

INTRODUCTION

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Statistics and research methods courses in psychology form the scientific foundation of the discipline and are required in virtually every undergraduate psychology program (Stoloff et al., 2010). Moreover, the American Psychological Association (APA) Board of Educational Affairs Working Group on Strengthening the Common Core of the Introductory Psychology Course (2014) recommended that introductory psychology students should learn scientific reasoning, problem solving, and research methods.

In addition, multiple concepts from these areas are essential components of the Advanced Placement (AP) high school psychology course. The number of students enrolled in AP Psychology continues to rise, as evidenced by significant increases in the number who take the AP Psychology Exam. According to the College Board's (2015) Program Summary Report, more than 275,000 high school students took the AP Psychology Exam in 2015. Approximately 8% to 10% of the AP Psychology Exam is composed of items pertaining to research methods, including descriptive and inferential statistics (The College Board, 2013). This percentage is equal to, or greater than, the percentage for any other topic on the exam.

Although instruction in statistics and research methods is universal in college and AP psychology curricula, these topics are typically among the more challenging for students, in particular for those students who experience math or statistics anxiety (Chew & Dillon, 2014; Chiesi & Primi, 2010; Onwuegbuzie & Wilson, 2003). In addition, comments posted by students on the website <http://www.ratemyprofessors.com> suggest that statistics courses are generally viewed less favorably than introductory psychology classes (Addison, Stowell, & Reab, 2015). Thus, instructors who teach these topics generally have at least some students with attitudinal barriers to learning the content.

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Activities for Teaching Statistics and Research Methods: A Guide for Psychology Instructors, J. R. Stowell and W. E. Addison (Editors)

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In many cases, these instructors may consider incorporating innovative strategies for developing and maintaining student interest.

We have learned the pedagogical value of classroom activities through a variety of sources (e.g., attending teaching conferences, reading journal articles, perusing activities books) and have found these activities helpful in our own teaching. After the first author gave a preconference APA workshop that included activities for presenting difficult-to-teach topics in biological psychology, the idea for an activities book shifted to a focus on activities that would benefit a broader audience of instructors. Having worked together on previous research projects, the two of us focused our complementary expertise on this project.

This book was designed to address the need for a comprehensive collection of classroom-tested activities that would engage students, teach correct principles, and inspire instructors. Each chapter describes one or more activities that are pedagogically sound, practical, easily implemented, and effective in helping students learn core topics in statistics and research methods in psychology and, more broadly, the social sciences.

The primary audiences for this book are college instructors who teach undergraduate introductory courses in statistics and research methods (and introductory psychology) and high school AP Psychology teachers. Novice instructors, including graduate students, can use this book as a guided set of activities to launch in their classroom from the start, and veteran instructors can use these activities to replace or supplement existing teaching activities.

The chapter authors represent a diverse group of experts in their respective fields. We have deliberately selected individuals who have distinguished teaching and/or publication records and who are representative of the audience for whom the book is written. Many of the authors have won local or national teaching awards, and some have authored textbooks in the areas of statistics and research methodology. As a whole, the group is demographically, geographically, and institutionally diverse.

The order of the chapters follows the typical progression of topics in an introductory statistics or research methods course. Each chapter is devoted to a concept typically found in these courses and contains one or more classroom activities relevant to this topic.

Each chapter is structured in the following manner:

- *Mini-abstract*: A concise description of the activity
- *Concept*: A brief explanation of the core concept that is being taught with the activity
- *Materials Needed*: Handouts, supplies, equipment, technology, and so on
- *Instructions*: Step-by-step detailed instructions for implementing the activity
- *Assessment*: A description of the methods for assessing student learning (or suggested forms of assessment)
- *Discussion*: A description of expected outcomes, cautions as to what may go wrong, postactivity discussion ideas, follow-up assignments, and other suggestions
- *References*: A list of works cited in the chapter
- *Resources (Appendix)*: Handouts for students, experimental stimuli, online resources, and other helpful information

Table 1 includes each chapter's key topics, the expected amount of time needed to complete the activity in class, and the targeted level for the activity. Most of the activities demonstrate introductory-level topics (e.g., measures of central tendency, operational

Table 1 Chapter Topics, Class Time, and Target Audience

Chapter no.	Topic	Total class time to complete	AP/ Introductory Psychology	Introduction to Statistics/ Research Methods	Advanced Statistics & Research Methods
1	Reducing statistics anxiety	30 min		x	
2	Interpreting graphs	Two 50-min classes about 1 week apart	x	x	
3	Measures of central tendency	30 min	x	x	
4	Measures of variability	45 min		x	
5	Frequency distributions	45 min	x	x	
6	Normal distribution, percentiles	50 min spread over 3 class periods	x	x	
7	Scatterplots, correlation and regression	30 min		x	
8	Sampling distributions	30 min		x	x
9	Hypothesis testing	30 min	x	x	
10	Confidence intervals	45 min		x	x
11	Type I and II errors	20 min		x	x
12	Statistical power	30 min		x	x
13	Effect sizes, p values	25 min		x	x
14	Scientific method	30–45 min	x	x	
15	IVs, DVs, goals of science	20 min for Part 1; additional 5–10 min each for Parts 2–4	x	x	
16	Operational definitions	30 min	x	x	
17	Random assignment	15–20 min to perform the memory experiment (Day 1) and an additional 20–30 min for the full discussion and demonstration of random assignment (Day 2)	x	x	
18	Confounding factors	45 min	x	x	
19	Experimenter bias, participant bias	20 min	x	x	
20	Ethics in human research	30 min	x	x	x
21	Ethics in animal research	50 min	x	x	x
22	Inter-observer reliability	60 min	x	x	
23	Survey construction	Six 50-min class periods		x	x
24	Qualitative research	30–150 min, depending on the scope of use		x	x
25	APA Style writing	35 min/class for peer review of writing early in the term (3 or 4 classes); 70 min/class for such review later in the term (2 or 3 classes)		x	x

Note. IVs = independent variables; DVs = dependent variables; APA = American Psychological Association.

definitions, the scientific method), whereas some topics are more appropriate for advanced undergraduate and/or graduate courses (e.g., confidence intervals, statistical power, qualitative research). Because of space limitations, we could not include a chapter on every important concept in these courses; however, many of the formats used for the activities described in this book (e.g., group activities, research scenarios) can be easily adapted for use with other topics.

We hope that instructors who teach topics in statistics and research methods enjoy using these activities as much as we enjoyed compiling them. We invite readers of this book to share their classroom experiences with us; after all, great teaching ideas deserve to be shared!

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THE ETHICS OF BEHAVIORAL RESEARCH
USING ANIMALS: A CLASSROOM EXERCISE

Harold Herzog

The use of nonhuman animals in behavioral and biomedical research raises complex ethical issues. In the activity described in this chapter, groups of students serve as members of hypothetical university animal ethics committees. The groups evaluate the potential costs and benefits of psychology experiments involving animals and decide whether to approve or reject scenarios that are based on actual studies.

CONCEPT

Psychology research with animals has long been controversial. In 1907, John B. Watson, the founder of behaviorism, was attacked by the press for a series of experiments in which rats were blinded and deafened (Dewsbury, 1990). More recently, in his book *Animal Liberation*, often referred to as the “bible of the animal rights movement,” the philosopher Peter Singer (1975) targeted classic behavioral experiments with animals that he deemed cruel and unnecessary. These included Harry Harlow’s studies on maternal deprivation in monkeys and Martin Seligman’s experiments on the use of electric shock to create learned helplessness in dogs.

The debate over the use of animals in research continues today, and public opinion is deeply divided on the issue. A recent survey conducted by the Pew Research Center (2015) found that 47% of American adults approved of the use of animals in scientific research, and 50% disapproved.

The primary legislation governing animal research in the United States is the Laboratory Animal Welfare Act of 1966 (Pub. L. No. 89-544; hereafter AWA). Amendments to the AWA enacted in 1985 required that colleges and universities in which animals are used for research or educational purposes establish Institutional Animal Care and Use Committees (IACUCs). These committees conduct regular inspections of animal research facilities and review experiments involving animal subjects. Note that rats, mice, and birds—the species that make up over 95% of animals used for research in the United States—are exempt from coverage under the AWA. All vertebrate species, however, are covered under the Public Health Service Policy on the Humane Care and Use of Laboratory Animals (Office of Laboratory Animal Welfare, U.S. Department of Health and Human Services, 2015). As a result, in spite of the exemption under the AWA, nearly all university IACUCS do review experiments involving rats, mice, and birds.

The activity described herein is designed to facilitate classroom discussions of ethical issues associated with the use of animals in research. Small groups of students evaluate the costs and benefits of animal research proposals and make decisions about

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whether the research should be permitted. In an optional second activity, a brief scale is used to assess student attitudes about the use of animals in research. This can lead to discussions of issues such as the origins of gender differences in beliefs about the treatment of other species.

**MATERIALS
NEEDED**

Appendix 21.1 includes two sample proposals. Additional proposals can be found at <http://files.harpercollins.com/OMM/SomeWeLoveResources.pdf>. Appendix 21.2 includes the 10-item version of the Animal Attitudes Scale (AAS-10; Herzog, Grayson, & McCord, 2015), a measure of individual differences in attitudes toward the treatment of animals.

INSTRUCTIONS

Divide the class into groups of five to seven students and select a group leader, who should be given a copy of the animal research proposal. The leader reads the proposal to the group members and leads a discussion of the proposal. You should encourage the groups to discuss the pros and cons of the study and try to reach a consensus rather than taking a quick vote on whether to approve the research. Among the issues the students should consider are the following: What will be gained by the experiment? Will the research potentially lead to more effective treatments for human disorders? Will it answer an important scientific question? The students should also consider the degree of harm or pain and suffering for the animals in the study.

Depending on the time available, give each group one or two proposals to review. This process usually takes 15 to 20 minutes. Once the groups have made their decisions, ask the group leaders to come to the front of the room and briefly describe the study to the rest of the class. They should report their group's decision to approve or reject the research proposal and their reasons for making that decision. At this point, other students in the class can weigh in on the proposed research. Often, groups will make different decisions for the same proposals. This is to be expected. A study of actual IACUCS found high levels of disagreement in decisions between committees reviewing the same proposals (Plous & Herzog, 2001).

Although not necessary, I have students read and discuss "Human Morality and Animal Research" (Herzog, 1993) before participating in the exercise. Although the article was written in 1993, the issues it raises related to moral consistency and the treatment of animals have not changed.

The research proposals are based on actual experiments. You should, however, feel free to modify the proposals or to write your own that address other ethical issues, such as housing, training of laboratory personnel, and veterinary care. A variant of this exercise can be used to facilitate class discussions of ethical issues associated with the use of human subjects. In this case, the students serve as members of hypothetical institutional review boards.

ASSESSMENT

You may want to administer to your students the AAS-10 (see Appendix 21.2) before and/or after discussion of the animal research proposals, to assess general changes in attitudes about animal research. This is a brief form of a scale that has been widely used to assess attitudes toward the use of other species. The 10-item version has excellent psychometric properties (Herzog et al., 2015), and it can be used to facilitate discussions of an array of topics related to the psychological aspects of relationships with other species. For example, women will usually have, on average, higher AAS-10 scores than men, indicating greater concern for animal welfare.

DISCUSSION	The use of animals in biomedical and behavioral research is among the thorniest of ethical issues associated with the treatment of other species. Group members often initially disagree about approval/rejection decisions. Sometimes group members come to a consensus decision after discussing the costs and benefits of the proposals. In other cases, however, they remain divided. When this happens, I encourage dissenting students to inform the class why they disagreed with their fellow group members. Some students will have strong feelings about the use of animals in science. In my experience, however, they tend to be respectful of each other's views when discussing the merits of specific proposals during this exercise.
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Appendix 21.1

Animal Research Proposals

Your group is the Institutional Animal Care and Use Committee (IACUC) for your university. It is the committee's responsibility to evaluate and either approve or reject research proposals submitted by faculty members who want to use animals for their studies. The proposals briefly describe the experiments, including their goals, potential benefits, and the costs of the research in terms of possible harm or discomfort to the animals. Your group must either approve or deny permission for the experiment to be conducted. Note that it is not your job to critique technical aspects of the projects, such as the experimental design. You should make your decision on the basis of the information given in the proposal.

**PROPOSAL 1:
THE EFFECTS
OF MATERNAL
DEPRIVATION
ON BRAIN
DEVELOPMENT
IN MONKEYS**

An estimated 3 million adolescents suffer from major depression each year. Dr. Kaleen uses a nonhuman primate model to study the developmental neurobiology of this disorder. He is requesting permission from your committee to conduct a study of the effects of maternal deprivation on brain development in young monkeys. Twenty baby rhesus monkeys will be taken from their mothers at birth. For the first month of their lives they will be raised in isolation. For the next 11 months they will be housed with another baby monkey. Every 3 weeks, the animals will be subjected to a short-term stressor, such as exposure to a harmless snake or a noisy novel toy. Immediately following each of these trials, small amounts of blood will be drawn to assess the animals' levels of cortisol, a stress hormone. In addition, every 4 months the monkeys will be anesthetized and given an MRI (a type of brain scan). This will allow Dr. Kaleen to study the development of areas of the primate brain involved in depression. The control group will consist of 20 monkeys who will stay with their mother for the entire year after they are born. They will also be given the stress tests, blood tests, and MRIs.

After 12 months, animals in both the experimental and the control groups will be painlessly euthanized. Their brains will then be subjected to detailed anatomical and neurochemical analyses.

Dr. Kaleen notes that his research is based on studies of the effects of isolation in monkeys by Harry Harlow, which showed that maternal deprivation can produce long-term depression in animals. But, unlike Harlow's studies, the baby monkeys will be only be completely isolated for 1 month. Kaleen notes that little is known about how maternal deprivation affects brain development. He argues that the results of this study will help lead to the development of new types of treatments for depression in teenagers and young adults.

Approve or reject the study? Give the reasons for your decision.

(Note to instructor: This scenario is based on a protocol that was initially rejected but subsequently approved by the IACUC of a major university with modification [a reduction in the length of social isolation]).

**PROPOSAL 2:
STIMULUS
CONTROL OF
EMPATHY IN MICE**

Dr. Jones studies pain using nonhuman animals. In his laboratory, pain is induced in mice by injecting the animals in their stomachs with a solution of acetic acid. This procedure produces a sequence of behaviors called the “writhing response.” In a previous study, Jones showed that mice are capable of experiencing a type of empathy when in pain: When tested in pairs, mice show higher levels of pain responses than when tested alone—but only if the second mouse is a former cage mate rather than a stranger.

Dr. Jones is requesting permission from your committee to conduct an experiment that will show whether the mice communicate their distress to former cage mates through vision, sound, or smell. The study will involve 150 mice. Half of the mice will be “stimulus” animals. They will simply be injected with the acetic acid solution. The other 75 mice will be “observers.” These animals will also be injected in the stomach with the acid solution, but, in addition, they will be deprived of one of their senses. The first group of animals will be blocked from seeing the stimulus animal by having an opaque barrier placed between them and their former cage mate. The second group of 25 mice will first be permanently deafened by having a chemical injected into their ears every day for 2 weeks. The third group will be permanently deprived of their ability to smell by having a toxin inserted into their noses that destroys odor-detecting nerve cells.

The mice will be given the writhing test in pairs to see which group of the observer animals shows empathy responses in the paired writhing test. Dr. Jones says the design of the experiment will allow him to determine whether the stimulus animals are communicating their pain by visual signals, high-frequency sounds, or chemical signals.

Approve or reject: What is the reason for your decision?

(Note to instructor. This scenario is based on series of studies that provided the first evidence that nonprimate animals experience empathy [Langford et al., 2006]. The experimenters found that mice deprived of their sense of hearing or smell still showed the empathy response, whereas the response was eliminated in mice who could not see other animals in pain. The study involved many hundreds of animals that were subjected to pain and/or permanent destruction of their sensory capacities. Given the degree of suffering involved in the research, it is ironic that it was lauded by some animal activists who argued that it demonstrated parallels between the emotional responses between mice and humans. [See Herzog (2010, Chapter 8) for a discussion of the paradox of using the results of studies of animal behavior to argue that animal research should be eliminated.]

Appendix 21.2

The Animal Attitudes Scale (10-Item Version)

The AAS-10 consists of all the items below. Higher scores indicate more concern for animal welfare. The numbers of points assigned to the response items are in parentheses. Starred items (*) are reverse scored. For psychometrics of the scale, see Herzog, Grayson, and McCord (2015).

Instructions: Listed below are a series of statements regarding the use of animals. Circle the letters that indicate the extent to which you agree or disagree with the statement:

SA = Strongly Agree (5)

A = Agree (4)

U = Undecided (3)

D = Disagree (2)

SD = Strongly Disagree (1)

1. It is morally wrong to hunt wild animals just for sport.

SA A U D SD

2. I do not think that there is anything wrong with using animals in medical research.*

SA A U D SD

3. I think it is perfectly acceptable for cattle and hogs to be raised for human consumption.*

SA A U D SD

4. Basically, humans have the right to use animals as we see fit.*

SA A U D SD

5. The slaughter of whales and dolphins should be immediately stopped even it means some people will be put out of work.

SA A U D SD

6. I sometimes get upset when I see wild animals in cages at zoos.

SA A U D SD

7. Breeding animals for their skins is a legitimate use of animals.*

SA A U D SD

8. Some aspects of biology can only be learned through dissecting preserved animals such as cats.*

SA A U D SD

9. It is unethical to breed purebred dogs for pets when millions of dogs are killed in animal shelters each year.

SA A U D SD

10. The use of animals such as rabbits for testing the safety of cosmetics and household products is unnecessary and should be stopped.

SA A U D SD

Note. From "Brief Measures of the Animal Attitude Scale," by H. Herzog, S. Grayson, and D. McCord, 2015, *Anthrozoös*, 28, p. 152. Copyright 2015 by Routledge. Reprinted with permission.