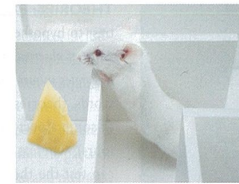




FotosearchRF/Glow Images



Left: AF archive/Alamy; centre: sextocto/Shutterstock.com; right: Flirt/SuperStock
Television personalities such as Phil McGraw, experiments involving animals running mazes, and sessions between a therapist and client are common notions about the work of psychologists. But how well do they represent the field?

Which words and images come to mind when you hear that someone is a psychologist? Many of us think of professionals conducting therapy or people in white lab coats watching rats run through mazes. The field of psychology is also viewed through the lens of “pop” psychology—the scores of self-help gurus on TV, on the radio, and in the books lining bookstore shelves. Although these images are not necessarily false, they don’t fully capture the scope of the field of psychology. One goal of this book is to challenge your expectations about psychology and to show you that psychology—and psychological research—affect almost every aspect of your life.

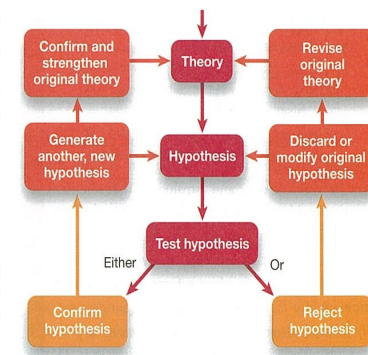
To begin, we should acknowledge that psychology is a vast discipline; in fact, we might do better to consider it to be a collection of disciplines composed of many overlapping fields of study. Two unifying qualities allow us to group all these fields into the category of psychological science. First, psychology involves the study of behaviour that, broadly defined, can include perceptions, thoughts, and emotions. Second, psychologists employ the *scientific method* in their work. On these grounds, we can define **psychology** as the scientific study of behaviour, thought, and experience, and how they can be affected by physical, mental, social, and environmental factors. In the following sections, we will discuss some basic principles of science. As you will see, psychologists share with other sciences a common set of methods and perspectives for understanding the world.

The Scientific Method 6

What exactly does it mean to be a scientist? A person who haphazardly combines chemicals in test tubes may look like a chemist, but he is not conducting science; a person who dissects a specimen just to see how it looks may appear to be a biologist, but this is not science either. In contrast, a person who carefully follows a system of observing, predicting, and testing is conducting science, whether the subject matter is chemicals, physiology, human memory, or social interactions. In other words, whether a field of study is a science, or a specific type of research is *scientific*, is based not on the subject

but on the use of the scientific method. The **scientific method** is a way of learning about the world through collecting observations, developing theories to explain them, and using the theories to make predictions. It involves a dynamic interaction between hypothesis testing and the construction of theories, outlined in Figure 1.1.

HYPOTHESES: MAKING PREDICTIONS Scientific thinking and procedures revolve around the concepts of a hypothesis and a theory. Both guide the process and progress of the sciences; however, it is important to differentiate between these terms. A **hypothesis** (plural: hypotheses) is a testable prediction about processes that can be observed and measured. A hypothesis can be supported or rejected (you do not *prove* a hypothesis), and a scientific hypothesis *must* be testable. These rules are regularly broken by people claiming to be scientific. For example, astrologers and psychics are in the business of making predictions. An astrologer might tell you, “It’s a good time for you to keep quiet or defer important calls or emails.” This sounds like a request to not even bother



[FIG. 1.1] The Scientific Method Scientists use theories to generate hypotheses. Once tested, hypotheses are either confirmed or rejected. Confirmed hypotheses lead to new ones and strengthen theories. Rejected hypotheses are revised and tested again, and can potentially alter an existing theory.

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Confirmation Bias

The Science of Psychology 1

Module
1.1

Learning Objectives
After reading this module you should

KNOW ...	UNDERSTAND ...	APPLY ...	ANALYZE ...
The key terminology of the scientific method 2	The steps of the scientific method The concept of scientific literacy	The biopsychosocial model to behaviour The steps in critical thinking 3	The use of the term scientific theory

Almost everyone has misinterpreted someone else’s meaning in a conversation. You could misinterpret someone leaning closer to you as flirting when really you were just talking too softly. You could mistake someone’s tone of voice as being annoyed when that person was actually talking loudly to be heard over other people in the room. We also frequently misjudge other people’s attitudes and personalities. The unfriendly and arrogant person at work might actually turn out to be a shy person who dislikes crowded social events. In all of these situations, we make inferences about another person based on the different cues they provide us. But how do we decide which cues are important? Are they really the right cues to be using when we want to explain other people’s behaviour?

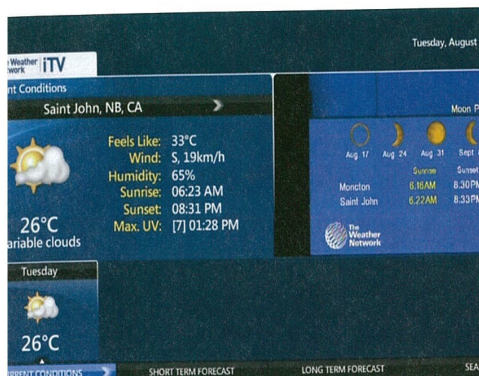
The situation is even more complicated in the wired world of the 21st century, with everyone plugged in to email, online gaming, and social networking sites like Facebook. But these new ways of interacting with people from around the world also come with their own set of challenges. How do you interpret someone’s behaviour or intentions when all you have to go by is words on a screen and cartoon-like happy faces? How much information do you need to (safely) disclose in order for other people to understand you? These puzzles have led researchers to

develop a new line of research, *cyber emotional intelligence*, that examines the assumptions that we make about people based on their online personalities (Ben Youssef & Ben Youssef, 2011).

The purpose of this opening section isn’t to depress you; instead, it is to show how complex human behaviour is and how challenging it can be to try to understand it. In this textbook, we will examine many different aspects of behaviour—from basic brain and perception functions to memory to social behaviours. But all of these chapters have the same central theme: the quest to understand *why* and *how* we behave the way we do.

Focus Questions 5

- How can the human mind, with its quirks and imperfections, conduct studies on itself?
- How can scientific and critical thinking steer us toward a clearer understanding of human behaviour and experience?



Hand-out/BELL ALIANT INC./Newscom

Supporters of psychics and astrologers often point out that scientific fields (such as meteorology) do not always make correct predictions. A key difference between science and pseudoscience is that in science an incorrect hypothesis is rejected and an alternative can be stated and tested.

testing the prediction, because it might come true. The horoscope leaves two courses of action: (1) cave in, fully accept the prediction, and heed the advice or (2) take your chances. If you take your chances, it is very likely that by the end of the day you can find at least a grain of truth in the prediction. Horoscopes make *very* general predictions—typically so much so that you could easily find evidence for them if you looked hard enough, and perhaps stretched an interpretation of events a bit. In contrast, a good scientific hypothesis is stated in more precise terms, such as the following:

“People become less likely to help a stranger if there are others around.”

“Cigarette smoking causes cancer.”

“Exercise improves memory ability.”

Each of these hypotheses can be confirmed or rejected through scientific testing. An obvious difference between science and astrology is that scientists are eager to test hypotheses such as these, whereas astrologists would rather you just take their word for it. We do acknowledge that astrology is a very easy target for criticism. In fact, it is often referred to as **pseudoscience**, an idea that is presented as science but does not actually utilize basic principles of scientific thinking or procedure. Incidentally, a 2005 Gallup poll found that 25% of Canadians (17% of males and 33% of females) believe that the position of the stars in the sky can affect a person's behaviour.

THEORIES: EXPLAINING PHENOMENA In contrast to hypotheses, a **theory** is an explanation for a broad range of observations that also generates new hypotheses and integrates numerous findings into a coherent whole. In other words, theories are general principles or explanations of some aspect of the world (including human behaviours), whereas hypotheses are specific predictions that can test the theory or, more realistically, specific parts of that theory. Theories are built from hypotheses that are repeatedly tested and confirmed. If a hypothesis is supported, it provides more support for the theory. In turn, good theories eventually become accepted explanations of behaviour or other phenomena. However, if the hypothesis is not supported by the results of a well-designed experiment, then researchers may have to rethink elements of the theory. Figure 1.1 shows how hypothesis testing eventually leads back to the theory from which it was based.

Similar to hypotheses, an essential quality of scientific theories is that they can be proved false with new evidence. In fact, any scientific theory must be **falsifiable**. Just as researchers can discover strong evidence in support of a theory, they can also discover evidence that challenges a theory. As Figure 1.1 shows, theories can be updated with new evidence. The process helps to ensure that science is **self-correcting**—bad ideas typically do not last long in the sciences.

The term *theory* is often used very casually, which has led to some persistent and erroneous beliefs that many people have about scientific theories. So to clarify a few common issues:

• **Theories are not the same thing as opinions or beliefs.** Yes, it is certainly true that everyone is entitled to their own beliefs. But the phrase “That’s just *your* theory” is neither the correct use of the term “theory” nor an argument that a scientist would make.

All theories are not equally plausible. Groups of scientists might adopt different theories for explaining the same phenomenon. For example, several theories have been proposed to explain why people become depressed. This does not mean that anyone can throw their hat into the ring and claim equal status for his or her theory (or belief). There are good theories, and there are not-so-good theories.

A measure of a good theory is not the number of people who believe it to be true. According to a 2009 Gallup poll, only 61% of Canadians (and only 39% of Americans) believe in the theory of evolution by natural selection (Angus Reid Opinion, 2012), despite the fact that it is the most plausible, rigorously tested theory of biological change and diversity.

Testing hypotheses and constructing theories are both part of all sciences. In addition, each science, including psychology, has its own unique way of approaching its complex subject matter as well as its own unique set of challenges. In the case of psychology, we must remember that behaviour can occur on a number of different levels including the activity of cells in different parts of the brain, thought processes such as language and memory, and sociocultural processes that shape daily life for millions of people. Therefore, psychology examines the individual as a product of multiple influences, including biological, psychological, and social factors.

THE BIOPSYCHOSOCIAL MODEL Because our thoughts and behaviours have multiple influences, psychologists adopt multiple perspectives to understand them. The **biopsychosocial model** is a means of explaining behaviour as a product of biological, psychological, and sociocultural factors (Figure 1.2 on p. 6). Biological influences on our behaviour involve brain structures and chemicals, hormones, and external substances such as drugs. Psychological influences involve our memories, emotions, and personalities, and how these factors shape the way we think about and respond to different people and situations. Finally, social factors such as our family, peers, ethnicity, and culture can have a huge effect on our behaviour. Importantly, none of these levels of analysis exists on its own. In fact, these levels influence each other! The firing of brain cells can influence how we think and remember information; this, in turn, can affect how we interact with family members or how we respond to social situations like a concert. But, these influences can occur in the other direction as well. Social situations can affect how we think (e.g., getting annoyed at the crowded hallway at



Ellie Rothnie/Alamy

“All swans are white” is a falsifiable statement. A swan that is not coloured white will falsify it. Falsification is a critical component of scientific hypotheses and theories.

your university), which, in turn, can trigger the release of chemicals and hormones in your brain.

The take-home message of this section is that almost every moment of your life is occurring at all three levels; psychologists have taken up the exciting challenge of trying to understand them. Indeed, behaviour can be fully explained only if multiple perspectives—and their interactions—are investigated. This “systems perspective” will become particularly apparent as you read about psychological research that tackles complex topics.

Throughout this text, we will apply the biopsychosocial model to many of the topics we will cover. An icon, like the one in the margin, will appear in these sections, prompting you to apply the biopsychosocial model to a specific problem or question about multiple influences on thinking and behaviour. Our hope is that by the end of this textbook, you will use a similar strategy when examining the events of your own life.



Quick Quiz 1.1a The Scientific Method

10

- 1** A testable prediction about processes that can be observed and measured is referred to as a(n) _____.
A theory C opinion
B hypothesis D hunch
- 2** A theory or prediction is falsifiable if
A it has been proven false.
B it is impossible to test.
C there can be evidence for it or against it.
D if and only if it comes from pseudoscience.
- 3** How would you apply the biopsychosocial model to a news report claiming that anxiety is caused by being around other people who are anxious?
A Recognize that the news report considers all portions of the biopsychosocial model
B Recognize that psychologists do not regard biological factors when it comes to anxiety
C Recognize that the only effective treatment of anxiety must be drug based
D Recognize that the news report only considers one portion of the biopsychosocial model
- 4** The hypothesis that “exercise improves memory ability” is a scientific one because
A it cannot be confirmed. C it makes a specific, testable prediction.
B it cannot be rejected. D it can be proven.

Answers can be found on page ANS-1.