

PART I

Learning

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Core Assumptions

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In an early television series called *Dragnet*, police sergeant Joe Friday was forever being confronted by incoherent witnesses to a crime. He would stoically endure their babbling until, his patience finally exhausted, he would interrupt, “We want the facts, Ma’am, just the facts.” Psychologists too want the facts, but, with experience, they acquire a certain wary respect for the problems involved in determining facts. What is a fact? Of course everyone knows what a fact is; a fact is . . . , well . . . it’s a *fact*, something that everyone knows to be true. Or is it? Was it a fact that the Earth was flat because everyone before Columbus believed it to be so? Or that the Earth was the center of the universe before Copernicus and Galileo moved it into orbit around the sun? And if we cannot be sure of the truth in cases as obvious as these (“Can’t you feel that the Earth is still? Can’t you see that the sun is moving?”), how much more difficult must it be when the truth is more obscure, and when experts can’t even agree among themselves? If one scientist claims that the moon is composed of blue cheese, and a colleague tartly

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replies, “So’s your mother,” how are we to decide which of their scientific views is correct?

In older sciences, such as physics and chemistry, disputes over scientific facts are less obvious: Over the years, basic concepts such as the atom and gravity have become firmly established; only after considerable training to learn dispute-free “facts” are new initiates to the profession gradually introduced to the ambiguities and uncertainties of current research. In psychology, which is a relatively new science, these disputes cannot be obscured so easily: The dividing line between “old established facts” and “new controversial hypotheses” is less clear, and there is no comforting bedrock of certainty and accomplishment to support students when they feel overwhelmed by conflicting claims. Consider such a relatively simple problem as the use of corporal punishment: Is corporal punishment an effective and ultimately humane way to eliminate a person’s harmful behavior, or is it a barbaric relic of our primitive past? There is evidence to support both views, and it can be more than a little frustrating to try to analyze the polemics of each side, and more than a little tempting to give up in disgust, crying “a plague on both your houses.”

In their attempts to resolve such disagreements – to decide what is a fact and what is not – psychologists have relied on several assumptions. These assumptions are now so widely accepted that psychologists rarely question them, but this does not necessarily mean that they are correct. It is perhaps worth emphasizing in advance that the assumptions we will be examining in this chapter really are assumptions, slowly developed over several centuries within a particular cultural and scientific tradition, and indeed not universally accepted even among psychologists. There are good grounds for you to approach these assumptions with a healthy skepticism and to form your own views of their validity. The better you understand these assumptions, however, the better you will understand why research has followed the paths that we will be tracing in subsequent chapters.

One purpose of this chapter, then, is to examine the methodological assumptions that have guided psychological research: Why psychologists rely on experiments to understand behavior, and the logic that guides researchers in designing these experiments. Before considering how to do research, however, we will begin by focusing on an even more fundamental issue: Why study behavior in the first place?

Is Behavior Lawful?

The most fundamental assumption underlying research into the laws of learning and memory is that there *are* such laws – if people’s behavior were simply capricious or random, there would be little point in trying to discover the laws governing it.

To clarify the issue, let us begin by defining more precisely what we mean by a law. Within science, a law is essentially a statement of the form “If A, then B.” That is, if some condition A exists, we predict that event B will occur. The statement “The sun rises every morning,” for example, predicts that if it is morning, then the sun will rise. Similarly, Einstein’s famous equation $E = mc^2$ says that if m has a value of 1 and c has a value of 2, then the value of E will be 4 (the real value of c is much greater). The assertion that behavior is lawful, therefore, is essentially a claim that behavior is in principle predictable: Whenever a certain set of conditions arises, the same behavior will always follow.

Determinism versus Free Will

Most of us believe that at least some aspects of behavior are predictable. However much we might dislike some powerful bully, for example, we don’t usually walk over to him and punch him in the nose, because we know very well that his reaction will not be random but intensely and unpleasantly predictable. Opinion varies, however, as to the extent of this predictability or lawfulness.

Determinism

At one extreme, some believe that *all* behavior is predictable. According to the doctrine of **determinism**, people’s behavior is entirely determined by their heredity and environment (as used here, the word “environment” refers to past experiences as well as present environment). Your decision to go to college, for example, was probably influenced by factors such as the educational background of your parents, the grades you received at school, the economic advantages of a degree, and so forth. According to determinism, these factors made it inevitable that you would eventually choose to go to college, whether or not you were consciously aware of their influence.

Dramatic advances in physics and chemistry have accustomed us to the idea that nature is inherently orderly, even though our ignorance sometimes makes it appear capricious. But is the behavior of a living organism just as lawful, just as determined, as the orbit of a rocket or the ticking of a clock? Are we really just helpless pawns in the grasp of environmental and genetic forces beyond our control?

Free Will

Within Western civilization, strict determinism of this kind has generally been rejected. Humans, according to most Western religions, are fundamentally free: We all have the power to determine our actions; this **free will** makes each of us responsible for our behavior and provides the basis for our concepts of morality and responsibility. Aside from formal religious teachings, however, a deep strain within all of us resents the notion that we are only insignificant links within a causal chain,

like billiard balls hurtling blindly through space, propelled by forces we cannot resist.

Why, then, do many research psychologists nevertheless believe in determinism? The reasons are complex, and in the following sections we will consider some of them. As you read this material, some of the arguments might strike you as more philosophical than psychological, and you might wonder why a psychology textbook should be devoting so much attention to this issue. The answer is that a belief in determinism plays an important role in guiding psychological research. If you carry out a study to find a lawful relationship and your effort fails, you are much more likely to persist if you are convinced that there really are laws. As a result, many of the most crucial discoveries about learning and memory have been made by psychologists with a stubborn, even fanatical belief that behavior is lawful. (See, for example, the discussions of Pavlov in Chapter 2 and Ebbinghaus in Chapter 8.)

Examples of Lawful Behavior

According to determinism, our genes and our experiences jointly determine our behavior, and in this section we will look at two examples of how our experiences in childhood powerfully shape how we behave as adults. We need to emphasize from the outset, however, that evidence that our environment influences us, even influences us powerfully, does not prove that it completely determines our behavior. We will return to this point later.

Child Abuse

A striking example of how powerfully our environment can influence our behavior comes from studies of children who are physically or sexually abused. Approximately two-thirds of children who are abused develop serious symptoms, ranging from anxiety and bed-wetting to depression and self-destructive behavior (Kendall-Tackett, Williams, and Finkelhor, 1993). One of the saddest of these after-effects is that many of these children have a greatly increased likelihood of themselves becoming abusers when they become parents. Kaufman and Zigler (1987) reviewed the many studies in this area and concluded, “approximately one-third of all individuals who were physically abused, sexually abused, or extremely neglected will subject their offspring to one of these forms of maltreatment” (p. 190). In one recent study the effect was even stronger, with 60 percent of abused children going on to abuse their own children when they became parents (Milaniak and Widom, 2015). Conversely, most adults who abuse children were themselves abused as children. Kasper and Alford (1988) studied 125 men who had sexually abused children and found that approximately 85 percent were themselves abused. The experience of abuse can profoundly influence a child’s present and future behavior.

Aggression

One consequence of childhood abuse is a 50 percent increase in the probability that boys will behave violently when they become adults. On the other hand, not all boys who are abused become violent. Why, then, do some boys become violent but not others?

One possibility is genetic. Animal research has shown that an enzyme called monoamine oxidase A (MAOA) plays an important role in reducing aggression and that a single gene regulates production of this enzyme. Perhaps, then, the reason that some abused boys are more likely to become violent is that they lack this inhibitory gene.

To investigate this possibility, a team led by Caspi and Moffitt studied males who had been monitored since birth as part of a longitudinal study carried out in Dunedin, New Zealand (Caspi *et al.*, 2002). Accurate records of their childhood experiences were already available, and the authors now tested them to determine if they possessed the MAOA gene that inhibits aggression. To assess violence, Caspi *et al.* used several measures, including convictions for violent crimes.

The results were striking. Males who had been abused as children and lacked the MAOA gene were found to be roughly *six times* more likely to be convicted of violent crimes than were males without these predisposing factors. Moreover, when antisocial behavior was defined more broadly, including measures such as a clinical diagnosis of adolescent conduct disorder, then the results showed that 85 percent of the boys in this category developed severe antisocial behavior. In other words, just two factors – a history of abuse and the absence of a single gene – were enough to almost completely determine how these boys would behave when they became adults. And this result has been confirmed repeatedly in subsequent studies. (For a review, see Fox, 2017.)

Another, perhaps surprising, cause of aggression turns out to be poor nutrition. In one study, 3-year-old malnourished children in Mauritius were enrolled in a program that provided them with healthy meals for 2 years. Their behavior was then assessed 18 years later, when they were 23, and the authors found that those who had participated in the program had 64 percent fewer criminal convictions than those in a control group who had not participated (Raine *et al.*, 2003). An improved diet when children were 3 was still affecting their behavior almost 20 years later. (See also Schoenthaler *et al.*, 1997; Fox, 2017.)

The effects are not always this strong, but poor nutrition does seem to be one important cause of aggressive behavior. (You may have experienced something resembling this if you've ever become irritable after not eating for a while . . .)

The Feeling of Freedom

Findings like these pose a puzzle: If our behavior is influenced so strongly by our heredity and environment, how is it that in our everyday lives we do not experience

any sense of being controlled? When you decide what clothing to wear or what to eat for lunch, you have no sense of compulsion that you *must* act in a certain way; quite the contrary, you freely decide. How can our behavior be determined if we constantly feel so free? The answer proposed by determinists is that although we may *feel* free in such situations, our behavior is being controlled just as surely as that of the abused children in the Caspi *et al.* study, who, if they also lacked the MAOA gene, had an 85 percent chance of becoming extraordinarily violent adults. The difference is simply that in everyday life we are often not aware of the forces that are affecting us.

Advertising

A classic example of how we can be influenced without our awareness is advertising. Most of us believe that we are not taken in by advertisements – we are not seduced by their glitz and instead base our decisions solely on evidence. Some research, however, suggests that we are all more susceptible to advertising than we realize. In one study on this point, Smith and Engel (1968) showed 120 men a picture of an automobile. For half the subjects, the photograph showed only the car, whereas for the other subjects a sexy redhead, dressed in black lace panties and a sleeveless sweater, was standing in front of it. After examining the picture, participants were asked to evaluate the car on several dimensions. Those who saw the car with the attractive female next to it rated the car as significantly more appealing and better designed. They also estimated it to be more expensive (by an average of \$340), faster, and less safe. When the authors later asked a subset of the participants if their ratings had been influenced by the presence of the model, however, 22 out of 23 denied it. One respondent claimed, “I don’t let anything but the thing itself influence my judgments. The other is just propaganda.” Another commented, “I never let myself be blinded by advertising; the car itself is what counts.” Thus, although the model’s presence clearly altered the participants’ ratings of the car, virtually none believed that he had been affected.

Politicians often take advantage of this unconscious transference of emotions to influence how we vote. In America, political ads on television often prominently feature the American flag, in the belief that the positive emotions aroused by the flag will be transferred to the candidate appearing before it. But are these candidates right? Can the presence of a flag in an advertisement really influence how we vote?

Some evidence suggests that the answer is yes. Perhaps the most compelling has come from a series of experiments by Ron Hassin. In one, Hassin and his colleagues studied the voting intentions of American voters in the 2008 Presidential election involving John McCain and Barack Obama (Carter, Ferguson, and Hassin, 2011). In a pilot study, the authors asked people whether their voting would be influenced by the presence of a flag; overwhelmingly (90 percent), they said no. In the main experiment, participants first filled in a questionnaire about their voting intentions.

For the experimental group, a small American flag was located in the top left corner of the questionnaire; the control group filled in an otherwise identical questionnaire but without the flag. Then, in the week after the election, the participants were contacted again and asked for which candidate they had voted. Eighty-three percent in the control group reported voting for Obama, but only 73 percent of those exposed to the flag did: A single exposure to the flag as they thought about their views was enough to alter how they later voted. And even more remarkably, effects were still apparent when they were interviewed 8 months later. They were asked a variety of questions about their political views; those who had seen the flag were now significantly more conservative than those who had not. (See also Hassin, Ferguson, Shidlovski, and Gross, 2007; Ballew and Todorov, 2007; Rutchick, 2010.)

As in the Smith and Engel study, almost no one in the pilot study believed their views could be altered by seeing the flag, but a single exposure was enough to change how they voted. (See also Janis, Kaye, and Kirschner, 1965; Winkielman, Berridge, and Wilbarger, 2005; Chan, 2017.)

Sexual Attraction

Another illustration of how the environment can influence us without our realizing it comes from research on sexual attraction. Why is it that we are sexually attracted to some individuals but not to others? Psychologists are still in the early stages of trying to understand attraction, but some interesting evidence has begun to emerge. One early study, by Dutton and Aron (1974), was carried out in an unusual setting for a psychology experiment, a deep river gorge in British Columbia. There were two ways of crossing the river: a narrow, wobbly footbridge located some 230 feet above rapids or a much more substantial wooden bridge only 10 feet above a small rivulet. Males were approached as they crossed either bridge by an attractive female who asked if they would answer some questions for a research project she was conducting. When the interview was over, she gave the males her telephone number in case they later had any questions.

The real purpose of the study was to measure sexual attraction – would the males later phone to ask for a date? Many did, but the study's striking finding was that the proportion asking for a date depended on where the interview took place: Half the men interviewed after crossing the rickety bridge later phoned for a date, compared with only 12 percent of those interviewed after crossing the solid bridge.

On the surface this result might seem bizarre – why should the location of the interview determine whether males think a female is attractive? Dutton and Aron, however, had predicted precisely this result on the basis of a theory of emotion previously proposed by Schachter and Singer (1962). We will not review the theory in detail, but in essence it proposes that all emotions are characterized by similar states of physiological arousal – increased heart rate, rapid breathing, and so on. Schachter and Singer argued that we therefore need to rely on environmental cues to

help us identify what emotion we are experiencing. According to this theory, males would have experienced strong arousal when crossing the high bridge; when they encountered the attractive interviewer, they would have unconsciously thought, “Aha, it must be her beauty that is making me feel so excited.” And believing that they were attracted to her, they would have been more likely to ask her for a date.

An alternative explanation might have occurred to you, namely that the results were due to differences in the kinds of men who used the two bridges. Perhaps the higher bridge attracted men who were more adventurous and thus would also have been less timid about asking for a date. To control for this possibility, Dutton and Aron ran a second experiment. Both groups now consisted of men who crossed the high bridge, with one group interviewed while they were on the bridge and the other at least 10 minutes after they had crossed, so that any arousal had time to dissipate. If the earlier results had been an artifact of differences in adventurousness, the two groups should now be equally likely to phone for a date because both consisted of men who chose the high bridge. If the results had been caused by arousal, however, then the group interviewed while still on the bridge should again have been more likely to phone, and this is what the authors found (see also Marin, 2017).

The most likely explanation for Dutton and Aron’s findings seems to be that the males who crossed the high bridge misinterpreted their arousal, attributing it to sexual attraction rather than to the more prosaic experience of crossing a rickety bridge. When they later decided to ask for a date, they almost certainly believed this to be a free choice, but they were being influenced by factors of which they were entirely unaware.

Evaluation

It seems clear that our heredity and environment do influence a wide range of our behaviors, from whom we find attractive to what political parties we support. The fact that our behavior is influenced, however, does not necessarily mean that it is totally determined. Even when under the most intense environmental pressure, it is possible that we still retain some freedom to choose, however circumscribed. Consider again the effects of sexual abuse on children. We have seen that roughly one-third of children who are abused go on to become abusers as adults. By the same token, however, this means that two-thirds of these children do not. Proponents of free will can thus argue that even under the most terrible pressures, each of us retains some capacity to choose our own path.

In the end, it is unlikely that the debate between free will and determinism will ever be resolved conclusively. Not even the most optimistic determinist believes that we will ever be able to predict every aspect of a person’s behavior – we would have to know every law and record every moment of the person’s life to be able to calculate the cumulative impact of all their experiences. If we can never fully predict behavior, however, then it will always be possible for believers in free will to argue