CHAPTER 1

INTRODUCTION TO RESEARCH IN HEALTH AND HUMAN PERFORMANCE

WHAT YOU'LL LEARN

- How to define research and begin to explore the nature of research
- How the scientific method helps guide the research process
- How the research continuum ranges from applied research in field settings to basic research in laboratory settings

As stated in the Introduction, research is part of our everyday lives. We use research in our personal lives to enhance our decision making and problem solving. For instance, when we are considering purchasing a new car, most of us will take the time to research and define specific criteria we are looking for in our car purchase. Through the information that is gathered, we are able to make an informed decision. Using data from current research to support the situation at hand will enhance our decision-making process. Next time you are having a debate with a friend, add a research claim or identify data to augment your position. Do not worry if you cannot cite the source; most likely your friend will not ask, because it is hard to argue with research claims and data!

Using research within your career is critical to your professional development. The research examples used in the Introduction for the health and human performance fields are good examples of how you may use research methods in your career. Whether you will conduct research or read about research to advance professionally, it is imperative to understand the concepts of research as well as research designs. We hope that you will be able to experience the process so that you will be able to better apply your experience with the sometimes difficult and complex nature of research. Through this textbook, we will guide

you through the research process. To begin, we must define research and examine the research continuum.

Defining the Research Process

How do we go about defining research? Think about research as a process that starts with a question and ends with a conclusion. To arrive at the end and have the ability to make a knowledgeable conclusion requires a systematic approach to answering your research question.

Research: a purposeful and systematic approach to problem solving

Consider the health educator scenario again from the Introduction. The salmonella outbreak with tomatoes in 2008 was covered extensively in the media. As a health educator, it is your professional responsibility to recognize that the reported information may be compelling but not always totally accurate or complete. Relying solely on mass media information is not recommended, especially those convincing and persuasive headlines. Furthermore, it is your responsibility to determine what information is truthful and how you will present and inform parents in your school system about this outbreak. As a health educator, you should use more accurate resources, such as the Centers for Disease Control and Prevention (CDC). When turning to more scientific resources in an attempt to provide accurate information, you need to remember that you are presenting this information to individuals without your content knowledge base. Therefore, you must be able to communicate clearly in such a manner that your audience will understand the information. With your education and training thus far, combined with the help of this textbook, you will know where to look for reliable resources, how to interpret information, and how best to communicate that information to others. With practice, sorting and filtering mass media information and reviewing scientific research will become easier, and you will be able to carefully and systematically report the needed information accurately to your audience.

Because the health and human performance fields are service-based professions, we need to stay current with new developments in our disciplines. It is our professional responsibility to stay current and be able to communicate ongoing changes within our fields to our clients. For example, in 2007, the American College of Sports Medicine (ACSM) and American Heart Association (AHA) announced recommendations on physical activity and public health

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FLAWED METHOD MAY UNDERESTIMATE CHILDHOOD OBESITY

The American College of Sports Medicine (ACSM) publishes a weekly bulletin titled *Sports Medicine Bulletin*. In the September 14, 2010 issue, Daniel O'Connor reported that the parent-reported values for children's height and weight that are used to identify obesity rates in the United States may be inaccurate. O'Connor examined data from clinics and found that parents tended to underreport weight and overreport height. With this information, it was noted that the data that we obtain from parents may not be reliable and that these errors affect the calculation of body mass index (BMI) that is used to identify obesity rates. O'Connor concluded that BMI may not be a good indicator of obesity, and new measures should be considered to provide a more accurate depiction of obesity rates.

O'Connor, D. P. (2010, September 14). Active voice: Flawed method may underestimate childhood obesity. *Sports Medicine Bulletin*. Retrieved from www.multibriefs.com/briefs/acsm/active9–14.htm

(Haskell et al. 2007). Updates are continually being made with regard to dosage, intensity, frequency, and duration of physical activity. In fact, in 2008, the United States Department of Health and Human Services (HHS) issued the 2008 Physical Activity Guidelines for Americans (www.health.gov/paguidelines). In 2010, First Lady Michelle Obama introduced the Let's Move initiative and renamed the President's Council on Fitness and Sports to the President's Council on Fitness, Sports, and Nutrition to provide a broader perspective of health initiatives for Americans. Staying informed and being a good consumer of research will assist you in informing clients and keeping you up to date on current trends. Continuing to read, interpret, and communicate scientific information will become easier with practice, as will further understanding of the research process.

Scientific Method

Remember, research is a purposeful and systematic process to problem solving. Understanding how to communicate research findings to individuals is only one aspect of research. Being able to develop a sound research design and execute the research methods is equally important. Personally experiencing the research

Table 1.1 Steps in the Scientific Method

1. Identify the problem	What is your area of interest? What questions are you curious about in your profession? What do you want to know more about in your professional field?
2. Research the area (Review of Literature)	How will you get a better picture of your research topic area?
3. Identify a hypothesis and/or research question	What are your initial predictions or questions based on the research that has been conducted in the field to date?
4. Design an appropriate research design (Research Methods)	How will you solve your research problem or question?
5. Collect data	How you execute your research methods, and what will you do with all your data?
6. Analyze data (Results)	How you will analyze your data, and what will you find?
7. Formulate findings and conclusions	How will you make sense of your results, and what does it all mean?

process will allow you to apply your experience to the concepts of research and its designs. The scientific method is used to answer your research question.

Scientific method: steps within the research process used to answer research questions

The scientific method is a way to ask and answer specific questions by making observations and performing experiments. See Table 1.1 for an overview of the steps in the scientific method.

Step One: Identify the Problem. The first step in the scientific method is to select/define a general problem or question of interest to you. You should ask yourself what you are interested in and want to know more about in your profession. Identify the problem you would like to solve. We cannot stress enough that this topic area must be of interest to you. You will be spending much of your time working with this topic area, and your choice of topic will affect the approach and execution of the remaining steps of the scientific process. This is like the foundation of a house; you need to have a solid underpinning to build your framework to have a well-built house that will withstand the test of time. At this point, you should be able to brainstorm some areas of interest to you; however, further refining your topic area is discussed in Chapter Three.

Step Two: Research the Area. Next, you need to begin to research your topic area of interest. What do you need to know to understand your topic? Where do you need to go to understand more? Secondary sources and browsing through government and professional organization Web sites may be useful to gain a broad sense of your topic area; see Tip for more information.

> **Secondary sources:** include sources such as textbooks, reviews of literature, and position papers that present research, but not the author(s)' own research

Primary or critical research journal articles will provide information on the research that has been conducted in the field to date.

> **Primary sources:** are sources in which the author(s) actually performed the research presented and include methods, results, and discussion sections

The review of the literature is like the framework that is built on the foundation of your house. You want to ensure that a solid framework is present, because the rest of the house is contingent on how the framework is designed and constructed.

Tip: Professional Organization Web Sites

National Institutes of Health	www.nih.gov
Centers for Disease Control and Prevention	www.cdc.gov
Coalition of National Health Education Organizations	www.cnheo.org
American School Health Association	www.ashaweb.org
National Center for Health Education	www.nche.org
National Athletic Trainers Association	www.nata.org
American College of Sports Medicine	www.acsm.org
National Strength and Conditioning Association	www.nsca-lift.org
American Public Health Association	www.apha.org
American Alliance for Health, Physical Education, Recreation and Dance	www.aahperd.org
International Association for Worksite Health Promotion	www.acsm-iawhp.org
Society for Public Health Education	www.sophe.org

Conducting a thorough review of the literature is discussed in Chapter Three, and Chapter Four guides you through writing a Review of the Literature.

Step Three: Identify a Hypothesis and/or Research Question. A thorough review of literature will help you understand the problem and allow you to successfully lead to the next step in the scientific method of identifying a hypothesis or research question. A hypothesis is an *educated* guess: What do you think will happen? This is not just a guess; it comes from the research you have performed in step 2. Based on past research, you will be able to develop a best guess (research hypothesis) as to what will happen. Another approach is to develop a research question. Sometimes it may be difficult to come up with an educated guess, especially when you are using the qualitative research approach. We will discuss much more on specific research designs; however, overall, research is divided into two approaches: quantitative and qualitative.

Quantitative research approach: research that relies on numerical data to reach results and conclusions

Further discussion on quantitative research designs is discussed in Chapter Five.

Qualitative research approach: research that asks *how* or *why* to explore research topic areas from the participants' descriptive perspective and thereby reach results and conclusions

Qualitative research designs are discussed in Chapter Six. The decision to formulate a research hypothesis or use a research question is sometimes up to the researcher or the type of research design. Not to complicate things more for you, but these two approaches could also be combined, which is known as mixed-methods research (discussed in Chapter Seven).

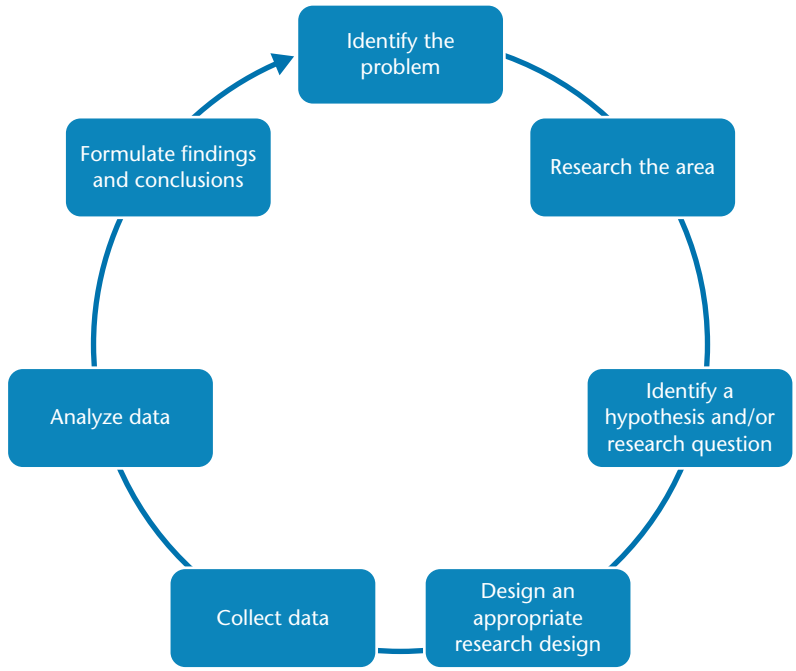
Step Four: Design an Appropriate Research Design. Once the research hypothesis or question is developed, the researcher will determine the most appropriate research design. The design and methodology are always driven by the research hypothesis or question. Going back to building a house, the framework that is set will dictate the design of the house. This is true here in our example; the research that was conducted that led us to developing our research hypothesis or question (framework) will dictate the research design. Your review of the literature will help to guide you in appropriately developing your own research design. As you begin reading past research, you will find that often researchers identify future research considerations or suggestions for future research designs. These can be

very helpful as you begin to develop your own design. At the same time, you must keep in mind ethics in research (Chapter Eight) and ensure that the benefits of the research outweigh the risks involved with conducting the research. Chapter Nine further discusses developing research designs and methodology considerations. At this point of refining the design and developing the methodology, you will define the research variables you can measure and the ways in which you can measure those variables. Further discussion and considerations of ways of measuring your research variables include considering validity, reliability, and objectivity, which are presented in Chapter Ten. In short, you want to make sure you will be measuring what you want to be measured (validity), and you want to be consistently (reliability and objectivity) measuring your research variable.

Steps Five and Six: Collect and Analyze Data. The next two steps in the scientific method include collecting and analyzing your data, which again are dependent on the research design that was selected based on the research hypothesis or question. This is the final finishing stage of building a house. All the finish work is dependent on the framework and type of design. The finish work of a house is contingent on its style and design. Likewise, in research, if you are using a quantitative research approach, you will be using inferential statistics to either accept or reject the statistical (null) hypothesis. Chapters Eleven and Twelve will provide you with more in-depth coverage of hypothesis testing and specific statistical procedures to test research hypotheses. Conversely, if the researcher will be using qualitative methods, Chapter Thirteen details how to interpret the data and answer research questions. If you are using a mixed-methods approach or combining qualitative and quantitative data analysis, you will be using statistical procedures and qualitative data analysis procedures to answer your research question.

Step Seven: Formulate Findings and Conclusions. The final step, formulating findings and conclusions, occurs when the researcher is ready to make connections between his of her research findings and the literature. At this point, the house is built, and the owner needs to determine how to decorate the house in accordance with the house's style. In other words, based on the analysis of the data from the previous step, it is now time to interpret the results and make conclusions. The researcher will ask (1) How are the findings from the current study similar to or different from past findings? and (2) How do the findings contribute to the existing body of research? The researcher also considers the implications and meaning of his or her findings. A term we often use in our research courses is the "so what" factor. Once you have answered the research question or supported your research hypothesis, so what? What does it mean?

FIGURE 1.1 Scientific Method



How can the information be used by practitioners? These are very important questions, and you want to be sure that these are answered at the conclusion of the research. Chapters Fourteen and Fifteen cover the final steps of the research process that include preparing your Results and Discussion sections, as well as ways of professionally presenting your research. Figure 1.1 provides a visual representation of the steps of the scientific method, as well as the continual flow of the research process.

Research Continuum: Applied and Basic Research

From a very global perspective, many researchers will identify two forms of research: applied and basic research. For purposes of defining the two, we can assume that they are dichotomous. Applied research attempts to address a specific question and is more concerned with the application of findings. Applied research usually uses a bottom-up approach or inductive reasoning to solve

problems. Research questions are generated through individual observations or experiences in an effort to solve actual problems in the field. The foundation of applied research is based on developing new theories as opposed to testing existing theories. Thus, conclusions are based on information generated from individual and direct observations.

Applied research: focuses on the application of research findings that are based on individual observations and experiences; typically conducted in field settings

For examples of applied research, please refer to Research to Practice.

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APPLIED RESEARCH EXAMPLES

Examining maximal strength testing among children: ''1RM testing in children would be useful for physical educators, youth coaches, and health care providers. Therefore, the purpose of this study was to evaluate the safety of 1RM testing in children and to assess its practical application as a testing tool in this age group'' (Faigenbaum, Milliken, & Westcott, 2003, p. 163).

Examining the effectiveness of a woman-held pregnancy record to help improve health behaviors for maternal and infant health: ''The 'Pregnancy Pocketbook' was examined on its effectiveness for 'improving smoking cessation, fruit and vegetable intake, and PA [physical activity] during pregnancy ' '' (Wilkinson, Miller, & Watson, 2010, p. 344).

Using clinical trials to examine smoking-related health risks of individuals with HIV: ''The purpose of the research was to 'determine smoking-related hazards ratios and population-attributable risk percentage for serious clinical events and death among HIV-positive persons, whose smoking prevalence is higher than in the general population ' '' (Lifson et al., 2010, p. 1896).

Conversely, basic research is usually considered to be more laboratory research that may or may not have immediate or direct implications. Whereas applied research uses more inductive reasoning, basic research uses a more top-down approach or deductive reasoning. Research questions are generated based on a theoretical underpinning that will drive research to develop new

hypotheses based on the results of the research. Basic research addresses the researcher's curiosity and is driven by a quest for knowledge, not necessarily to answer a specific question.

Basic research: focuses on the quest for knowledge that is based on theoretical foundations; typically conducted in laboratory settings

Essentially, applied research is thought to be more practical, and basic research is considered more theoretical. For examples of basic research, please refer to Research to Practice.

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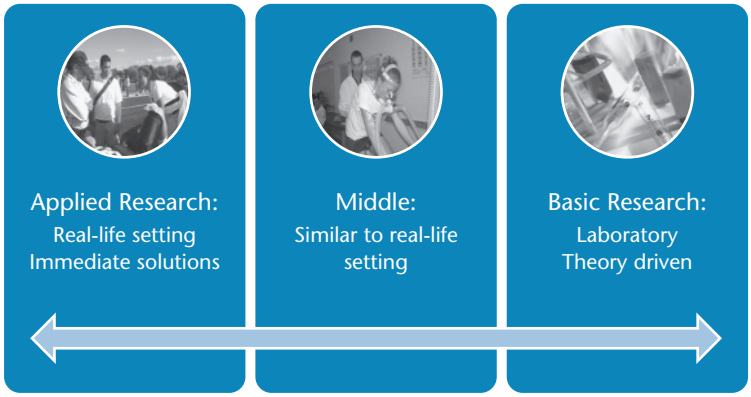
BASIC RESEARCH EXAMPLES

Examining postpartum depression in female rats: The researchers examined ''the effects of a diet-induced loss of brain DHA [docosahexaenoic acid] content and concurrent reproductive status in adult female rats'' (Davis et al., 2010, p. 161). (DHA is connected with postpartum depression.)

Example conducted in a laboratory setting using mice in clinical trials to explore obesity and the effects of an environment that promotes exercise: Researchers were able to test and measure levels in mice that are not possible in humans because of unethical risks in research yet results in the SNARK-deficient mice can assist in better understanding obesity and energy expenditure in humans. (SNARK-deficient mice are mice that exhibit mature-onset obesity and related metabolic disorders.) ''The results of the present study clearly indicated that SNARK deficiency contributed to the regulation of physical activity. Our observations provide a basis for further studies to define a molecular mechanism of action of SNARK and to determine its physiological significance'' (Ichinoseki-Sekine et al., 2009, p. E1020).

Although we clearly define these two forms of research, one can argue that there is no clear dichotomy, but rather a continuum that exists between the two forms. If we consider a continuum, applied research that answers more immediate

FIGURE 1.2 Applied and Basic Research Continuum



questions and occurs in a real-world setting would be on one end, and basic research that addresses more theoretical issues and has more strict scientific controls would be at the other end. Consider research in exercise physiology. Often as researchers we attempt to control specific parameters during exercise, such as time of exercise, fluid intake, temperature, and diet. We also may have the subjects tested in a laboratory setting where scientific controls are in place versus a real-life setting. However, we attempt to apply the findings to a real-world setting. In the fields of health and human performance, applied research is used most; however, basic research is still very important and essential to many professionals. Specifically, medical professionals conduct basic research in various areas to better understand infectious diseases and discover treatments and cures for developmental diseases and cancer. These are only a few examples, and there are many aspects or lines of research, such as biomedical and genetic research, that are being conducted to better understand the human organism and how we function. As we consider applied and basic research along the continuum, a balance of both may be the most appropriate research design, as illustrated in Figure 1.2. Refer to the Research to Practice on Balancing Applied and Basic Research. We also encourage you to review the online student resources for more information on these cited articles, as well as Web page links to various organizations conducting research.

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BALANCING APPLIED AND BASIC RESEARCH

Example with controlled parameters conducted in a laboratory setting yet applying findings to real-world settings: Researchers controlled hydration levels to examine the effects of strength, power, and performance among resistance exercises. ''The current results indicate that hypohydration significantly attenuates performance of an isotonic, multirepetition, multiset exercise bout typical of conventional resistance exercise'' (Judelson et al., 2007, p. 1822).

Summary

Research can provide us with knowledge and the ability to better solve problems. Staying current in your career is imperative to your professional development. At the same time, research can lead to misleading findings and conclusions. As illustrated in the Research to Practice example, methods can be flawed that lead to unfounded conclusions. Such findings may not be unfounded but rather misinterpreted by readers who simply read the mass media headlines. Thus, you need to be good consumers of research. Through this textbook, you will learn to review and interpret information and systematically report accurate and relative findings within your profession.

Research is very systematic in nature, and understanding the scientific method will assist you with developing an overall command of the research process. Beginning with identifying a research problem that is of interest to you is imperative. You will be spending a great amount of time researching this area and must be invested in what you are doing. Much of your time will be spent on preparing a review of literature, which provides a foundation for the remaining steps in the scientific method. Based on the research, you can make an educated guess or hypothesis as to what you think would happen. However, if your topic area warrants more investigation that explores the how and why, then you would develop research questions. These two examples help differentiate the quantitative and qualitative research approaches.

Research design and methodology are based on research hypotheses or questions. Many considerations need to be addressed at this step that are discussed in later chapters. Not only is learning about the various quantitative

and qualitative research designs in Chapters Five through Seven important, but also discussing ethics (Chapter Eight) is crucial for developing your research proposal (Chapter Nine). Finally, analyzing and formulating findings will allow you to make conclusions based on the research conducted. Through this process, we hope you will have a greater understanding and appreciation for the research process.

Review Questions

1. How would you define *research*? Provide an example of how understanding the research process will benefit you professionally.
2. Why is being a good consumer of research important to understanding and interpreting findings and conclusions?
3. What are the steps in the scientific method? Why is step 2 (review of the literature) a critical step in the subsequent steps of the scientific method?
4. What is the difference between applied and basic research? Provide an example of each that is in your area of interest.

Key Terms

Applied research

Basic research

Primary sources

Qualitative research approach

Quantitative research approach

Research

Secondary sources

Scientific method