

- Defining Consciousness
- The Biology of Consciousness
- Selective Attention

Brain States and Consciousness

Every science has concepts so fundamental they are nearly impossible to define. Biologists agree on what is alive but not on precisely what life is. In physics, *matter* and *energy* elude simple definition. To psychologists, consciousness is similarly a fundamental yet slippery concept.

Defining Consciousness

7-1 What is the place of consciousness in psychology's history?

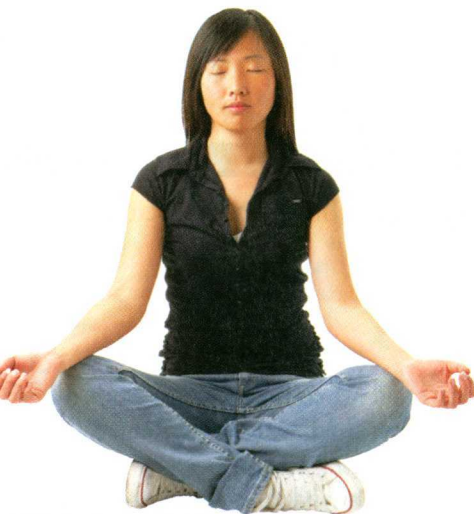
At its beginning, *psychology* was "the description and explanation of states of consciousness" (Ladd, 1887). But during the first half of the twentieth century, the difficulty of scientifically studying consciousness led many psychologists—including those in the emerging school of *behaviorism*—to turn to direct observations of behavior. By the 1960s, psychology had nearly lost consciousness and was defining itself as "the science of behavior." Consciousness was likened to a car's speedometer: "It doesn't make the car go, it just reflects what's happening" (Seligman, 1991, p. 24).

After 1960, mental concepts re-emerged. Neuroscience advances related brain activity to sleeping, dreaming, and other mental states. Researchers began studying consciousness altered by hypnosis and drugs. Psychologists of all persuasions were affirming the importance of *cognition*, or mental processes. Psychology was regaining consciousness.

Most psychologists now define **consciousness** as our awareness of ourselves and our environment. This awareness allows us to assemble information from many sources as we reflect on our past and plan for our future. And it focuses our attention when we learn a complex concept or behavior. When learning to drive, we focus on the car and the traffic. With practice, driving becomes semi-automatic, freeing us to focus our attention on other things. Over time, we flit between various *states of consciousness*, including sleeping, waking, and various altered states (FIGURE 7.1).

Today's science explores the biology of consciousness. Evolutionary psychologists speculate that consciousness must offer a reproductive advantage (Barash, 2006). Consciousness helps us act in our long-term interests (by considering consequences) rather than merely seeking short-term pleasure and avoiding pain. Consciousness also promotes our survival by anticipating how we seem to others and helping us read their minds: "He looks really angry! I'd better run!"

Such explanations still leave us with the "hard-problem": How do brain cells jabbering to one another create our awareness of the taste of a taco, the idea of infinity, the feeling of fright? Today's scientists are pursuing answers.



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FIGURE 7.1
States of consciousness In addition to normal, waking awareness, consciousness comes to us in altered states, including daydreaming, sleeping, meditating, and drug-induced hallucinating.

Some states occur spontaneously	Daydreaming	Drowsiness	Dreaming
Some are physiologically induced	Hallucinations	Orgasm	Food or oxygen starvation
Some are psychologically induced	Sensory deprivation	Hypnosis	Meditation

"Psychology must discard all reference to consciousness."

Behaviorist John B. Watson (1913)

The Biology of Consciousness

7-2 What is the "dual processing" being revealed by today's cognitive neuroscience?

Cognitive Neuroscience

Scientists assume, in the words of neuroscientist Marvin Minsky (1986, p. 287), that "the mind is what the brain does." We just don't know *how* it does it. Even with all the world's chemicals, computer chips, and energy, we still don't have a clue *how* to make a conscious robot. Yet today's **cognitive neuroscience**—the interdisciplinary study of the brain activity linked with our mental processes—is taking the first small step by relating specific brain states to conscious experiences.

A stunning demonstration of consciousness appeared in brain scans of a noncommunicative patient—a 23-year-old woman who had been in a car accident and showed no outward signs of conscious awareness (Owen et al., 2006). When researchers asked her to *imagine* playing tennis, fMRI scans revealed brain activity in a brain area that normally controls arm and leg movements (FIGURE 7.2). Even in a motionless body, the researchers concluded, the brain—and the mind—may still be active. A follow-up study of 22 other "vegetative" patients revealed 3 more who also showed meaningful brain responses to questions (Monti et al., 2010).

Many cognitive neuroscientists are exploring and mapping the conscious functions of the cortex. Based on your cortical activation patterns, they can now, in limited ways, read your mind (Bor, 2010). They can, for example, tell which of 10 similar objects (hammer, drill, and so forth) you are viewing (Shinkareva et al., 2008).

Despite such advances, much disagreement remains. One view sees conscious experiences as produced by the synchronized activity across the brain (Gaillard et al., 2009; Koch & Greenfield, 2007; Schurger et al., 2010). If a stimulus activates enough brain-wide coordinated neural activity—with strong signals in one brain area triggering activity elsewhere—it crosses a threshold for consciousness. A weaker stimulus—perhaps a word flashed too briefly to consciously perceive—may trigger localized visual cortex activity that quickly dies out. A stronger stimulus will engage other brain areas, such as those involved with language, attention, and memory. Such reverberating activity (detected by brain scans) is a telltale sign of conscious awareness. How the synchronized activity produces awareness—how matter makes mind—remains a mystery.

RETRIEVAL PRACTICE

- Those working in the interdisciplinary field called _____ study the brain activity associated with perception, thinking, memory, and language.

ANSWER: cognitive neuroscience

Dual Processing: The Two-Track Mind

Many cognitive neuroscience discoveries tell us of a particular brain region (such as the visual cortex mentioned above) that becomes active with a particular conscious experience. Such findings strike many people as interesting but not mind-blowing. (If everything psychological is simultaneously biological, then our ideas, emotions, and spirituality must all, somehow, be embodied.) What is mind-blowing to many of us is the growing evidence that we have, so to speak, two minds, each supported by its own neural equipment.

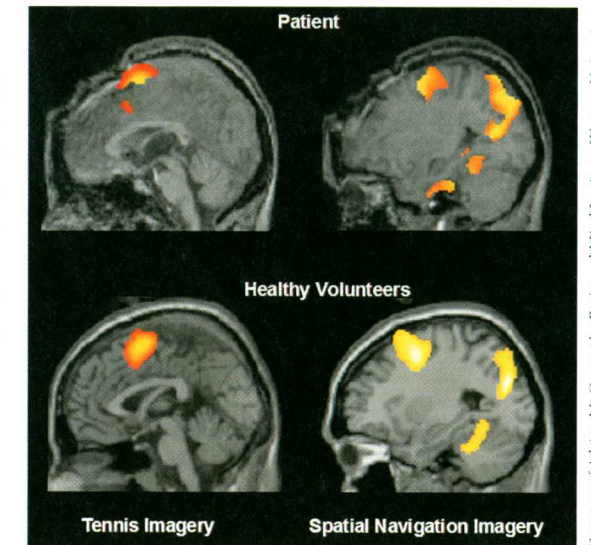


FIGURE 7.2
Evidence of awareness? When asked to imagine playing tennis or navigating her home, a vegetative patient's brain (top) exhibited activity similar to a healthy person's brain (bottom). Researchers wonder if such fMRI scans might enable a "conversation" with some unresponsive patients, by instructing them, for example, to answer *Yes* to a question by imagining playing tennis (top and bottom left), and *No* by imagining walking around their home (top and bottom right).

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cognitive neuroscience the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory, and language).