

# RESEARCH METHODS EXERCISES

PART

I

Exercises in the first component cover major course concepts such as design types and data collection techniques, literature reviews and library research, reading journal articles, identifying variables, ethical guidelines, subject sampling, and descriptive and inferential statistics. These exercises are organized by each step in the research process. See the organizational table in the introductory pages.

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## 1. SCIENCE VERSUS PSEUDOSCIENCE EXERCISE

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One of the goals of the course you are taking is to help you recognize the difference between scientific evidence and pseudoscience. Knowledge gained with the scientific method relies on carefully controlled studies that produce results that can be replicated. In addition, according to Lawson (2007), there are six common characteristics of pseudoscience:

- Use of imprecise, scientific-sounding language
- No evidence of continued research or new knowledge gained over time
- Reliance on anecdotes as evidence
- Reliance on authority endorsements, especially “false authorities” (i.e., people who claim to be authorities but do not have any real expertise in the area)
- Extraordinary claims without supporting evidence
- Evidence relies on confirmation rather than refutation

There are many advertisements presented in the media (e.g., TV commercials, newspaper and magazine ads) that rely on pseudoscience to advertise a claim or product. For this exercise, find such an advertisement and write a short paragraph that (1) describes the claim or product, (2) identifies any of the above elements of pseudoscience used in the ad, and (3) explains why the ad relies more on pseudoscience than science for its claims.

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## 2. SCIENCE IN THE NEWS

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Find an article in the newspaper that reports the results of some research (Hint: Check the science section). For that article, try to identify as many “scientific method details” about the research as you can.

For example, What was the hypothesis for the research? What methodology was used (e.g., experimental, correlational, case study)? How were the participants obtained? What were the conclusions of the research? What were the limitations of the study?

How convinced are you by the study’s results? What questions about the research do you have? What other details were left out that would be useful in evaluating the quality of the study?

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### 3. READING JOURNAL ARTICLES EXERCISE—SHACHNAI ET AL. (2022)

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This exercise accompanies a reading of

Shachnai, R., Kushnir, T., & Bian, L. (2022). Walking in her shoes: Pretending to be a female role model increases young girls' persistence in science. *Psychological Science*, 33(11), 1818–1827. <https://doi.org/10.1177/09567976221119393>

Please answer the following questions about the Shachnai et al. article (you must read through the article before you begin this assignment—the reference to the article is provided above). For each question, indicate which section of the article (e.g., Introduction, Method) the information was in.

1. What is the research question?
2. How did they answer the research question? (Hint: You should be able to answer this question by reading the Introduction of the article.)
3. Did the authors make a hypothesis? If so, what was it?
4. What type of research design (e.g., correlational study, experiment, quasi-experiment) did the authors use?
5. Do you think the data collection technique used in the study qualifies as naturalistic observation? Why or why not?
6. What was measured in the study and *how* was it measured? (Hint: Three things were measured—see the headings in the Method section.)

7. What was the difference between the exposure and roleplay conditions? How did the researchers check that the children in the roleplay condition were following the instructions? (Hint: Read the Method section carefully.)
  
8. What source of bias might have been added to the study if the researchers had used pictures of the scientists?
  
9. What do you notice about the persistence scores looking at Table 1? Did the boys and girls persist equally? Explain your answer.
  
10. Why did the researchers think that self-reported motivation was not affected by the instruction condition?
  
11. Based on the results, what answer did the authors get to their research question?
  
12. What is the main piece of information learned by this study?
  
13. Based on what was learned, what real-world application does this study have?

#### 4. READING JOURNAL ARTICLES EXERCISE—SANA AND YAN (2022)

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This exercise accompanies a reading of

Sana, F., & Yan, V., X. (2022). Interleaving retrieval practice promotes science learning. *Psychological Science*, 33(5), 782–788. <https://doi.org/10.1177/09567976211057507>

Please answer the following questions about the Sana and Yan article (you must read through the article before you begin this assignment—the reference to the article is provided above). For each question, indicate which section of the article (e.g., Introduction, Method) the information was in.

1. State the research question.
2. Discuss some of the past research regarding blocked and interleaved study practice. Why did the authors think that additional studies were needed on this topic?
3. What was the researchers hypothesis for this study? Why did they make this prediction?
4. What was the primary independent variable in this experiment? What were the levels of this variable? (This can be found in the Method section.)
5. Why did half of the classes in the study start with blocked quizzes and half started with interleaved quizzes?

6. Why did the study involve both weekly quizzes and a final test a month later? Which one was used to measure the dependent variable?
  
  
  
  
  
  
  
  
  
  
7. What are some possible sources of bias in this study?
  
  
  
  
  
  
  
  
  
  
8. Overall, what do the results suggest for how one should study for exams to increase exam performance?
  
  
  
  
  
  
  
  
  
  
9. What are some real-world applications of this study, and how can teachers use this information to help students learn more over the long term in their classes?

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## 5. READING JOURNAL ARTICLES EXERCISE—MOJDEHI ET AL. (2020)

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This exercise accompanies a reading of

Mojdehi, A. S., Shohoudi, A., & Talwar, V. (2020). Children's moral evaluations of different types of lies and parenting practices and across cultural contexts. *Current Psychology*, 1–14. <https://doi.org/10.1007/s12144-020-01059-7>

Please answer the following questions about the Mojdehi et al. article (you must read through the article before you begin this assignment—the reference to the article is provided above). For each question, indicate which section of the article (e.g., Introduction, Method) the information was in.

1. Explain why, specifically, the stories utilized in the study were chosen as modes of researching distinguishing lying and truth-telling by children for this experiment. How do these stories differ from each other in a way that can be accurately tested?
2. Explain the moral response card task used in this experiment. Do you think this is a good task for measuring lying interpreted by children? Why or why not?
3. What were the hypotheses for the different kinds of lies that the stories presented? Be sure to differentiate these predictions between the younger and older children.
4. What were the hypotheses for the different kinds of parenting disciplinary strategies?
5. What were the hypotheses for the impact of different cultures?



6. Based on the results, what answer did the authors get to their research question?
  
  
  
  
  
  
  
  
  
  
7. It is noted when discussing the limitations of the study that the used instruments that have only been used with North American samples. What sort of confound does this create in the results? What are some potential ways in which this could be changed to eliminate this confound?
  
  
  
  
  
  
  
  
  
  
8. How does the information you learned in this article relate to previous concepts you may have learned in other psychology courses (e.g., positive reinforcement, positive punishment, negative reinforcement, negative punishment, classical conditioning)?
  
  
  
  
  
  
  
  
  
  
9. Do you think influence from media (childhood movies, television shows, etc.), instead of childhood picture books, might be any more effective in promoting honesty? Why?
  
  
  
  
  
  
  
  
  
  
10. Is it possible to apply the results from this study to ages past childhood? For instance, if one were attempting to investigate how to promote honesty and reduce lying behavior in adolescents, how could this study be modified?
  
  
  
  
  
  
  
  
  
  
11. How might the results from this study apply to other moral conventions that we attempt to teach children (e.g., manners, bullying, hard work)? In what ways might the study have to be modified to investigate other moral conventions?

## 6. READING JOURNAL ARTICLES EXERCISE—FLANIGAN AND TITSWORTH (2020)

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This exercise accompanies a reading of

Flanigan, A. E., & Titsworth, S. (2020). The impact of digital distraction on lecture note taking and student learning. *Instructional Science*, 48, 495–524. <https://doi.org/10.1007/s11251-020-09517-2>

Please answer the following questions about the Flanigan and Titsworth article (you must read through the article before you begin this assignment—the reference to the article is provided above).

1. One of the research questions addressed in this study is
  - a. Of all note-taking techniques, which is the best?
  - b. Which note-taking technique do students use most often?
  - c. Which note-taking technique is better: longhand or using a laptop?
  - d. Which information is better remembered: a lecture about the earth's crust or about the sun?
2. The researchers' hypothesis in this study is
  - a. information about otters will be remembered better than information about the sun.
  - b. digital distraction will be more consequential for the longhand note-taking because of a speed disadvantage.
  - c. re-reading information on a lap-top will result in better memory than recalling information.
  - d. none of the above.
3. The researchers conducted a pilot study to
  - a. eliminate a subset of participants.
  - b. test the research procedures.
  - c. make sure that the laptops used functioned properly.
4. The main experiment used a between groups factorial design. This means that
  - a. all participants received both the longhand and laptop conditions.
  - b. participants only completed either the note-taking medium or the distraction level condition.
  - c. participants only completed one of four conditions: the longhand with texting, or the longhand with no-texting, the laptop with texting, or the laptop with no texting condition.
  - d. all subjects received two of these conditions in the study.
5. The results of the study depicted in Figure 1 show
  - a. an interaction between distraction level and note-taking medium.
  - b. that more words were used in the distracted conditions.
  - c. participants recalled more about the passage they found more interesting.
  - d. that participants using laptops for note-taking used fewer words.
6. Note-taking efficiency was
  - a. an independent variable in the study.
  - b. a control variable in the study.
  - c. a dependent variable in the study.
  - d. both a and c.
7. The primary conclusion from this study is that
  - a. laptop note-takers were more disrupted by texting than longhand note-takers.
  - b. undistracted laptop users use more words and complete lecture ideas than longhand note-takers.
  - c. longhand note-takers adapt to their speed disadvantage by taking more efficient notes.
  - d. all of the above.

## 7. LITERATURE REVIEWS

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1. How does an empirical journal article differ from a popular magazine article (e.g., an article in *Time* magazine)? Who is the intended audience of empirical journal articles in psychology?
  
2. Describe how you might use PsycINFO or Google Scholar (or a similar database) to conduct a literature review on the topic of **obesity stereotypes and helping behaviors**. Describe the steps you would take to collect relevant articles for your literature review and what you might expect to find at each step.
  
3. Using PsycINFO, find an article co-authored by David A. Rosenbaum that was published in 2022 in the *Journal of Experimental Psychology: Human Perception and Performance*, and then type up the APA-style reference for the article.
  
4. Using PsycINFO, find a **recent article (2018 or later)** that examines the relationship between violence in video games and violent behavior in children. Type the APA-style reference for the article.
  
5. You've probably heard the saying "Opposites attract." This is really a hypothesis about what people are attracted to, and research in psychology has attempted to test this hypothesis. Search for studies that tested this hypothesis. However, before you begin, you must first convert the saying into a research question about behavior.
  - a. State the research question for this saying in terms of behavior that might be examined in a research study.
  
  - b. Using your research question to develop keywords (do NOT type in the saying), conduct a literature search within your preferred database to find one article that provides empirical evidence that either supports or does not support the hypothesis. In your own words, write a short paragraph indicating why you think the article supports or does not support the hypothesis. Include the APA-style reference of your article and describe how you conducted your search.
  
  - c. Describe how the empirical evidence you found could be used by companies that run dating sites (e.g., match.com) to help their clients identify potential dating partners.

## 8. IDENTIFYING AND DEVELOPING HYPOTHESES ABOUT VARIABLES

Finding and developing research ideas takes practice. One source of some research ideas is our common wisdom. This exercise has you practice developing commonly held beliefs into testable research ideas. Listed below are 10 statements that are common pieces of cliché advice (many of which you may have heard at some point in your life). Pick two of the clichés, and turn them into testable research ideas.

Ignorance is bliss.	The bigger they are the harder they fall.
Good things come to those who wait.	Birds of a feather flock together.
The grass is always greener on the other side of the fence.	Blood is thicker than water.
The apple doesn't fall far from the tree.	One bad apple doesn't spoil the bushel.
Better late than never.	The early bird catches the worm.

For each of the clichés that you select

- Identify a potential research method that may be used to investigate the idea
- Identify the relevant variables and specify how the researcher might manipulate and/or measure the variables
- Identify other variables that might be relevant (e.g., to control or measure)

*Example:* Laughter is the best medicine.

**Research Method:** Experiment

**Independent Variable:** “Laughter”

This variable may be operationalized by manipulating whether there is laughter present or absent.

**Dependent Variables:** “Best Medicine”—this probably could refer to many different variables that we consider “health.”

This variable may be operationalized by measuring a variety of aspects of health:

- Physiological health may be measured with a standard physical examination by a physician.
- Psychological health may be measured with a set of questionnaires designed to measure aspects of psychological health.

**Other potentially relevant variables:** “Medicine” suggests that “laughter” is a treatment for an ailment, so factors like the type and severity of the ailment might be important variables to measure or control.

Now try it yourself choosing two of the clichés in the table.

**Cliché #1:**

**Cliché #2:**

## 9. BIAS AND CONTROL EXERCISE

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For each study description below, list possible confounding variables that might be present in the study based on the description provided and how the researcher could control for these variables in their study.

1. A researcher wanted to determine whether different forms of exercise improve memory and problem-solving skills, with the hope of helping treat elderly people with cognitive impairments. She recruited 10 members of the swim team and 10 members of the track team at a local college to be tested on two types of tasks. Each group received a memory task that involved memorizing a list of 10 words and recalling them, and a problem-solving task that involved solving anagrams of these same 10 words (an anagram is a jumbled word that needs to be rearranged, like HBCEA for BEACH). The swim team received the memory task followed by the problem-solving task, and the track team received the problem-solving task followed by the memory task. Each group was tested 15 minutes after its respective team practices (either swim or track). The results showed a significant interaction in that members of the swim team performed significantly better on the problem-solving task than the track team, and the members of the track team performed significantly better on the memory task than the swim team members. The researcher concluded that to help elderly people with their problem-solving skills, they should swim more, and to help with their memory, elderly people should take up running or jogging.
  
2. Tzapelas et al. (2009) recently conducted a study to examine the effects of boredom on marital satisfaction. Participants included 123 couples. Couples were questioned separately in their homes after 7 years of marriage and after 16 years of marriage. At each session, couples were asked to rate how much they felt their marriage was “in a rut” and how satisfied they were with their marriage. Results of the study indicated that boredom with marriage at 7 years was related to a decrease in marital satisfaction at 16 years.

3. A social psychologist is interested in studying the effect of the size of a group on problem-solving. She conducts the experiment in her two Introductory Psychology courses. During a class exercise in each class, she asks students to form groups of two, five, or eight to work on the activity. She records how quickly each group finishes the task. She conducts related samples  $t$ -tests to compare the completion times for the three group sizes. She finds that groups of size two finished slower than the other two groups and groups of size five finished slower than groups of size eight.

4. I want to conduct an experiment to determine the effect of course mode on learning. I teach three sections of the same course in the same semester. I teach one section fully in person, one section as a hybrid with some online content and some in person lectures and activities, and one section fully online asynchronous. All sections are presented with the same material and complete the same assignments and exams. I find that the hybrid section scores higher on the final exam than the other two sections.

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## 10. DESIGN A STUDY EXERCISE

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Design a research study to answer one of the research questions below. Then answer the questions that follow about the study you designed.

Choose a research question (or come up with your own):

1. Is reading news sites more often related to being anxious more often?
2. Does 30 minutes of exercise per day increase your mood?
3. Do mindfulness exercises improve working memory skills?

Consider what behavior(s) will be observed, how you can rule out alternative explanations of results, and how your observations can answer the question.

1. Which research question did you choose?
2. What is the best research design (correlational, experiment, quasi-experiment) to use for this research question?
3. What are the operational definitions in your study?
4. What behavior(s) that you observe will answer the research question (i.e., how will you know the answer from the behaviors you are observing)?
5. What are some alternative explanations of those behaviors (other than the factor listed in the research question)?

## 11. RESEARCH DESIGN EXERCISE

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For the research questions below, design a study to answer the question using the research design specified. Be sure to describe any variables you would include in the study, as well as any operational definitions needed.

1. Does watching violence on TV cause violent behavior? (experiment)
2. Do people who play video games have better hand–eye coordination in other tasks? (correlational)
3. Does divorce in families negatively affect children? (case study)
4. Are smoking and lung cancer related? (quasi-experiment)
5. Does studying with background music improve test scores? (experiment)



6. Are there fewer helping behaviors in large cities? (correlational)

7. Are color and mood related? (correlational)

8. Are caffeine and work productivity related? (quasi-experiment)

9. Does watching violence on TV cause violent behavior? (correlational)

10. Do people who play video games have better hand–eye coordination in other tasks?  
(experiment)

## 12. DESIGN AND DATA COLLECTION EXERCISE

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For each study description below, identify the data collection technique and the research design that were used.

1. Researchers (Banks & Landau, 2021) were interested in the effects of exposure to microaggressions (automatic and often unintentional behaviors that are insulting to or invalidating of another person) on cognitive functioning in Black college students. In their study, groups of Black college students heard either racially microaggressive or benign remarks from a white experimenter. They then completed a Stroop color-naming task to measure cognitive resources. Cognitive resource depletion is shown by slower naming of font colors of contrasting color words (e.g., the word *green* printed in orange) in the Stroop task relative to baseline control words (e.g., the word *house* printed in orange). The results of the study showed that the women who heard the microaggressive remarks had more cognitive depletion on the Stroop task than the women in the control group, suggesting that there are negative cognitive effects of exposure to microaggressions on college students.

**Data collection technique:**

**Research design:**

2. In a study that examined links between vaping and family conflict, adolescents completed surveys twice about their use of e-cigarettes and levels of family conflict (Finan et al., 2022). The results showed that higher levels of family conflict reported on the first survey were related to a greater likelihood of e-cigarette use on the second survey that was taken 6 months later.

**Data collection techniques:**

**Research design:**

**What type of relationship was found in the results of this study?**

3. Researchers (Assefi & Garry, 2003) were interested in the effects of the belief that one has consumed alcohol on cognition. In particular, they tested whether a belief that subjects had consumed alcohol during the study would increase their susceptibility to memory errors. Participants were randomly assigned to one of two groups. In one group, they were told the drink they consumed had contained alcohol (with some alcohol rubbed on the outside of the glass for realism). In the other group, they were told the drink did not contain alcohol. All participants then saw a slide show of a crime (shoplifting). After a short delay, participants then read a description of the crime that contained errors. After another short delay, they answered questions about the slides they had seen and were asked to rate their confidence in their answers. Participants told they drank alcohol made more errors in their answers and were more confident in their responses.

**Data collection technique:**

**Research design:**

### 13. EXPERIMENTS EXERCISE

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**Part 1:** Imagine that you were a participant in an experiment where you were asked to eat cookies and rate how much you liked each cookie on a scale from 1 to 5, where higher ratings mean higher liking of the cookie. You are asked to eat an Oreo cookie and rate it and then eat a Chips Ahoy cookie and rate it. For this experiment, answer the questions below.

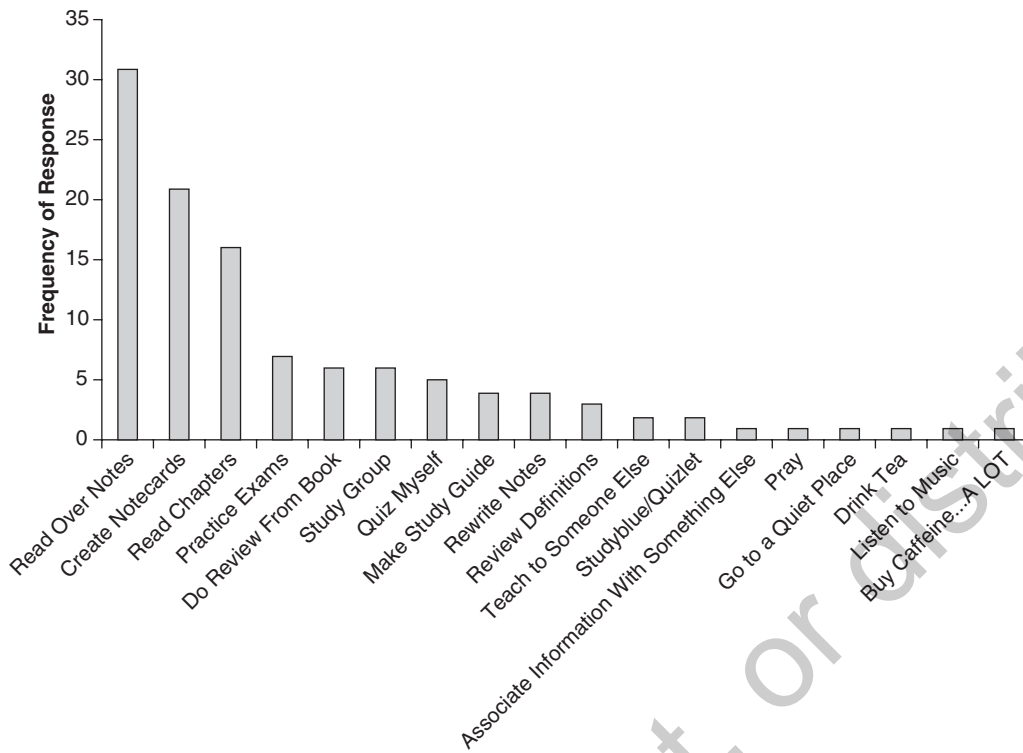
1. What is the independent variable (IV)? What are the levels of the IV?
2. Was the IV manipulated between-subjects or within-subjects? How do you know?
3. What is the dependent variable (DV)? What operational definition was used in this experiment?
4. What scale of measurement was used for the DV?
5. The IV was bivalent. Explain how you can make it multivalent.
6. Change the cookie experiment into a factorial experiment. Explain what you would need to add and what conditions you would have in your factorial experiment.
7. Do you think the cookie experiment has more internal validity or external validity? Explain your answer.

**Part 2:** Testing causal relationships—Roediger and Karpicke (2006):

One question students often ask is how they can best prepare for exams in their classes. This is a question that we can answer based on experiments. For example, some researchers (e.g., Roediger & Karpicke, 2006) wanted to know if “reading over your notes” is an effective way to remember information for a test. But they wanted to test the causal link between study method and memory so they compared two learning conditions for text material (e.g., a passage about sea otters) in an experiment to see which of the study conditions resulted in better memory performance. In one condition, subjects read through the passage and then tried to recall what they read without re-reading it. In the other condition, subjects read through the passage and then re-read the passage a few times for the same amount of time that the other group spent recalling the passage. Thus, this study compared techniques like “reading over your notes” or “re-reading chapters” that are reported fairly often with techniques like “quiz myself” and “teach to someone else” that are reported less frequently (see the graph on the next page for some sample data that students might report when asked what study techniques they use in preparing for exams). Both groups of subjects in the study took a final recall test on the passage after a delay. They found that after 2 days (let’s pretend you all study for an exam 2 days before it instead of the night before), the read-test group recalled almost 70% of the passage ideas and the read-read group recalled only about 52% of the passage ideas. Use this study description to answer the questions below.

8. What is the independent variable in the Roediger and Karpicke (2006) study? What are the levels? How does this IV connect with real-world situations?
9. What was their dependent variable? How was it operationally defined?
10. Why does the Roediger and Karpicke (2006) study show that the read-test study technique *causes* one to remember better? Why don’t the sample survey data below show that the “read over your notes” technique listed most often *causes* better test scores?

### Sample Data From Class Survey on Study Techniques



Sample Data From Class Survey on Study Techniques

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## 14. IDENTIFYING INDEPENDENT AND DEPENDENT VARIABLES EXERCISE

Remember that an independent variable (IV) is manipulated, while a dependent variable (DV) is measured and may change as a result of exposure to the independent variable.

1. The effectiveness of advertisements is influenced by the attractiveness of the actor(s) in the ad.

**IV:**

**DV:**

2. A fitness company is advertising a new exercise program that helps people lose weight faster. You are skeptical, so you conduct an experiment to test their claim. In your experiment, 100 people are recruited to participate in a 2-month fitness program. During the 2 months, half the participants perform the new exercise program. The other half of the participants participate in an older program. All participants are weighed before and after their participation in the 2-month programs.

**IV:**

**DV:**

3. Pennycook et al. (2020) conducted a study that examined an inattention explanation for the sharing of false information on social media. Past studies had shown that misinformation is passed on in social media, not because people can't tell that it is false, but because they don't pay attention to whether it is false or not. The researchers tested this hypothesis in the sharing of information about COVID-19. Participants viewed 15 true and 15 false news headlines about COVID-19 formatted as if they were presented in Facebook. They were then asked two yes/no questions: whether they thought the headline was accurate and whether they would consider sharing the story online on social media.

**IV:**

**DV:**

## 15. OPERATIONALLY DEFINING VARIABLES EXERCISE

Remember that the variables that we make hypotheses about are often abstract constructs. Designing research to examine the relationships between variables involves the process of operationally defining those variables in terms of how they are manipulated or measured. Consider each of the following research descriptions, identify the variables, and briefly describe how they are operationally defined.

The full reference to these articles appears below:

Strayer, D., Castro, S. C., Terrill, J., & Cooper, J. M. (2022). The persistence of distraction: The hidden costs of intermittent multitasking. *Journal of Experimental Psychology: Applied*, 28(2), 262–282. <http://dx.doi.org/10.1037/xap0000388>

Belmi, P., Jun, S., & Adams, G. S. (2022). The “Equal-opportunity jerk” defense: Rudeness can obfuscate gender bias. *Psychological Science*, 33(3), 397–411. <https://doi.org/10.1177/09567976211040495>

1. It is common to multitask in our daily lives. Strayer et al. (2022) conducted an experiment that examined the impact of doing a difficult counting task (count backward by 1s and 3s from a given number for 20 seconds) on participants’ driving behavior. Participants simulated driving in a driving simulator under both easy (low traffic) and hard (dense traffic) conditions. They were instructed to stay in the right lane except to pass traffic that was traveling under the speed limit. While driving, the participants were also engaged in a Detection Response Task (DRT). This task requires that the participants press a button in response to a simple stimulus (e.g., a vibration) when they detect it. The stimulus is typically presented every 3 to 5 seconds. Driving performance was measured of lane position (how centered the driver was) and speed. The counting task was scored for accuracy and number of backward counts in the 20-second period. DRT performance was based on the speed of the response and hit rate (accurately detecting the signal) to the simple stimulus. As expected, the results indicated DRT performance was impacted by driving condition (difficult driving conditions decreased DRT performance). Similarly, the difficulty of the counting task also impacted DRT (counting backward by 3 had a greater impact than counting backward by 1). These results were demonstrated even after the counting task was over, suggesting that the effect of the distracting task persists to include periods when only one task is being performed.

2. Belmi et al. (2022) examined whether general rudeness can create the illusion of gender blindness making sexism hard to recognize. In one of their studies, they asked participants to imagine that they worked at an investment bank with a competitive culture. All participants were told that within the scenario they witnessed the male managing director tells a female intern that he did not understand “why the firm keeps hiring women like you.” Participants were randomly assigned to one of four conditions. The baseline group only read about the director’s behavior toward Amy. In the other three conditions participants were given additional material that included the director being rude to either one, two, or three male interns. Following the story, the researchers assessed perceptions of the manager as sexist (e.g., indicated on a scale of 1 [strongly disagree] to 7 [strongly agree] that the manager is “sexist”) and gender blind (e.g., indicated on a scale of 1 [strongly disagree] to 7 [strongly agree] “the manager is the type of person who believes that all people are basically the same regardless of their gender.”). The results indicated that when participants only were presented with the scenario with the lone female intern, they rated the manager as sexist and not very gender blind. However, the more participants were exposed to the manager being rude to men, the less they rated him as being sexist and the more they viewed him as gender blind.

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## 16. IDENTIFYING VARIABLES FROM EMPIRICAL ARTICLES

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This exercise accompanies a reading of Pennycook et al. (2020). The full reference appears below:

Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 misinformation on social media: Experimental evidence for a scalable accuracy-nudge intervention. *Psychological Science*, 31(7), 770–780. <https://doi.org/10.1177/0956797620939054>

Please answer the following questions about the variables used in the Pennycook et al. study (you will need to read the article to answer most of the questions—the reference to the article is provided above).

1. The purpose of the Pennycook et al. (2020) study was to investigate the sharing of false information in social media and how this can be reduced. Based on this information alone, can you state the authors' general research question?
2. In Study 2 of the article, the researchers described a method they thought would reduce the sharing of false information. Describe this method as it was used in this study.
3. What were the independent variables in each study? (Hint: Figures 1 and 2 in the article can help you identify the independent variables—look at the  $x$ -axes labels.)
4. What were the primary dependent variables in each study (Hint: Look at the  $y$  axes in Figures 1 and 2)? How were they measured?
5. In Study 2, what results were found in a comparison of the independent variable groups for the main dependent variable? In other words, what do the results in Figure 2 show us about their accuracy nudge?
6. Overall, what did the authors learn from this study?

## 17. INTERNAL AND EXTERNAL VALIDITY EXERCISE

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For each Abstract below, evaluate the internal and external validity of the study (remember, in many studies, the higher one is, the lower the other is). Also identify two or three issues that could threaten the internal validity of the study.

1. There is evidence suggesting that children's play with spatial toys (e.g., puzzles and blocks) correlates with spatial development. Girls play less with spatial toys than do boys, which arguably accounts for males' spatial advantages; children with high socioeconomic status (SES) also show an advantage, though SES-related differences in spatial play have been less studied than gender-related differences. Using a large, nationally representative sample from the standardization study of the Wechsler Preschool and Primary Scale of Intelligence—Fourth Edition, and controlling for other cognitive abilities, we observed a specific relation between parent-reported frequency of spatial play and Block Design scores that was invariant across gender and SES. Reported spatial play was higher for boys than for girls, but controlling for spatial play did not eliminate boys' relative advantage on this subtest. SES groups did not differ in reported frequency of spatial play. Future research should consider quality as well as quantity of play, and should explore underlying mechanisms to evaluate causality. (Jirout & Newcombe, 2015)
2. In the United States, police are becoming increasingly militarized. Whereas the racialized nature of police militarization has been documented, the relationship between racial prejudice and police militarization is less understood. We assessed the link between racial prejudice against Black and Native Americans and police militarization at individual and regional levels. Study 1 (N = 765) recruited a nationally representative sample of white Americans and found a positive association between racial prejudice and support for police militarization. Study 2 (N = 3,129,343) sourced regional aggregates of prejudice among white Americans from Project Implicit and policing data from the Defense Logistics Agency and found that police departments in states higher in prejudice acquired greater amounts of militarized equipment. Together, these studies demonstrate that, in terms of attitudes and policies, racial prejudice predicts police militarization. (Jimenez et al., 2022)

3. We showed that anticipatory cognitive control could be unconsciously instantiated through subliminal cues that predicted enhanced future control needs. In task-switching experiments, one of three subliminal cues preceded each trial. Participants had no conscious experience or knowledge of these cues, but their performance was significantly improved on switch trials after cues that predicted task switches (but not particular tasks). This utilization of subliminal information was flexible and adapted to a change in cues predicting task switches and occurred only when switch trials were difficult and effortful. When cues were consciously visible, participants were unable to discern their relevance and could not use them to enhance switch performance. Our results show that unconscious cognition can implicitly use subliminal information in a goal-directed manner for anticipatory control, and they also suggest that subliminal representations may be more conducive to certain forms of associative learning. (Farooqui & Manly, 2015)

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## 18. ETHICS EXERCISE

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Pretend that you and your lab group are members of the **institutional review board** (IRB). Read each research proposal below and evaluate the study for adherence to ethical principles of research conduct. Think about and answer the questions below to help you evaluate each study. Make suggestions, where possible, on how to improve the study to meet ethical guidelines.

- a. Does the study have scientific merit? How will society or the subjects of the study benefit?
- b. Does the study place subjects at risk for either physical or psychological harm? If it does, what aspects of the study cause this risk? Can you suggest less risky procedures that would still provide the researcher with the same information?
- c. Will subjects read and sign a consent form? If not, is there enough information given to the subjects to provide informed consent?
- d. Does the study use deception? If it does, will the subjects be fully debriefed? Can you think of a way for the researchers to answer the research question without using deception?
- e. Can the participants reasonably refuse to participate or withdraw during the study? If not, what part of the study appears to be coercive?
- f. Will the subjects' data be kept confidential?
- g. Do you have any other concerns about the study? If so, what are they?

\* \* \*

**Study 1.** The current study will examine the idea that exercise will interfere with performance in an attention task. In the experiment, participants will be strapped to a treadmill while they also respond verbally to images on a computer screen. The experimenter will control the speed of the treadmill during the experiment. The participant will also be told that the experiment takes 1 hour and that they will receive \$250 if they successfully complete the experiment. All participants will sign a consent form if they wish to participate. To avoid distractions during the experiment, the participants will run in a soundproof room and no communication between the participants and the experimenter will be allowed after the experiment has started. However, as a safety precaution, the experimenter will continuously monitor the participants' heart rates. After the participant is given instructions, the participant will be strapped to a restraining device that is connected to the treadmill. The participants' task will be to respond to target stimuli by verbally identifying the objects presented. The participants will be fully debriefed after the experiment.

\* \* \*

**Study 2.** This study will examine conflict resolution behaviors between romantic couples. Participants will be romantic couples who have been dating at least 6 months. They will be asked to separately fill out questions about personal topics (e.g., sexual behaviors, drug and alcohol behaviors). Then the couple will be placed in a room together and asked to talk about an issue in their relationship. The session will be videotaped and later coded for conflict resolution behaviors by the experimenter. To be able to match the questionnaires with the tapes of the sessions, participants will be asked to put their name on the questionnaires when they complete them.

\*\*\*

**Study 3.** In order to test the effects of control of eating behaviors on stress responses, rats will be run in pairs through an experiment. One rat in the pair will be presented with food whenever it makes the correct response in a discrimination task. A second rat will be presented with food at random times (i.e., not connected to its behavior). The rats and their food will be visible to each other during the experiment. Immediately after the experimental session, the rats will be removed from the test chambers and sacrificed. Their stomachs will be inspected for ulcers. The study will determine if the rats that lack control over the availability of food develop more stomach ulcers than the other rats. This information may have implications for health of humans with different eating habits. Therefore, the important information this study will provide justifies the use of shock treatments to the animals.

\*\*\*

**Study 4.** In a simulation training study, undergraduate participants will be asked to help another participant learn a list of words. In reality, though, the participant learning the words will be an experimenter confederate who purposely gets some of the words wrong. The actual participants will be told that they have to scold the learner whenever the learner makes a mistake. Anytime the participants hesitate in scolding the learner for mistakes, the experimenter will tell them that they must scold the learner or they will not receive credit for the experiment. The number of times the participants scold the learners will be recorded. Each participant will sign a consent form before the experiment begins.

## 19. ETHICS IN PUBLISHED STUDY EXERCISE

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Download and read the following article:

Haun, D. B. M., Rekers, Y., & Tomasello, M. (2014). Children conform to the behavior of peers; Other great apes stick with what they know. *Psychological Science*, 25(12), 2160–2167. <https://doi.org/10.1177/0956797614553235>

Answer the following questions about the article:

1. Summarize the research question, the basic procedure used, and the results of the research.
2. List an ethical issue the researchers needed to address for the human participants in this study.
3. List an ethical issue the researchers needed to address for the nonhuman subjects in this study.
4. Compare and contrast the ethical issues relevant to the different groups of participants/ subjects in Study 1 of this article.

## 20. SUBJECT SAMPLING EXERCISE

---

Interpreting Poll Results: A Sampling Methodology Exercise

1. Find a report about a poll from a newspaper or the internet (e.g., <http://people-press.org/>) and summarize the main findings.
2. Discuss how the respondents were sampled.
3. Discuss the strengths and potential weaknesses of the sampling method used in the study.
4. How is your interpretation of the results affected by the sampling method used?

## 21. DESCRIPTIVE STATISTICS EXERCISE

*Instructions:* Below are data from a fictional two-factor experiment. Compute mean and standard deviation for each condition according to the instructions given. In addition, compute the marginal means for both factors.

Dr. Readalot conducted a study examining the effectiveness of different kinds of studying. He had students study either for 5 hours the night before the test (crammed study) or for 1 hour each of the five nights prior to the test (distributed study). Additionally, he was interested in whether the kind of material being studied (and tested) would interact with the method of studying (math or vocabulary). He tested five participants in each of the four conditions. The test score (in percentage correct) for each participant is presented in the table below. Follow the instructions given below the table.

<i>Factor A: Math v. Vocabulary Questions</i>				<i>Marginal Means for Type of Studying</i>
<i>Factor B: Crammed v. Distributed Practice</i>				
	<b>Math</b>	<b>Vocabulary</b>		
Crammed	82	80		
	60	79		
	67	67		
	68	73		
	48	71		
	_____	_____		
	<i>M:</i>	<i>M:</i>		
	<i>SD:</i>	<i>SD:</i>		
Distributed	83	93		
	70	84		
	77	74		
	70	79		
	75	95		
	_____	_____		
	<i>M:</i>	<i>M:</i>		
	<i>SD:</i>	<i>SD:</i>		
<b>Marginal means for type of material</b>				

### Marginal Means for Type of Material

1. Compute the Crammed Math condition mean. Record your answer into the table on the previous page.

*Step 1:* Add up the five scores.

*Step 2:* Divide the total by 5 (the number of scores).



2. Do the same for the other three conditions. Record your answers into the table.

Step 1: Subtract the mean from each score in the condition (these are the deviations).	Step 2: Square each of the deviations.	Step 3: Add up the squared deviations (sum of squared deviations, SS).	Step 4: Divide SS by $n - 1$ (number of scores - one). This gives you variance.	Step 5: Take the square root of variance. This gives you your standard deviation.
82- ____ = ____	_____			
60- ____ = ____	_____	_____		_____
67- ____ = ____	_____		(5-1)	
68- ____ = ____	_____			
48- ____ = ____	_____			

3. Compute the Crammed Math condition standard deviation. Record your answer into the table.
4. Do the same for the other three conditions. Record your answers into the table.
5. Compute the marginal means for study method. Record your answers into the table.

Add up all of the scores in the crammed condition (that's 10 scores, 5 from math and 5 from vocabulary). Then divide by 10 (the total number of scores in the crammed condition). Repeat the process for distributed studying.

(Hint: Don't just add the two means together and divide by 2. This will work for this example, but only because there are equal numbers of scores in the two conditions. If there are unequal numbers in your conditions, you will get the wrong number.)

6. Repeat the process to compute the marginal means for the material type. Record your answers into the table.

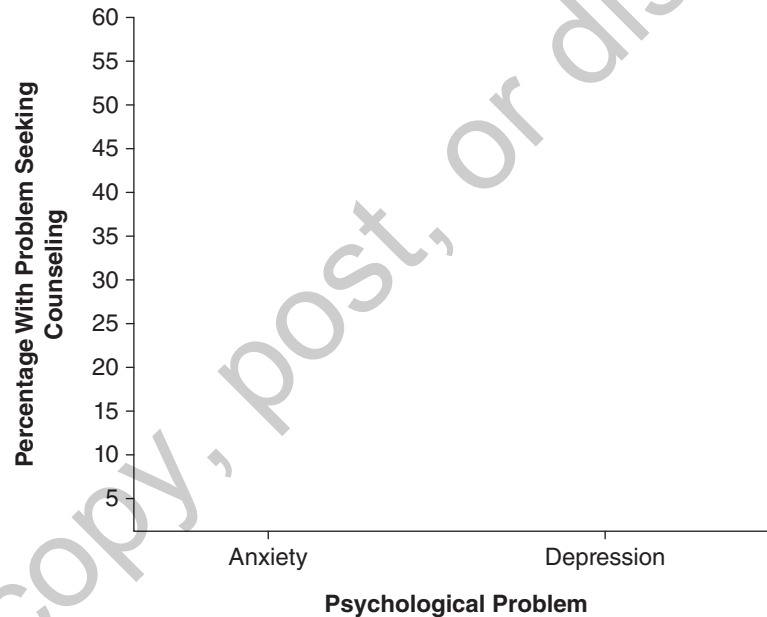
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## 22. GRAPHING EXERCISE

A study has been conducted to compare men and women on the likelihood of seeking counseling for a psychological problem. A survey was completed by 1,000 men and 1,000 women to determine the number of each group suffering from anxiety or depression. The survey also asked if the respondent had sought counseling for his or her anxiety or depression. The mean values below indicate the percentage of those reporting one of the psychological problems who also sought counseling.

	<i>Anxiety</i>	<i>Depression</i>
Men	35%	15%
Women	20%	55%

1. Complete the bar graph below by including a point in the graph for each mean value given above. Be sure to connect lines for each gender.



2. Re-create the graph above as a bar graph using a software package such as Excel. If using Excel, type in the means and variable levels as given above into a new worksheet, highlight what you have typed, and choose Insert Chart. Under Chart Type, you can choose a bar graph. Chart Options allow you to label the axes and adjust axis scales and fonts.
3. Describe in your own words the results displayed in the graphs.

### 23. MISLEADING GRAPHS EXERCISE

Graphs are powerful statistical tools that can help reveal patterns in datasets. However, like any tool, they are sometimes used inappropriately which can lead to incorrect interpretations of the data.

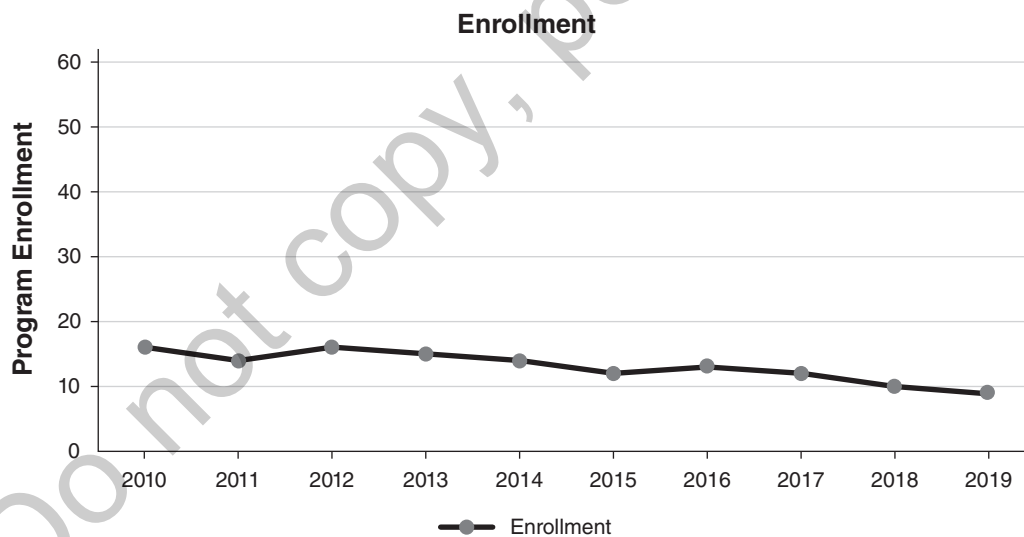
For each graph below

1. What is the likely conclusion drawn from the graph?
2. Are there design features of the graph that may bias this conclusion? If so, what are those features and how might they be changed to reduce this biased conclusion?

Graph #1: Examine this graph which shows program enrollment over a decade.

1.

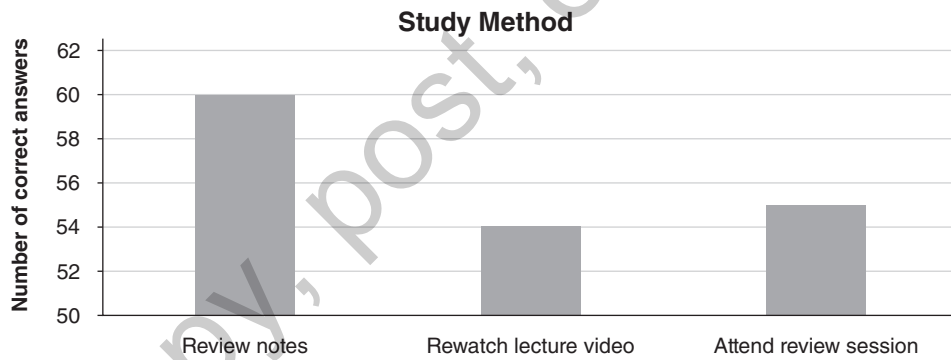
2.



Graph #2: Examine this graph which shows exam performance (in terms of number of correct answers) and method of studying used for the exam.

1.

2.



Graph #3: Examine this graph which shows sales figures at a gift shop.

1.

2.

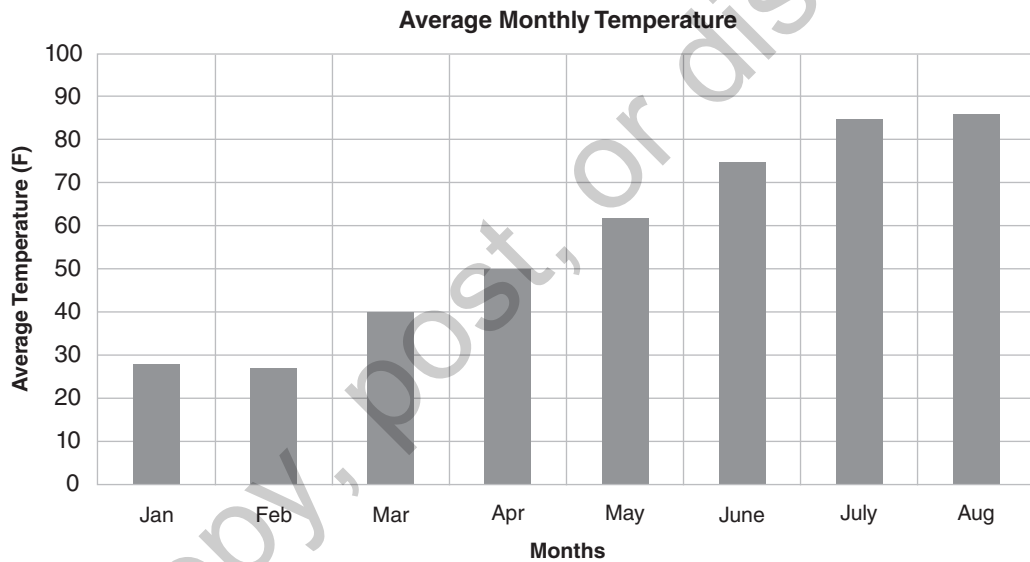


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Graph #4: Examine this graph which shows the relationship between Average Temperature and Time of Year.

1.

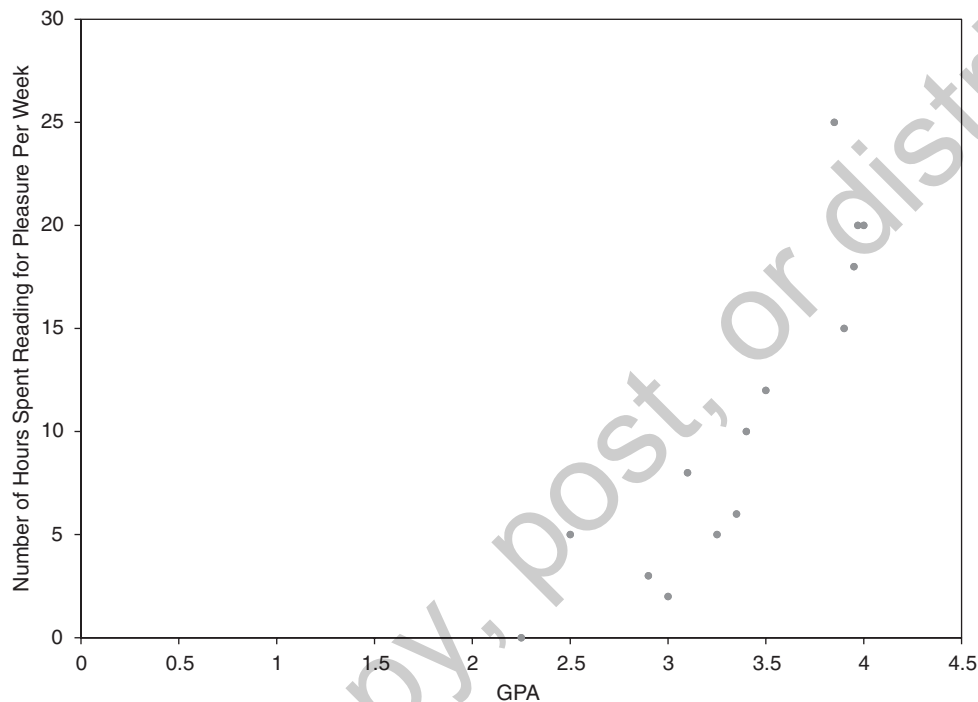
2.



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## 24. CORRELATIONS AND SCATTERPLOTS EXERCISE

1. Josie conducted an honors research project in which she measured GPA (Grade Point Average) on a 4-point scale and number of hours spent reading books for pleasure for several students. Her results are shown in the graph below. Each data point in the graph represents one student.
  - a. Below the graph, identify the relationship as either positive, negative, or no correlation.
  - b. Estimate the numerical correlation value ( $r$ ) as a number between  $-1.0$  and  $+1.0$ . Write your  $r$  estimate below the graph.
  - c. Why do you think the data points all cluster in the right side of the graph?



2. Each pair of variables below has a known relationship. Use common sense to determine what type of relationship (positive, negative, or none) likely exists between the variables.
  - a. The number of times per day you smile at other people and the number of times per day others smile at you.
  - b. The number of hours per day a person studies and the number of exams per semester a person fails.
  - c. The number of gallons of water a person drinks in a week and the number of close friends the person has.
  - d. The number of alcoholic drinks a person has each week and the person's GPA.

## 25. MAKING HYPOTHESES EXERCISE

For each study described below, state the null hypothesis. Then review the results for the study and decide what your decision (accept or reject) should be with regard to the two hypotheses. Remember, you should NEVER accept a null hypothesis.

### Study 1

*Alternative Hypothesis:* Anxiety increases lying in children.

*Null Hypothesis:*

*Study 1 results:* A study compared 50 children who were placed in an anxiety-inducing situation with 50 children in a control group. They were then asked about their behavior, and the number of inaccurate responses was recorded. Inaccurate responses did not differ for the two groups.

1. We should \_\_\_\_\_ the null hypothesis.
2. We should \_\_\_\_\_ the scientific hypothesis.
3. Suppose that the study described above was conducted inaccurately and that anxious children really do lie more. In this case, we have made a

**Type I**      **Type II**      (circle one) decision error.

### Study 2

*Alternative Hypothesis:* People are more likely to help a stranger if there is no one else around than if they are in a group (i.e., the bystander effect).

*Null Hypothesis:*

*Study 2 results:* A situation was set up on a busy highway where someone needed help with her car. Researchers observed 100 cars drive by and counted the number of people who stopped and whether they were alone or with other people in the car. People driving with others stopped less often to help than people who were driving alone.

1. We should \_\_\_\_\_ the null hypothesis.
2. We should \_\_\_\_\_ the scientific hypothesis.
3. Suppose that the above study contains a confounding variable, and when tested properly, people driving with others actually stop just as often as people driving alone. In this case, the study described above has led us to make a

**Type I**      **Type II**      (circle one) decision error.

Whenever we reject the null hypothesis, what does this tell us about the independent variable?



## 26. INFERENCE STATISTICS EXERCISE

Read through the brief description of each of the studies below and answer the corresponding questions.

### Study 1

A behavioral psychologist conducts an experiment to determine whether operant conditioning techniques can be used to improve balance in people who consider themselves “clumsy.” She recruits 50 participants, each of whom responds yes to the question “Do you consider yourself clumsy?” on a pre-experimental questionnaire. Half the participants are given a balance task (stand on one foot with your arms in the air) with the time they can balance recorded. They are then excused and asked to return 3 weeks later. The other half of the participants are given 3 weeks of operant training during a balance exercise. In this training, the participants are asked to perform the balance task described above. Each time they can beat their previous balance time, they receive \$10. After the 3-week period, all participants are asked to perform the balance task again. Alpha is set at 0.05. The members of the Training Group can balance for an average of 25 seconds. Members of the Control Group (who did not receive the training) can balance for an average of 24.3 seconds. When the inferential statistical test is conducted on these data,  $p = 0.08$ .

1. What is the IV for this study? The DV?
2. What is the alternative hypothesis?
3. What is the null hypothesis?
4. What *population* is being tested in this study?
5. Is the difference observed in the study statistically significant? Why or why not?
6. Based on your answer to (5) above, what decision should be made about the null hypothesis?
7. In the context of this experiment, what *exactly* is  $p$  the probability of?

## Study 2

Some have claimed that children of divorced parents are not as well adjusted as children of parents who are married. To test this idea, you set up a study with two groups. One group consists of 100 children who have divorced parents. The other group consists of 100 children who have married parents. Each child in the study is asked to complete the Social Adjustment Scale for Children (SASC). Higher scores on the scale indicate better social adjustment.

1. Does this study contain an independent variable? Why or why not?
2. What dependent variable is measured in this study?
3. What is the null hypothesis for this study?
4. What is the alternative hypothesis?

The results indicate a mean difference of 10 on the SASC scale between the two groups of children. With alpha set at .05,  $p = .02$ .

5. What decision should be made with regard to the null hypothesis?
6. Describe one possible source of bias that could be present in this study causing the results that were observed.

## 27. INFERENCE STATISTICS AND ANALYSIS EXERCISE

Listed below are 10 statements that are common pieces of cliché advice (many of which you may have heard at some point in your life). Pick two of the clichés, and design a study to test each one following the example provided below.

Ignorance is bliss.	The bigger they are the harder they fall.
Good things come to those who wait.	Birds of a feather flock together.
The grass is always greener on the other side of the fence.	Blood is thicker than water.
The apple doesn't fall far from the tree.	One bad apple doesn't spoil the bushel.
Better late than never.	The early bird catches the worm.

*Example:* Laughter is the best medicine.

**Tails** (circle one):  One-Tailed     Two-Tailed

**Null Hypothesis:** Within the population, laughter is not the best medicine (is worse or as good as without it).

**Alternative Hypothesis:** Within the population, laughter is the best medicine.

**Independent Variables:** Laughter (presence vs. absence), Time health is measured (start and end of study)

**Details:** Between-subjects, Within-subjects, or Mixed?

Laughter = Between-subjects

Time = Within-subjects

**Why?** Laughter should be done between-subjects to avoid order effects. Time is a within-subjects variable because all subjects will receive the measures twice.

**Dependent Variables:** Physiological and Psychological Health

**Analysis Plan**

One Sample  $t$ -test

Paired samples  $t$ -test

Independent Samples  $t$ -test

One-Way ANOVA

Two-Way ANOVA

**Why?** This is a factorial design with 2 IVs so you need a two-way ANOVA.

Now try it on your own for two of the clichés:

Cliché #1: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Tails (circle one): One-Tailed      Two-Tailed

Null Hypothesis: \_\_\_\_\_

Alternative Hypothesis: \_\_\_\_\_

Independent Variable(s): \_\_\_\_\_

Dependent Variable(s): \_\_\_\_\_

Details: Between-subjects, Within-subjects, or Mixed?

Why? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Analysis Plan**

One Sample <i>t</i> -test	_____
Paired Samples <i>t</i> -test	_____
Independent Samples <i>t</i> -test	_____
One-Way ANOVA	_____
Two-Way ANOVA	_____

Cliché #2: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Tails (circle one): One-Tailed      Two-Tailed

Null Hypothesis: \_\_\_\_\_

Alternative Hypothesis: \_\_\_\_\_

Independent Variable(s): \_\_\_\_\_

Dependent Variable(s): \_\_\_\_\_

Details: Between-subjects, Within-subjects, or Mixed?

Why? \_\_\_\_\_

\_\_\_\_\_

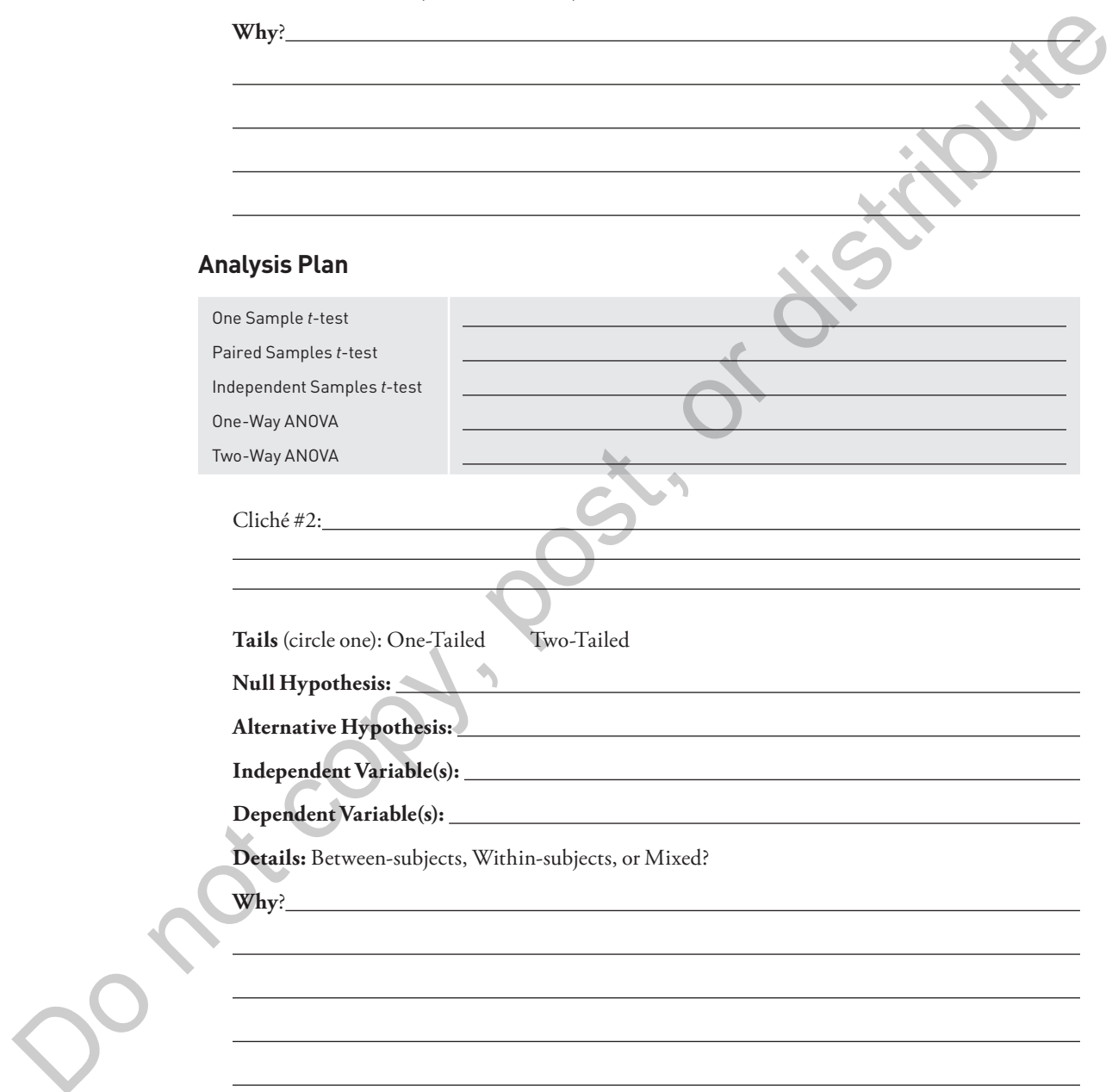
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Analysis Plan**

One Sample <i>t</i> -test	_____
Paired Samples <i>t</i> -test	_____
Independent Samples <i>t</i> -test	_____
One-Way ANOVA	_____
Two-Way ANOVA	_____



## 28. STATISTICAL HYPOTHESIS GENERATION EXERCISE

---

For each of the following research descriptions

- a. Write out the null and scientific (alternative) hypotheses
- b. Indicate whether a one-tailed or two-tailed statistical test should be performed
- c. Identify the dependent variable and the scale used to measure it
  1. IQ scores for the general population form a normal distribution with a mean of 100 and a standard deviation of 15. However, there are data that indicate that children's intelligence can be affected if their mothers had German measles during pregnancy. Using hospital records, a researcher obtained a sample of schoolchildren whose mothers all had German measles during their pregnancies. The researcher wants to test whether the children in the sample have an average IQ lower than that of the general population.
  2. Suppose we think that listening to classical music will affect the amount of time it takes a person to fall asleep. An experimenter randomly assigns participants to one of two groups. Both groups of participants are asked to spend two nights sleeping in the researcher's laboratory. On the second night, one group goes to sleep listening to classical music, while the other goes to sleep in silence (the first night is used to allow the participants a chance to become accustomed to sleeping while wearing the sleep-monitoring equipment). The researcher measures the time span between when the lights are turned off and the onset of Stage 2 sleep.
  3. A developmental psychologist believes that a new technique can help kids learn math skills faster than the current technique. He measures math skills of two groups of fifth graders using a standardized math skills test (higher scores on the test correspond to stronger math skills). For one group of kids, the psychologist uses the new technique. For the other group, he uses the standard math curriculum.

4. A psychologist examines the effect of chronic alcohol abuse on memory. The researcher obtains a sample of alcohol abusers and finds that the group averaged a mean score of 47 on a standardized memory test. In comparison, scores on the memory test are normally distributed around a mean of 50 (standard deviation of 6) for the general population. Is there evidence for memory impairment among alcoholics?

5. On a vocational interest inventory that measures interest in several categories, a very large standardization group of adults (i.e., a population) has an average score of 22 (higher scores represent greater interest). A researcher would like to determine if scientists differ from the general population in terms of writing interests. The researcher administers the test to a random sample of scientists (selected from the directory of a national science society). The test scores on the literary scale for the scientists are compared to those of the general population to examine the question of whether scientists differ from the general population in their writing interests.

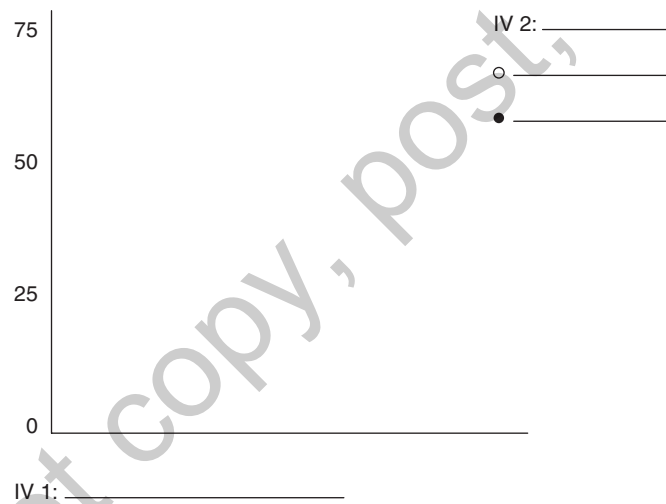
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## 29. FACTORIAL DESIGN EXERCISE

1. Consider the following data from a factorial-design experiment. The DV was “% of participants who offered help to a stranger in distress.”

Number of Bystanders	Gender of Stranger	
	Male	Female
No bystanders	35	85
Ten bystanders	15	45

- What is the design of this study (e.g.,  $2 \times 2$ ,  $2 \times 3$ )?
- List the independent variables of this study, and list the levels of each.
- Sketch a graph of the results of the study. Fill in the names and levels of the IVs.



- Main effects

- On the average, how does the number of bystanders affect helping?

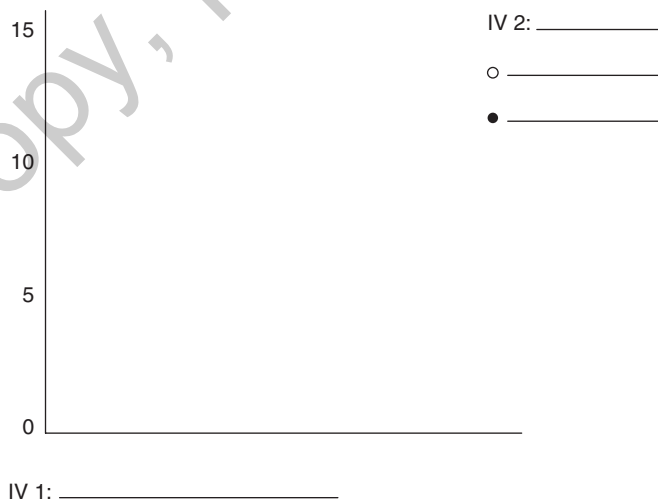
- On the average, how does the gender of the stranger in need affect helping?

e. Do the graphed data suggest the presence of an interaction effect? If so, describe it.

2. In the factorial design experiment summarized below, the dependent variable was “Average number of hallucinations.”

Dose of drug	Type of Drug	
	LSD	Marijuana
Low	4	1
Medium	7	2
High	15	4

- What is the design of this study (e.g.,  $2 \times 2$ ,  $2 \times 3$ )?
- Sketch a graph of the results of the study. Fill in the names.

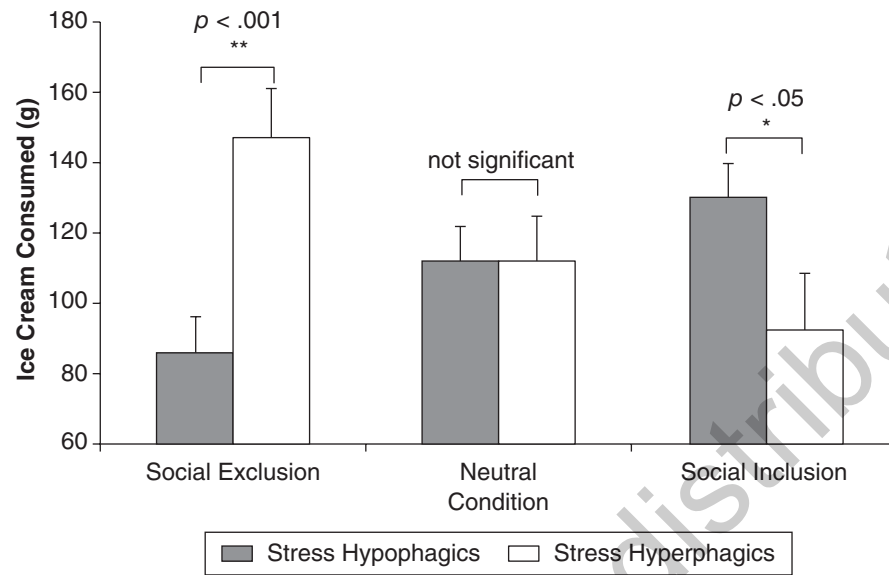


- Main effects: For each factor and levels of the IVs, state whether a main effect appears to exist. If one does, describe it.
- Do the graphed data suggest the presence of an interaction effect? If so, describe it.





The results of the experiment are displayed in the graph below:

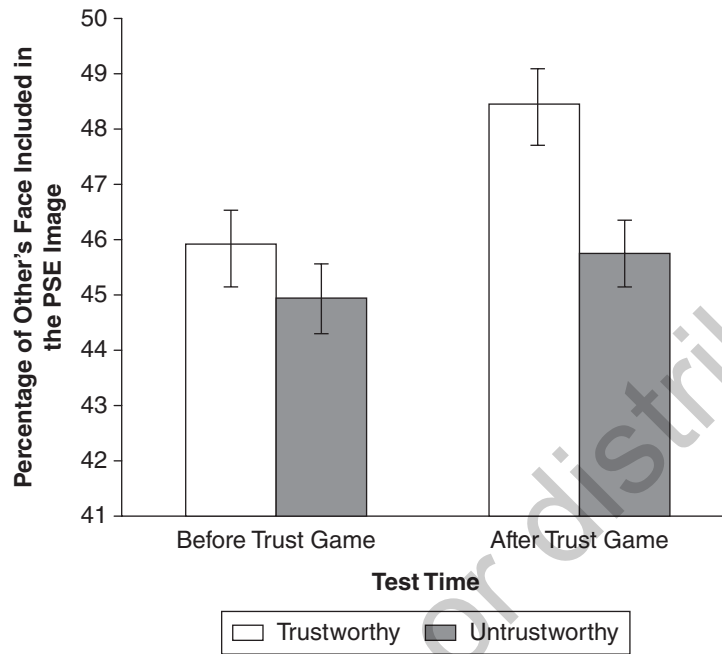


Sproesser et al., 2014

- Does this graph indicate a main effect of social condition? Explain your answer.
- Does this graph indicate a main effect of eating phagic group? Explain your answer.
- Does this graph indicate the presence of an interaction? If so, describe the interaction.



The results presented in the graph below show the mean percentage of the trustee's face that was present in the photos judged to be at (PSE) as a function of the conditions of the experiment.



Farmer et al., 2014

4. Describe the pattern of results seen in the graph. Does the pattern suggest that an interaction is present? If so, describe the interaction; if not, describe why the pattern does not indicate an interaction.
  
5. What do the statistical outcomes in the Results section tell you about the main effects and interaction? (Note: This question should only be answered if downloading the article and reading the Results section was assigned).
  
6. What do these results tell us about the hypotheses for this study?