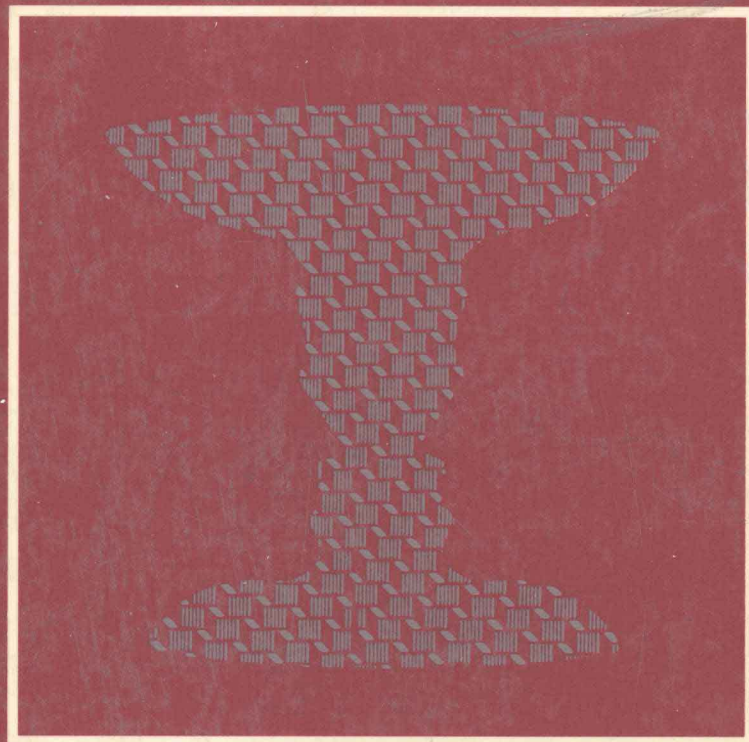# CLASSIC READINGS IN
PSYCHOLOGY

edited by

James V. McConnell
Daniel W. Gorenflo

CLASSIC READINGS IN PSYCHOLOGY

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James V. McConnell, Ph.D.

and

Daniel W. Gorenflo, Ph.D.

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This book of readings is unique in at least three ways: the manner in which the articles were *selected*, the way in which the articles are *presented*, and the technology involved in *publishing* the book. In order to describe what this book is like, therefore, we need to discuss all three of these unique features.

SELECTING THE ARTICLES

Most editors of "readers" use rather arbitrary criteria to select the journal articles that they include in their books. While this approach has its strengths, it also has one glaring weakness: The editors typically screen the literature for papers *they* think are important. Whether or not the editors' selections are those that most *instructors* of introductory classes want to assign their students, therefore, is a matter of chance.

We approached the task of selecting articles for our reader from rather a different viewpoint. We assumed that most instructors would prefer to have a reader contain papers that *almost all psychology teachers* would agree are important. The problem then became how to determine which articles might meet that criterion.

Our solution was simple-minded in concept, but fairly difficult in execution. We assumed that the authors of most introductory psychology texts survey the behavioral literature rather thoroughly. Obviously, the authors of these texts have their own sets of biases. But, we decided, if we collated the bibliographies of a substantial number of introductory texts, the overlap *across* texts would compensate for idiosyncracies *within* any single book. So this is the approach we took.

First, we selected 24 of the best-known introductory psychology texts presently on the market. The list of these texts appears at the end of this Preface.

Next, we used an optical scanner to "read" the bibliographies of each of the 24 texts onto the hard disk of a computer. All in all, we ended up with more than 37,000 different entries. Then we "sorted" this massive list of references alphabetically and checked to see which journal articles appeared on the list most frequently. The results of our labors were as follows:

Cited in 22 of 24 Textbooks

Miller, G.A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, **63**, 81-97.

Schachter, S., & Singer, J.E. (1962). Cognitive, social, and physiological determinants of emotional state. *Psychological Review*, **69**, 379-399.

Sperling, G. (1960) The information available in brief visual presentations. *Psychological Monographs*, **74**, 1-29.

Holmes, T.H., Rahe, R.H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, **11**, 213-218.

Peterson, L.R., & Peterson, M.J. (1959). Short-term retention of individual verbal items. *Journal of Experimental Psychology*, **58**, 193-198.

Bem, D.J., & Allen, A. (1974). On predicting some of the people some of the time: The search for cross-situational consistencies in behavior. *Psychological Review*, **81**, 506-520.

Bower, G.H.. (1981). Mood and memory. *American Psychologist*, **36**, 129-148.

Brown, R.W., & McNeil, D. (1966). The "tip of the tongue" phenomenon. *Journal of Verbal Learning and Verbal Behavior*, **5**, 325-337.

Hobson, J.A., & McCarley, R.W. (1977). The brain as a dream state generator: An activation-synthesis hypothesis of the dream process. *American Journal of Psychiatry*, **134**, 1335-1348.

Rosenhan, D.L. (1973). On being sane in insane places. *Science*, **179**, 250-258.

Scarr, S., & Weinberg, R.A. (1976). IQ test performance of black children adopted by white families. *American Psychologist*, **31**, 726-739.

Asch, S.E. (1951). Effects of group pressure upon the modification and distortion of judgments. In K.S. Guetzkow (Ed.), *Groups, leadership, and men*. Pittsburgh: Carnegie Press.

Eysenck, H.J. (1952). The effects of psychotherapy: An evaluation. *Journal of Consulting Psychology*, **16**, 319-324.

Jensen, A.R. (1969). How much can we boost I.Q. and scholastic achievement? *Harvard Educational Review*, **39**, 1-123.

Watson, J.B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology*, **3**, 1-14.

Cannon, W.B. (1927). The James-Lange theory of emotions: A critical examination and an alternative theory. *American Journal of Psychology*, **39**, 106-124.

Craik, F.I.M., & Lockhart, R.S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, **11**, 671-684.

Ekman, P., Levenson, R.W., & Friesen, W.V. (1983). Autonomic nervous system activity distinguishes among emotions. *Science*, **221**, 1208-1210.

Festinger, L.A., & Carlsmith, J.M. (1959). Cognitive consequences of forced compliance. *Journal of Abnormal and Social Psychology*, **58**, 203-210.

Gibson, E.J., & Walk, R.D. (1960). The "visual cliff." *Scientific American*, **202**, 64-71.

Milgram, S. (1963). Behavioral study of obedience. *Journal of Abnormal and Social Psychology*, **67**, 371-378.

Rodin, J. (1981). Current status of the internal-external hypothesis for obesity: What went wrong? *American Psychologist*, **36**, 361-372.

Cited in 16 of 24 Textbooks

Bandura, A., Ross, D., & Ross, S. (1963). Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology*, **66**, 3-11.

Tolman, E.C., & Honzik, C.H. (1930). Introduction and removal of reward, and maze performance in rats. *University of California Publications in Psychology*, **4**, 257-275.

This book of readings includes 22 of the 24 articles on the above list. We did not include the article by Gordon Bower since, in recent publications, he states that his early work on "mood and memory" (described in the article listed above) cannot be replicated reliably even in his own laboratory. Nor did we include the article on "racial differences in IQ" by Arthur Jensen since it ran to 123 pages in length and would have taken up almost half the pages in *this* book.

Analyzing the Articles

Several points of interest emerge from an analysis of these 24 articles:

1. In terms of content, the articles cover almost the entire field of psychology. Perhaps that isn't surprising, given the fact that introductory texts are presumed to range across psychology from its biological underpinnings to its sociological strivings. Given that fact, however, we find it somewhat surprising that there wasn't *more* overlap among the bibliographies of the 24 introductory texts. How can it be, we asked ourselves, that not one article was cited by *all* the texts, and that only three articles in *all of the psychological literature* were important enough to merit mention in at least 22 of these texts? The answer seems to be that there was tremendous overlap among the texts as far as *authors cited* was concerned, but far less agreement as to which of the authors' *works* were cited.

2. There are surprisingly few *recent* articles on the list. Only two are from the 1980s, and the oldest (by Watson and Rayner) was published in 1920. Most of the articles, in fact, were published in the 1960s and 1970s. These, then, really are *classic* readings in psychology.

3. There is considerable overlap as far as the source of the articles is concerned: Three appeared in the *Psychological Review*, another three were in the *American Psychologist*, and three more were published in the *Journal of Abnormal and Social Psychology*. Two articles on the list appeared in *Science*, and another two were taken from the *Journal of Verbal Learning and Verbal Behavior*. Thus, some 60 percent of the articles came from just five journals.

4. Despite the fact that all of the authors of these 24 journal articles are well known, there are some rather famous psychologists whose names are missing: Skinner, Freud, and Piaget, to name but three. An inspection of the textbook bibliographies suggests, however, that

psychologists of this exalted stature primarily appear as authors of *books,* not as authors of *journal articles.*

As far as the content of the articles is concerned, there were few surprises. Given the fact that the majority of articles come from the 1960s and 1970s, when classical "learning theory" still was dominant, we might expect this topic to appear frequently. And it does. At least 10 of the 24 articles touch on this subject. Social psychology comes in second, being the main topic in at least eight of the articles. However, given the emphasis in modern-day psychology on child and developmental psychology, it strikes us as odd that only two articles on the list focus on this area. Clinical psychology and personality theory also appear to be under-represented.

Overall, however, we believe that our "collating" technique snared 24 of the most important journal articles ever published in the field of psychology.

PRESENTING THE ARTICLES

We believe, as do many other instructors who have taught the introductory course, that reading the primary literature is an excellent way to help beginning students discover what our field is all about. Unfortunately, most of these students have neither the experience to make much sense of the average journal article, nor do they typically find digging into articles a very rewarding endeavor. We have tried to solve both these problems in this reader.

First, in the introductory chapter, we attempt to explain to the students in very simple terms what science is all about, why scientists publish their data, and why anyone who takes an introductory course should learn something about experimental design. In addition, we give the students some helpful hints on *how to read a journal article.*

Second, we have written comments that appear at the start of each chapter in which we attempt to explain why this particular article is "classic." We also attempt to put the published material into historical context and explain what prompted the author(s) to conduct the research (or write the article). Whenever possible, we have tried to discuss the relationships that exist *across articles.*

Third, there is the matter of *definitions.* Most beginning students simply don't comprehend the complex terminology used in most journal articles. They are perfectly capable of *learning* these terms, but are unlikely to do so unless given a fair amount of assistance. In our experience, students simply don't look words up in the dictionary, nor do they make much use of a glossary if it appears at the end of the book. However, they *will* learn new terms if the definitions appear close to where the students actually encounter the terms themselves. Therefore, we have included a *running glossary* with each article. We have printed in **boldface** each term the student might have difficulties with in the article. We then give a rough pronunciation for the term, as well as a working definition, in the lower right-hand corner of even-numbered pages throughout the reader.

As far as we know, the first use of a "running glossary" in any text was in the first edition of the senior editor's book *Understanding Human Behavior* (McConnell, 1974). Since that date, feedback gathered from thousands of students suggests that they greatly value the "running glossary." We believe that use of this pedagogical device is even more important in a book of readings than in an introductory text. Given that fact, we are surprised that no one seems to have used a page-by-page glossary before in a reader.

Finally, we have included quotations from William James at the end of many chapters. Most of these quotes come from his monumental text, *The Principles of Psychology*, which was published almost exactly 100 years ago. We selected the quotations to shed new light and understanding on the material covered in the chapter the student has just read. We were surprised--as we think the students themselves will be--at how "current" much of what James said a century ago turns out to be.

All things considered, we hope we have made it as easy and as rewarding as possible for the beginning student to discover the exciting world of information contained in the primary scientific literature.

PUBLISHING THE BOOK

Years ago, when the editors of a book of readings were ready to publish their selections, they would simply send to the publisher copies of the materials they had chosen. The production department at the publisher would then reset the journal articles in type, redraw the graphic materials, and redo the tables and graphs. This process was not only slow and laborious, but quite expensive as well.

These days, publishers are beginning to demand that authors and editors provide the publisher with *camera-ready copy*. With the growing availability of computers and optical scanners, that demand has recently become easier for authors and editors to meet.

Desktop Publishing

This book was prepared in final form by employing techniques that are now known as "desktop publishing." For those people with an interest in modern technology, we used both an IBM PS/2 Model 80 and an IBM PC AT computer as our primary devices. Optical scanning was accomplished with a Kurzweil Discover Model 30 optical scanner. We printed the final draft of the manuscript using a Hewlett-Packard Laserjet Series II laser printer.

For initial preparation of the text, we used two word-processing software packages, High-Style and WordPerfect 5.0. To prepare some of the graphics, we made use of Harvard Graphics. The final step in preparing the manuscript involved gathering all the materials together and laying out the pages using a powerful software package called Ventura Publisher (version 2.0).

Use of the Kurzweil optical scanner allowed us to "read" the text of many of the articles onto the computer straight from the pages of the journals themselves. Using a very complicated algorithm and a built-in dictionary, the scanning software attempts to "interpret" what it sees on each page as English language. It then files each page on the computer's memory disk as text, not merely as a "picture." We then could edit and rearrange the scanned text according to our own needs, just as if we had typed the article into the computer by hand. The scanning process is far from perfect, but can save enormous amounts of effort when it works. We retrieved the text itself from bound journals borrowed from the University of Michigan and Eastern Michigan University libraries. Unfortunately, as we soon found out, many of the journal articles had been so marked up by generations of students that the scanner was hard-pressed to "read through" the underlining, the yellow highlighting, and the cryptic hand-written comments that covered the pages. In some cases, then, we did have to type the

articles directly into the computer the old-fashioned way. We also used the Kurzweil to copy some graphics and artwork onto the computer, and then (using Ventura Publisher) we simply "plugged" the artwork into the text at the "appropriate" places.

Whether, overall, computers actually "save time" is still something that hasn't been precisely determined. However, it is apparent that these marvelous machines allow us to do things we couldn't (or wouldn't) have done before. Take, for example, the matter of determining which articles to include in this reader. As noted, we scanned the bibliographies of the 24 introductory texts into a single file on the computer using the Kurzweil. The file itself was huge: The 37,000 + entries took up 6 million bytes on the computer's hard disk. Putting this many references into alphabetical order by hand would have been a formidable task. However, a software package called Opt-Tech Sort alphabetized all 37,000 entries in less than five minutes. We had hoped to create a software program that would scan the 37,000 entries for redundancy. However, there was so little stylistic consistency across the 24 texts that we soon gave up hope. Fewer than half the textbook authors followed APA style when preparing their bibliographies. The sorting program we used is excellent, but it cannot tell that an entry under "Watson, J.B." is the same as one under "Watson, John B." Nor does the sorting software recognize that an article by "Watson *and* Rayner" is the same as an article by "Watson & Rayner." There still are some tasks that the human brain accomplishes better than today's computers do!

Finally, and in the same vein, we ask the reader's indulgence. Since we scanned most of the articles from the journal pages into the computer, we have left them (for the most part) *as is*. Which is to say that the authors of the journal articles too used different styles, particularly when preparing their bibliographies. We have maintained consistency in such matters within, but not across, the articles.

We believe that the use of desktop publishing techniques will become more widespread in the near future, and we anticipate that instructors will soon use this technology to "custom-tailor" the materials they use in class. We note, though, that the process remains laborious, and simply tracking down long-out-of-print journals (such as the *University of California Publications in Psychology*) can be a major chore.

FINAL THOUGHTS

Despite the many obstacles we had to overcome using the new technology described above, we have thoroughly enjoyed the process of putting together this book of readings. Editing the articles reprinted herein--some read for the first time, we reluctantly admit--has given us new respect for the wisdom of our peers. We continue to be convinced that the *science* of psychology is a robust discipline with much to offer students in any field.

We hope too that the pedagogical devices we have employed in this book will make it easier for students to learn what our discipline is all about, and perhaps encourage them to become involved in creative activities in the behavioral sciences.

Finally, it is our sincerest wish that both the instructors and the students who read this book will find it a rewarding experience.

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Contents

Compulsory Introduction: Please Read This Chapter First!

James V. McConnell and Daniel W. Gorenflo[1]

THE PILFERING PROBLEM

Suppose that you are the manager of a large department store. One day, as you check the quarterly sales figures, you notice that shop-lifting has increased dramatically in the last several months. Some of your customers (or maybe even some of your own employees) are stealing you blind. You ask yourself, what should you do to stop this "pilfering problem?"

First off, you call a friend who manages a similar store. She tells you that when she had the same difficulty, she "used psychology." That is, she hired a company that installed public address loudspeakers throughout the store. A high-powered stereo set played background music through the speakers all day long. But "hidden" in the music were *subliminal messages* that whispered, "Don't steal," over and over again. She claims that shoplifting decreased by 50 percent in her store immediately thereafter.

You ask her what *subliminal messages* are. She informs you that they are commands spoken so softly that you can't consciously hear them. "How can they work?" you ask her. "Psychologists have found that subliminal messages 'speak directly to the subconscious mind,'" she replies. "You don't know they're there, so you can't guard against them. The thieves respond to the messages unconsciously and stop stealing without knowing why they're doing so. It's really neat," she says. "And not only is it highly scientific, it actually works! How else can you explain the fact that shoplifting went down by 50 percent?"

Subliminal Stimulation

As it happens, there *are* such things as "subliminal messages." They are stimulus inputs which are so weak they function *below the threshold of conscious awareness* (*limen* is the Latin word for "threshold"). And, under very stringent laboratory conditions, these very weak stimuli *can* have a "just detectable" influence on behavior. However, study after study has shown that subliminal stimulation has *no measurable effect* in real-life situations (McConnell, 1966; McConnell, Cutler, & McNeil, 1958).

But didn't shoplifting *decrease* after your friend installed all that fancy equipment to broadcast the subliminal commands? Doesn't that fact *prove* that the hidden messages worked, no matter what the scientific data show? No, not at all. But if you are to understand why this is the case--and what actually did occur in your friend's store--you first must learn something about the *science of psychology*. And that, of course, is the major goal of this book.

THE SCIENCE OF PSYCHOLOGY

Psychology is a *science*. It came into being as a separate academic discipline some 100 years ago. Medicine had already shown the benefits that could come from studying the workings of the human body from an objective point of view. And psychology got its start when a number of American and European philosophers, physicists, and physiologists decided to study the mind in the same scientific manner.

Because psychology *is* a science, its theories and conclusions are based primarily on *experimental evidence*. That is, the scientific study of human behavior is based on findings obtained from laboratory studies and other types of objective observations. For the most part, these findings are published in scientific journals. If you want to become a psychologist--or if you want to learn more about human behavior from an objective point of view--then you *must* become acquainted with the scientific literature. This book is designed to help you do just that.

Why Science?

What is the major difference between a "witch doctor" who attempts to cure sick people in primitive cultures, and a "medical doctor" who attempts to cure sick people in America? The answer--as you know quite well--is *scientific knowledge*. The witch doctor's techniques are based on superstition and casual observations; the techniques the medical doctor uses are based on evidence gathered from thousands and thousands of experiments conducted in scientific laboratories.

Make no mistake: Some of the witch doctors' patients do get better; and some medical patients get worse (or even die) despite being treated with the best techniques modern technology can offer. But *overall*, your chances of being cured of a serious disease are far better if you go to see an M.D. than if you put yourself in the hands of a witch doctor.

Why do some sick people treated by witch doctors get better? There are several reasons. First, your body is a marvelous biological machine with great powers to cure itself. Many medical doctors will tell you that about half the patients they see would get better whether they were treated or not--an effect known as "spontaneous recovery." (Both witch doctors and medical doctors have been known to take credit for these "natural cures," of course.) But second, the very act of *seeing a doctor* or *taking a pill* can have a profound effect on the way your body mobilizes its natural defenses--something we call the "placebo effect." For example, if you have a headache and take a placebo (sugar pill) rather than an aspirin, your body may well (1) produce an increased amount of its natural painkillers, the endorphins; and/or (2) produce an increased amount of the "arousal hormones," adrenalin and nor-adrenalin. Thus, taking a placebo can not only reduce pain, but increase activity levels as well. Little wonder, then, that placebos have an honored place in both witch doctoring and in medicine. However, consider also the following facts: Medical studies show that about 60 percent of the people who take placebos for their headaches report relief--and about half those individuals report *as much relief* as if they had taken aspirin (McConnell, 1989). But some 90 percent of the patients who take aspirin report relief. Given the data, which pill would *you* prefer to take if you had a headache?

Furthermore, if a witch doctor gives you a pill for your headache, and you *don't* get better, the witch doctor may well say that the fault is *yours*--you don't have the "right attitude," or you have "bad karma," or you are "being punished for your sins." If the treatment prescribed by your physician doesn't work, he or she will probably put you on a different medication--or even

suggest a series of tests (including a brain scan) to determine whether there might be something seriously wrong with you. One of the major differences between the two approaches, therefore, is the *extensiveness of the data base* on which the techniques are based.

Why Journal Articles?

If a "conjure woman" living in a remote area discovers through experience that chewing the bark of the willow tree seems to "cure headaches," she has no way of communicating her findings with witch doctors and conjure women elsewhere in the world. However, if a group of medical scientists discovers through experimentation that chemicals extracted from the bark of the willow tree alleviate the pain associated with headaches, they can communicate their findings with other physicians throughout the world in rather short order. They do so by publishing the results of their research in a scientific journal. Other researchers can then attempt to *replicate* the original findings in their own laboratories and clinics. If the original results "held up" under further tests--which is what "replication" is all about--physicians everywhere might well begin prescribing willow bark extracts for headaches. Other medical scientists who had read the reports might then be motivated to determine how the bark extracts actually brought about pain relief. Eventually--because of the worldwide communication that scientific journals allow--some smart experimenter might discover a way to synthesize the important ingredient in willow bark extracts (which is how aspirin was actually developed).

If the results of the first study *didn't* hold up under replication, of course, that fact would be reported in the literature as well. And medical doctors who *read the literature* would soon learn that was the case and probably would stop prescribing willow bark.

THE SCIENTIFIC METHOD

At its simplest, the scientific method (as practiced both in psychology and in medicine) is little more than a *set of controlled observations* that can be *repeated by other scientists*. However, scientific discoveries often begin with "hunches," or *uncontrolled observations*.

For instance, suppose you were the first person to notice that giving willow bark extracts to people with headaches helped ease their pain. Is the fact that you gave the extracts to 50 people--and discovered that almost all of them reported relief--a *controlled* observation? No, as you will see, it's an *uncontrolled* observation. But it does give you the notion that willow bark might contain a natural pain-killer. In science, we call

this kind of notion a "hypothesis." But you haven't really tested this hypothesis scientifically yet. As we've already noted, the mere act of giving a "pill" to people often acts to relieve their pain.

So, what next? To *prove* the willow bark extract really works, you must perform a set of *controlled* observations. Which is to say, you'd need to undertake a scientific experiment.

In psychology, almost all scientific studies are based on comparisons of performance--comparisons made either *across groups,* or comparisons made on the same group of subjects *across time*. We call the former "between-subjects" comparisons, and the latter "within-subjects" comparisons. If you wanted to test the power of willow bark extract to cure headaches, you could use either approach.

Within-subjects Comparisons

Let's assume you have 60 patients who frequently suffer from heachaches. You might well decide to give each of the 60 patients the willow bark extract the *first* time one of them came to you for help. But the *second* time the same patient had a headache, you'd give the person a placebo (or "sugar pill") instead. The third time the patient asked for help, you'd give her or him the willow bark again, but the fourth time the patient would again receive a placebo medicaton. If the patients reported far greater pain relief after taking the willow bark than after taking the placebo, you'd have *compared the same subjects across time*. Put more technically, since you'd have taken repeated measures on the same people, you would have used a "within-subjects comparison," since you would have compared the performance of each subject at *one point in time* with his or her performance at *another point in time*. And, given the fact that the subjects showed greater improvement after taking the willow bark, you'd have scientific evidence to support your hypothesis that willow bark extracts are helpful.

Of course, you'd also want to control for a few other aspects of the experimental situation, as well. For one thing, you'd want to make sure that the two types of pills looked (and tasted) the same. Otherwise, your results might be due to the look or taste of the pill, not to what was in it. (For obvious reasons, we call this "running the experiment blind.") Second, you'd have the same person who gave out the pills the first time give them out the second, third, and fourth times too. Third, you'd make certain that the person distributing the two types of pills (and the person who recorded whether the patients felt any pain relief) *didn't know which pill was which*. (Can you guess why this is called "using a double-blind control?") Fourth, you'd probably want to give half the subjects the willow bark extract first, and the placebo second. The other half would receive the pills in reverse order. (We use this technique to control for what are called "order effects.")

Between-subjects Comparisons

When you make "within-subjects" comparisons, you systematically *vary* what you do to each subject, and note how each person responds. When you make "between-subjects" comparisons, however, you first divide the subjects into various groups, and then vary the conditions *across groups*. For instance, if you started with 60 patients, you might divide them into three groups of 20 patients each. The first group--which technically is known as the *experimental group*--would receive the willow bark extract. The second and third sets of patients would act as *controls*, thus would be called "control groups." One of these control groups would receive no pill at all--and thus would "control for" the fact that most people who get headaches recover rather rapidly even if they *don't* take medications. The other control group would, of course, receive the placebo--a control for the effects of "just taking a pill." Here, you're comparing performance *between* various groups of subjects.

At the end of the study, if the patients in the experimental group reported far greater relief than did the patients in either of the two control groups, you'd have scientific evidence to support your hypothesis that willow bark extracts reduced the pain associated with headaches.

Of course, you'd run this type of experiment using "double-blind" controls. But you'd also want to be very careful that you selected the patients for each group in truly *random* fashion. It might be, for example, that young people respond to placebos more frequently (or in stronger fashion) than do older people. Thus, if you put all the young patients in the "placebo control" group, you'd surely bias your results.

To summarize: In the "within-subjects design," you test each subject more than once and use each subject as her or his own control. In the "between-subjects design," you typically test each subject but once and use different groups of subjects as controls.

Generally speaking, the *more control groups you use, the more reliable your results are likely to be*. That's why we call science "a set of controlled observations."

Statistics

There's probably nothing that "turns off" students to psychology more than the thought that, somewhere down the line, they'll have to learn a little something about *statistics*. In fact, statistical devices are merely tools to help you describe sets of data and to determine what is likely to be true, and what isn't. You "use statistics" every time you play a game of chance (such as poker, bridge, or the lottery), or figure out a baseball player's batting average, or calculate your chances of getting into graduate school.

Unless you actually *conduct* psychological research yourself, you don't really need to learn much about most types of statistical techniques. There are three important points you should understand, though.

First, there are two types of statistics. We call them *descriptive* and *inferential* statistics. Descriptive statistics help you "describe" something, such as a distribution of scores. A "bell-shaped curve" is a descriptive statistic that tells you the distribution of scores on some set of data (such as the scores on an intelligence test). Whenever you calculate your grade point average, you're "figuring the mean of a distribution," which is also a descriptive statistic. However, you use inferential statistics to help you *draw conclusions*. And usually the conclusion that you wish to draw is that the responses you observed in your experimental group subjects were somehow *conclusively different* from those you observed in your control group subjects. Put another way, inferential statistics let you decide whether the results of your study were "for real," or whether they probably were due to chance effects.

Second, behavioral scientists typically report their data in terms of *probabilities*, which they calculate using such inferential statistics as "T-tests," "U-tests," and "correlation coefficients." By convention, if the results of a study probably wouldn't have occurred "by chance alone" more than one time in 20--which is usually written as $p < .05$, or $p = .05$--we assume the differences between the groups were *statistically significant*. If the statistical test shows that the differences were *not* significant "at the .05 level or better," then the hypothesis being tested wasn't confirmed.

Third, and perhaps most important, the first law of scientific research is as follows: Your statistical inferences are never better than the design of your experiment will allow. Picking the right sort of control groups in a given study is, practically speaking, far more important than is picking the "proper" statistical tool to use. For, if you fail to control for obvious sources of variability in a study (such as not running "blind" controls, or not using a "placebo control"), your results will be garbage no matter how elegant your statistics happen to be. In brief, the old saying, "garbage in, garbage out" applies to scientific research as it does to many other aspects of life. Let's show you why that's the case by taking a closer look at how psychologists discovered "the facts" about those "subliminal messages" that supposedly reduce pilfering in department stores.

SUBLIMINAL PERCEPTION

First, some history. More than a century ago, a middle-European experimenter named Suslowa made a remarkable discovery. As you surely know, the *sensitivity* of the receptors in your skin varies from one part of the body to another: The skin on your lips, on the tip of your tongue, and on your fingertips is much more sensitive than is the skin on your stomach or on the small of your back. Suslowa was one of the early experimenters who "mapped out" the human skin in terms of its sensitivity. He did so by measuring what is called the "two-point threshold" on various areas of the body.

The Two-point Threshold

Suslowa used an instrument that had two adjustable, needle-like points on it. He blindfolded his subjects and then touched the instrument to the subject's skin. Sometimes he touched the skin with both points, but sometimes he used just one point. When the points were far apart, the subjects could almost always discriminate them as being two. However, when the points were close together, the subjects often couldn't tell whether Suslowa had touched them with two points, or just one. By varying the distance between the two points, Suslowa determined how far apart the points had to be for the subjects to guess correctly exactly 50 percent of the time. By definition, that's what we call a *threshold* (or "limen")--a stimulus just strong enough to be perceived correctly 50 percent of the time.

When Suslowa did this sort of research a century ago, he discovered that the skin on the small of the back was very insensitive: The two-point threshold (limen) on the back is about 2 inches for most people. Which is to say that, when the points were 2 inches apart, Suslowa's subjects perceived them as "two" 50 percent of the time. Having made this discovery, Suslowa then did rather an odd thing. He adjusted the points so they were only half an inch apart. At this distance, his subjects *almost never* consciously perceived them as being "two." However, when Suslowa *absolutely demanded* that they guess whether the stimulus was one point or two, their guesses were significantly above the chance level. Don't misunderstand: The subjects' couldn't *perceive* the

points as being one or two; but *if forced to guess*, their guesses were in the right direction. Put more properly, the subjects were responding correctly to what were below-threshold (sub-liminal) stimuli.

When Subliminal Stimulation Works

There have been hundreds of similar studies since Suslowa's. In almost all cases, subjects in these experiments could make "above chance level" guesses about subliminal stimuli. But they only did so under rather special conditions:

(1) The effect occurred only in laboratory settings where the subject could be *forced* to focus closely on the stimulus input.

(2) The effect occurred only if the subjects were *highly motivated* to guess correctly, usually because they were rewarded for giving right answers or were punished for being wrong.

Unless *both* these conditions occurred, the subjects simply *ignored* the subliminal inputs. There is not one study in the scientific literature showing that people pay any attention to subliminal messages *outside the laboratory* (McConnell, 1989; McConnell, Cutler, & McNeil, 1958). (This fact alone should tell you why it's important to read the scientific literature. Suppose someone tells you that "hidden messages" reduce shoplifting. If the effect is "for real," a search of the literature will turn up lots of experiments supporting the "realness" of the phenomenon. But if you search the literature and can't find any support, the effect is probably a fake of some kind.)

Now, how do we get from Suslowa's laboratory to the department store you're supposedly manager of? We do so by looking at what happened in a movie theater in New Jersey some 30 years ago.

Subliminal Advertising

Back in 1956, an advertising executive named James Vicary shocked the world by reporting that he had conducted a "scientific study" in a movie theater in Fort Dix, New Jersey. He claimed that when he projected "subliminal messages" on the screen (during the movie), the audience responded in surprising fashion. The messages Vicary said he projected were "Eat Popcorn" and "Drink Coca-Cola." Vicary announced that popcorn sales rose some 50 percent and Coca-Cola sales went up about 18 percent over the previous week.

As soon as Vicary announced his results, the news media went into a frenzy about this new method of "mind control." Distinguished members of Congress made eloquent speeches denouncing Vicary and intro-duced bills designed to outlaw the use of subliminal advertising. And the radio and television networks announced that they would *never* allow the use of subliminal messages on their networks.

Behavioral scientists, however, took rather a different approach. First, they asked Vicary what variables he had *controlled for* in his so-called study. Vicary refused to answer. (What sorts of things would *you* have tried to control for? For instance, what influence on cola sales or popcorn purchases might the *type of movie* being shown have had?) When Vicary refused to describe his work in detail, or publish it in a scientific journal, many psychologists tried to *replicate* his results under controlled conditions. Unfortunately for Vicary, they failed to do so (McConnell, 1958). As a result of this failure, there presently is no law against the use of subliminal advertising in the US. There doesn't have to be: It just doesn't work. (If it did, the government would probably be bombarding you right now with such "hidden" announcements as "Pay your taxes" and "Vote Republican," and General Motors would have long ago taken over the entire automobile industry.)

But people seem to love magical solutions to difficult problems. And little wonder. For, at times, magic not only is cheaper and easier to use than is scientific investigation, it also sometimes seems to work.

Being Right for the Wrong Reason

There's a crucial difference between subliminal advertising and the "subliminal messages" used to reduce pilfering in department stores: Subliminal advertising simply isn't effective under any known conditions. Oddly enough, though, some department stores did report significant (short-term) reductions in shop-lifting after they began playing subliminal "Don't steal" messages over their public address systems. And that fact *proves* that the subliminal messages *worked*, right?

No, it merely proves how necessary it is to understand what the scientific method is *really* all about. For, unless you base your opinions on *controlled* observations, you risk the chance of getting good (if temporary) results, but not for the reason you think.

Correlations and Causes

Perhaps the most important point to remember about scientific experiments is this one: *Correlations don't prove causes*. Most humans grow up believing that if Event A *precedes* Event B, then A must have *caused* B to occur. We are particularly likely to *apply causality* in such situations if we have some *logical explanation*