Sensation and Perception

Sensory receptors are specialized neurons that respond to specific types of stimuli. When sensory information is detected by a sensory receptor, sensation has occurred. For example, light that enters the eye causes chemical changes in cells that line the back of the eye. These cells relay messages, in the form of action potentials (as you learned when studying biopsychology), to the central nervous system. The conversion from sensory stimulus energy to action potential is known as transduction (Spielman 2017)

Absolute Threshold	Another way to think about this is by asking how dim can a light be or how soft can a sound be and still be detected half of the time. The sensitivity of our sensory receptors can be quite amazing. It has been estimated that on a clear night, the most sensitive sensory cells in the back of the eye can detect a candle flame 30 miles away

Sensation and Perception (cont)

Subliminal Messages	A message below that threshold is said to be subliminal: We receive it, but we are not consciously aware of it. Over the years there has been a great deal of speculation about the use of subliminal messages in advertising, rock music, and self-help audio programs. Research evidence shows that in laboratory settings, people can process and respond to information outside of awareness. But this does not mean that we obey these messages like zombies; in fact, hidden messages have little effect on behavior outside the laboratory

Perception

One way to think of this concept is that sensation is a physical process, whereas perception is psychological. For example, upon walking into a kitchen and smelling the scent of baking cinnamon rolls, the sensation is the scent receptors detecting the odor of cinnamon, but the perception may be “Mmm, this smells like the bread Grandma used to bake when the family gathered for holidays.

Perception (cont)

Although our perceptions are built from sensations, not all sensations result in perception. In fact, we often don’t perceive stimuli that remain relatively constant over prolonged periods of time. This is known as sensory adaptation. Imagine entering a classroom with an old analog clock. Upon first entering the room, you can hear the ticking of the clock; as you begin to engage in conversation with classmates or listen to your professor greet the class, you are no longer aware of the ticking. The clock is still ticking, and that information is still affecting sensory receptors of the auditory system. The fact that you no longer perceive the sound demonstrates sensory adaptation and shows that while closely associated, sensation and perception are different.

Spielman 2017

Schacter (2016) on Sensation and Perception

Synesthesia	Hearing Colours/ Tasting shapes
	Stimulation in one sense modality causes sensation in one or more senses
	A letter evoke colour/ Sound can trigger feelings and shapes
	Appears to run in the families
	Stable and durable percept's e.g. Wednesdays will always be yellow
	Most Common: coloured letters and numbers
	Rarest: taste or smell related
	May be related cross wiring in the brain areas with perceptual systems, so, auditory areas get signals from visual areas.

Vision

The visual system constructs a mental representation of the world around us (Figure 5.9). This contributes to our ability to successfully navigate through physical space and interact with important individuals and objects in our environments

Light waves are transmitted across the cornea and enter the eye through the pupil. The cornea is the transparent covering over the eye. It serves as a barrier between the inner eye and the outside world, and it is involved in focusing light waves that enter the eye. The pupil is the small opening in the eye through which light passes, and the size of the pupil can change as a function of light levels as well as emotional arousal. When light levels are low, the pupil will become dilated, or expanded, to allow more light to enter the eye. When light levels are high, the pupil will constrict, or become smaller, to reduce the amount of light that enters the eye. The pupil's size is controlled by muscles that are connected to the iris, which is the coloured portion of the eye

Vision (cont)

Stereo blindness	Bruce Bridgeman was born with an extreme case of lazy eye that resulted in him being stereoblind, or unable to respond to binocular cues of depth. He relied heavily on monocular depth cues, but he never had a true appreciation of the 3-D nature of the world around him. This all changed one night in 2012 while Bruce was seeing a movie with his wife. The movie the couple was going to see was shot in 3-D, and even though he thought it was a waste of money, Bruce paid for the 3-D glasses when he purchased his ticket. As soon as the film began, Bruce put on the glasses and experienced something completely new. For the first time in his life he appreciated the true depth of the world around him. Remarkably, his ability to perceive depth persisted outside of the movie theater. There are cells in the nervous system that respond to binocular depth cues. Normally, these cells require activation during early development in order to persist, so experts familiar with Bruce's case (and others like his) assume that at some point in his development, Bruce must have experienced at least a fleeting moment of binocular vision. It was enough to ensure the survival of the cells in the visual system tuned to binocular cues. The mystery now is why it took Bruce nearly 70 years to have these cells activated (Peck, 2012).

Hearing

The ear can be separated into multiple sections. The outer ear includes the pinna, which is the visible part of the ear that protrudes from our heads, the auditory canal, and the tympanic membrane, or eardrum. The middle ear contains three tiny bones known as the ossicles, which are named the malleus (or hammer), incus (or anvil), and the stapes (or stirrup). The inner ear contains the semi-circular canals, which are involved in balance and movement (the vestibular sense), and the cochlea. The cochlea is a fluidfilled, snail-shaped structure that contains the sensory receptor cells (hair cells) of the auditory

Sound waves travel along the auditory canal and strike the tympanic membrane, causing it to vibrate. This vibration results in movement of the three ossicles. As the ossicles move, the stapes presses into a thin membrane of the cochlea known as the oval window. As the stapes presses into the oval window, the fluid inside the cochlea begins to move, which in turn stimulates hair cells, which are auditory receptor cells of the inner ear embedded in the basilar membrane. The basilar membrane is a thin strip of tissue within the cochlea

As hair cells become activated, they generate neural impulses that travel along the auditory nerve to the brain. Auditory information is shuttled to the inferior colliculus, the medial geniculate nucleus of the thalamus, and finally to the auditory cortex in the temporal lobe of the brain for processing

Spealman 2017

Memory

Retrieval	Available: all info is stored in memory
	Accessible: the info we are able to retrieve
	Encoding specific principle: the effectiveness of retrieval cues
Measuring Retrieval	Production tests: generation of students info=free call
	Recognition tests: selection of studied info from aggregate info=multiple choice
Factors Influe-ncing Memory	Sleep: for laying down new memory traces
	Depth of Processing: the more effort or processing you carry out on info, the better it will be remembered
	Contextual Dependency: memory for x is better if you are in place of learned x
	Repetition
Forgetting Memory	"loss" of info from memory
	Decay Theory of Forgetting: passage of time leads to loss of info from STM
	Interference Theory of Forgetting: other info present in STM makes the desired info inaccessible.

The Hippocampus

MLT structure; part of limbic system that receives massive imput from sensory and association cortices and frontal lobe

Patient HM 1953	Surgery for epilepsy (age 23)
	Removed his hippocampus and amygdala
	Resulted in Anterograde Amnesia (couldn't create new memories)

Eyewitness Testimony

Loftus 1974	"witness" watched video of a car crash
	Later were asked what they had seen
	Half were asked "was there much glass when car collided?"
	Other half. "collided" was replaced with "smashed into each other"
	Those who heard word "smashed" reported seeing broken glass when there was none

Phrasing of the question influenced recall significantly. Therefore, it was found that phrasing impacted how fast people thought the car was travelling.

Schacter (2016) on Memory

Memory is a 'modal' model that consists of a flow of info that passes through three stages	Atkinson and Shiffrin 1968
Memory Problems	Most common in the elderly

Schacter (2016) on Memory (cont)

With age, comes a natural decrease in brain tissue

Cell loss in frontal lobes and hippocampus likely responsible for memory decline

Neurotransmitters (Spielman 2017)

There also appear to be specific neurotransmitters involved with the process of memory, such as epinephrine, dopamine, serotonin, glutamate, and acetylcholine.

Although we don't yet know which role each neurotransmitter plays in memory, we do know that communication among neurons via neurotransmitters is critical for developing new memories. Repeated activity by neurons leads to increased neurotransmitters in the synapses and more efficient and more synaptic connections. This is how memory consolidation occurs.

It is also believed that strong emotions trigger the formation of strong memories, and weaker emotional experi-ences form weaker memories; this is called arousal theory (Christia-nson, 1992)	Strong emotional experiences can trigger the release of neurotransmitters, as well as hormones, which strengthen memory; therefore, our memory for an emotional event is usually better than our memory for a nonemo-tional event.

Amnesia (Spielman 2017)

loss of long-term memory that occurs as the result of disease, physical trauma, or psychological trauma.

Anterograde amnesia is commonly caused by brain trauma, such as a blow to the head. With anterograde amnesia, you cannot remember new information, although you can remember information and events that happened prior to your injury. The hippocampus is usually affected (McLeod, 2011). This suggests that damage to the brain has resulted in the inability to transfer information from short-term to long-term memory; that is, the inability to consolidate memories.

Attention

Wunt (Leipz-eig), James (Harvard)	Taking possession by mind, in clear, vivid form of one out of what seems several simultane-ously possible objects or train of thoughts.

Attention (cont)

Dichotic Listening	A situation when two messages are presented simultaneously to an individual, with one message to each ear. In order to control which message the person attends to, the individual is asked to repeat back one of the messages as he hears it.

Our selective attention system allows us to find or track an object or conversation in the midst of distractions. We can only perform one cognitively demanding task at a time and we may not even be aware of unattended events even though they might seem too obvious to miss.

Schacter (2016) on attention

Early Filter Model	Selective attention model that proposes that info is discarded early in the stream of proces-sing.
Attenu-ation Model	Selective attention model that proposes that information is not entirely discarded in the stream of processing but is suppressed relative to other important signals.
Response Selection Model	selective attention model that proposes that selection occurs late in the stream of processing before a response has been made.

Schacter (2016) on attention (cont)

Unilateral Visual Neglect	damage to the dorsal pathway including the parental lobe can produce this condition=the patient fails to no notice or attend to stimuli that appear on the side of space opposite the side of a hemispheric lesion. It produces loss of attention to events and objects in their left visual field.

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Not published yet.
Last updated 26th July, 2022.

Schacter (2016) on attention (cont)

Helmho-ltz's Attention Experiment	Participants performed a simple reaction time task where they had to press a button whenever a light appeared at any one of several locations on a computer screen. Prior to the onset of the light, a cue was presented that provided information about the likely location of the target (see figure 8.9). When the cue was valid, there was a benefit of faster response times compared to either a no cue condition or an invalid cue trial where the participant was directed to the wrong location. Like James's schoolteachers who could keep their eyes on the blackboard and pay attention to the children, even though participants in the experi-ments did not move their eyes, their attention was automatically being drawn to events around them.

Schacter (2016) on attention (cont)

Disorders Following Brain Damage	Unilateral Visual Neglect= This disorder is most typically found in patients with lesions of the right parietal lobe, which produces a loss of attention to events and objects in their left visual field. For example, they may eat food only off the right side of the plate, fail to notice someone standing on their left side or ignore words on the left side of the page. The condition is not due to blindness because patients with unilateral visual neglect (or 'neglect patients') notice objects in the affected side of space if their attention is drawn towards them. Neglect is most pronounced when the patient is presented simultane-ously with two visual stimuli, one in each field.

Schacter (2016) on attention (cont)

Another remarkable feature of unilateral visual neglect is that it also affects mental imagery. As we saw in Chapter 5, we can form visual mental images to help us create memories. For example, if you are asked to visualize your bedroom, you can form a mental picture of it. You can report various objects in the layout on both sides of the room. However, neglect patients fail to report objects on the contralesionally side of their mental image. For example, when Italian neglect patients were asked to visualize a famous square in Milan and report what they saw standing from the steps of the cathedral, they reported all the shops lining the right side of the square. They were then asked to imagine walking to the opposite side of the square to turn round and face the cathedral. This time they reported all the remaining shops that had previously been on the left side but were now on the right.

We actively engage the world looking for information. Usually, when we want to attend to something, we align or orient towards
the source. In the case of visual targets, for example, we shift our gaze. Under these circumstances, our attention shift is overt, as the direct

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