, the plan should describe how the collected data will be analyzed in order to confirm or refute the stated hypotheses. If the design includes a qualitative

FIGURE 1.1 (Continued).

component, researchers may, for example, interview participants (or a subgroup of participants) about their experiences on the nutritional plans and how they are feeling at various time points across the study.

4. **Collecting and Analyzing the Data**
At this point, the research plan is actually implemented, and data are collected. Assuming that the former was carefully developed, this stage of the scientific method requires the investigator to systematically follow the prescribed procedures. For example, this may include the management of an experimental treatment, consisting of actually testing or observing the participants, conducting an interview, observing, or administering a questionnaire. Although it is critical to focus attention on the operational details of gathering data, arguably the most important aspect is in preplanning behaviors—beginning with the development of a sound research plan. Once the data are collected, appropriate techniques must be utilized to analyze the data. In quantitative studies, numerical data are typically examined statistically, first to simply describe the data and then, if appropriate, to determine if the evidence supports the hypotheses being tested. Inasmuch as qualitative studies generally result in nonnumerical data or words, such as interview records or detailed descriptions of events, data analysis becomes inductive in nature, relying on coding and categorization processes to uncover predominant themes and subthemes.

5. **Interpreting Results and Forming Conclusions**
While data analysis is an important step in the overall process, it is not an end in itself. At this point, the researcher attempts to interpret the results of the data analysis and formulate meaningful conclusions. Does the evidence support or refute the hypotheses? Depending on the nature of the research study (keeping in mind that not all studies have hypotheses), a decision to accept or reject each hypothesis is made. For qualitative studies, themes are determined using a variety of data sources and trustworthiness measures to provide confidence in the findings or themes (such as member checking or having participants review their transcripts and/or the themes for accuracy and using peer reviewers to independently review the data and negotiate findings).
Finally, conclusions should not simply be restatements of the results or findings of the study. Rather, discussions and conclusions should attempt to provide an explanation of the results. To that end, it is important to recognize that they should relate back to the original research question that prompted the study in the first place. Yet, in many cases, inferences are typically made to situations beyond the specific study. It is also important to understand how the study findings relate to other studies from the body of literature in the area. Ultimately, researchers report the details of their study to interested persons, describing the underlying basis for the study, the participants and procedures used, and the results and discussion/conclusions as well as practical implications or "what does this mean statements." In so doing, a researcher is thereby submitting his or her work for open and public review, a feature that distinguishes scientific inquiry from the other sources of knowledge.

FIGURE 1.1 Stages of the scientific method.

The stages described here provide the framework of the scientific method. The research process, then, is the application of the scientific method to solve a problem, answer a question, or learn more about a situation. It is important to note that the research process is cyclical in nature, whereby the first stage in the process begins with the identification of a problem or question. The process then proceeds through a number of other stages, ending with the researcher affirming or rejecting the research hypothesis and drawing conclusions that enable the question to be answered. In effect, the process begins and ends with a focus on the question of interest. Inevitably, however, the results of a single research study will give rise to other questions that warrant further investigation as the whole process starts anew and the body of knowledge continues to grow. Drew, Hardman, and Hosp (2008) refer to this model as the closed-loop conceptualization of the research process.

As such, the essence of the scientific method is the structure, objectivity, and marked control it can provide the researcher. The structure and rigor imposed by the scientific method has satisfactorily served the natural sciences as investigations focus on physical and biological phenomena. However, in the social sciences, including education, health, and much of kinesiology, the strict application of the scientific method has proven to be more challenging. For example, the use of performance-enhancing drugs in sports has received considerable attention in recent years, but the use of human research participants diminishes our ability to administer some treatment conditions as well to control all factors that could affect an experiment. To truly determine the effect of these drugs, a sample of athletes should be drawn from the population of interest, these individuals should be given drugs over a period of time, and then the effects on various body organs should be observed. Yet medical research and individual case studies suggest that performance-enhancing drugs may be harmful to the body. Considerable moral, ethical, and legal reasons preclude studies designed in the manner just described. Research participants have a right to expect researchers to prevent or minimize harm and preserve their safety and human dignity. To that end, researchers cannot predict all the potential risks and hazards to participants but must inform them of all those that are known.

In addition, many research studies in kinesiology involve attitudes and personal opinions. While it is possible to determine the prevalence of one opinion or another, to fully explain the basis for such opinions is problematic because they are so subjective in nature and are influenced by many factors. A major limitation associated with research involving human subjects is the inability of the researcher to exercise the degree of control often needed. Not only are there moral and ethical issues that should be considered, but practicality also becomes a major factor when dealing with human behavior. Yet, the scientific method as previously described has provided the basic framework for research in the social and behavioral sciences and has led to the accumulation of a vast amount of knowledge. Despite the use of this structured process, the social sciences have generally not attained the scientific stature of the natural sciences (Ary, Jacobs, & Sorensen, 2010).

Because the social scientist is typically dealing with human research participants and their behaviors, problems of control, accuracy of measurement, and complexity of function are considerably greater than would be expected in the natural sciences. Control over the research situation is often more difficult in studies done in gymnasia, swimming pools, camps, and playing fields. When answering traditional research questions, it is important to adhere to the scientific method as much as possible to help increase the trustworthiness of results. For example, utilizing a comparison group improves the confidence that the differences being observed may be due to the measured intervention rather than random coincidence. Fortunately, many newer forms of scientific inquiry have expanded our understanding of situations in other ways. For example, phenomenology, credited to Husserl in the early twentieth century, is a way of learning about the reality of living, or an individual's lived experiences (Tuohy, Dowling, Murphy, & Sixmith, 2013), and thus, helping researchers understand others' experiences related to human movement on a deeper level.

The Nature of Research, Science, and Theory

The ultimate goal of science is the formation of theory based on the synthesis and interpretation of facts and information. Through scientific research efforts, facts are discovered. As these facts grow, there is a need to organize and synthesize this information in order to make meaningful interpretations. Theories are formulated to bring order to the facts and to provide meaningful generalizations about the phenomenon being studied, but the word "theory" is often misunderstood.

Not only does **theory** summarize and organize existing knowledge, but it also enables scientists to predict and ultimately, control phenomena. Theories abound concerning the relationship between human behavior and the environment. Moreover, as these relationships are delineated and explained, predictions are offered regarding what will happen if certain human behaviors are either changed or not changed depending on the circumstances. For instance, a growing body of scientific evidence clearly establishes the relationship between physical activity and one's health. For more information, please see the most current guidelines and summaries of the scientific evidence on physical activity and health ("2018 Physical Activity Guidelines Advisory Committee Scientific Report," U.S. Department of Health and Human Services, 2018). Briefly, though, regular physical activity can reduce the risk of numerous conditions and diseases in the United States (e.g., heart disease, type 2 diabetes, dementia, stroke, depression and postpartum depression, certain types of cancer, excessive weight gain, falls (among the elderly), and hypertension. Furthermore, active individuals with the aforementioned conditions, as compared to peers with the same conditions, have a reduced risk of mortality, developing other conditions/diseases, and progression of the diseases. Ultimately, regular moderate to vigorous physical activity leads to improved physical function and life quality.

Many theories have been advanced by researchers in different fields that purport to explain various aspects of human behavior. Some of these theories have important applications in kinesiology and related areas. For example, Martin (2017) discusses the various motivational theories, including participant motivation theory, achievement motivation theory, achievement goal theory, and self-determination theory that help to explain an individual's motivation to participate in physical activity and sport. Cognition theories also play a role in understanding an individual's participation patterns in physical activity and sport including self-efficacy, self-esteem, personality, and performance enhancement (Martin, 2017).

Overall, researchers utilize theory as a vehicle for obtaining new knowledge by providing hypotheses for additional investigation in a particular area. Frequently, scientists examine theory through diverse circumstances or interventions to determine if broad generalizations are possible. In effect, the theory is being tested. This provides a framework for explaining phenomena and may serve as the basis for further research as well as practical application. For example, as overweight and obesity rates continue to rise throughout the world, considerable attention has been directed toward developing a better understanding of contributing factors, namely nutrition and physical activity behaviors. Interest in physical activity among children has resulted in numerous research studies in recent years that have sought to identify and explain the various factors influencing children's physical activity patterns. One model that is being used and studied in schools is the Comprehensive School Physical Activity Program (CSPAP) that supports the promotion of physical activity across the school day including: before- and after-school physical activity, physical activity during the school day (e.g., physical activity breaks in the classroom, intramurals, recess), school staff physical activity programming, and programming involving families and communities. Many positive outcomes have been established from CSPAP programs including (a) quality physical education programming, (b) increased physical activity opportunities across the school day, (c) increased programming before and after school (showing improved student health, academic performance, and attention), and (d) the establishment of staff and community/family programming (summarized in Kulinna et al., 2020).

As previously mentioned, the strict application of the scientific method to research investigations in the social and behavioral sciences has proved challenging. Moreover, research efforts in exercise science, athletic training, physical activity, physical education, and other areas in kinesiology have not always emphasized theory. Consequently, theory development has occurred less than in the physical sciences. The continued development of kinesiology as a field of study is dependent on greater attention being given to theory development and the explanation of observed facts and relationships. In the quest for theory development, the veracity of the knowledge is paramount.

Types of Research Classifications

While the underlying framework of research is founded on the scientific method, various types of research have differing purposes and approaches to the process. Virtually every research methods textbook provides some classification system. It should also be noted that various research categories are not mutually exclusive, meaning that a given research study could be identified in several different classification systems. For instance, a study to determine the physiological characteristics of elite distance swimmers could be classified as applied research, quantitative research, or descriptive research, among others. Moreover, by developing knowledge of the various types of research, you will acquire an understanding and appreciation of the goals, methodologies, and activities that guide each. It is important to understand, however, that a researcher's approach to a given problem should depend largely on the nature of the problem under investigation and the question being asked.

Basic and Applied Research

One simple classification system for research organizes studies into the categories of either basic or applied. Generally, **basic research**, which is sometimes referred to as pure or fundamental research, is theoretical in nature. Its primary purpose is the discovery of new knowledge and the development of theory, and it is largely motivated by intellectual curiosity and interest in a specific problem area. Fundamental knowledge about such phenomena as the environment, space, human behavior, and exercise is sought. Broad generalizations and principles, such as the overload, specificity, and laws of learning, frequently result from basic research. In the end, this type of research may have no immediate practical application or utility, because such an approach often leads to knowledge for just knowledge's sake. It may take years before the results from basic research find some practical utility. The majority of this type of research is done in highly controlled experimental settings in which selected variables are formally manipulated by the researcher in order to test causal relationships. For example, testing a hypothesis about physical activity and brain function with youth participants. In a basic research study, it may occur in a laboratory using an exercise bike and an electroencephalogram (EEG) to test electric activity changes in the brain. If a test was done, however, in an afterschool program setting to determine the impact of cycling on selective attention (e.g., d2 Test of Attention) with a group of children, this research could be considered more on the applied end of the research spectrum.

Applied research has as its central purpose the solution of an immediate practical problem, yet it seeks to make inferences beyond the group or situation studied as it is guided by and builds on theories and findings of basic research. In kinesiology, most research is applied research in which professionals in the field are confronted with real-world problems and are interested in solving them. For example, a conditioning coach may be interested in determining the effectiveness of a new strength training protocol or a youth sports coach may seek to compare different motivational strategies. A new theory of motor skill acquisition may be tested by the motor skill researchers in the laboratory and then by physical education teachers in the gymnasia. The idea is to improve products and processes and to test theoretical concepts, and ultimately, improve professional practices and services. The results of this type of research are intended to be generalized and to extend to the target population and setting. An adapted physical education researcher who finds that an instructional method (such as peer tutoring) is successful in improving the social skills of a sample of individuals with and without intellectual disabilities is likely to want to apply those results to students in other classrooms. Some examples of what might be considered applied research studies include the following:

1. A study of the effects of different nutrition protocols on weight loss/body composition.
2. A study of the effects of different exercise protocols on strength development (1 Repetition Maximum).
3. A study to investigate the attitudes of kinesiology majors about working with diverse populations.

Action Research

Action research is a type of applied research where interest is in local, not universal, applicability. This research is typically very pragmatic in nature, albeit objective, but the problem exists in a local setting. For instance, in an effort to increase the performance of the junior high cross-country running team, a coach may incorporate a dynamic flexibility protocol. Although the approach is scientific in nature, the coach is interested only in this local situation (this specific team), and typically, there is no group used for comparison. In addition, the person conducting the study can be involved in the setting (e.g., coach) without a conflict of interest, because the aim is to improve this program. Methods, techniques, and practices are employed that may promise better results and provide the basis for improved decisions. Behavioral modification, intervention, and in-service training skills are frequently employed in action research studies. To increase successful outcomes, the action researcher should use sound research procedures, collect data, and thoroughly analyze results to drive subsequent decisions. This area of action research will be discussed in more detail in Chapter 5, "Historical Research and Action Research."

Quantitative, Qualitative, and Mixed-Methods Research

Another way of classifying research is based largely on the philosophical assumptions the researcher brings to the study and the approach taken to collect and analyze the data. At the practical level, quantitative research tends to focus on specific behaviors that can be measured or quantified (expressed as numbers) and lends itself to testing theories. Qualitative research, on the other hand, tends to focus on describing the meaning of behaviors occurring in natural settings by gathering in-depth information (usually expressed in words) on a relatively small number of individuals. It may be useful to think of these approaches to research as existing along a continuum. At one end of the spectrum is quantitative research, and at the opposite end is qualitative research. The terms quantitative and qualitative are conveniently used to differentiate one approach from the other, but the terms themselves are generic in nature and refer to a family of research methods that fall under these broad categories at various points along the quantitative–qualitative continuum. This suggests that some methods more fully embrace the principles of quantitative research while others lend themselves to more qualitative approaches.

On one side of the spectrum, **quantitative research** uses an approach that is designed for the collection and analysis of numerical data that are usually obtained through direct testing, questionnaires, or a multitude of instruments. This approach to research, which is also referred to as the traditional or positivist approach, has been and continues to be a popular method used in kinesiology. Quantitative approaches are commonly used to describe existing conditions or phenomena, investigate relationships between two or more variables, and explore cause-and-effect relationships between phenomena. The general procedures for carrying out research activities, analyzing resultant data, and deriving conclusions have been widely accepted.

A quantitative approach involves more than simply the use of numerical data. First of all, these methods are based on a paradigm adopted from the natural sciences that subscribes to the assumption that reality is relatively stable, uniform, measurable, and governed by rational laws that enable generalizations to be made. Moreover, a quantitative approach follows a linear research path and involves (a) clearly stated questions, (b) rationally conceived hypotheses, (c) fully developed research procedures, (d) tightly controlled extraneous factors to lessen interference with the data collected, (e) large samples of participants to provide meaningful data, and (f) strategically employed data analysis techniques based on statistical procedures (Drew et al., 2008).

At the other end of the classification system, resides qualitative research. Although long used in anthropology and sociology, and more recently in educational research, **qualitative research** methodologies have gaining popularity during the past 25 years. Most authorities would agree that qualitative research generally includes research methods that rely heavily on extensive observations and in-depth interviews that result in nonnumerical data. Furthermore, qualitative research is often conducted in natural settings and does not attempt to control the context or conditions surrounding the research setting, thus prompting the use of the term *naturalistic research* to describe this approach. Founded on beliefs and assumptions different from those of quantitative research, qualitative research does not subscribe to the viewpoint that the world is stable and uniform and can be explained by laws that govern phenomena. Rather, qualitative research adopts a constructionist perspective by suggesting that meaning and reality are situationally specific. This allows for the production of many different meanings or themes, none of which is necessarily more valid than another. In many cases, there may not be an attempt to generalize the results of qualitative research because the context of the study is situationally specific.

In qualitative methodology, the researcher may not state hypotheses before the collection of data. Similar to quantitative data collection, the process is well planned and follows a protocol. Analysis and interpretation of data collected using a qualitative research approach is mainly interpretative and descriptive in nature, resulting in a categorization of the information gathered to identify trends and patterns. Statistical procedures are rarely used.

Overall, the use of quantitative and qualitative techniques are complementary in the pursuit of truth and knowledge. Each has its advantages and disadvantages, and examined together, they allow us to understand different things about the world in which we live.

In fact, we are more commonly seeing both approaches being utilized within the same research studies. For instance, a study of six first-year teachers to determine their effectiveness using the Academic Learning Time-Physical Education measure of students' motor appropriate activity and the Qualitative Measures of Teacher Performance Scale instrument of teacher behaviors (quantitative) was followed up with detailed interviews and classroom observations over one academic year (qualitative) in order to obtain a deeper understanding of teachers' first-year experiences (Ensign, Woods, & Kulinna, 2018). Researchers have used the term **mixed-methods research** to describe research that combines both quantitative and qualitative methods of data collection and analysis (Greene, 2007). Mixed-method approaches involve more than merely mixing data collection methods from both sides of the research strategies continuum. ". . . it involves collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks. The core assumption of this form of inquiry is that the integration of qualitative and quantitative data yields additional insight beyond the information provided by either quantitative or qualitative data alone" (Creswell & Creswell, 2018, p. 4). In the end, the nature of the question or the problem to be investigated will usually determine the preferred research approach, whether it be quantitative, qualitative, or mixed-methods. Often, either qualitative or quantitative methods are used to enhance the findings through the other method, they are seldom equally used in the protocol. An overview of the distinguishing characteristics of these approaches to research is shown in **TABLE 1.1**. Further discussion of qualitative research methods and mixed research methods are presented in Chapter 4 "Qualitative and Mixed-Methods Research" and Chapter 16 "Qualitative and Mixed-Methods Data Analysis and Interpretations."

Experimental Research and Nonexperimental Research

Just as classifications exist between each of the aforementioned types of research, a major distinction is generally made between experimental and nonexperimental research. While the general purpose of research is to increase our understanding and the body of knowledge within a given field, there are substantial differences in the approach one may take in

TABLE 1.1 Characteristics of Quantitative and Qualitative Research

Quantitative Research	Mixed-Methods Research	Qualitative Research
Positivist philosophy	Multiple paradigms	Constructivist philosophy
Objective social reality		Social reality is constructed by the participants in it
Social reality is relatively constant		Social reality is continuously changing across time and settings
Objective relationship with research participants	Relationships are dependent on the types of methods utilized	Collaborates with research participants
Predetermined methods	General methods are often predetermined	Emerging methods
Study samples that represent populations	Study smaller samples or numbers of cases	Study cases
Study behavior and other observable phenomena	Study behaviors and emerging phenomena trends	Study the meanings that individuals create
Study behaviors in natural or contrived settings	Study in natural or contrived settings	Study behaviors in natural settings
Use theories to guide research	Use theories to guide research design and provide evidence for new theory generation	Theory generation
Numerical data	Combinations of numerical, verbal, and graphic data	Verbal and graphic data
Statistical methods to analyze data	Use of complementary quantitative and qualitative analytical methods	Analytic induction to analyze data
Seeks generalizability from sample to defined populations	Can provide evidence for generalizability to defined populations	Little generalizability from cases to other cases or settings

Data from Gall, Gall, & Borg (2003); Greene (2007).

pursuit of this end. While the previous introduction to quantitative and qualitative research methodologies characterizes the nature of research activities using each respective approach, understanding the distinction between experimental and nonexperimental research adds yet another perspective to better understanding the research process and the wealth of methodologies available. The following sections briefly discuss experimental research and describe the most prevalent forms of nonexperimental research in kinesiology.

Experimental Research

In **experimental research**, the researcher explores the cause-and-effect relationship between variables by manipulating certain variables (referred to as independent variables) to determine their effect on another variable (referred to as the dependent variable). Furthermore, the researcher attempts to control all other factors that could possibly influence the dependent variable. Consider, for example, a situation in which a researcher is interested in investigating the effects of two different methods of training (with and without cardiovascular exercise) on strength development. In this case, the method of training represents the independent variable and is being manipulated by the researcher. Ideally, the researcher would be able to randomly assign research participants to either a treatment group that utilizes weight training and cardiovascular training or a treatment group that utilizes weight training only. Participants would then train for a specified length of time, and the researcher would determine if there were differences between the two groups in terms of strength development. These two groups would also be compared to a third group (one that did not perform any training). In such a study, the researcher would attempt to ensure that both experimental groups trained for the same length of time, for the same duration, and at the same intensity. Moreover, the researcher would attempt to control other factors that could reasonably affect the outcome—factors like nutrition, other forms of physical activity, and even motivation, to name a few. The researcher would compare the three groups based on the research participants' strength scores (dependent variable) at the end of the training period. Assuming that there were no differences in strength when the study commenced, if the final strength scores were significantly higher for the group using weight training only, the researcher would be able to conclude with some confidence that training using only weight training was more effective at increasing muscular strength than training using weight training and cardiovascular training or simply doing no training.

At its essence, experimental research is designed to answer the question "What if . . .?" by systematically manipulating one or more variables and observing the consequences on another variable as the researcher is primarily interested in the future because of the intervention. Experimental research methods are quantitative in nature, typically begin with clearly stated hypotheses to fit the research questions, and are commonly associated with a laboratory setting. It is the most formally structured of all the various types of research. According to Ary, Jacobs, and Sorensen (2010), in its simplest form, experimental research has three characteristics: (a) an independent variable that is manipulated by the researcher, (b) control of other relevant variables, and (c) observation of the effect of the manipulation of the independent variable on the dependent variable. A more thorough discussion of experimental research is presented in Chapter 3, "Experimental Research"; related variables are described further in Chapter 3, and in Chapter 7, "Understanding the Research Process."

Causal-Comparative Research

Causal-comparative research is similar to experimental research in that it seeks to investigate possible cause-and-effect relationships. However, in this case, the independent variable is not manipulated by the researcher, either because it cannot be manipulated or because it would be unethical to do so. With causal-comparative research, the independent variable is often referred to as an attribute or organismic variable because frequently it is some attribute or characteristic that the research participant already possesses due to the natural course of actions (e.g., gender, ethnicity, medical condition, family background, employment status). As a result, the participants are already members of a particular class or group of individuals that possess the same attribute. The researcher then compares groups that differ on the attribute (independent variable) to determine whether there are differences on some dependent variable of interest. Because the researcher has no control over the independent variable, which is either innate or has already occurred, this type of research is also called *ex post facto* (after the fact) research.

One example of causal-comparative research is represented by current studies that are investigating the effect of vaping (independent variable) on nicotine addiction and health changes (dependent variable) in adolescents. Because of the potential harm to participants, it would be unethical to assign some participants to a group and force them to vape and other participants to a group that is not allowed to vape. Researchers would instead compare the incidence of nicotine addiction and brain and lung development in a group of nonvapers to a group of longtime adolescent vapers. Clearly, the researcher did not have control over the independent variable in this example, or in causal-comparative research in general. The group membership, either vaper or nonvaper, was determined before the study commenced; the researcher merely selected research participants from each of the preexisting groups and compared them on the dependent variable—in this case, nicotine addiction and brain and lung development. Because of the lack of control, especially the capability to manipulate the independent variable, the ability of the researcher to draw cause-and-effect conclusions is limited compared to experimental research. This has been one of the arguments used by the vaping industry in refuting the findings of initial research pointing to a linkage between vaping and nicotine addiction as well as impaired lung and brain development, although the evidence available today shows a relationship between vaping and nicotine addiction as well as between vaping and impaired brain and lung development in adolescents (Fraga, 2018). Causal-comparative research generally functions to identify group differences and to discover relationships among variables, but stops short of establishing causality. Although there are limitations associated with causal-comparative research, it nevertheless is frequently used in kinesiological research.

Descriptive Research

Descriptive research, as the name suggests, attempts to gather information from groups of research participants in order to describe systematically, factually, and accurately specific characteristics of interest or conditions that presently exist. Quite simply, a descriptive study first determines and then describes the way things are. In direct contrast to experimental designs, these studies are nonexperimental in nature and are concerned with the present and describing *what is.* It typically precedes experimental research. There is no manipulation of an independent variable in descriptive research because there is no intent to explore a cause-and-effect relationship. Descriptive research utilizes a wide variety of methodologies to collect data—surveys, interviews, life histories, direct measurement, and observational techniques being the most prevalent. Frequently, descriptive research is interested in comparing relevant subgroups (for example, groups based on gender, age, grade level, socioeconomic status, or ethnicity) with the results being reported according to each subgroup as well as for the total sample. An example of such a comparative study is a recent investigation by Tremblay et al. (2018) who measured physical literacy (and domains of daily behavior, physical competence, knowledge and understanding, and motivation of confidence) of 10,034 Canadian children ages 8 to 12. Literacy findings and domain scores were compared by age and gender. Results provide baseline information on physical literacy of youth in Canada that can be used to monitor changes and inform future intervention plans to increase physical literacy.

Although descriptive research is similar to qualitative research in some regards, there are important distinctions: (a) methodology is more structured and standardized; (b) variables of interest are predetermined; (c) it inevitably uses more research participants, often selected through randomization procedures; (d) data are analyzed predominately through the use of statistical procedures; and (e) there is typically less in-depth researcher interaction with the participants.

Descriptive studies have been commonplace in kinesiology as well as in education and the social and behavioral sciences. Best and Kahn (2005) indicate that descriptive research is the predominant research method used in the behavioral sciences. Furthermore, many doctoral dissertations and master's theses involve descriptive research. Descriptive research methodology is particularly suited to studies that seek to identify the attitudes or opinions of various groups of individuals or to those that purport to detail behaviors that may naturally occur in places such as parks, classrooms, gymnasia, workplaces, playing fields, or homes. Because descriptive research commonly seeks to generalize the information collected from a sample (e.g., opinions, attitudes, abilities, behaviors) to a target population, researchers often employ randomization procedures in an attempt to obtain a sample that is representative of the population of interest. Examples of descriptive studies in kinesiology are studies to identify the physiological characteristics of elite women distance runners or studies to ascertain the physical activity and sedentary behaviors of adolescents.

Some of the best examples of descriptive research are represented by public opinion surveys in which the respondents are asked their opinion or attitude on a multitude of topics ranging from presidential preference to physical activity and exercise. The Centers for Disease Control and Prevention (CDC) regularly conducts a number of national probability studies aimed at describing health behaviors of American youth and adults (e.g., Youth Risk Behavior Surveillance System [started 1990, YRBSS], School Health Policies and Practices Study [started 1994, SHPPS], National Health Interview Survey [started 1957, NHIS], and Behavioral Risk Factor Surveillance System [started 1984, BRFSS]).

Correlational Research

Nonexperimental in nature, **correlational research** is closely related to both descriptive and causal-comparative research. It is similar to descriptive research in that it describes currently existing phenomena; it is similar to causal-comparative research in that it explores relationships between or among variables. According to Gay, Mills, and Airasian (2008), the purpose of correlational research is to either determine whether and to what extent a relationship exists between two or more variables or to use these relationships to make predictions. That is, it may be either relational or predictive in nature. If a relationship exists, the degree of that relationship is usually expressed as some type of correlation coefficient. An example of this type of study in kinesiology would be an investigation to determine how self-esteem corresponds (relates) to physical fitness among females. Measures of self-esteem and physical fitness would be collected on a representative group of adolescent girls, and the association between the variables would be measured as a correlation coefficient.

In contrast to experimental research, there is no manipulation of variables in correlational research; therefore, it is important to recognize that these types of studies never establish cause-and-effect relationships between variables, even in the presence of a high correlations. Additionally, even if a high correlation between self-esteem and physical fitness in this example did exist, it does not mean that self-esteem increases or decreases physical fitness or that physical fitness leads to increases or decreases in self-esteem. It simply means that adolescent girls who have higher levels of self-esteem tend to have higher levels of physical fitness, and those who have lower levels of self-esteem tend to have lower levels of physical fitness. Although similar to causal-comparative studies in the fact that causal relationships cannot be definitively established, correlational research methodology differs in that usually there is only a single group of participants from which data on two or more variables are collected for each participant. In contrast, causal-comparative research methodology takes into consideration scores from two distinct groups of participants (e.g., females and males; youth and adults). It should be noted, however, that the existence of a high correlation does permit more accurate predictions based on the relationship. For example, correlational research has established that there is a relationship between graduate school grades and scores on the Graduate Record Exam (GRE). As a result, we can now establish a prediction model (equation) whereby we can predict, with a certain degree of accuracy, a student's graduate school success (grades) based on her/his GRE scores. There is a higher correlation (with GRE scores) than with TOEFL scores (English language skills) and undergraduate grades. As this example illustrates, the results of prediction studies may be used to facilitate decision-making or selection processes, as in the case of admission to graduate school.

Historical Research

Most historical research can be regarded as both qualitative and descriptive in nature, yet relationships can be explored and hypotheses tested in certain types of well-designed and well-executed historical studies. In the historical approach, the researcher endeavors to record and understand events of the past in order to provide a better understanding of the present and suggest possible directions for the future. For instance, a researcher might be interested in investigating the "evolution of attendance and trends at Women's National Basketball Association events in 2019 over the 22 years of the WNBA." Such a study would likely be based on official records and reports from teams, as well as newspaper and magazine articles, refereed Internet sources, and interviews with selected individuals who had played or coached in the league.

The historical approach is oriented toward the past as the researcher seeks to provide a new perspective on a question of current interest by conducting an intensive study of material that already exists. However, historical research differs from other forms of research because its subject matter, the past, is difficult to capture, and the researcher cannot generate new data—only synthesize and interpret data that already exist. Moreover, locating all the relevant information concerning a particular subject from many, widely scattered sources is typically a difficult and tedious process. Sources of data or evidence for historical research can generally be classified into two main categories, primary sources and secondary sources. Primary sources of data consist of original materials prepared by individuals who were participants or a direct eyewitness of an event under investigation. Secondary sources of data, on the other hand, are those one step removed from the historical happenings of interest and consist of materials based on secondhand accounts of events (accounts that are prepared by individuals who were not present or witness to the events). In Chapter 5, "Historical Research and Action Research," we provide a more extensive description of historical research methods.

The Significance of Research in Kinesiology

The body of knowledge in the various kinesiology fields is currently expanding at a rapid rate. Tremendous progress has been made because scholars in these fields have focused on all aspects of the human being—physical, mental, and emotional. The whole person is studied in relation to movement, attitude, and lifestyle. The research has been both theoretical and practical and has reflected a sharp increase in quality, range, and depth.

Even so, research in the kinesiology field has a relatively short historical footprint compared to other disciplines. Most authorities agree that systematic research in kinesiology (formerly only referred to as physical education) in the United States originated in the mid-1800s. Although the Association for the Advancement of Physical Education (now the Society of Health and Physical Educators America or SHAPE

America) was established in 1885 to serve as the professional organization for the fledging field, the disciplinary knowledge base was just being shaped. In the 75th anniversary issue of the *Research Quarterly for Exercise and Sport*, Roberta Park (2005) traces the historical development of research and building the body of knowledge we know today as kinesiology. Park describes the difficulty that early scholars and professional leaders had in reconciling the diverse interests often expressed under the "physical education" label. It was not until the publication of the *Research Quarterly* (now *Research Quarterly for Exercise and Sport*) in 1930 that a professional journal devoted exclusively to reporting scholarly research in physical education existed. As *Research Quarterly* matured as a professional journal for reporting research findings, subdisciplines of physical education (e.g., sport psychology, sport sociology, biomechanics, exercise physiology, pedagogy, sport history, motor behavior, etc.) began to emerge and create their own knowledge base. Park described the 1960s as a time of rapid growth in scientific and scholarly endeavors, leading to the creation of several specialized journals associated with the various subdisciplines (e.g., *Medicine and Science in Sport*, 1969; *Journal of Motor Behavior*, 1969; *Journal of Sport History*, 1974; *Journal of Sport Psychology*, 1979). In 1986, leading scientists representing several of the subdisciplines gathered at Arizona State University for a symposium on Future Directions in Exercise/Sport Research. An edited monograph of the symposium proceedings provides a historical perspective of exercise and sport science research and provides recommendations for future research needs in the various subdisciplines (Skinner, Corbin, Landers, Martin, & Wells, 1989). Similarly, a conference held in Pittsburgh, Pennsylvania, in 2007 brought together researchers to reflect on research about teaching and teacher education in physical education. The resulting conference proceedings, *Historic Traditions and Future Directions of Research on Teaching and Teacher Education in Physical Education* (Housner, Metzler, Schempp, & Templin, 2009), provide a valuable resource for students and young professionals in physical education pedagogy, curriculum, and teacher preparation. It is important for leading researchers to gather regularly to provide recommendations for lines of research, such as recent recommendations for more emphasis on research on physical activity patterns, health-optimizing physical education, and student outcomes from programming in all physical activity and sport settings.

Much has been written about the advantages and disadvantages of the various types of research and the ways to interpret their results. Although quantitative methods have historically been used more frequently by researchers in kinesiology, the use of qualitative research methodologies and mixed-methods have become equal. For example, in a research review of coaching literature (from 2005 to 2015), quantitative studies were used 48.9%, with qualitative studies used 43.9%, and mixed-methods 7.1% of the time (Griffo, Jensen, Anthony, Baghurst, & Kulinna, 2019). The body of knowledge in kinesiology continues to expand at a rapid rate. This is partly due to the fact that the scope of research activities within the kinesiology discipline is broad and includes such topics as biomedical research, social and behavioral research, educational research, and marketing research. Over time, researchers are becoming more adept at using better study designs, improving instrumentation, and developing increasingly sophisticated analysis techniques. The tremendous progress in the volume of research has led to the creation of a number of new professional journals in recent years. In fact, the American Kinesiology Association now identifies more than 100 leading journals in kinesiology on their website (American Kinesiology Association, 2018).

The demand for research to provide answers to many of the questions and problems facing society continues to grow. More and more we hear the call, *show me the evidence*! Leaders and professionals in many fields often demand empirical evidence to help guide decision making and professional practice. It is not uncommon to hear of evidence-based medicine, evidence-based education, evidence-based therapy, and so forth. The typical kinesiology practitioner has become more active in research in recent years while the focus of the professional researcher appears to have become more fixed on research having utilitarian value. The so-called gap between the researcher and the practitioner appears to be narrowing. We are seeing more and more cooperative efforts between the researcher and practitioner, a trend that promises to help solve practical kinds of problems as well as to validate theoretical concepts.

In its simplest form, research is just another way of looking at the problems that permeate the fields of kinesiology. Research is for everyone, and everyone can and should engage in this process. Deep knowledge of statistics and research design is not necessary to carry out creditable research. All that is needed is someone who is interested and willing to undertake the activity and has some background knowledge of the problem to be studied. Research should not be relegated to just a few experts in the profession, but rather, it is the responsibility of many people. Larger numbers of individuals engaging in research are needed to guarantee that the problems, questions, and interests of all fields of kinesiology are represented in research investigations. Research can help broaden the base of knowledge and improve the practices that have long been associated with kinesiology. It is, and should continue to be, an active and continuing ingredient of the scholarly efforts of those fields. It is a tool that professionals cannot do without. It is the lifeblood of a profession and must be pursued vigorously.

Summary of Objectives

1. **Explain the relationship between research and a profession**. Research is the lifeblood of a profession because it produces information that adds to the profession's body of knowledge. In the kinesiology professions, research is a growing field that has produced a variety of conceptual and methodological approaches for dealing with all aspects of movement and human health.
2. **Explain the scientific method**. The scientific method is a systematic approach to solving problems and acquiring knowledge that involves a series of stages: identification of the problem, formulation of a hypothesis, development of a research plan, collection and analysis of data, and interpretation and usefulness of results.
3. **Describe the nature of research**. The research process is a formal, systematic, and logical attack on a problem using the scientific method as the mode of inquiry. An organized endeavor to obtain facts about some subject and, ultimately, answers to a specific question, research attempts to discover truth.
4. **Understand the various types of research classifications and how they are applied**. Research that is theoretical in nature and intended for the fundamental purpose of discovering new knowledge is called basic research. In kinesiology, research is usually done for the purpose of addressing a specific problem or issue and, as such, is considered applied research. The methodology should always follow the research question. Which type of research is appropriate for a given study depends on the nature of the question being asked.

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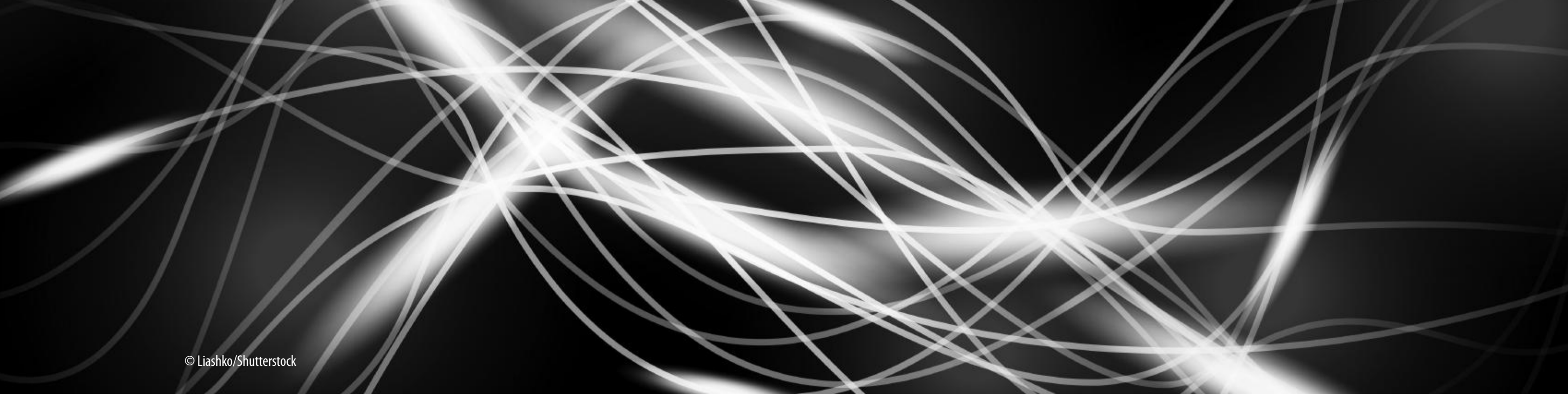

CHAPTER 2

Descriptive Research

This chapter contains information about descriptive research. You should become familiar with the various types of descriptive research and the techniques commonly used in conducting descriptive research.

OBJECTIVES

After reading Chapter 2, you will be able to:

1. Identify the common types of descriptive research.
2. Explain several types of survey methods.
3. Evaluate the quality of a research questionnaire.

KEY TERMS

Causal-comparative research	Longitudinal approach	Semistructured interview
Completion item	Multiple choice	Structured interview
Criterion-referenced standards	Norm-referenced standards	Unstructured interview
Cross-sectional approach	Open-ended	
Focus group	Percentile ranks	

Descriptive research is oriented toward the present; in the next chapter you will find that experimental research focuses on the future. Descriptive research is conducted to describe a present situation, what people currently believe, what people are doing at the moment, and so forth.

Descriptive research is a broad classification of research under which many types of research are conducted. Some people mistakenly believe that experimental research is the only approach. Others mistakenly believe that descriptive research is easier to conduct than experimental research. Any type of research is good if it is conducted properly, and all research is demanding. For a study to be conducted well, the researcher should have some formal training and practical experience in the research area. It is foolish to try to conduct a research study in physics without sufficient formal training in physics. Likewise, it is improper to use research techniques on elementary school-aged children that are used on teenagers or adults.

Descriptive research is conducted by collecting information and, based on that information, describing the situation. Descriptive research can, but does not have to, include a research hypothesis. Consider a study in which 10,000 high school seniors are selected from a population and surveyed as to whether they smoke tobacco, and 38% indicate they do. The researcher reports that 38% of high school seniors in the population smoke tobacco. Using the same research procedures, the researcher could have hypothesized prior to conducting the study that at least 30% of high school seniors in the population smoke tobacco. In that case, the researcher reports the 38% and whether the research hypothesis is accepted or rejected.

Descriptive research is commonly conducted in physical education and may be the predominant research approach in health, recreation, and sport management. Descriptive research is often conducted in exercise science, but not as commonly as in the other disciplines mentioned.

Types of Descriptive Research

The types of descriptive research are briefly described in this section to provide a general awareness of and broad appreciation for them. The types of descriptive research discussed are: survey, developmental, case study, correlational, normative, observational, action, and causal-comparative. Isaac and Michael (1995) offer a useful overview of descriptive research and the types of descriptive research.

Survey

Survey research is the most common type of descriptive research. It involves determining the views or practices of a group through interviews or by administering a questionnaire. The questionnaire may be administered to a group by the researcher or mailed to the members of the group for them to complete and mail back to the researcher. Due to the rapid development of the Internet and increased prevalence of mobile phones, more and more surveys are now conducted using these new technologies and media. Survey research will be discussed in detail later in this chapter.

Developmental

Developmental research usually deals with the growth and developmental change of humans over time. For example, what are the growth and developmental changes each year from age 6 to age 18? More accurately, what are the growth and developmental attributes of each age group? Other developmental research might examine how organizations or professional groups develop over time.

There are two approaches to developmental research. One is the **longitudinal approach** in which a group is measured and observed on a regular basis for multiple years. For example, twice a year from age 6 to age 18 a large group of children is fitness tested. Based on this information, fitness standards are developed for each age level. The problem with this research approach is that it takes many years to complete, and it is often difficult to keep track of the participants over the many years that the study lasts. However, such studies are tremendously valuable. Presently, many epidemiologists wish there were more fitness data available on middle-aged adults as children, because this would allow them to answer questions concerning how fit children need to be in order to be fit as adults. As valuable as longitudinal studies may be, they are not a good choice for master's theses or doctoral dissertations due to the vast length of time involved.

The other approach to developmental research is the **cross-sectional approach**. Taking the earlier example of developing fitness standards for age groups, with the cross-sectional approach, large samples of each age group are tested at the same time, and standards for each age group are developed. The assumption underlying this research approach is that each age group is representative of all other age groups when they will be or were that age. If this assumption is true, cross-sectional research will yield the same results as longitudinal research, but in a shorter time period. Cross-sectional research cannot always answer questions that can be answered by longitudinal research. The earlier question by epidemiologists about fitness in children as an indicator of fitness in adults can be answered only with a longitudinal study. More information on how these approaches are used in epidemiological research can be found in Chapter 6, "Epidemiologic Research." Interested readers may also refer to Hauspie, Cameron, and Molinari (2004) for a more complete introduction on methods in human growth research.

Case Study

Case study research typically involves studying a person or event in great detail and describing what is found. A study of the training techniques or performance techniques of a highly skilled athlete is an example of a case study. It is assumed that less-skilled performers should use the techniques of the highly skilled. A study of the way the Boston Marathon is organized and conducted for use as a model for how to organize and conduct a marathon is another example of a case study.

Being highly organized and systematic in collecting the information needed to write the report is vital in this research approach. Essential to case study research is preparation by looking at the literature on how to conduct case study research and also at actual case studies for the techniques used.

Correlational

The purpose of correlational studies is to determine if a relationship exists between variables. The statistical techniques used in correlational research are discussed in Chapter 14 "Descriptive Data Analysis," and Chapter 15, "Inferential Data Analysis." To determine if a relationship exists between two variables, each participant must be measured on both variables. For example, to determine if a relationship exists between time spent practicing a task and ability in performing the task, a practice time and task ability score must be obtained for each participant. If the data analysis shows that the longer a participant's practice time, the better the participant's task ability score tended to be, the researcher can conclude that a relationship exists and that practicing a task is beneficial for performance.

Usually, the variables in a correlational study are not ones that the researcher tries to manipulate, as is done in an experimental study. In the previous example, the researcher just determined how much each participant practiced and how well each participant performed the task. Many correlational studies deal with the relationship between a participant's classification variable (e.g., height, weight, gender, age, income, education) and a variable of interest to the researcher. For example, what is the relationship between age and beliefs concerning use of leisure time?

Sometimes correlational studies involve three or more variables, and the purpose of the research is to determine how well one of the variables can be predicted by some combination of the other variables. For example, how well can college grade-point average be predicted by high school grade-point average and SAT scores?

Correlational studies can be conducted to try to explain why participants differ on a variable. This is a regression approach to a correlational study. Why don't all dancers execute a dance move with equal skill? Part of this difference in ability among dancers is explained by differences in amount of training, percentage body fat, flexibility, and leg length to body height ratio. Wouldn't it be interesting to find that the leg length to body height ratio explained much of the difference among dancers in executing a move and that ability had little to do with things like amount of training, percentage body fat, or flexibility?

Normative

Norms are standards of performance. The purpose of normative research is to develop performance standards. Performance standards are developed on a large representative sample from a population; these standards then are applied to other samples from the population.

Standards can be *norm-referenced* or *criterion-referenced*. The majority of standards have been norm-referenced, but this discussion will consider normative research contributing to the development of either type of standard. **Norm-referenced standards** are designed to rank order individuals from best to worst and are usually expressed in **percentile ranks**. Test scores commonly achieved are presented in charts; for each test score there is a percentile rank indicating the percentage of the participants in the norming group who scored below that test score. An example of norm-referenced standards is presented in **TABLE 2.1**. The percentile rank for the test score 4 is 42, indicating that 42% of the participants scored below the test score of 4. Standards published with most physical fitness tests prior to 1980 and many other nationally distributed tests are norm-referenced. Measurement books such as Baumgartner, Jackson, Mahar, and Rowe (2016) detail how to develop norm-referenced standards. Because a person is compared with his/her peers (often by same age and sex in kinesiology in a norm-referenced test), the norms should be updated and the population should be healthy and normal; otherwise, the evaluation derived from the norms may be misleading, and a score at the average or above average becomes meaningless (Zhu, 2012).

TABLE 2.1 Example of Percentile Rank Norms for a 10-Point Test

Test Score	0	1	2	3	4	5	6	7	8	9	10
Percentile Rank	3	8	15	30	42	55	65	74	80	91	100

Criterion-referenced standards are a minimum proficiency or pass-fail standard. Drivers' license test standards and Red Cross lifesaving and first aid certification standards are criterion-referenced. Many physical fitness tests now have criterion-referenced standards. For example, if the criterion-referenced standard for passing the written drivers' license test is 70%, the examinee must answer at least 70% of the test questions correctly to pass. Any percentage from 0% to 69% is failing, and any value from 70% to 100% is passing.

Observational

In this type of research the data are observations of people or programs. For example, 5 days per week for 18 weeks a researcher observed a community recreation program and recorded everything he observed. At the end of the 18 weeks, the researcher wrote a report based on those recorded observations.

With this type of research, data collection and analysis are time-consuming and involve considerable technique. Formal training and practical experience are necessary before this type of research can be attempted. Because of advances in technology that make the data collection in observational research easier, observational research has gained in popularity within fields such as kinesiology since 1980.

Action

Action research is conducted in the natural setting where it will be applied. Thus, it lacks some of the control possible with other types of research, but the results of the research are certainly correct for the setting. Action research is always conducted to try to find an answer to a problem that exists in the natural setting. Practitioners who constantly strive to do a better job are actually performing an informal type of action research. An example of action research could be the testing of a new approach to interest students or adults in starting a fitness program. Isaac and Michael (1995) contrast formal research, action research, and the causal approach to solving problems; they characterize action research as less precise and demanding than formal research, but superior to the casual approach.

Causal-Comparative

Also called *ex post facto,* **causal-comparative research** is research conducted using data that were generated before the research study was conceived. It is after-the-fact research, looking for relationships or explanations for certain phenomena that presently exist by looking at data from the past. For example, looking at differences between heavy drinking and nondrinking 18-year-olds based on information kept on file about these individuals over the last 8 years is ex post facto research.

Isaac and Michael (1995) present a thorough discussion of this research method, also referring to it as causal-comparative research. Best and Kahn (2005) warn that just because two variables are related does not mean that a cause-and-effect relationship exists, with one variable causing an effect on the other variable. Several research books in education (Wiersma, 1991; Best & Kahn, 2005) discuss this research approach in detail.

Survey Research

Survey research is one of the most common types of descriptive research performed in the kinesiology area. For that reason, survey research is discussed further in this section of the chapter. The information presented under "Measurement Techniques" and "Questioning Techniques" in Chapter 10, "Developing the Research Plan and Grant Application," should be reviewed at this time, particularly the information concerning scaling techniques (rating scales, semantic differential scales, and Likert scale) and structured questionnaires as they may apply to the discussion at this time concerning questionnaire construction and use.

In survey research, information concerning opinions or practices is obtained from a sample of people representing a population through the use of interview or questionnaire techniques. This information provides a basis for making comparisons and determining trends, reveals current weaknesses and/or strengths in a given situation, and provides information for decision making.

As with most types of research, information obtained by a survey has limitations. Survey information reveals, at best, what the situation *is,* not what the situation *should be.* Surveys that deal with behaviors or attitudes do not reveal the factors that cause or influence the behaviors or attitudes. Furthermore, a survey cannot be used to secure all the information sometimes needed for decision making. Surveys are quite often limited by the sample used and the information obtained. Finally, the information obtained may be inaccurate or misinterpreted.

The many survey methods and the techniques used along with them make it impossible to discuss all methods and techniques in detail. The authors' intent in this section of the book is to provide an overview of the methods and to discuss some of the more common techniques. Many books are available on the survey method and the techniques involved with it. Bradburn, Sudman, and Wansink (2004) have written a practical guide to questionnaire design. Publishers such as Sage Publications and Lawrence Erlbaum Associates often list in their catalogs many excellent publications dealing with survey research, survey construction, phone interviews, personal interviews, attitude measurement, and much more. Recently, Web-based and mobile phone-based surveys have been used (Cronk & West, 2002; Daley, McDermott, Brown, & Kittleson, 2003; Dillman, Smyth, & Christian, 2008; Jones, 1999; Pealer & Weiler, 2000; Riva, Teruzzi, & Anolli, 2003; Schonlau, Fricker, & Elliott, 2002; Sills & Song, 2002; Simsek & Veiga, 2000; Vispoel, 2000).

Preliminary Considerations in Planning a Survey

As in all types of research, the objective in planning the survey is to try to ensure that the data collected will be pertinent to the research question or problem. Survey research is performed no more easily or quickly than any other type of research. Sufficient training and experience in conducting survey research, plus considerable planning, is necessary.

One consideration is whether the survey method is the most appropriate way to investigate the research problem. Survey research can be very time consuming and financially expensive, so estimates of the time and cost should be made early in the planning stage. Finally, survey research can be conducted by phone interview, personal interview, self-administered questionnaire, mailed questionnaire, or online questionnaire; planning should involve consideration of which survey method is best.

Survey Methods

Phone interviews are not often used by researchers in kinesiology as the primary data collection method. Personal interviews are becoming more prevalent. Administering a questionnaire to a group of participants is a technique commonly used in the field. However, a mailed or emailed questionnaire to a sample of participants is the method used more often than any other.

Phone Interview

Marketing research, a form of survey research, and product sales commonly take place over the phone. Why do people in marketing research always call you at dinner time? Because you are likely to be home and probably have not been home all day. This is a phone interview technique: Call when people are home and are probably willing to talk to you. Don't call at 3:37 a.m., although people are usually home. When the phone is answered, the caller has about 10 seconds to say something to get the person's attention, or the individual is likely to hang up. This is also a technique: What questions do you ask the person, and in what order do you ask the questions? How long can you hold a person's attention on the phone? Ask questions that require a short answer, and plan how to record the person's answers. There is considerable planning and technique in conducting a phone interview. Much of the planning and technique for administering a phone interview is the same as that for doing a personal interview.

What are the advantages of a phone interview over other survey techniques? Phone interviews are quick and inexpensive when the sample is spread over a wide geographical area. However, the method does not allow for very many questions to be asked, and recording the answers may be difficult. Talk to the survey researchers among the business and sociology students on campus who do phone interviews. Read the literature on phone interviews. Many educational research books address this topic. Babbie (2004) discussed phone surveys and noted that not all people have phones with listed numbers. That may bias phone survey results. However, Babbie indicated that random-digit dialing overcomes this problem and that this technique has gained popularity. Finally, a phone list with targeted demographic populations is often available through commercial companies.

Personal Interview

In the personal interview the researcher meets with each member of the sample and, based on their conversations, the needed information is obtained. If the sample is small and accessible, this is a feasible technique. When the information the researcher desires cannot be collected by asking a series of questions on paper (questionnaire), the personal interview must be used. For example, a personal interview is probably necessary to obtain information from a senior citizen about how things were 50 years ago.

What are some things to consider if the personal interview is selected as the data-gathering technique? One issue is how to contact potential participants for an interview time. Another is the decision regarding whether to use a **structured interview** (asking each participant the same specific questions), a **semistructured interview** (asking each participant the same general questions), or an **unstructured interview** (just letting the conversation develop). The decision is dependent on what information the researcher needs, whether questions can be formulated in advance, and what the participant is comfortable with or will tolerate. Still another decision is how to record the information provided by the participant. Recording the interview may be best because every word is permanently saved. An alternative is to take notes during the interview. Both approaches may be unacceptable to the participant or be so intimidating that the participant will not be open or totally truthful with the researcher. A sufficiently experienced or skilled interviewer may be able to just talk to people, and then write everything down after the interview is over and the participant is no longer present. The point is, personal interviews require much more planning and technique than many people realize.

Some of the advantages of the personal interview are completeness of responses, ability to clear up misconceptions, opportunity to follow up responses, and increased likelihood that the respondent will be more conscientious with the interviewer present. Isaac and Michael (1995) favor the structured interview because it requires less training of the researcher and is more objective than the unstructured or semistructured interview. They also present some guidelines for interviews. Other useful references for those who desire additional information are Wiersma (1991), Rubin (1983), Babbie (2004), and Gall, Gall, and Borg (2010).

Focus Groups

A **focus group** is a group interview in which a moderator or interviewer guides the interview when a small group of participants discusses the topics that the interviewer raises. The size of a focus group is usually between six and eight people, and what the participants say in the discussion is sound-recorded (sometimes also video-recorded) and used as the research data. The interviewer should be a well-trained professional who guides the group discussion through a predetermined set of questions or topics and explores and follows up the new questions or topics when they are raised. For more information on focus groups, see a "Focus Group Kit" developed by Sage Publications (Morgan, Krueger, & King, 1998).

Self-administered Questionnaire

For a variety of reasons, the majority of survey research conducted in kinesiology uses questionnaires as the data-gathering technique. A questionnaire is a series of questions or statements on paper. Each participant is given a copy of the questionnaire. The participant responds to the questionnaire and then returns it to the researcher. If the researcher can meet with the participants, the questionnaire will probably be administered to all the participants at one time or to several groups of participants at several times. However, the most prevalent procedure is to mail or distribute the questionnaire to the participants, who complete the questionnaire on their own, and then return it to the researcher. Because the majority of procedures are the same no matter whether the researcher administers the questionnaire or distributes it for completion, the majority of the information about questionnaires is discussed in the section on distributed questionnaires. Information specific to administered questionnaires is presented here.

If the researcher is unable to get the participants together at one time or in several groups to administer the questionnaire, the researcher may as well distribute the questionnaire. Often, a researcher seeks permission to administer a questionnaire to an intact group such as a class, school, agency, or exercise program. The other possibility is to organize the participants so they come together in one or more groups to complete the questionnaire. In either case, a room or facility must be secured for administering the questionnaire. The facility must be large enough to easily accommodate the largest possible group and conducive to completing a questionnaire (i.e., is quiet, contains desks or tables providing a writing surface, has adequate seating, etc.). Some thought should be given to whether pencils and other materials need to be provided. Certainly, what to say to the participants about the purpose of the questionnaire and how to complete it needs to be planned. How to pass out and receive back the questionnaires has to be thought through as well. The larger the group, the more important these plans become, particularly if the researcher has access to the room or facility for a limited amount of time. A common pitfall is to think that a questionnaire that typically takes 45 minutes to complete can be administered in 60 minutes. All participants will not arrive on time, giving the verbal directions and distributing and receiving the questionnaire will take time, and some participants will take more than 45 minutes to complete the questionnaire.

Distributed Questionnaire

When the sample is geographically spread out or cannot be brought together as a group, a distributed questionnaire is used. Distribution may be by mailing or emailing it to the participants or putting it in their mailbox at work, by handing it to participants in class or at work or in some location where they gather, or by having another person distribute the questionnaires in classes or on job sites. This will include some planned procedure for having participants return the completed questionnaires to the researcher. Researchers distribute more questionnaires by mail or email than by any other method.

Good questionnaire research requires considerable planning and technique and is not something that just anyone can accomplish quickly. Professional pollsters and marketing research experts conduct outstanding questionnaire research. Graduate students sometimes do a poor job with questionnaires due to a lack of knowledge and sufficient planning.

Virtually everyone receives many questionnaires in the mail or by email each year. The good ones are often completed and returned; the poor ones usually go in the trash. By way of example of the latter, the authors once received a poorly Xeroxed copy of a questionnaire. One question asked, “Do you belong to TAHPERD?” First, was the question referring to the Tennessee or Texas Association of Health, Physical Education, Recreation and Dance? Second, why would a person living in Georgia or another state belong to either one? The questionnaire was a Xeroxed copy of one that another researcher had developed for use in Tennessee. The questionnaire went in the trash.

The following discussion of questionnaire research assumes that the questionnaire is distributed and returned by mail. Questionnaire development, format, distribution, return, and examples are treated separately.

Questionnaire development. Questionnaires are used for a variety of purposes, and often the purpose dictates the type of items (i.e., question or statement) used in the questionnaire. Thus item type is one decision to be made in questionnaire development. An item is classified as **open-ended** if participants have the freedom to respond however they choose. For example, the question “Why did you enroll in this adult fitness program?” is open-ended. A second type of item is a **completion item**; the subject fills in the blank. For example, “What is your age in years to the current year?” is a completion item. The third type of item is **multiple choice** or closed-ended; the possible responses to the item are provided and the participant selects the most appropriate response(s).

The following are two examples of a closed-ended item:

1. Select the response below that best reflects your feelings about the research course you are presently taking.
1. Great
2. Above average
3. Average
4. Below average
5. Terrible

2. Of the types of vehicle listed, check the one(s) you own.
_____ 1. Car
_____ 2. Truck
_____ 3. Jeep
_____ 4. Motorcycle
_____ 5. RV
_____ 6. Van

Commonly, questionnaires are used to determine opinions or attitudes. Here is an example:

Indicate your degree of agreement or disagreement for each of the following items.
1. Being the best in a group is very important to me.
1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

Each item must be carefully written so that it is easy to understand and not ambiguous. This takes considerable time if done correctly because the questionnaire must be read and edited several times. Rules and hints on writing knowledge tests generally apply here. The reading level as well as the attention span of the participants must be considered. Directions for responding to the questionnaire must be presented at the top of the first page of the questionnaire. A sample question and response are often provided following the directions. If the questionnaire is supposed to cover a content area or be all-inclusive, then care must be taken to develop items that cover the necessary area.

Reliability and validity of the questionnaire must be determined *before* it is used in the research study. Validity is the degree to which the interpretations of the questionnaire data are correct. These concepts are discussed in Chapter 10, “Developing the Research Plan and Grant Application,” and Chapter 13, “Measurement in Research.” Thus, it is assumed that the questionnaire measures what it is supposed to measure. Just because you developed the questionnaire does not make it perfect. Validity is usually estimated by a jury of experts. The jury should have representation from content experts, questionnaire construction experts, and questionnaire use experts. Hopefully, the jury will find the questionnaire to be well constructed, covering the necessary content, and ready for use. Based on the input from the jury, the questionnaire may be revised and evaluated by the jury again, depending on the extent of the revisions.

Reliability is consistency of response. Reliability is discussed in Chapter 10, "Developing the Research Plan and Grant Application," and Chapter 13, "Measurement in Research." The researcher wants to be assured that the responses of the participants to the questionnaire would not be different if the questionnaire were administered to them at some other time. As ideal as it might be to administer the questionnaire to some participants on two different days to check for consistency of response, this is rarely done. Instead, researchers put several pairs of items in the questionnaire with items in the pair either similar or opposite. Items 6 and 33, shown here, provide an example of paired opposite items with the same response choices (agree vs. disagree).

6. I like candy.	33. I don't like candy.
1. Agree	1. Agree
2. Disagree	2. Disagree

The questionnaire is administered and the responses to paired items are examined to see whether they are as expected. No matter whether the questionnaire is administered on two different days or on one day with paired items, an intraclass *R* can be obtained as an estimate of reliability, either for each item administered twice or for each pair (see Chapter 13, "Measurement in Research," or Baumgartner, Jackson, Mahar, & Rowe, 2016).

The quality of the questionnaire should be determined before it is used to collect the research data. This is always the case with the reliability and validity of a questionnaire, as just discussed. Some researchers determine reliability or validity using data from the research study. The problem with this method is that if the reliability or validity is poor, it is too late to make changes in the questionnaire to improve reliability or validity. Unreliable or nonvalid data are no good, so all unreliable or nonvalid data should be discarded.

A pilot study is the best solution to this possible problem. For further information, see Chapter 10, "Developing the Research Plan and Grant Application," under "Instrument Development." The questionnaire is administered to a small number of individuals who are similar to the participants who will take part in the research study, and the reliability and validity for their data are estimated. As part of the pilot study, it is a good idea to keep track of such things as how long it takes individuals to complete the questionnaire, whether the questionnaire appears to contain any ambiguous items, and any other factor that could affect the successful administration of the questionnaire. Based on the pilot study, the questionnaire is revised as needed.

Questionnaire format. The appearance and layout of the questionnaire is as important as the content. The questionnaire must be professional in the way it is designed and in the quality of the paper and reproduction, or people will not complete it. Items need to be arranged in rows or columns for a neat appearance, ease of completing the questionnaire, and ease of data entry into the computer, if necessary, for analysis. Demographic information such as age, gender, education, and income are often requested on the questionnaire. Because questions about age and income sometimes irritate people, demographic questions should be placed at the end of the questionnaire. Irritating questions at the end of a questionnaire are often left blank, but if they appear at the beginning of a questionnaire it may cause the entire questionnaire to go into the trash. In fact, any controversial item should be placed at the end of the questionnaire for the same reason (e.g., "Have you gained a lot of weight in the last 5 years?").

Answers to closed-ended items that will be computer-analyzed need to be numerically coded. Participants should be asked to check the appropriate item or circle the appropriate number.

EXAMPLE:

Poor format

What is your sex? _______

Better format

Circle the number for your sex.

1. Female 2. Male

or

Check the number for your gender.

_______ 1. Female

_______ 2. Male

Closed-ended items are preferable to completion items. Also, it is better to provide choices in the form of nonoverlapping intervals rather than specific values, particularly on items that may have a large number of different values, for which the participant may not know the exact value, where the researcher does not need the exact value, or which may irritate the participant.

EXAMPLE:

Poor format
What is your income? _______

Better format
Which group most closely represents your income?
_______ 1. Less than $12,000
_______ 2. $12,001 to $18,000
_______ 3. $18,001 to $27,000
_______ 4. $27,001 to $40,000
_______ 5. More than $40,000

Inform the participant whether one answer is desired or whether multiple answers to an item are desired (see the earlier example in this chapter on vehicles owned). This is particularly important when the data are going to be computer-analyzed, because sufficient space must be allowed to accommodate all answers. When multiple answers are possible, each answer choice is treated as if it were an item: A one (1) is entered into the computer if that answer is checked, and zero (0) if it is not checked.

Questionnaire distribution. The biggest concerns with distribution are controlling the cost of getting the questionnaire to the participants and trying to obtain a high rate of questionnaire return. The researcher can influence both. For example, the fewer the number of pages in the questionnaire, the less expensive it is to mail, the shorter it looks to the participant, and the more likely it is to be returned. Generally, there is a tendency to have too many items on a questionnaire. No matter what the number of items, reproduce the questionnaire on both sides of the page and use the smallest readable print size. Even the weight of the paper used can sometimes influence the mailing return rate.

The researcher is expected to provide a self-addressed stamped envelope for returning the questionnaire. Failure to do so will almost certainly decrease the rate of return. To minimize the postage on the return envelope, ask participants to respond to all closed-ended items on a standardized answer sheet rather than on the questionnaire and to just return the answer sheet. Standardized answer sheets are often an efficient tool for organizing the data to be entered into a computer. However, if participant groups are not familiar with standardized answer sheets, their use will decrease questionnaire return rate or result in such poorly erased or completed answer sheets that data will be lost.

A good mailing list is an essential component of distributing a questionnaire. Lists are not always highly accessible. Lists with the name of a person rather than a title (e.g., "department head") are generally desirable. However, if the questionnaire is going to the person presently in the position and there is considerable turnover in the position, a title may be better than a personal name. Check into the advantages and disadvantages of bulk mail in comparison to first- and second-class mail in terms of cost, speed of delivery, and forwarding, because considerable cost reduction is possible with bulk mail.

Researchers can do a number of things to try to improve the percentage of questionnaires returned. To give some idea of the extent of this problem, the expected rate of return is 50%; perhaps an 80% return rate may be expected from professional participants who have an interest in the questionnaire results; but only a 10% return is likely when surveying the general public. For this reason researchers tend to send out enough questionnaires to ensure a desired number of returns. However, a low return rate makes the validity of the results questionable. Are the participants who returned the questionnaire really a representative sample of the target population? Would the results have been different if more people had returned the questionnaire? It is important to motivate people in every way possible to return the questionnaire. A cover letter with the questionnaire explaining why the study is being conducted and its importance to humanity will improve the return rate. A cover letter signed by an influential person also increases the return rate. Offering to share the results, giving money, a catchy saying ("a penny for your thoughts," and enclose a penny) all help to motivate people to return the questionnaire.

Sending the questionnaire out at a time when people are likely to have time to complete and return it is good strategy. Sending questionnaires to coaches in the middle of their season or to anyone just before Christmas is not wise. Also, one to three follow-up letters sent at 2- to 3-week intervals after the first mailing and reminding people to return their questionnaire increases the percentage of returns. Having participants put their name on the questionnaire before they return it makes follow-up easier and is to the advantage of the researcher. However, some participants will not return the questionnaire or will not be totally truthful in completing it if they have to put their name on it. If there are any highly personal items on the questionnaire or any items dealing with illegal activities, do not request the participant's name on the questionnaire. Meanwhile, numbering each questionnaire when mailed can be keyed to the recipient.

EXAMPLE:

How often do you smoke pot?
1. Weekly
2. Monthly
3. Several times a year
4. Never

Law enforcement agencies have been known to confiscate questionnaires dealing with illegal activities. Generally, it is better not to ask for names on questionnaire returns unless you really need them.

Questionnaire return. Most survey studies require the use of a computer to analyze the volume of scores. A 50-item closed-ended questionnaire returned by 350 participants generates 17,500 scores. When questionnaires are returned, scan them to be sure they are ready for data entry. Even if names are on the questionnaires, give each questionnaire an identification number, enter that number and the questionnaire data into the computer, check the information for data entry error, and then destroy the questionnaire. Of course, open-ended questions must be analyzed by hand.

Anticipate that some items on some questionnaires will not be answered because participants will accidentally skip or decline to answer certain items. This is acceptable as long as only a few items on each questionnaire are left blank and it otherwise seems that the participant completed the questionnaire accurately. Some researchers put items on a questionnaire to check for accuracy of participant response and reject those questionnaires that fail the accuracy check. For example, a drug-use questionnaire includes a long list of drugs and requests participants to check the ones they use. If kerosene is on the list of drugs and a participant checks it, the questionnaire is rejected. Unexpected responses to open-ended items are sometimes found. The same drug-use questionnaire contained the item: "Is there a big drug problem on campus?" One participant responded, "No!! You can get it anywhere." The questionnaire was not rejected.

The accuracy of participant response to attitude scale questionnaires is usually checked by stating some items positively (e.g., smoking is okay) and some items negatively (e.g., drinking alcohol is evil) to produce a varied response to items among participants. In this case, a researcher rejects the returned questionnaire if visual inspection shows that the majority of the items are answered with the same response; in this case, it appears that the participant just checked answers without reading the items.

Questionnaire examples

I. *Poor format*

Listed are activities taught in the physical education department. Please check the activities you have taken at the university. If you check an activity, then please check the skill level you presently have in the activity. "B" is beginner, "I" is intermediate, and "A" is advanced.

Activity	Taken	Skill Level		
		B	I	A
Archery Bowling Golf Dance Swimming Tennis				

Note: This is a poor questionnaire because much space is wasted and there is no numerical coding of responses.

Improved format

Listed are activities taught in the physical education department at the university. Please use the following codes to indicate your status for each activity.

CODE: 0—Did not take activity
1—Took activity; presently have beginner level skill
2—Took activity; presently have intermediate level skill
3—Took activity; presently have advanced level skill

____ Archery ____ Dance
____ Bowling ____ Swimming
____ Golf ____ Tennis

II. *May I have about five minutes of your time?*

I need your assistance.

This is my dissertation research. The purpose of the study is to determine what faculty members think are important attributes in a department head. Using the scale shown below, please rate the importance of each attribute of a department head. Then return your ratings in the enclosed addressed, stamped envelope.

Importance Rating Scale

Extremely Unimportant — Extremely Important

1 2 3 4 5 6 7

Attributes
_____ Friendly
_____ Professional
_____ Organized
_____ Good looking

III. *Using the key below, rate each task by putting an "X" in the face that best represents your feeling.*
KEY ☺ I know that I have the ability to perform the task.
😐 I am not sure that I have the ability to perform the task.
☹ I know that I don't have the ability to perform the task.

1. How do you feel about your ability to dribble a ball without your opponent getting it away from you? ☹ 😐 ☺
2. How do you feel about your ability to do a front roll? ☹ 😐 ☺

Note: This questionnaire can be scored 3–2–1 from smile to frown; the faces follow no pattern from item to item; faces can be used with young children.

IV. *What are the four biggest problems in our discipline today?*
Note: This is an open-ended question because the researcher does not know all the problems and probably does not have enough space on the questionnaire to list all the problems.

V. *What was your undergraduate degree major?*

VI. *An example of a popular international physical activity questionnaire is presented in* **EXAMPLE 2.1**.

The questionnaire presented in Example 2.1 has a number of desirable features. The beginning page includes an introduction to the questionnaire, its background and how to use it appropriately, and instructions on how to complete it correctly.

EXAMPLE 2.1 Example Questionnaire

International Physical Activity Questionnaires (August 2002)
Short Last 7 Days Self-Administered Format
For Use with Young and Middle-Aged Adults (15–69 years)

The International Physical Activity Questionnaires (IPAQ) comprise a set of four questionnaires. Long (five activity domains asked independently) and short (four generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is supported to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken, we highly recommend using the prescribed back-translation methods available on the IPAQ website. If possible, please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is ongoing and an International Physical Activity Prevalence Study is in progress. For further information, see the IPAQ website.

(*continues*)

EXAMPLE 2.1 Example Questionnaire (*Continued*)

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and in Booth, M. L. (2000), Assessment of physical activity: An international perspective. *Research Quarterly for Exercise and Sport, 71*(2), s114–120. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the *last 7 days*. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise, or sport.

Think about all the *vigorous* activities that you did in the *last 7 days*. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the *last 7 days*, on how many days did you do *vigorous* physical activities like heavy lifting, digging, aerobics, or fast bicycling?
   _____ days per week
   ☐ No vigorous physical activities → *Skip to question 3*
2. How much time did you usually spend doing *vigorous* physical activities on one of those days?
   _____ hours per day
   _____ minutes per day
   ☐ Don't know/not sure

   Think about all the *moderate* activities that you did in the *last 7 days*. *Moderate* activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.
3. During the *last 7 days*, on how many days did you do *moderate* physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
   _____ days per week
   ☐ No moderate physical activities → *Skip to question 5*
4. How much time did you usually spend doing *moderate* physical activities on one of those days?
   _____ hours per day
   _____ minutes per day
   ☐ Don't know/not sure

   Think about the time you spent *walking* in the *last 7 days*. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.
5. During the *last 7 days*, on how many days did you *walk* for at least 10 minutes at a time?
   _____ days per week
   ☐ No walking → *Skip to question 7*
6. How much time did you usually spend *walking* on one of those days?
   _____ hours per day
   _____ minutes per day
   ☐ Don't know/not sure

   The last question is about the time you spent *sitting* on weekdays during the *last 7 days*. Include time spent at work, at home, while doing coursework, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.
7. During the *last 7 days*, how much time did you spend *sitting* on a *week day*?
   _____ hours per day
   _____ minutes per day
   ☐ Don't know/not sure

This is the end of the questionnaire. Thank you for participation.

Questionnaire Summary

Research using a questionnaire as the data-gathering instrument is quite common in kinesiology. Considerable information has been presented concerning construction and use of a questionnaire. For people who will seldom use a questionnaire, it may be too much information, but for people who will use a questionnaire in their research, it is probably not enough information. A number of excellent sources are available for those who desire more information. All of the following are enlightening: Isaac and Michael (1995); Wiersma (1991, chapter 7); Best and Kahn (2005, chapter 5); and Neutens and Rubinson (2002). Books specific to survey methods and mail surveys such as Babbie (1990) and Weisberg and Bowen (1977) are excellent sources.

Summary of Objectives

1. **Identify the common types of descriptive research**. The most common and familiar type of descriptive research is the survey. Other types of descriptive research include developmental research, case studies, correlational studies, normative research, observational research, action research, and causal-comparative, or "after-the-fact," research.
2. **Explain several types of survey methods**. Surveys can be conducted as phone interviews, or personal interviews, which can vary in structure from very specific to very general. Surveys can also be conducted through the use of administered questionnaires. Questionnaires can include multiple choice or closed-ended questions, which are easy to compare, as well as open-ended questions that allow more varied responses.
3. **Evaluate the quality of a research questionnaire**. To be a useful research tool, a questionnaire must meet several criteria. The survey itself must be carefully designed and administered to a randomly chosen but appropriate population. It should be easy to read, complete, and submit. Questions should be unambiguously written and should extract the desired information in a consistent manner. Validity and reliability of surveys should be judged by a panel of experts.

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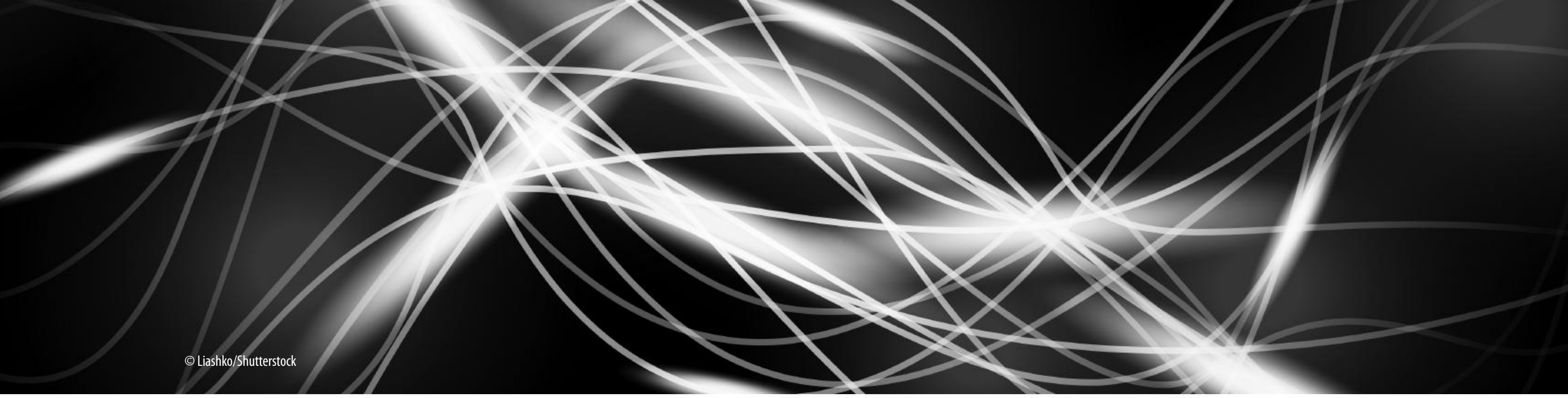

CHAPTER 3

Experimental Research

This chapter contains information concerning experimental research. You should be familiar with how experimental research is conducted and the major issues in conducting this type of research.

OBJECTIVES

After reading Chapter 3, you will be able to:

1. Understand what experimental research is and how it is conducted.
2. Know the threats to validity and how to control them.
3. Recognize the types of designs commonly used in experimental research.
4. Identify common errors of interpretation in research findings.

KEY TERMS

Analysis of covariance (ANCOVA)
Block design
Central tendency error
Control group
Counterbalanced design
Covariate
Designs
Double-blind study
External validity
Halo effect
Internal validity
Matched pairs design
Mediating variable
Moderating variable
Physical manipulation
Placebo
Preexperimental designs
Quasi-experimental design
Selective manipulation
Single-blind study
Statistical techniques
True experimental designs
Variate

Experimental research is a traditional type of research and is conducted in most disciplines. It is virtually the only type of research performed in the sciences. In all cases, experimental research is conducted to increase the body of knowledge in the discipline being studied and to suggest what procedures should be followed in the future. For example, a researcher who compares the effectiveness of two or more teaching or training methods, drugs, or techniques is trying to determine if there is one approach that is best and should be used in the future. The scientific method is always followed in experimental research. The scientific method is discussed in detail in Chapter 1, "The Nature, Purpose, and Overall Process of Research." Finally, experimental research always involves manipulation of the experimental unit (e.g., human participants, animal participants). Consider the typical methodological study in which each group of participants receives a different treatment. The treatment received by a participant has the potential to change (manipulate) the participant. Isaac and Michael (1995) state that the purpose of experimental research is to investigate cause-and-effect relationships by subjecting experimental groups to treatment conditions and comparing the results to control groups not receiving the treatment.

TABLE 3.1 Example Two-Dimensional Design

		Minutes of Training Time per Day			
		30	40	50	60
Number of Training Days per Week	3	Group 1			
	4				
	5				Group 12

Procedure in Experimental Research

In order to conduct a research study in a systematic manner, the researcher should follow a definite, orderly procedure, starting with initiating a problem area and ending with dissemination of the research findings. The five Ps: *p*rior *p*lanning *p*revents *p*oor *p*erformance, really apply here. The procedure outlined here applies specifically to experimental research and provides researchers with 14 systematic stages.

1. *State the research problem.* Clearly identify both the problem to be researched and the purpose of the research. The research should not continue without a clear statement of the purpose, because all subsequent steps and the entire conduct of the study are based on the statement of purpose.
2. *Determine if the experimental approach is appropriate.* Experimental research is conducted for the future and involves some manipulation of the participants by applying an experimental treatment. Not all aspects of the research have to be experimental, but the major thrust and conduct of the research is experimental.

   It is interesting to note that a study comparing existing groups (e.g., physical fitness differences between boys and girls) is often considered experimental research, but there is no manipulation of the participants. However, if the difference between boys and girls in terms of leisure time pursuits is being studied, the research is more apt to be classified as not experimental. In these two situations, the research will be conducted the same way no matter how it is classified.
3. *Specify the independent variable(s) and the levels of the independent variable(s).* An *independent variable* is used to form the experimental groups and is unaffected by the experimental treatment. Independent variables are explained in Chapter 2, "Descriptive Research." The levels of the independent variable are the number of different values it will take in the research study. For example, if four treatment groups are used in a study, the independent variable is treatment, and there are four levels. If the independent variables are training days with three levels and training time with four levels, the design is two-dimensional and each of the 12 groups receives a different combination of the two treatments, as presented in **TABLE 3.1**. Group 1 trains 3 days per week for 30 minutes each training day, while Group 12 trains 5 days per week for 60 minutes each time.

   Essentially, it is at this point that decisions are made concerning the basic design of the study.
4. *Specify all of the potential dependent variables. Dependent,* or *outcome variables* are the variables that could be measured during the research study to generate the data for analysis. Scores of the participants on these variables are dependent on the treatment they received. One or more dependent variables are identified at this step. The number and type of dependent variables are influenced by the statement of the research problem mentioned earlier.
5. *State the tentative hypotheses.* Experimental research requires a written *research hypothesis* that is either accepted or rejected based on the findings of the research study. The hypothesis is based on either personal belief, presently accepted beliefs, and/or what the research literature supports. Because the researcher is supposed to be unbiased as to the outcome of the study and, in many cases, has no special insight as to the outcome of the study or present beliefs, the research hypothesis is often one of equality. That is, the research hypothesis states that all groups are equal in ability at the end of the study, or, if a single group is measured before and after the experimental treatment, the hypothesis states there is no change in the ability