

Teams

Seven Lessons (Plus or Minus Two)

My problem is that I have been persecuted by an integer. For seven years this number has followed me around, has intruded in my most private data, and has assaulted me from the pages of our most public journals. This number assumes a variety of disguises, being sometimes a little larger and sometimes a little smaller than usual, but never changing so much as to be unrecognizable.

—George A. Miller (1955, p. 343)

Seven was the recurring number that inspired famed psychologist George Miller. His paper “The Magical Number Seven, Plus or Minus Two,” is among the most widely cited articles in all of psychology (Kintsch & Cacioppo, 1994), and led many to believe that seven items of information, plus or minus two, is the definitive capacity of short-term memory. This conclusion is misleading, and Miller himself withheld judgment about the number seven. Nevertheless, each of our chapters naturally gravitated toward this number of key concepts, so we decided to recognize this with a nod to Miller by beginning each chapter with five to nine succinct “lessons.” These summaries are intended to jump-start discussion among members of your research team so that you can set goals related to your research project. They can also serve as a learning check for you and a discussion guide for your instructor or research mentor when the chapter is covered in class or in the lab.

1. Engage in undergraduate research! It will impart lifelong personal and academic skills.
2. Scaffold your experiences by relying on both your professors and your peers to learn something new about the research process.
3. Although research experiences take place in diverse settings (e.g., small colleges, large universities) and contexts (e.g., classrooms, laboratories), the underlying

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goals for the researcher remain the same: to acquire new knowledge, to share findings, and to become a better researcher in the process.

4. Successful team-based research is characterized by the development of a strong personal connection with the goals of the group (*vision*), the other people in the group (*togetherness*), and the contributions that you and others are making to the group's success (*ownership*).
5. An immersive and well-structured research experience encourages collaboration, produces high-quality research, and enables you to apply your newly acquired skills to your life within and beyond the halls of academia.

Bringing together a diverse set of research skills by forming a team of scientists . . . can make your empirical contributions far more profound and influential than they would otherwise be.

—Shelley E. Taylor (2008, p. 51)

Congratulations! You are reading this book because you are about to engage in team-based, collaborative research. This should be a rewarding and productive endeavor, and it could be life changing. Doing science rather than simply reading about it can be transformative, and numerous studies have shown that undergraduates who engage in research develop a number of personal and academic skills that continue to benefit them long after graduation (Hunter, Laursen, & Seymour, 2007; Landrum & Nelsen, 2002). Time and time again, our own students report that their collaborative research experiences have been both gratifying and extremely practical, helping them to shape and succeed in their future pursuits. These students have gone on to careers as research practitioners, medical and public health professionals, statisticians, lawyers, and educators. Many of them have completed or are now pursuing advanced degrees in psychology at top graduate schools, and a few are now professors collaborating with their own undergraduates. So whatever path you take after completing your undergraduate degree, your research experiences and skills will serve you well.

Many students have the option or are required to complete an independent research project. However, the notion of independent research is misleading, and at the core of this book is a steadfast dedication to the benefits of team-based collaborations. Yes, there is an important role for individual efforts throughout the research process, but the very best work ultimately comes from collaborative endeavors. If you are new to psychological research, you will have to trust us when we say that team-based efforts add a level of depth and intensity to your experience that you cannot achieve on your own. If you are an experienced research assistant already, you may be seeing glimpses of the benefits of collaboration in your own work. Perhaps you have even considered enlisting your own collaborators (i.e., younger research assistants) to help you complete an “independent”

project, or what we prefer to call a *student-initiated* project or thesis. If you have not considered building your own team, you should. Researchers, especially in psychology and other lab-based sciences, rarely work alone. They seek out collaborators whose efforts and abilities will contribute to their projects' success. The benefits of working as a team go well beyond additional person-power. Effective teams are truly synergistic, bringing an unmatched level of energy, intellect, creativity, and commitment to any project. Because of this, teams of scientists typically produce the most compelling research. As an added bonus, working side by side with other researchers is great fun.

Our goal, then, is to help you develop into a collaborator that your peers and mentors will find indispensable: one who brings vigor, insight, and considerable talent to every project. Whether you are a student new to research methods, a seasoned research assistant, or an individual who is preparing to complete a research-based thesis, this book's collaborative approach will encourage you to progress to the next level of inquiry and intellectual challenge. At the same time, a well-structured research experience can be extraordinarily rewarding. Your research team will be pursuing a common intellectual goal, and this shared pursuit will create a vibrant atmosphere of collaboration among you, your fellow undergraduates, and your research mentor or professor. Many undergraduate researchers find that team-based collaborations foster a strong sense of community, a supportive "academic home," and a base of activity that uniquely prepares them for their future pursuits.

We look forward to guiding you through the process of conducting collaborative research, helping you develop the perspective and skills that will make the most of your research experiences. The chapters of this book are organized around the crucial tasks that span a research project: generating creative research ideas, searching for relevant literature, designing a study, considering ethical issues, writing a research proposal, piloting methods and materials, recruiting participants, collecting and analyzing data, writing up the results, and giving formal presentations of your team's research findings. Each chapter is explicitly designed so that novice and more advanced students alike will have something important to learn. If you are new to research methodology or want a systematic review of the process, you can follow the order of the book. Alternatively, you may find it just as informative to read the chapters out of order once you have finished this introductory chapter. Research on effective teaching suggests that people learn best while engaged in an activity. So if you are starting from scratch, begin with the chapter about ideas. If you are about to run participants, start instead with our chapter on piloting or the one on conducting a study. If your project is in the data analysis phase, read the statistics chapter first. Applying what you are reading about in these pages will be essential if the work you are doing is to take shape and thrive.

THE UNDERGRADUATE RESEARCH EXPERIENCE

The day-in, day-out experience of "doing" research as an undergraduate varies depending on the setting, but it often includes many hours running participants through experimental procedures. It seems fitting that in this introductory chapter we introduce you to the first

laboratory-based research experience that one of us had as an undergraduate student. To frame this experience, imagine that you are a participant in the study. At the appointed time, you take an elevator to the third floor of the psychology department, where you are greeted by a research assistant. She walks you to a small laboratory, where you encounter an array of tasty junk food spread out on the table in front of you. It is midafternoon, you feel hungry, and the heaping plates of Doritos, M&Ms, and chocolate-chip cookies look, quite simply, irresistible.

The experimenter asks you to take a seat in front of the food, and then she explains that this is a study of the effect of emotion on memory. She tells you that other researchers use stimuli such as pleasant music to induce moods, but for this study the researchers are using delicious snacks. She says that you should feel free to eat as little or as much of the snacks as you would like, although you should eat at least some. Your main “job” during the study is to watch and memorize a series of slides of famous paintings. Later, you will be tested on your memory of the slides. Finally, as a measure of your attention to the memorization task, you will hear a beeping noise every 30 seconds or so. As soon as you hear the noise, you should quickly press a button on the floor with your foot. With these instructions in mind, you hunker down, grab some food, and begin the process of juggling snacks, slides, and beeps for the next 10 minutes.

When the slide show is over, the experimenter sits down and explains that the project is not exploring mood and memory at all, so there will be no test on the slides. Instead, the research question involves the effects of cognitive load (i.e., how much attention you were paying to a distracting task) on eating behavior. You were in the “high” cognitive load condition, requiring you to respond to a series of beeps as you tried to memorize the art slides. Moreover, in your Psychology 101 class a few months earlier, you and your peers filled out a questionnaire about eating habits, enabling the researchers to identify the extent to which you generally restrain your eating (i.e., stick to a diet). The researchers hypothesize that nondieters will eat *less* when their attentional resources are being taxed. That is, they will be too busy to eat. In contrast, people who typically restrict their diets will eat *more* under the same conditions. That is, they will be too busy to *control* their eating. Before you leave the study, you are reassured that all participants tend to eat a wide range and amount of snacks during the study and that the study’s data will be analyzed as a group, thus assuring the anonymity of your individual behavior.

That is the study in a nutshell from the point of view of the participant (for additional details, see Ward & Mann, 2000). But what was happening behind the scenes? Much of the allure of conducting research is the process of becoming a partner in the drama that unfolds during the collection of data. Whether you are administering a survey, conducting an interview, or carrying out an experimental manipulation in the research lab (as in this example), you are becoming a partner in staging a smooth and efficient “performance.” For this study, research participants completed a survey assessing their level of dietary restraint even before they came into the lab. Through random assignment, half of the restrained eaters (i.e., dieters) were assigned to the high cognitive load condition, and half were assigned to the low cognitive load condition. Similarly, the nonrestrained eaters were randomly assigned to one of these two experimental conditions. However, the research assistant running the study was *blind* to the participant’s level of dietary restraint, meaning that she did not know whether the participant in a given session was a dieter or not.

The nitty-gritty of setting up this study is worth mentioning as well because the logistics were not trivial. First, the research assistant had to set up the computer that would deliver the beeps and the slide projector that would display the artwork. Then she counted the number of cookies she put on the plate and used a scale to measure the weight of the bowl of M&Ms and plate of Doritos. All of this information was carefully recorded. After each participant completed the study, this same process of counting, weighing, and recording had to be repeated, and this had to be done with precision because the amount of food consumed by the participant was the study's primary outcome measure, or *dependent variable*. Weighing snacks meticulously over and over again was a tedious chore. The research assistant also was responsible for discarding the leftover cookies and chips at the end of each day. At least initially, this meant devouring the delicious leftovers and was a nice benefit, but after a few weeks of running the study she found the mere thought of these snacks thoroughly unappealing.

One of the most challenging aspects of running this study was the debriefing. Telling a (potential) dieter that the researchers were scrutinizing how much she had just eaten felt like an unfair violation of trust. What if she felt devastated because she broke her diet and ate a large amount of snacks during this experiment? What if she went home after the study and tried to make herself vomit? What if she never trusted the motives of psychology researchers again? The importance of being sensitive while explaining a study to participants, especially when deception has taken place, is covered in detail later in the book. For now, rest assured that with time and practice, the research assistants for this experiment learned to explain the study in a caring manner and in a way that emphasized the study's important scientific questions.

TEAM-BASED LEARNING AND TEACHING

From the experiment we just described, you might get the impression that being a research assistant is a relatively solitary experience. Yes, you interact regularly with participants, but the act of conducting a study often falls on just one research assistant during any experimental session. Many undergraduate research assistants spend much of their time alone, gathering journal articles, setting up experiments, and collecting and entering data. But this is a limited picture of psychological science. When we were undergraduates, we were part of a much more immersive, team-based research environment. We each started out working under the supervision of a graduate student mentor, who in turn worked in collaboration with other graduate students and a faculty adviser. Later, we collaborated more directly with a faculty adviser and worked on projects in parallel with graduate students.

Throughout all of this, our strongest connections were always with other undergraduates. Some were older than us and helped show us the ropes, some were younger than us and learned the ropes as our own research assistants, and some had roughly the same amount of research experience as we did. This cohort of students learned a great deal from one another, shared ideas, and socialized. These were the people we talked to in the hallways between running participants, on the roof of the psychology department while studying for statistics exams, and in the campus coffeehouse as we contemplated graduate

school. (This pretty much covers how the two of us got to know each other, by the way.) Between our interactions with our research mentors and these peers, we were part of a rather ideal community of researchers. We were not alone at all.

Within that community, what solidified our appreciation for collaborative research was the experience of sitting in the offices of our professors, side by side with other students, learning about the history and future of psychology and engaging in expansive conversations about intriguing hypotheses and compelling experimental designs. We were trained not only in the procedures of a research project but also in the process of playing with ideas. Our professors lit the spark of our imaginations, and our peers' contagious enthusiasm kept the ideas flowing long after we left those meetings. Even as we worked in the relative isolation of the lab or library, we were able to connect our moment-to-moment tasks back to those big-picture conversations. As a result, the conversations were always ongoing. This shaped our passion for psychological research and gave us a sense of the immense benefits of collaborative research.

We learned only later that having this kind of open-door relationship with professors is the exception rather than the rule at most universities. Time is precious, some universities have tens of thousands of undergraduates, and professors can be extraordinarily busy. Still, research opportunities exist for undergraduates at almost every institution. These opportunities vary a great deal from school to school, however, and no specific model for undergraduate research will fit every situation. Fortunately, the field of psychology is full of outstanding models for involving students in research, whether in the classroom or in a mentor's lab, at a small college or large university, during the summer or throughout the academic year (for numerous examples, see Miller et al., 2008).

The good news, of course, is that you are reading this book because your instructor or research mentor has a commitment to involving you in research. The structure of your research experience might differ substantially from how we involve our own students in research, and your school might seem massive compared to the small liberal arts college where we teach. Nevertheless, your instructor or mentor shares with us a common goal. Simply assigning this book reflects a desire to have you function less as a mere laborer (e.g., someone who mindlessly enters data into a computer) and more as a collaborator. You will come across the word *collaborator* often in our writing, but we do not use this term lightly. Being a good collaborator is an extremely valuable skill. Moreover, it is a skill that can be taught. We are confident that, in reading and applying what we teach in these pages, you can become a successful collaborator and develop a strong sense of contributing to your research team.

THE EVOLUTION OF EXPERTISE

Collaborating with others and becoming a better researcher are two sides of the same coin. This is because expertise truly *evolves* in the company of others. The subject matter of any research project and the process of conducting research together involve a substantial amount of uncertainty and complexity. Because of this, it takes multiple trial-and-error exposures to the ideas and methods of a research project for learning to sink in and for

mastery to emerge. This learning process will require you to challenge yourself on a regular basis. You will need to take ownership of your learning, and you will need to take on things that are slightly beyond your current level of comfort and competence. Rather than sticking to familiar tasks, it is crucial to ask, “What more can I do?” and “What more might I learn?”

Although you could attempt to do this entirely on your own and in relative isolation, how would you gauge your successes? How would you track your progress? What would you do when you felt completely stuck? Who would help you to break set and think of novel ideas and new directions? Psychological science is too rich and open-ended for anyone to go it alone. All of us need to scaffold or ladder our experiences in the presence of others. We need to challenge ourselves and gather corrective feedback from our collaborators. We need to seek out information and ideas from those whose strengths differ from our own, and we need to refine our own strengths by teaching and learning from others. Laddering your experiences in this way will benefit you personally, and it will benefit your research team and project as a whole.

As an undergraduate, you can expect the evolution of your research skills to take some time, so be patient. As you will see, even a seemingly straightforward research question is rarely “answered” quickly. Because most studies need to be repeated and extended before they are publishable, a research psychologist may spend a few years or more on a particular line of research. If you are reading this book in the context of a research methods class, the experiment you complete by the term’s end is likely to raise many unanswered questions. If you end up enjoying the research process, you can then transform these unanswered questions into directions for future research. You can fulfill a desire for continuing your research on your own (see Chapter 11, on student-initiated projects), or you might join a research mentor’s lab group. Classroom-based experiences often provide an “in” to a professor’s research lab because they allow you to draw on what you have learned and demonstrate that you would be a valuable addition to a research team. And once you become part of a professor’s or graduate student’s research lab (or if you are currently in this position), you will steadily learn new skills and techniques as you progress through various stages of one or more research projects. This is a path that you can follow as far as you want, through graduation, into graduate school, and even on to a career in research and mentoring.

RESEARCH IN THE LAB OR THE CLASSROOM?

Most psychology professors earned their doctorates in programs that rely on the natural hierarchies that come from coordinating the efforts and expertise of faculty, postdoctoral students, advanced graduate students, and a cadre of younger graduate students and undergraduate research assistants. Together, these groups help further the research agenda of the project’s lead investigator (typically the professor). Researchers who have advanced through this hierarchical system on the path toward their master’s or doctoral degrees think of it matter-of-factly. It suits both the research and its setting, and it happens to be an effective training model as well. In contrast, the goal of most undergraduate research is primarily educational. Most undergraduates conduct research for the first time

in the context of course projects, and only a small number go on to assist faculty advisers or graduate students with research outside the classroom. In an undergraduate setting, faculty and other research mentors tend to work one-on-one or in the classroom with students by supervising independent study projects, theses, or small-group projects.

Although research takes place in many contexts, it is important that you not allow the particular setting to obscure the overall purpose of conducting research. The goals underlying all research in psychology are to learn something about a phenomenon that interests you, to convey what you have learned to others, and to become a better researcher in the process. When you work as part of a research team, learning and teaching happens not just through the results of your research project but also through your day-to-day interactions with your collaborators. This is the real value of team-based research efforts. Within collaborative projects, each person (from the most inexperienced to the most expert) should make a point to learn from and teach something to all members of the research team.

Laboratory-Based Research

Our professors in graduate school were experts in their fields, but the very best among them had a passion for learning from the experiences of their graduate and undergraduate students. This was also true of our professors when we were undergraduates. (If you have read Philip Zimbardo's foreword to this book, you know that his prison study and subsequent work on shyness grew out of ideas and questions from his undergraduate students.) Likewise, our very best undergraduate research assistants have always found something to teach us. Younger researchers tend to see phenomena with a fresh eye, and they are more willing to build bridges between different disciplines and draw ideas from disparate sources. Younger students also may have more experience with new technologies that can benefit the research process. Finally, everyone (including your professors) has his or her own strengths and weaknesses, so research mentors and more advanced students must recognize and harness the comparative strengths of their younger counterparts. We have known first-year undergraduates whose organizational skills were so refined that they were able to keep their mentors on task and manage the logistics of experiments better than anyone else in the lab. Some of our students have had an uncanny eye for detecting mistakes in experimental materials, while others have had a special knack for devising new ways to recruit study participants. Some of them have been superb writers. These strengths need to be utilized by a research team. Team members, regardless of their levels of expertise, must be prepared to teach *and* learn from one another.

Effective teamwork gives rise to an efficient teaching–learning approach to doing collaborative research. At our school, we have adapted this general model to an undergraduate liberal arts environment. We recruit teams of undergraduates, and each team works on a separate project. Three-student teams are the norm, with a senior or advanced psychology major (the team leader) supervising a younger major and a student new to psychology (the team associate and assistant, respectively). This model ladders student experiences and lends a sense of continuity to projects over an extended period of time. Ideally, team members advance from novices to accomplished team leaders, and as they do so there is an explicit progression of responsibilities (see Detweiler-Bedell & Detweiler-Bedell,

2004; Detweiler-Bedell & Detweiler-Bedell, 2007; Detweiler-Bedell, Detweiler-Bedell, & Eldred-Skemp, 2010).

Team leaders have the highest level of responsibility (i.e., organizing and overseeing daily team operations and weekly team meetings, attending team leadership training, delegating tasks to team members and subsequently integrating the members' efforts, analyzing study results, and writing literature reviews and drafts of manuscripts). Team associates take a lead role in preparing research materials, running studies, and collecting literature for review. Team assistants are charged with learning as much as possible about the various aspects of the research by assisting with the team's many tasks, and they are required to help other project teams when needed (again to learn as much as possible about the research process). But, importantly, the teaching of new skills is not just "top-down." Younger team members often find themselves in the position of explaining concepts to more senior team members. As suggested by the quotation from UCLA professor Shelley Taylor that we used to open this chapter, members of a research team bring different strengths to the table, and this is true regardless of seniority.

We are by no means alone in recognizing the benefits of having students mentor one another and ladder their experiences in a team-based undergraduate research setting. At Baldwin-Wallace College, for example, Andrew Mickley and his colleagues have developed an undergraduate research model similar to ours (Mickley, Kenmuir, & Remmers-Roeber, 2003). Like us, they started their lab at a primarily undergraduate institution and had the goal of engaging students in research beyond the classroom by pairing each student with a faculty member and other peers. Being able to view both your peers and your professors as sources of knowledge, guidance, and inspiration is central to such models.

Of course, the value of the teaching–learning model of collaborative research is not limited to a liberal arts setting. Anyone involved in research can seek out mentors, assistants, and peers with a variety of skills and abilities. For instance, if you are being asked to conceive and complete an independent research project, our team-based approach might seem incompatible with your assignment, but quite the opposite is true. You should reach out to a mentor, typically a professor or graduate student, to help you formulate your research question and methods. At the same time, you should ask your mentor if you are permitted to recruit research assistants to help you refine and conduct your research. We hope your mentor will answer with a resounding yes, because teamwork epitomizes the research process and your assistants will benefit immensely from the experience. You can assure your mentor that you will be the project's team leader, or *principal investigator*, as researchers more generally refer to this position. In addition, a few ground rules might be helpful. For instance, you should be in charge of the project's design and statistical analyses, and you should write up the research on your own, allowing for feedback from your assistants. In the end, the effect of this arrangement is to put into place a vibrant team that can benefit from the teaching–learning model of collaborative research.

Classroom-Based Research

What about carrying out team-based research in the context of a classroom rather than a laboratory? In the classroom, students who work together on a research project are likely

to have a similar base of knowledge and experience. This levels the playing field. Although there are certain benefits to this, one of the weaknesses of the typical classroom-based model of group work is the lack of a clear leader. This can result in misunderstandings, inefficiencies, and the feeling that someone has to “step up” whether or not he or she is prepared to do so.

The best way to avoid many of the common misunderstandings and inefficiencies associated with group projects is to assign transparent but flexible roles and responsibilities to each team member. Before doing this, it is helpful for the group to identify the component tasks of a typical research project. These include the following:

- Coordinating the team (e.g., establishing a meeting schedule, defining the group’s structure)
- Generating ideas and hypotheses
- Designing the study
- Considering ethical issues
- Creating materials
- Scheduling participants and experimenters
- Piloting the study
- Running the study
- Overseeing participant compensation
- Handling data
- Synthesizing results
- Presenting the findings
- Writing up the findings
- Identifying future directions for research

These tasks, in turn, can be grouped fairly naturally into the following three roles:

1. Organization and logistics
2. Design and analytics
3. Storytelling and writing

The organization and logistics role focuses on coordination of the research team, ranging from scheduling team meetings and setting deadlines for individual tasks to scheduling participants. The design and analytics role focuses on operationalizing variables (i.e., selecting experimental manipulations and outcome measures), weighing ethical issues, and working with the project’s data. Finally, the storytelling and writing role focuses on

creating a coherent whole out of the research process, beginning with the generation of hypotheses and following through to the presentation of the project's results.

Although it is useful to keep these three roles in mind, we are *not* suggesting that each member of the team take on just one role for the entire duration of a project. Instead, we encourage you to evaluate your strengths and weaknesses honestly by asking, "Do I naturally gravitate more toward one role than another?" And, if so, "Why?" Your most important first tasks as a member of a nonhierarchical team are to recognize your own strengths and weaknesses, to identify which unique skills you bring to the group, and to make a commitment to develop the skills you currently lack.

In order to assess your skills, we encourage you to complete the questionnaire included in Table 1.1, which is adapted from an activity developed by Dr. Michael Bednarski. After you have completed this exercise, return to your research team to discuss the skills you currently possess and the skills you would like to develop. As you review your skill set individually and with your team, be aware that a person's strengths and weaknesses may be related to the topic of your research (e.g., familiarity with the literature) or specific technology (e.g., comfort with statistical software) or with an approach to group work (e.g., interpersonal style).

Ideally, your group's members will find that they have a mixture of interests, talents, and personality characteristics. Such diversity will serve your team well. If it happens that one member of your team is especially detail oriented, another is a whiz at statistics, and yet another is a talented writer, then each of you can play to your strengths by taking the lead role in organization, analytics, and storytelling, respectively. However, do not fret if your team lacks such a perfect balance of these skills. Much more often, team members' strengths will overlap substantially, and some tasks (such as conducting statistical analyses) might be outside everyone's initial comfort zone. This reality is a good thing. The point of undergraduate research is to learn *new* skills, and your team should never completely divide responsibility for any task. Groups work best together when individuals take lead roles on different tasks but the team as a whole shares responsibility for accomplishing each task. With this in mind, the best approach is to acknowledge the strengths each person brings to the group and to support each person as he or she strives to develop additional skills.

PRINCIPLES OF EFFECTIVE COLLABORATION

Identifying the different types of expertise within your team is a crucial first step in the research process, but developing and sustaining an effective collaboration requires even more attention to *melding* your team's efforts. What are the core principles underlying successful team-based efforts? To answer this question, think back on a time when you felt deeply fulfilled as a member of a group. Perhaps you were part of an athletic team, a choir, or a theater group. Perhaps you were involved with a student newspaper, a religious organization, or a grassroots political campaign. Your sense of fulfillment in such a group likely came from a strong personal connection with the *goals* of the group, a connection with the other *people* in the group, and a connection with the *contributions* that you and

TABLE 1.1 Research Skills Exercise

Below is a list of skills. Please place a checkmark (✓) by the five skills you feel confident about having mastered through past work, classes, or other experiences. Next, circle (○) five other skills that you would like to learn or develop. Finally, star (*) the five skills that you most enjoy doing, regardless of your level of mastery.

1. ___ **Present before groups:** Deliver a message or point of view to an audience with the intent of informing or motivating
2. ___ **Evaluate and assess:** Determine the needs of a situation in order to identify a particular course of action
3. ___ **Implement and follow through:** Initiate and follow the steps that need to be taken to start and complete a project
4. ___ **Write:** Construct written reports and recommendations requiring skills in using vocabulary, grammar, and punctuation
5. ___ **Invent:** Develop a new service or process through creative thinking and experimentation
6. ___ **Analyze:** Examine data, concepts, and ideas to determine how they all fit together
7. ___ **Plan:** Develop and organize a series of steps and timelines to meet goals and objectives
8. ___ **Inspire:** Motivate groups or individuals to take action for producing optimal results
9. ___ **Memorize:** Bring together facts, faces, and knowledge from the past
10. ___ **Supervise:** Work directly with others to monitor work projects and ensure that performance goals are met
11. ___ **Synthesize:** Pull together separate pieces of data or information to form a new way of thinking or conceptualizing
12. ___ **Build consensus:** Communicate knowledge in a way that engages the interest and action of others
13. ___ **Edit:** Improve or revise written material for final use
14. ___ **Coordinate:** Organize separate facts, ideas, or concepts into a working model, theory, or product
15. ___ **Design:** Think through and form a plan that can be carried out as an outline, service, or invention
16. ___ **Categorize:** Organize information, ideas, or objects into groups or classifications
17. ___ **Display:** Present ideas and products in a manner that is designed to get others' attention
18. ___ **Investigate:** Systematically explore different sources of information to determine their relation to each other for the goal of supporting ideas or drawing conclusions
19. ___ **Direct:** Create order and direction from different types of events, activities, and information
20. ___ **Conceptualize:** Develop new ideas, theories, or processes, or redesign old ones
21. ___ **Monitor:** Observe and manage work assignments, projects, or processes
22. ___ **Calculate:** Use math and statistical operations to answer questions or explain data
23. ___ **Delegate:** Achieve desired goals through enlisting the use of other people's skills
24. ___ **Facilitate group action:** Motivate teams for the purpose of creating agreement on and attaining common goals
25. ___ **Brainstorm:** Freely generate ideas without restriction or judgment
26. ___ **Keep records:** Organize and save important information through databases, written material, and classification systems
27. ___ **Make decisions:** Comfortably use information to make and communicate choices and options among alternatives
28. ___ **Plan events:** Coordinate information, people, timelines, and logistics to actualize projects or events
29. ___ **Solve problems:** Pull apart different and sometimes conflicting elements of a situation to identify possible solutions
30. ___ **Explain:** Express information, beliefs, and so on in a clear manner so that others will understand

(Continued)

TABLE 1.1 (Continued)

List the 5 skills you have checked off above as **Skills I Already Have**. To the right, list the 5 skills you have circled as **Skills I Want to Develop**. Next, list the 5 skills you have starred as most **Enjoyable**. Finally, from your **Skills I Already Have** and **Enjoyable Skills** columns, select the 5 skills you think would be most helpful to **Utilize** in your team-based research. List these 5 skills in order of importance (1 = most important, 2 = next most important, and so on) under the column **Skills to Utilize**.

Skills I Already Have	Skills I Want to Develop
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
Enjoyable Skills	Skills to Utilize (in order of importance)
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

Source: Adapted with permission from Michael Bednarski (2012).

others were making to the group's success. These three types of connection highlight the core principles underlying effective collaboration: *vision*, *togetherness*, and *ownership* (see Table 1.2).

Vision

Having a sense of connection with the goals of a group typically motivates a person to join the group in the first place. If you don't believe that human activity is a cause of global warming, then it is highly unlikely that you will join a grassroots campaign in favor of a "green" tax on gas-guzzling cars. On the other hand, if you love writing about and discussing current events, joining the staff of a newspaper makes good sense. But what happens when you find yourself joining a group that has less certain goals? This is one

TABLE 1.2 Three Principles of Effective Collaboration

<i>Vision</i>	Develop a shared vision by discussing with your team the purpose of the research project and routinely reminding one another of the overarching goals of your work.
<i>Togetherness</i>	Develop a feeling of togetherness by building relationships with and respect for the members of your team and by relying on one another to give support, advice, and critical feedback.
<i>Ownership</i>	Develop a sense of ownership by recognizing individual and group contributions to the success of the project and by creating a shared sense of responsibility for and pride in the group's work.

of the challenges of research. In the earliest phases of a research project, the only thing that is certain is that you will have to conduct an experiment and report the results. If you are being asked to conduct research as a class requirement, you might have to develop a project from scratch. The specific purpose of your research and what your results might look like will be entirely up in the air. Alternatively, if you are working in a lab as a beginning research assistant, you might be assigned small tasks at first that reveal very little about your mentor's research goals. So to have a successful team-based research project, the first challenge is to develop a shared *vision*. Developing a shared vision is necessary for the success of any project because, just as in any other positive group experience you have had, knowing *why* you are doing something and believing in the rationale for doing it serve as potent motivators.

Especially if you are creating a project from scratch, the process of developing a vision will take time, and it will require both individual and group effort. One of the key ingredients of vision is being able to step back from the concrete or day-to-day details of the task in order to take in the bigger picture. Perhaps the bigger picture for your group is to learn more about why stereotyping occurs or how to help people who suffer from major depressive disorder. No single study will get close to answering either of these big questions, but single studies are needed to crack the surface of these problems. When you find yourself feeling dissatisfied with the small day-to-day details of research or a bit despondent because any particular study can get at only a narrow range of questions, remind yourself of the importance of the bigger picture, and make sure that you and your teammates see the connections between your research and this bigger picture. This is the vision that will connect your specific efforts to your broader goals.

Togetherness

Vision is great, but having a connection with the people in your group is what will keep you coming back to the group even on days when you feel too tired or busy to do any work. Having a solid connection with and respect for the people who surround you is important in any group setting. Imagine a skilled soccer player who doesn't respect the other members of her team. The trust she needs to pass the ball won't always be there,

and the team's cohesiveness will suffer. Imagine a deeply spiritual individual who nevertheless feels detached and uncomfortable around the other members of his religious congregation. Such a feeling of alienation, especially if it spreads, will quickly undermine the strong sense of community that characterizes most religious groups and enables these groups to flourish.

A positive interdependence between you and the other members of your team is *togetherness*. It results from members of the group relying on one another for support, advice, critical feedback, and motivation to persevere in the face of challenges. Team members must trust that they can delegate tasks to one another, and each person must be confident that the group will respect his or her contributions. As with the principle of vision, developing a sense of togetherness takes time and effort. Developing trust in others does not come quickly for everyone, so it is possible that you might find yourself slower or faster than others in forming these connections. Interestingly, and contrary to popular belief, togetherness is not always guaranteed or even enhanced when a team forms among friends. Friendship groups have added layers of complexity that often undermine a more professional sense of togetherness. But whether or not the members of your team knew each other before the team was formed, the goal is to be *intentional* in your efforts to work collaboratively. Togetherness requires thoughtfulness; it is not simply a function of getting along.

Ownership

Feeling a strong sense of connection with your particular role and contributions to your group, not just with the group's purpose and other members, is the final principle of successful teamwork. This is *ownership*. In Western culture, the idea of ownership is very individualized. We tend to view what can be "owned" as finite, so ownership is often associated with competition. This connotation might make it difficult to appreciate how ownership can be both personal and shared within a group, as well as how this merged sense of ownership is crucial to a team's functioning. We urge you to let go of the negative connotations of ownership. Instead, focus on the quality of your team's efforts and how everyone benefits from the team's success.

Looked at this way, ownership develops when you come to recognize that your contributions directly support the success of your group. Because you are engaging in a collaborative effort, your sense of ownership is further enhanced when your teammates make contributions that usher the project along. One person's accomplishments become the team's accomplishments, thus deepening each person's sense of responsibility for and pride in the project. Moreover, team-based research tends to be an iterative process. The group sets goals, individuals do some initial work on their own, the group comes back together for an exchange of ideas and reassigns or trades individual tasks, and so on. As a research project moves forward through this process, each goal that is checked off of the team's "to do" list represents a shared accomplishment. Instead of being a matter of competition, this type of ownership deepens the group's shared vision and sense of togetherness over time.

Conclusion

The total effect of an immersive, well-structured research experience is to create a vibrant atmosphere of collaboration among undergraduates and their research mentors. This teaching–learning approach is an efficient mechanism for producing high-quality research, and it is a system that will enable you to make the very most of your undergraduate education. By the time you finish this book, you will have learned how to generate creative research ideas, design studies, write research proposals, pilot methods and materials, recruit participants, collect and analyze data, write up research in APA style, and give formal presentations of research findings. By engaging in well-structured team-based research, you will be involved in a caliber of work usually reserved for graduate students and faculty members. Based on this experience, you might be inspired to continue doing research, perhaps working with a professor over the summer or during the academic year. Later, you might find yourself on an airplane to Washington, D.C., or Cancún, along with your fellow students and research mentor, on your way to present your research at a national conference. You might find yourself applying to graduate school so you can continue to build on your excitement for research. Or you might find yourself talking to a future employer about your team-based research experiences. In other words, doing collaborative research could easily shape your future pursuits, and whatever path you take after completing your undergraduate degree, your research experiences and skills will serve you well.

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The Idea

Seven Lessons (Plus or Minus Two)

1. Go beyond your typical course work by seeking ownership of the ideas that make a research project exciting.
2. Idea generation is not without constraints. Creative ideas must also be relevant, theoretically sound, and feasible.
3. Fuel idea generation by paying attention to day-to-day experiences, questioning your assumptions, exploring cause-and-effect relationships, and referencing past research in areas that interest you.
4. To invent and refine compelling ideas, utilize the quasselstrippe, lively and rigorous back-and-forth conversations with your collaborators.
5. Encourage productive brainstorming by approaching it as an iterative process, alternating between individual and group idea generation. In team meetings, take turns playing the roles of scribe, process monitor, and assumption chaser.
6. Be patient and postpone feelings of ownership during this early idea-generation phase. You will use the literature to ground your ideas and shape them into a good hypothesis.

The sound of one hand clapping . . . and the wrong hand.

—William J. McGuire (1973, p. 450)

The best educations are those that we outgrow. Do you remember your grade school grammar lessons? Proper grammar provides an essential foundation for *good* writing, but *great* writing often breaks these rules and invents new forms of expression. In other words, great writers must go *beyond* grammar. Likewise, there is no substitute for high

school and college training in critical reasoning. An unruly mind is the mind of a sucker, willing to believe just about anything that can be made to sound reasonable. But critical reasoning only ensures decent thinking. Great thinkers invent new ideas, and they place enough belief in these untested ideas in order to give them a fair hearing. In other words, great thinkers go *beyond* being critical. On occasion, this means that a new idea must be tolerated even though it seems unreasonable. An idea that seems eccentric, far-fetched, or flat-out wrong must be championed despite the likelihood of its failing. This chapter is about outgrowing your critical reasoning skills so that you can invent and champion new ideas. This is how research goes beyond course work, and it is what makes psychological science so exciting.

IDEA GENERATION

The hunch. The vision of something new and exciting. The idea. How do researchers come up with that idea, that cool insight that changes how we think about ourselves and the world around us? Does it come as a flash of brilliance, perhaps in a dream? Or is the idea a faraway destination reached after tireless hours of searching, pondering, and questioning? The quest for an idea gives rise to images of a long and exhausting journey. A journey fraught with false starts, wrong turns, and great difficulty. A solitary journey ending in a sudden, serendipitous discovery. These are romantic images, but they are of little use. Trekking alone through a dark cave, hoping for a flash of light to illuminate hidden treasure—this is no way to go about research. It is far too chancy, and, besides, it is too scary. So for now, set aside your preconceptions of how researchers come up with their ideas.

Instead, imagine transporting yourself to your local coffeehouse or neighborhood pub. Surround yourself with the sounds of boisterous conversation, and envision being encircled by other scholars who love puzzling through the realities of day-to-day life in order to identify compelling questions that are worth answering. This is the true spirit of idea generation in psychology, and undergraduate researchers can and should participate in the lively “coffeehouse” conversations that give rise to exciting research ideas. Although most psychological research appears to build on what has been done before, every idea should be vetted from the ground up through a rigorous series of conversations among collaborators.

The Need for Creativity

This chapter describes the first step in designing a high-quality experiment: coming up with an idea worth pursuing. Unfortunately, most college students never have the opportunity to participate in the lively invention and testing of new ideas. Imagine having to capture and keep the attention of a lecture hall full of students on a daily basis. Your professors, at least the good ones, can do this. They pass along some information. They model critical thinking. They motivate and inspire. But going beyond this to harness and direct each student’s imagination is something else entirely. This can be done in smaller classes and labs, but the ability of professors and undergraduates to collaborate with one another

evaporates quickly as class size increases beyond a dozen or so students. Inquiry-based learning loses out to mere instruction, as good as that can be. But you, as a student, need to wring the most out of your education. Certainly, you need to engage yourself as much as possible in large lectures, medium-size classes, and smaller sections and labs. But that is not enough. You need to outgrow and go *beyond* your typical course work. Research is a perfect vehicle for doing this.

Outgrowing your typical course work does not mean setting out entirely on your own. The backdrop for your thinking will be the lessons and theories of psychology, and you should look to your instructor or research mentor for extensive guidance. These are truisms. If you are intent on understanding your eccentric aunt, or if you want to pursue a self-styled theory of cyberpunk novels and their ability to nurture extrasensory perception, you are coming at psychological research from the wrong direction. Successful undergraduate research requires close collaboration between student and mentor, and, more often than not, student projects should piggyback on a professor's or graduate student's existing interests or lines of research. This will ensure that your efforts are sufficiently grounded in relevant theory and will be meaningful to other researchers in the field. In addition, your instructor or research mentor will help you develop a realistic project that you can complete in a set amount of time and with available resources. These considerations are essential. The most exciting, creative idea for a research project will go absolutely nowhere unless it is relevant, theoretically sound, and feasible.

In light of these constraints, many research mentors argue that undergraduates should “think small” as they conceive and design any research project. This sentiment is understandable from a practical standpoint. Yes, you will have to attend carefully to psychology's prevailing theories and current research literature. Yes, you will have to focus your thinking at some point in order to develop a set of good, workable hypotheses. And, yes, even the most independent student research must be doable and should reflect a partnership between the student and a research mentor or instructor. But you will have plenty of time to address these concerns. (You will read more about the research literature and theory-driven predictions in the next chapter, and you can skip at any time to our discussion of student-initiated research, in Chapter 11, if you are developing an independent thesis.) Moreover, emphasizing the many constraints on the research process often has the undesirable effect of crippling researchers' thinking. Students, especially, need to enter into research with a sense of their important role in contributing to psychological science. So whether you are in a methodology course, are participating in a thesis seminar, or are serving as a research assistant in a professor's lab, you should make a point of *owning* the ideas that make a research project exciting.

How do you own an idea? If you are anything like our students, you will struggle. We often assign papers requiring undergraduates to generate their own novel ideas for studies. Our students respond with blank stares, and they overflow our office hours seeking these elusive ideas. In a classic paper published decades ago, William McGuire (1973) recognized this challenge and called for a drastic change in the teaching of psychology research methods. To his dismay, McGuire noted that undergraduate and graduate training in psychology was focused almost exclusively on critical hypothesis testing. What about *creative idea generation*? After all, a bad idea is not worth testing. Adapting a traditional Zen Buddhist

TABLE 2.1 “Needed Innovations and Correctives” for Psychologists in the Form of Seven Koans

<i>Koan 1:</i>	The sound of one hand clapping . . . and the wrong hand.
<i>Koan 2:</i>	In this nettle chaos, we discern this pattern, truth.
<i>Koan 3:</i>	Observe. But observe people, not data.
<i>Koan 4:</i>	To see the future in the present, find the present in the past.
<i>Koan 5:</i>	The new methodology where correlation can indicate causation.
<i>Koan 6:</i>	The riches of poverty.
<i>Koan 7:</i>	The opposite of a great truth is also true.

Source: McGuire (1973, pp. 446–456).

koan (that is, a thought-provoking puzzle), McGuire described this state of affairs as “the sound of one hand clapping . . . and the wrong hand” (p. 450; see Table 2.1 for a complete list of McGuire’s koans). The entire framework of hypothesis testing is boring and mute on its own. On the other hand, the process of idea generation can be profound and, as we have suggested, quite boisterous.

As McGuire noted, “The neglect of the creative phase in our methodology courses probably comes neither from a failure to recognize its importance nor a belief that it is trivially simple. Rather, the neglect is probably due to the suspicion that so complex a creative process as hypothesis formation is something that cannot be taught” (pp. 450–451). Because of this, the problem persists unchanged today, and most course work pays scant attention to the creative phase of psychological research. Even so, all hope is not lost. In his 1973 paper, McGuire boasted of knowing a “dozen or so” effective ways to promote creative idea generation. Alas, he described only nine of them. Humbled by readers clamoring to hear more of his suggestions, McGuire (1997) set to work and eventually came up with a list of 49 ways to generate creative ideas!

Building from McGuire’s sage advice, we suggest the following tips to kick-start your idea generation (see Table 2.2). First, look around you. What do you observe in the course of your day-to-day life that captures your attention or curiosity? The ordinary and extraordinary are fair game here, and your goal is to take note of these occurrences and ask yourself *when*, *how*, and *with whom* these natural events occur. Second, question the things you take for granted. Do you find yourself making assumptions about cause-effect relationships without any “proof” that your assumptions are accurate? If so, what alternative patterns of cause and effect might exist, and how might you test them? (The goal here is to play with ideas. For example, are heated arguments the sign of a troubled romantic relationship? Perhaps not. Maybe what really matters in a healthy relationship is that romantic partners share the same inclination to argue.) Third, ask *why*. Even if a presumed cause-effect relationship holds up to closer scrutiny, there might be an unexpected *mechanism* (that is, an explanation for what links A to B) lurking in the background. What might this explanation be? (Okay, perhaps frequent arguments are a bad sign for relationships, but

TABLE 2.2 Four Approaches to Developing Research Ideas, Inspired by McGuire’s “Creative Hypothesis Generating in Psychology” (1997)

Look around you. What do you observe in the course of your day-to-day life that captures your attention or curiosity?

Question the things you take for granted. What assumptions do you make about cause-effect relationships? What alternative patterns of cause and effect might exist, and how might you test them?

Ask why. If a cause-effect relationship holds up under scrutiny, what explains the relationship between the cause and effect?

Look at past research. Are there simpler explanations for complex conclusions? Ways of linking disparate ideas together? Questions left unanswered by a particular study? Qualitative data that suggest new questions?

this might be true because couples who argue more never argue about arguing. Ironically, heated discussions *about* arguing might be needed to resolve relationship issues, decrease the frequency of future arguments, and bolster the health of a romantic relationship.) Finally, look at past research. Are there simpler explanations for complex conclusions? Ways of linking disparate ideas together? Questions left unanswered by a particular study? Qualitative data (e.g., interviews) that capture your attention and suggest new questions? If so, pursue these possibilities.

Metaphor as a Powerful Tool: An Example

With these suggestions in mind, let us illustrate an instance of effective idea generation. Brainwashing became a hot topic following the Korean War, when a number of Americans who had been prisoners of war appeared to have been “broken” by their Chinese and North Korean captors. These once-loyal soldiers denounced the United States and appeared to embrace communism. Motivated by these troubling reports, a handful of social psychologists, including McGuire, felt a compelling need to change the focus of their research. Rather than continuing to study various means of persuading individuals, they switched their attention to ways that individuals might be able to *resist* persuasion. In other words, what could be done to prevent brainwashing?

McGuire’s extraordinary idea was that persuasion can be considered metaphorically as the transmission of a disease. The process of persuasion communicates new attitudes and beliefs, which are like an illness. If attitude change works like the transmission of a disease, how can we protect ourselves and others from “falling ill”? Based on this analogy, McGuire and his colleagues reasoned that “we can develop belief resistance in people as we develop disease resistance in a biologically overprotected man or animal: by exposing the person to a weak dose of the attacking material, strong enough to stimulate his defenses but not strong enough to overwhelm him” (McGuire, 1970, p. 37). In other words, we should be able to develop a vaccine that inoculates our attitudes against persuasive attacks.

This is an intriguing idea, and, as McGuire (1970) remarked, “the notion is such a beautiful one that it really deserves to work” (p. 37). That, in a nutshell, is the essence and spirit of creative idea generation. Indeed, McGuire and his colleagues went on to demonstrate that attitude inoculation is a particularly effective means of developing resistance to persuasion. Exposure to a weak form of an argument prompts individuals to counterargue and build their defenses against a persuasive attack. Later, when the individuals are confronted with much stronger persuasive attacks, these bolstered defenses enable them to resist being persuaded (e.g., Papageorgis & McGuire, 1961).

So how did McGuire get his idea for attitude inoculation? We were not there, so we cannot be sure. Still, when we were graduate students, we interacted with McGuire a number of times. Our discussions with him had that characteristic frenzied intellectual quality of all coffeehouse conversations, and we are confident that the idea of attitude inoculation arose and was vetted through these types of interactions between McGuire and his colleagues and students back in the 1950s. In other words, idea generation is inherently social.

The Quasselstrippe

How can we formalize the coffeehouse conversations that lead to great ideas? To formalize something that is inherently informal might seem contradictory, but it would be a mistake to characterize the fun and play of these conversations as frivolous and merely entertaining. The goal is to be productive, and this goal must be taken seriously. Idea generation is comparable to the serious, disciplined focus of professional athletes who nevertheless lose themselves in their sport when they play a game or match. Likewise, researchers can immerse themselves in the flow of creative idea generation through the *quasselstrippe*, an informal environment for generating research ideas. The *quasselstrippe* is a process of lively and determined “yapping” that follows the winding thread of an idea from its first principles to a workable, theoretically driven research hypothesis. Kurt Lewin, one of the fathers of modern psychology, famously championed this method. The beauty of the *quasselstrippe* is that it can take place just as effectively in the classroom or lab as in the coffeehouse.

The *quasselstrippe* is inherently collaborative. It relies on the contributions of each group member, and the process fuels a sense of passion and excitement among the group as a whole. In regular, free-ranging meetings, members of a research team step back and play with ideas in the characteristically Lewinian fashion of “searching and seeking—working a problem this way, working it that way, turning it upside down, inside out, left to right, right to left” (Marrow, 1977, p. 234). The process should be fun rather than discouraging. Any observation could be the seed of an idea, but, importantly, no single observation should dominate any part of the conversation. Although there will come a time for constraining the group’s ideas, the initial process of *quasselstripping* should be freewheeling and open-ended. Only after the group generates and fully explores a broad collection of ideas should the members focus their discussion and commit to a particular question.

This process of idea generation may appear to be an exercise in tolerating chaos, but it will be much less chaotic and more productive if one key prerequisite is met: Each

individual must engage in his or her own brainstorming session *before* the group's quasselstrippe. This is comparable to an athlete practicing before the big game, and it will provide a solid foundation for your group's conversation. Then, after each group session, it is the individual's job to revisit the ideas, sort them, push them further, and assign a value to each one. The results of this independent work are brought back to the group's subsequent discussions.

Of course, researchers have generated countless ideas, and it would be naive to assume that the only effective means of creative idea generation is to iterate between individual brainstorming sessions and the quasselstrippe. Still, we think this process is a crucial means of melding a team's efforts, enabling all team members to take collective ownership of a research project. This point is essential. Individuals, on their own and before the quasselstrippe, must develop their own thinking, processing their own experiences and reflections alongside whatever relevant and thought-provoking theories, research, and ideas have been proposed by others. Then, when the group sits down to the quasselstrippe, it will be "pre-armed" with the varied perspectives of the participants. Each person comes to the conversation already invested in the issue, and the participants agree to let their ideas mingle and clash. Done in the spirit of collaboration (even if the conversation gets heated now and then), this process transforms the substance of individual ideas into a much more compelling vision that is owned collectively by the team.

PUTTING EFFECTIVE BRAINSTORMING INTO PRACTICE

This book is devoted to the idea that the group can be much more effective than the individual in conducting psychological research. But as we have noted, effective brainstorming requires time for the individual to consider ideas away from the group. Research suggests that group brainstorming in and of itself can have a serious downside, stifling creativity and the group's ultimate productivity because it preempts individual thinking (Mullen, Johnson, & Salas, 1991). So you must think of effective brainstorming as an iterative process (see Brown & Paulus, 2002; Girotra, Terwiesch, & Ulrich, 2010). Individual team members should first ponder ideas they find interesting, and then they should bring these ideas to the group for a freewheeling discussion. The highlights of the group's conversation are taken up again by the individual for further thought and consideration. And so the circle of brainstorming continues. To help you prepare for this process, we have developed a number of concrete recommendations for putting effective brainstorming into practice.

Keep a Written Record

In addition to a mug of strong coffee, soothing tea, or hoppy beer, there is a prerequisite of any brainstorming session that should not be overlooked: paper and pencil, or your favorite electronic equivalent. In practice, it works best to have one team member take notes at every meeting. But because note taking is likely to pull this person's attention away from his or her own thoughts, the position of *scribe* should rotate among team members

from one meeting to the next. Similarly, when each individual engages in his or her own brainstorming sessions, taking notes is crucial. Ideas are fleeting, ephemeral creatures. Unless they are captured immediately, on paper or electronically, they tend to disappear and be forgotten. Ideally, each team member should keep an individual lab notebook and record ideas in it as they occur across the entire span of the project. Many of these ideas will be irrelevant to the current project, but they should all be recorded. Good ideas will wait patiently for your future self to dig them up and make use of them. This is yet another reason a written record is essential.

Identify an Area of Interest

How does the brainstorming process begin? Sometimes researchers begin the process of idea generation with certain predetermined parameters in place, such as a specific question or topic of study. This will be true more often than not for undergraduates collaborating with faculty or graduate student mentors within a research lab. It also will be true in classes if the professor proposes a general topic or theme to guide everyone's projects. Other times, the field of inquiry is wide open. Having an open field is both a blessing and a curse. Freedom of choice maximizes the chance that the group will come up with a project that interests all the members, but, as Swarthmore College professor Barry Schwartz (2000) argues, too much choice can be paralyzing and rarely leads to happiness. So if a research mentor or professor focuses your attention on a particular area of study, be glad and work contentedly within this constraint.

If your team does have to develop its own idea entirely from scratch, first be sure to acknowledge that this is a difficult (though certainly not insurmountable) challenge. The interests and suggestions of group members may be so far-ranging that it may seem impossible to reconcile the disparate ideas. To sidestep this difficulty and organize a more effective planning meeting, your team needs to set as its first goal the identification of a broad theme that is of common interest to the group. If you are not sure where to start, flip through your Introduction to Psychology textbook. Is there a particular chapter *subtopic* (e.g., children's development of gender identity) that captures your attention? Do the other members of your group share this area of interest? If so, you have created the appropriate boundary conditions to begin brainstorming.

Brainstorm Individually

After identifying the theme of your group's research, it is time for your group to part ways for a while and do some individual brainstorming. Some people prefer to brainstorm in a quiet location. Others find the din of conversation and background music of a coffee shop to be the ideal setting for coming up with ideas. The objective of individual brainstorming is to record as many ideas as possible. To do this, it is important that you refrain from dismissing, critiquing, or fixating on any particular idea. There is an approach to meditation that urges practitioners to allow their thoughts to flow by unobstructed. The person "watches" these thoughts in much the same way he or she would watch clouds pass by in the sky. Clouds cannot be judged; they are neither good nor bad. Clouds cannot be held

on to; they will pass by at a pace all their own. Apply this perspective to your ideas. Do not judge the character of your thoughts. Do not hold on to any particular thought. Unlike in meditation, however, you will be recording your thoughts as they occur. Simply list your ideas; you will return to this list later.

For most individuals, successful brainstorming requires more than one session. Breaks are incredibly helpful for allowing ideas to stew and develop. Some of your best ideas may come to you after a nap or a distracting activity. Take a brisk walk, go chat with friends for a while, or treat yourself to an indulgent bowl of ice cream. Your mind will continue important work on your project even when you let it slip outside your conscious awareness (Wallas, 1926). Taken as a whole, individual brainstorming cannot be forced or done quickly at the last minute. When done well, the process is time-consuming. But it is worth it in the end.

Monitor the Group's Dynamics

When your team gets together to quasselstrippe, your initial objective is to keep the conversation playful. Your group's thoughts must be allowed to flow at this early stage; developing specificity and focus will come later. Insisting on structure or working too quickly toward a full-blown research design will interfere with the development of *the idea*. Each individual should be asked to share his or her ideas, but not necessarily as one long list. A balance must be struck between giving each individual the time and opportunity to share ideas and giving the group time to build on, discuss, and develop any ideas of mutual interest. For this reason, we recommend that one person in the group be assigned the explicit role of monitoring the group brainstorming process.

The *process monitor* should be as engaged in brainstorming as the other members, but he or she should assess periodically whether the focus of the conversation should slow down or, alternatively, shift. The group's string of thoughts must be allowed to wind back and forth. Generally, it is not appropriate to go around the circle rigidly, having each person take turns suggesting an idea. Instead, try having one person begin talking about his or her ideas with the understanding that other group members will jump in to elaborate and build on these ideas. Sometimes this will lead to a new idea or to other group members adding ideas from their own individual brainstorming sessions. It is up to the process monitor to elicit contributions from every team member (e.g., "Julia, you look like you have something to say about this"), put the conversation back on track by returning to an individual's original idea (e.g., "Alexa, say more about what you were thinking"), and redirect conversations that have become bogged down (e.g., "Let's back up and think about what else we can do with this idea"). In addition, the process monitor might notice that an individual has not spoken much at all, and in this case it is appropriate to prompt the person by saying, "What's on your list that we have not discussed, Chris?" Alternatively, someone might be dominating the conversation. It helps for everyone to know that this is commonplace, and a handy expectation to cultivate is that the process monitor will occasionally ask more talkative participants to "go completely silent" for a few minutes.

As the string of ideas grows longer, it is likely that the group will be able to identify a common area of interest or excitement. Perhaps the topic represents an area of maximal

overlap of all the members' interests, or perhaps the questions emerging from the team's discussion fill each group member with a feeling of anxious anticipation because the prospect of searching for an answer is so compelling. Feelings such as these are clear indicators that the idea is close.

Avoid Groupthink

Although it is thrilling to imagine arriving at an idea for your research project, we should pause for a moment to discuss a potential pitfall of group brainstorming. Brainstorming in a group can quickly go awry because of a phenomenon known as *groupthink*, first described in detail by Irving Janis in the 1970s. Janis observed that groups have a strong tendency to latch onto a single, narrow vision, essentially putting up psychological barriers to the further exploration of good ideas. This can happen in many different settings. For instance, Janis (1972) attributed the Kennedy administration's ill-fated decision to orchestrate an invasion of Cuba in 1961 to groupthink. The Bay of Pigs invasion failed miserably and helped precipitate the Cuban missile crisis, which brought the United States and the Soviet Union to the edge of nuclear war. Although the stakes are not nearly as high in your brainstorming sessions as they were for President Kennedy and his advisers, the lesson is the same: Do not settle on any particular idea too quickly.

To avoid groupthink, be particularly aware of the *illusion of unanimity* (Janis, 1972). Sometimes it will appear as if everyone else in the group, except you, is in complete agreement about a particular idea. However, actual unanimity in groups is quite rare, and the only way the illusion of unanimity will be dismantled is if someone speaks up. Unfortunately, the illusion of unanimity can be especially powerful in small, self-managed teams (see Moorhead, Neck, & West, 1998), and individuals may feel too intimidated to offer a perspective that contradicts the group's vision or train of thought. Our first bit of advice is simple: Just say it! Your team needs to establish a norm of good-natured nonconformity in these brainstorming sessions. As this norm takes hold, you will find that other individuals or perhaps the whole group will share your questions and concerns. Even if you are alone in your perspective, your insight might be correct or otherwise invaluable to the group's full consideration of an idea. So try to avoid fearing that others will judge you or your ideas harshly. It is much better to contribute often during this early stage of work than it is to wait until later to express concerns.

Ironically, a cohesive team mentality can be dangerous in the initial stages of brainstorming. Because of this, we highly recommend that another group member adopt the role of *assumption chaser* (see Cress, Collier, & Reitenauer, 2005). The assumption chaser is responsible for recognizing and calling attention to groupthink and to illusions of unanimity. It is also the assumption chaser's job to play devil's advocate by explicitly bringing the group's attention to important concepts that have been overlooked or dismissed too quickly. The assumption chaser must help the group avoid stifling some ideas altogether and criticizing other ideas too harshly. The goal of the assumption chaser (and, indeed, the group as a whole) is to keep the conversation open, flowing, and wide-ranging. The narrowing of ideas will come, but only later.

Take Time to Pause and Reflect

Groups, just like individuals, must take breaks from the brainstorming process. Although it would be nice to assume that only one brainstorming session will be necessary before your group decides on a topic, we urge you not to make that assumption. Time pressure is yet another contributor to groupthink. With this in mind, it can be especially helpful for each individual to take the group's ideas home and return a few days later to continue the conversation. Having time to pause and reflect not only enhances the overall quality of the final idea but also allows group members to recognize any constraints put on the team's initial brainstorming by groupthink.

Conclusion

In the first chapter of this book, we discussed how to engineer a series of relationships among you, your group, and the project that will maximize the likelihood of successful collaborative research. The overarching goal is to create an experience that builds a collective sense of vision, ownership, and togetherness. At the idea-generation stage of a research project, these characteristics of the group are in their infancy. Rather than seeing this initial lack of vision, ownership, and togetherness as a problem, you should see their absence as advantageous. Each group member needs to bring a different perspective and disparate ideas to the table.

Getting to know the other members of your team is a process, just like the development and execution of your research idea is a process. In some cases, you may be part of a brand-new team. In other cases, some team members may have preexisting relationships. Although many students look forward to working with friends, the truth is that friendships can make the process of working together more challenging. In large part this is because friends' interpersonal comfort with one another may be interpreted mistakenly as shared vision. This is not ideal at this early stage of the process. Rather, this is a rare time when it is advantageous for each individual in the group to bring a strikingly different perspective to the discussion. As you work at brainstorming, facing the pitfalls head on, you will begin to feel the first hints of interpersonal connection that we think of as professional togetherness. But be patient at this early stage; only after you and your teammates have collaborated for a longer period of time will a sense of shared experience be cemented.

Likewise, as you engage in the process of developing *the idea* for your team's research project, your group must be patient. When you are immersed in idea generation, you are at the starting gate. Individual ideas must be treated with care at this point, for they are the delicate beginnings of what will eventually become the common threads of a unified vision. Giving each individual idea a role in these initial conversations is vital. At the same time, too much courtesy can lead to the acceptance of an idea before the time is right. When, you might ask, is the time right? Our answer? Not now! Your project is still in its earliest phase of development, and becoming too attached to any particular idea (as an individual or group) could lead to disappointment as the project progresses. Experienced

researchers know that the path from first ideas to a final project is neither straight nor narrow. You should avoid any sense of ownership for now, and prepare yourself to use the research literature to link your team's ideas to relevant theories and to narrow your ideas into a compelling hypothesis.

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