Acquired Language Disorders

A CASE-BASED APPROACH

Fourth Edition

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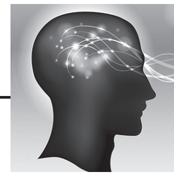

Introduction

Integrating theoretical knowledge and research into clinical practice is a goal for most clinicians, although complex, especially for the new clinician. We believe that academic knowledge should inform clinical practice. Therefore, given our years of experience as teachers and practitioners, it is our intention to bridge the gap between theory and practice by providing the reader with a case-based approach to understanding and treating individuals with acquired language disorders (ALDs). To further our goal in making ALDs come to life for the reader, we developed a model that depicts the individual's language and cognition following a cerebrovascular accident or other neurological event. We discuss 16 cases, each with a corresponding ALD Target Assessment Snapshot as well as a diagnostic profile, case analyses, and treatment considerations to connect theoretical knowledge with practical application. This model, combined with salient features of the various disorders, matches the clinical needs of speech-language pathologists practicing in health care today.

How the Book Is Organized

Each chapter includes an actual case. The case scenarios were developed based on actual patients whom the authors or their colleagues evaluated and treated. For purposes of anonymity and confidentiality, the patients' names and identifying information have been changed. Using real clinical cases brings to life each communication impairment for the learner, who can better conceptualize the specific characteristics of the disorder in the context of a real person. We believe it is essential to understand the characteristics of an ALD and the functional effects it may have on a person's life.

Special Features

The 16 cases in this book offer a comprehensive overview of the assessment process, major nonfluent aphasias, fluent aphasias, bilingual aphasia, right-hemisphere disorder, traumatic brain injury, dementia, encephalopathy, and other etiologies affecting the ability to communicate. The final chapter provides information about selected treatment programs and new therapeutic approaches for individuals with ALD.

Each chapter is based on a case study and includes the following sections:

- **Characteristics** of the disorder are presented, including neurological correlates.
- A **Case Scenario** provides a brief overview of the case history.
- The **Diagnostic Profile** includes language expression, speech production, auditory comprehension, reading, written expression, cognition, and behavioral symptoms of the case.
- A **Functional Analysis** consists of a narrative that succinctly summarizes the case and helps the clinician understand the impact of disability on daily life. Critical features relevant to treatment and goal planning are provided.
- The **Critical Thinking/Learning Activity** poses questions to reflect on the details of the case to help the clinician develop problem-solving skills and optimize clinical decision-making necessary to maximize the patient's progress. The social determinants of health are also considered for each case.

- **Treatment Considerations** provide areas to consider for rehabilitation based on the patient's strengths and weaknesses, individualized to the patient's psychosocial context. General therapeutic objectives are also provided.
- The **Target Assessment Snapshot** presents a visual representation that captures the type and degree of language impairment as well as areas of cognition that may be affected.
- **Therapeutic Goals With the A-FROM Model (Living With Aphasia: Framework for Outcome Measurement)** are based on the International Classification of Functioning, Disability, and Health (ICF; World Health Organization, 2001). For each of the cases, quality-of-life goals are provided. The A-FROM model provides a visual representation of the patient's language and related impairments, communication environment, participation in life situations, and personal factors including identity, attitudes, and feelings (Kagan, 2011). The framework was adapted to provide a profile of treatment considerations for patients with a variety of neurogenic communication disorders, not only aphasia.

The Acquired Language Disorders Target Model

We developed the Acquired Language Disorders model, referred to as the *Target Assessment Snapshot*, from an embedded language framework. This model is shown in Figure I–1 and reflects the influence that cognition plays in normal communication and, by extension, in the rehabilitation of people with ALDs. The physical appearance of the model depicts a schematic relationship between language and cognition as well as the relationship among functional language modalities.

There are five primary domains of the model: *language, attention, memory, executive functions,* and *visual spatial* skills. The *language* domain includes four areas: expression, comprehension, reading, and writing. Expression (E) and comprehension (C) involve the verbal modality, whereas reading (R) and writing (W) involve the visual modality. As speech-language pathologists, we are clinically oriented to the *language* domain, but we must also consider the other four cognitive areas of functioning because they are integral to functional communication.

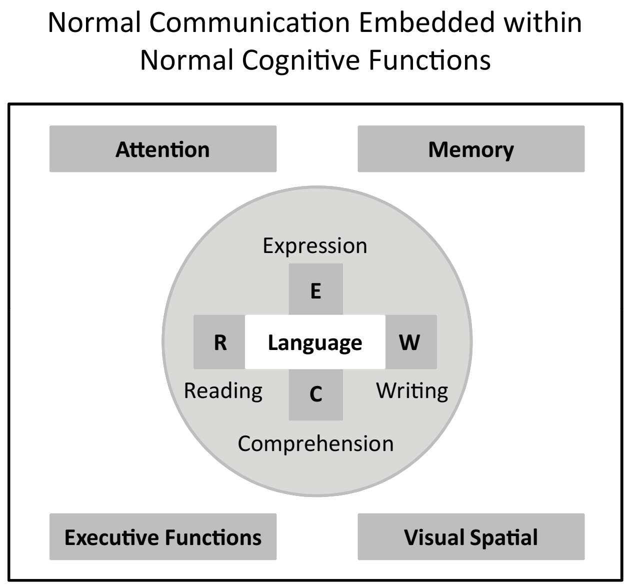

Figure I–1. The Acquired Language Disorders Target Model.

For an individual who has typical communicative functions, the lettered squares (E, C, R, and W) remain attached to the rectangle containing the word *language*. For an individual with an ALD, the lettered squares separate from the *language* rectangle, reflecting the level of impairment for that domain. The subscript numbers 1 to 4 are assigned to further reflect the level of severity, with 1 being typical and 4 being severely impaired. For each type of ALD, the pattern varies. For example, in a person with nonfluent aphasia (Broca's type), the square labeled E (verbal expression) and the square labeled W (written expression) are placed on or outside the circular border with the subscript 3 or 4 to indicate more impaired functioning. Depending on the ALD, any or all of these language modalities may be impaired at varying degrees. This ranges from (1) typical, to (2) mild-moderate, to (3) moderate-severe, to (4) severe-profound. Impairment level is depicted in Figure I–2.

The ALD Target Assessment Snapshot includes the cognitive domains of attention, memory, visuospatial skills, and executive functions in aphasia that should be considered in a standard evaluation for treatment planning (Helm-Estabrooks & Albert, 2004). A dotted line through any of the four cognitive domains in each specific case marks that domain as impaired. For example, in an individual with severely impaired executive functions, the box labeled *executive functions* will have a line through the word.

How to Use This Book

For the Student and the Practitioner

- A graphic image of the ALD Target Assessment Snapshot representing each disorder enhances the student's or practitioner's understanding of the cognitive-linguistic impairments associated with that specific case.
- The value of the case-based approach to ALD is that it brings each type of disorder to life because it is associated with a person and their story. As a learning tool, the case-based approach helps the student or practitioner to attach clinical information to a case that is also represented with a photo image.
- The ALD Target Assessment Snapshot combined with the functional analysis can be very useful for clinical practice in a health care setting. This permits the student or practitioner to integrate the neurological, cognitive, linguistic, and functional aspects of each patient to formulate a holistic picture for treatment.
- PowerPoint slides are provided to supplement the text and support lectures.
- More than 25 treatment approaches are provided to assist the practitioner in planning a program for each patient.
- Each case has a one-page diagnostic profile that describes each patient's language expression, speech, auditory comprehension, reading, written expression, cognition, and behavioral symptoms. In addition, an *Assessment Summary Sheet* is available to help the clinician develop their own patient profile.
- Each case includes a set of personal goals including social determinants of health pertinent to the patient. In addition, a graphic of the Living With Aphasia: Framework for Outcome Measurement (A-FROM) depicts areas

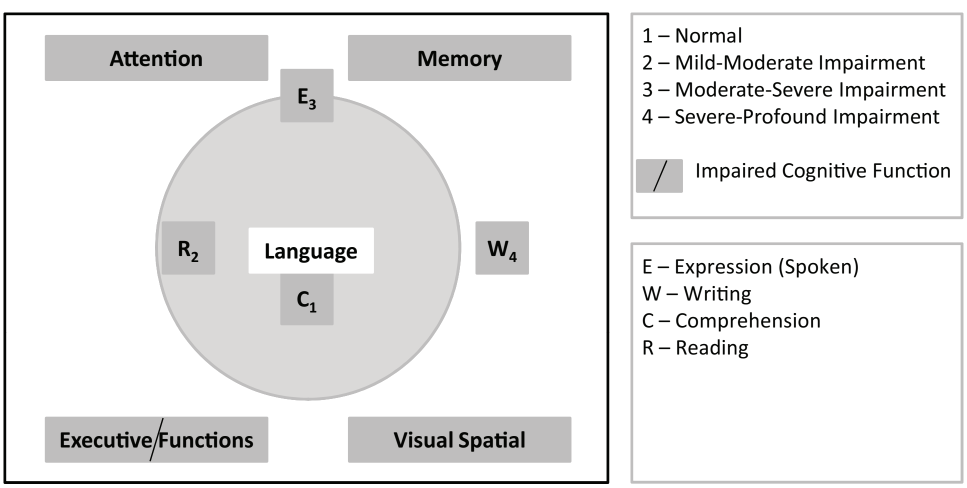

Figure I–2. The key to understanding the Acquired Language Disorders Target Model.

of treatment considerations for the patient's *Participation in Life Situations*; *Personal Identity, Attitudes,* and *Feelings*; *Communication and Language Environment*; and *Language and Related Impairments* (Kagan et al., 2008).

For the Instructor

- An overview of basic neuroanatomy for ALDs is provided.
- This book offers a detailed summary of more than 30 formal and informal assessments and more than 25 treatment programs for those with ALD. A cognitive-linguistic evaluation is provided (see Appendix C).
- There are 16 cases illustrating various ALDs, each with assessment and treatment considerations to facilitate class discussion and clinical problem-solving.
- Engaging PowerPoint slides augment the text and offer important lecture material, diagrams, illustrations, and online links for teaching.
- Charts, tables, and figures including the ALD Target Assessment Snapshot help categorize and concretize various ALDs.
- Functional treatment can be more easily planned using the *Functional Communication Connections Octagon* (see Appendix 2–A in Chapter 2). The Functional Communication Connections Octagon provides the clinician with a tool for planning therapeutic activities based on the patient's skills using combinations of the language modalities: reading, writing, speaking, and listening.
- A *Test Your Knowledge* examination with 50 multiple-choice questions is also provided using seven case scenarios (see Appendix F).
- The Living With Aphasia: Framework for Outcome Measurement (A-FROM) model helps instructors teach students to formulate personal goals pertinent to the patient for *Participation in Life Situations*; *Personal Identity, Attitudes, and Feelings*; *Communication and Language Environment*; and *Language and Related Impairments*.

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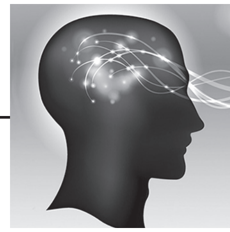

Chapter 1

AN OVERVIEW OF NEUROANATOMY AND NEUROPHYSIOLOGY RELATED TO ACQUIRED LANGUAGE DISORDERS

The Neuron

The brain has more than 100 billion neurons, or nerve cells. These structures comprise the fundamental units of the nervous system and are its functional "workhorses." Each neuron is composed of a body, referred to as the soma; filamental extenfsions called dendrites; and longer fibers called axons. Each neuron has one axonal fiber that can measure from micrometers to meters in length (Figure 1–1). The axon functions as a conductor of electrical impulses. Dendrites receive stimuli or input from other neurons, and axons send stimuli to other neurons, glands, or muscles (Webb & Adler, 2008). These neurons communicate with each other electrochemically via neurotransmitters (a discussion of neurotransmitters appears in this chapter).

The nervous system has sensory neurons (receptors) and motor neurons (effectors). Sensory neurons are sensitive to light, sound, touch, temperature, smell, and taste and transmit sensory information from the environment via the nervous system. Motor neurons receive excitation from other cells and send impulses to the muscles instructing them to contract and to the endocrine glands to regulate hormonal secretions. Input from sensory neurons can be transmitted to motor neurons; for example, a sensory neuron may detect a dangerous stimulus and respond by alerting interneurons in the spinal cord to notify the motor neurons to remove that body part in danger. At the endpoint or terminal of the nerve cell, neurotransmitters are released into the synaptic space between the cells. Neurotransmitters are biochemical compounds that help neurons communicate, acting as messengers between them (Figure 1–2).

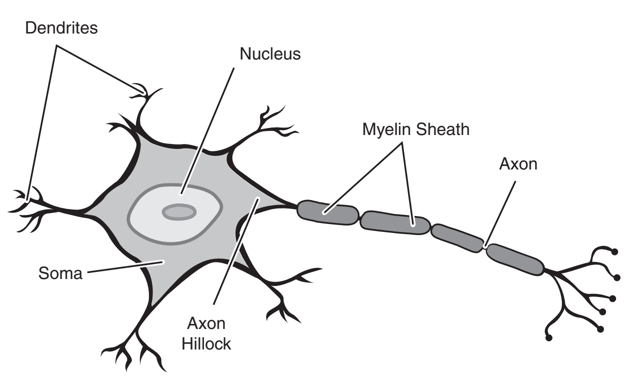

Figure 1–1. Neuron.

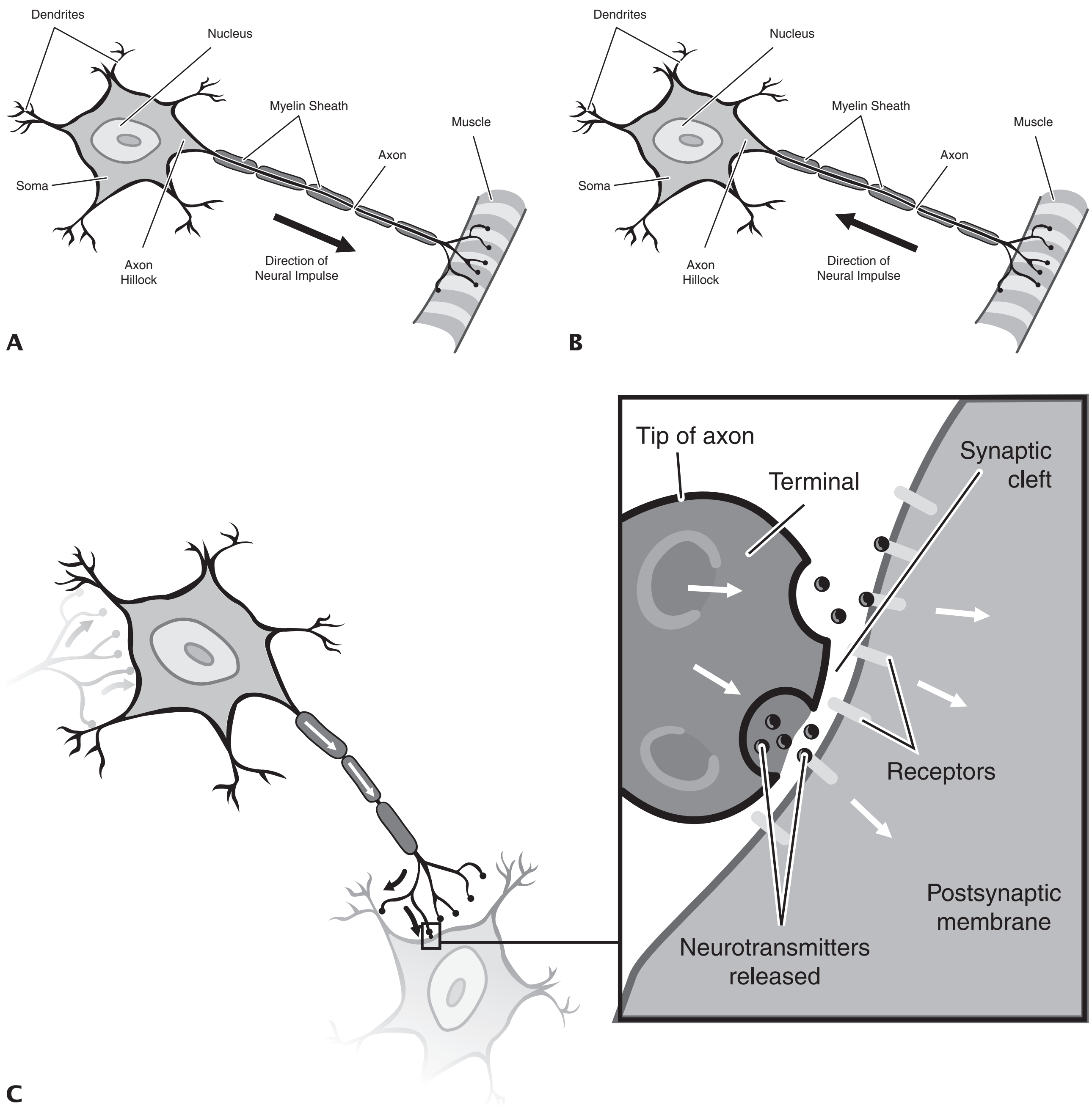

Figure 1–2. A. Motor neuron. **B.** Sensory neuron. **C.** Events at synapse.

Neurotransmitters

Neurotransmitters are chemicals that assist in the regulation of the brain's ability to control metabolic activity, speech and language, motivation, personality, mood states, and cognition, including attention and memory (Bhatnagar, 2017). Each neuron releases neurotransmitters at the synapse, which is where the bulb of the axon communicates with the dendrites. The neurotransmitter passes across the synaptic cleft and bonds with the receptor site on the postsynaptic membrane. This results in a change in the electrical current across the cell membrane and the nerve fibers. The change in the electrical valence of the cell is referred to as the action potential. An excess or depletion of neurotransmitters can have significant effects on functioning. For example, excess dopamine interacting with other factors has been linked to schizophrenia, and a depletion of dopamine concentration contributes to Parkinson's disease.

Sensory

There are two main types of neurotransmitters: the small molecules and the large molecules, also known as neuropeptides. The small molecule transmitters include acetylcholine, serotonin, dopamine, norepinephrine, glutamate, histamine, and gamma aminobutyric acid (GABA). In this group, GABA is primarily inhibitory, whereas glutamate is excitatory. Yet in many cases, neurotransmitters can be either excitatory or inhibitory depending on the receptor site. Dopamine can act in this way. The large molecule neuropeptides include vasopressin, somatostatin, neurotensin, enkephalin, and endorphins. These neuroactive substances are hormone mediated and affect the body's metabolic functioning. Pituitary peptides such as endorphins are opioidlike and function in pain management. Neuroactive peptides may be specific to particular organs and have multiple roles in the body. Both groups of neurotransmitters are crucial to a person's feelings of pleasure, pain, stress, cravings, the promotion of sleep and rest, and emotional attachment, as well as basic metabolic functioning (Schwartz, 1991; Webb & Adler, 2008) (Table 1–1).

The Brain: A Brief Review of Structure and Function

The central nervous system consists of the brain and spinal cord. Each segment of the spinal cord has both sensory and motor nerves that innervate our skin, organs, and muscles (Figure 1–3).

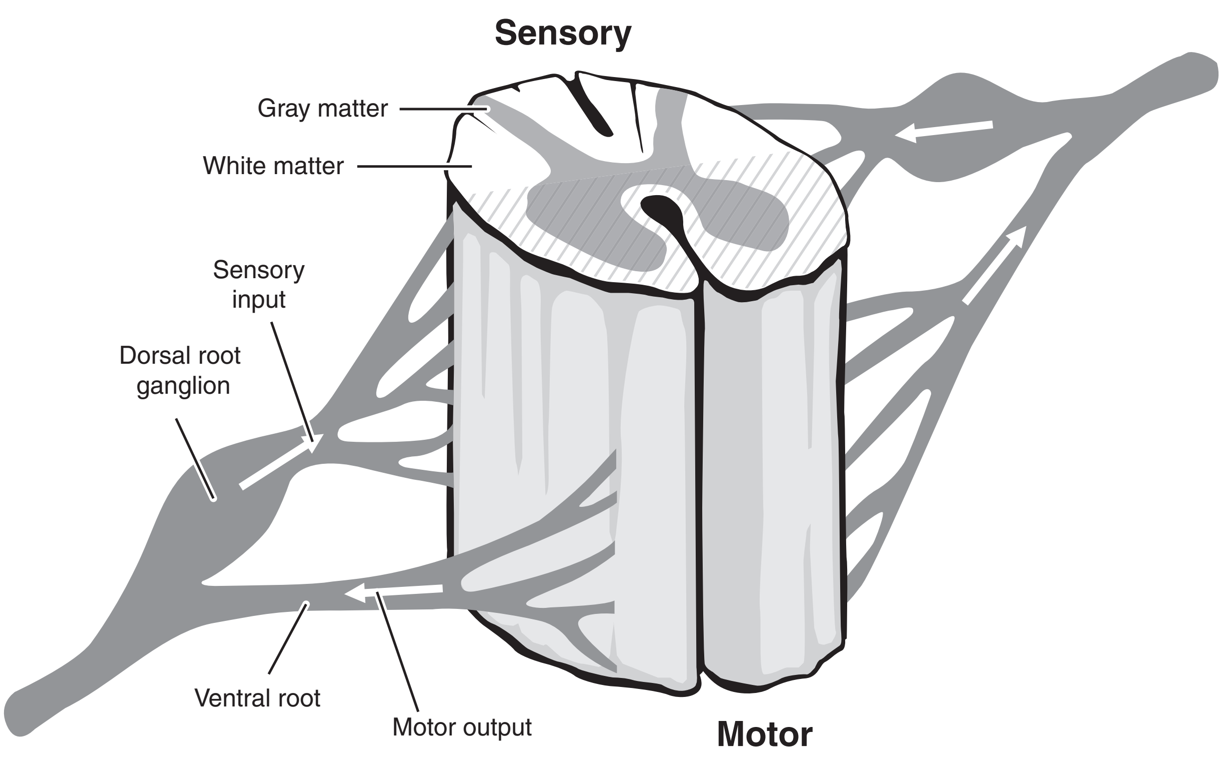

Figure 1–3. Spinal cord cross section.

Table 1–1. Selected Neurotransmitters

Neurotransmitter	Distribution	Proposed Impact
Acetylcholine	It is the primary neurotransmitter of the peripheral nervous system (PNS) and important to the central nervous system (CNS) as well. It is concentrated in the basal forebrain, striatum, and reticular formation. It is also concentrated within regions of the brainstem involved with cognition and memory.	Involved in voluntary movement of skeletal muscles and viscera including spinal and cranial nerves. Drugs that affect cholinergic activity within the body impact heart rate, bladder function, digestion, and may cause dry mouth. This neurotransmitter is also important to sleep-wake cycles. Decreased cholinergic projections on muscle cells are found in myasthenia gravis. Decreased projections in the hippocampus and orbitofrontal cortex are related to Alzheimer's disease.
Dopamine	Concentrated in neuronal groups in the basal ganglia. Dopaminergic projections originate in the substantia nigra and have terminals in the cortex, amygdala, and nucleus accumbens.	Decreased dopamine in the brain is linked to Parkinson's disease. An increase of dopamine in the forebrain is linked to schizophrenia. Dopamine is involved in cognition and motivation and is related to wanting pleasure associated with love and addiction.
Norepinephrine	Norepinephrine neurons are found in the pons and medulla. Most are in the reticular formation and locus ceruleus.	Important to maintaining attention and focus. It increases excitation in the brain and is involved in wakefulness and arousal. It is also associated with the sympathetic nervous system and feelings of panic, fight, or flight.
Serotonin	Synthesized from the amino acid tryptophan and found in blood platelets and the gastrointestinal tract. Terminals are localized in nerve pathways from the nuclei at the center of the reticular formation.	Controls mood, regulates sleep, involved in perception of pain, body temperature, blood pressure, and hormonal functioning. Low levels are associated with depression. It is also involved in memory and emotion.
GABA	A major neurotransmitter with cells found in the cerebral cortex, cerebellum, and hippocampus. GABA projections are inhibitory from the striatum to the globus pallidus and substantia nigra to the thalamus.	Loss of GABA in the striatum is linked to a degenerative disease that causes involuntary abnormal movements (Huntington's chorea). It is associated with the inhibition of motor neurons.

During brain development in childhood, neurons create new connections with other neurons. At birth, the brain weighs about 350 g (12 oz) and is about 1,000 g (2.2 lb) at 1 year old. For an adult, the brain weighs approximately 1,200 to 1,400 g (2.6 to 3.1 lb) This section discusses the brain's covering, the ventricles, and the following major structures of the central nervous system: the cerebral cortex, brainstem, subcortical structures, cerebellum, and the neural pathways.

The Coverings of the Brain, Ventricles, and Cerebrospinal Fluid

There are three layers of tissues, the meninges, which protect the brain. They include the dura mater, arachnoid membrane, and pia mater (Figure 1–4). Between the arachnoid membrane and pia mater is the subarachnoid space. This space contains blood vessels and cerebrospinal fluid (CSF).

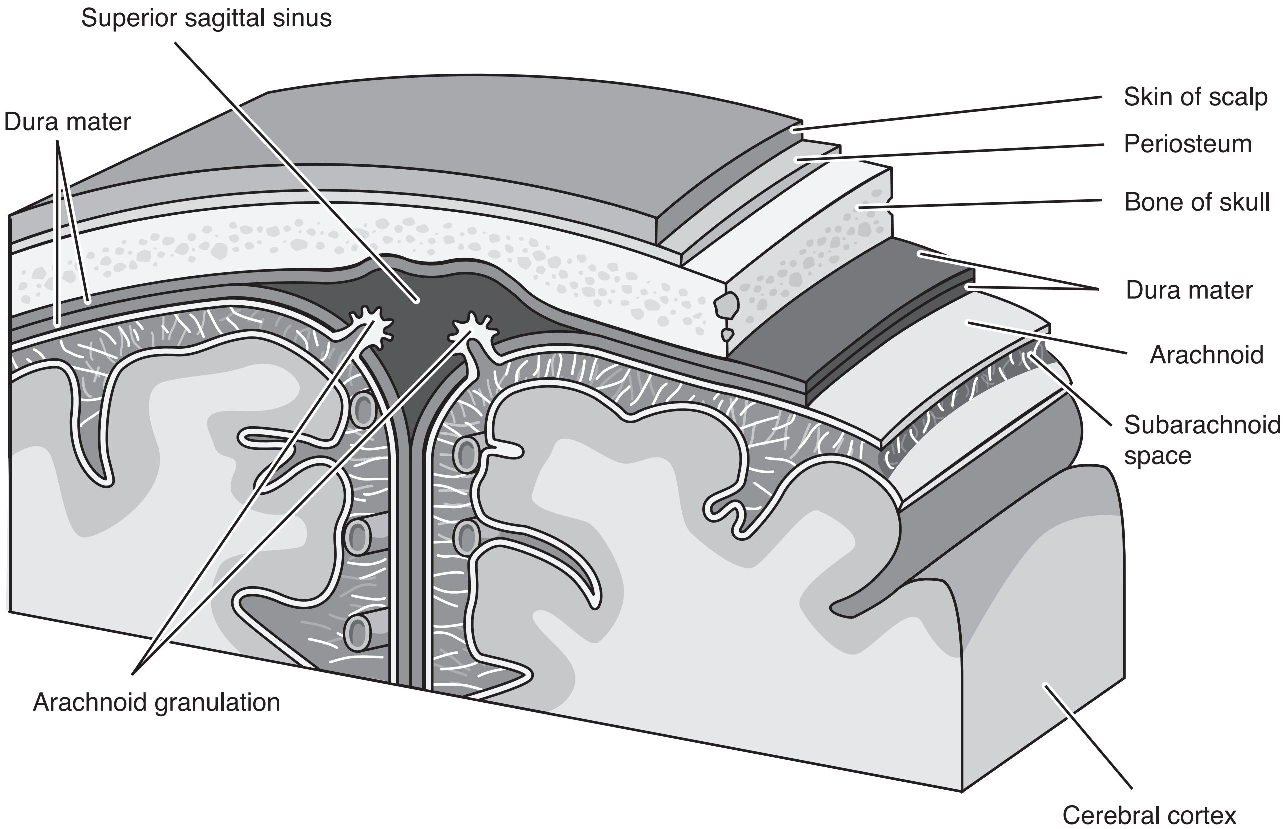

Figure 1–4. Meninges.

The CSF protects the brain. It is a clear and colorless fluid that circulates throughout the brain and the spinal cord cushioning and protecting them from injury. There are four ventricles within the brain: two lateral ventricles, the third ventricle, and the fourth ventricle (Figure 1–5). Each ventricle contains the choroid plexus, which is the structure that produces the CSF. The CSF flows from one ventricle to the next and finally into the subarachnoid space. It is reabsorbed back into the blood. The lateral ventricles are connected to the third ventricle, and the third ventricle is connected to the fourth. Blockage in any of the spaces can cause CSF to back up, leading to a number of serious medical conditions including hydrocephalus, which increases pressure on the brain.

Cerebral Cortex

The cerebral cortex is also referred to as the cerebrum, and it composes the largest part of the brain.

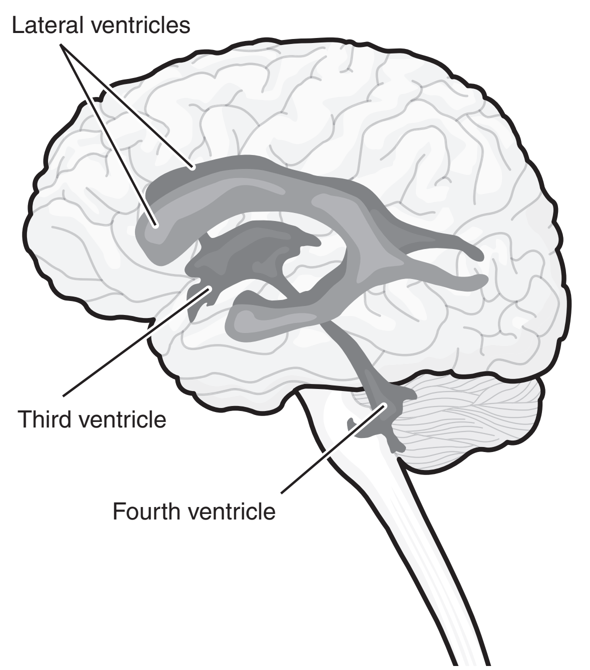

Figure 1–5. Ventricles.

It is involved in complex thought and executive functions, learning, personality, movement, touch, and vision, and it is divided into two hemispheres: right and left. The outer surface of each hemisphere is composed of gray matter that contains nerve cell bodies (more than 6 billion), glial cells, capillaries, axons, and dendrites. The gray matter directs sensory or motor stimuli to the interneurons of the central nervous system for responsiveness via synaptic activation. White matter consists of axons that travel throughout the cortex. These structures are referred to as white matter because of the color of the myelinated sheaths that wrap each axon. The color reflects the fact that they consist primarily of lipids, or fatty material. As noted in the section on neurons, the axon is responsible for carrying motor information (efferent) away from the cortex to the periphery and from the periphery to the cortex via sensory (afferent) neurons. These axons form tracts, and the tracts take the information to their intended destination. Two neurological diseases that manifest white matter changes are multiple sclerosis, which destroys the myelin shield surrounding the axons, and Alzheimer's disease. In Alzheimer's disease, these white matter changes produce amyloid plaques.

The two hemispheres of the brain primarily receive sensory information from the contralateral side of the body and affect movement on the contralateral side of the body. The two hemispheres are separated by a longitudinal fissure but communicate by two large bundles of axons, the corpus callosum, composed of commissural fibers, and subcortical connections. The proper and efficient functioning of the corpus callosum is critical to the transmission of information between the left and right hemispheres. The left hemisphere typically is best for processing speech and language and is involved in verbal memory. The right hemisphere has been known to process paralinguistic information and pragmatics as well as provide skills with nonlinguistic information that is visual, spatial, emotional, and musical.

The cerebral cortex integrates sensory and motor signals in order to execute the primary sensory, motor, and association area functions. The sensory areas of the cortex receive input from the environment such as touch, taste, smell, vision, and hearing. The motor areas are responsible for muscular activity throughout the body. The association areas of the cortex connect the sensory and motor systems and give humans the ability to integrate the sensory (afferent) and the motor (efferent) information, permitting normal function. Figure 1–6 shows a midsagittal view of the brain depicting the subcortical, cerebellar, and brainstem structures involved in sensory-motor integration.

Lobes of the Brain

Each hemisphere is composed of four lobes: frontal, temporal, parietal, and occipital (Figure 1–7). The left side of the brain generally controls the right side of the body, and the right hemisphere controls the left side of the body. Damage to either hemisphere can result in paresis, paralysis, or loss of sensation. Weakness on one side of the body is referred to as hemiparesis, and paralysis on one side of the body is referred to as hemiplegia. Thus, if a person has a left hemispheric stroke with a paralysis on the right side of the body, that person has a right hemiplegia. If the right side is only weak, it is then a right hemiparesis.

The following website provides an overview of the lobes of the brain and their associated functions: https://www.biausa.org/brain-injury/about-brain-injury/what-is-a-brain-injury/function-of-the-brain The lateral views, shown in Figure 1–8, provide further detail of the structural landmarks and functional association areas of a cerebral hemisphere.

The Frontal Lobes. The frontal lobes are at the most anterior part of the brain. The anterior limit of the frontal lobe is dorsal and posterior to the bony case of the eyes. The posterior limit of the frontal lobes is the precentral gyrus. The posterior portion of the frontal lobe is specialized for control of movement. In humans, the frontal lobe is critical for language production. The prefrontal area is important for planning and initiation, judgment and reasoning, concentration, emotional range, disinhibition of behaviors, and adaptation to change. Functions of the frontal lobes are essential to consciousness and let us appropriately judge what we are doing in the environment and how we initiate and respond to life's events. Proper functioning

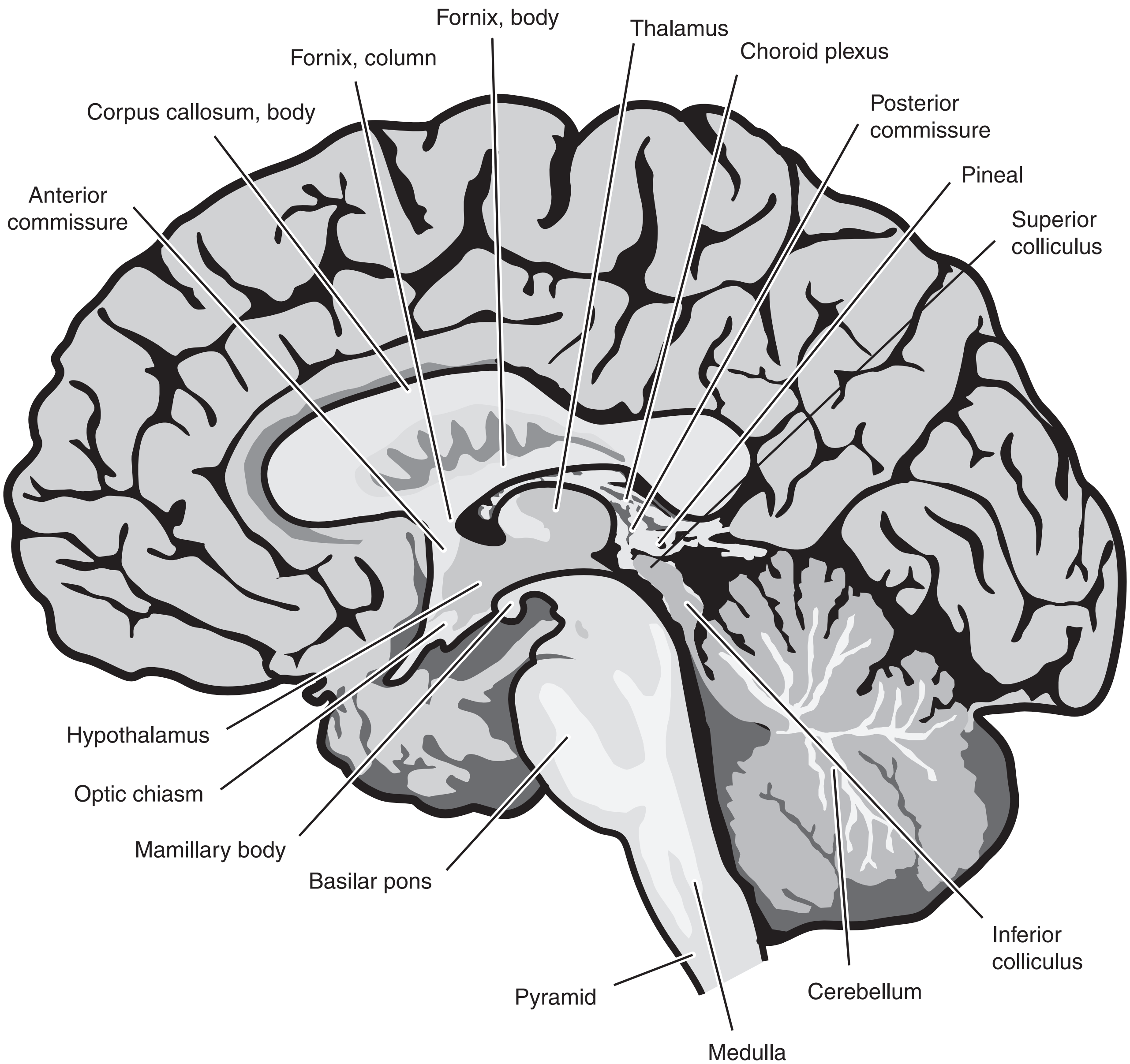

Figure 1–6. Midsagittal view of the brain.

assists with our emotional response and expressive language choices. Essentially, the frontal lobes make us aware of our conscious actions. Our emotional responses, memory for habits, motor activities, and expressive language are all mediated by the frontal lobe.

People who have frontal lobe damage may demonstrate the following impairments:

- loss of simple movement (paralysis)
- loss of spontaneously interacting with others
- loss of flexible thinking
- persistence on a single thought (perseveration)
- inability to focus on a task
- mood changes that are frequent and inappropriate (emotional lability)

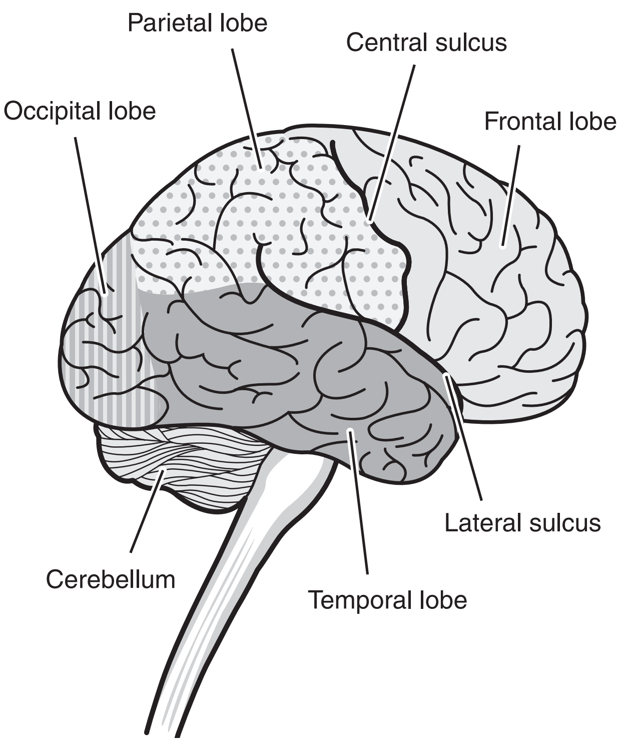

Figure 1–7. Lobes of the brain.

- changes in personality and social behavior
- difficulty in problem-solving
- inability to express language (Broca's nonfluent aphasia)
- inability to sequence complex movements
- difficulty making a decision and performing voluntary actions that coincide with reduced speech output (abulia)

The Temporal Lobes. The temporal lobes are located laterally in the cerebral hemispheres, approximately at the level of the ears. They house the primary and secondary auditory cortex and are involved in auditory sensation and perception. Wernicke's area is located in the posterior part of the superior temporal gyrus and is important to auditory comprehension of language. In this area, auditory stimuli are transformed for comprehension. However, many associations connect auditory input with other systems, including memory needed for the auditory comprehension of language. Hearing ability, some visual perceptions, and categorization

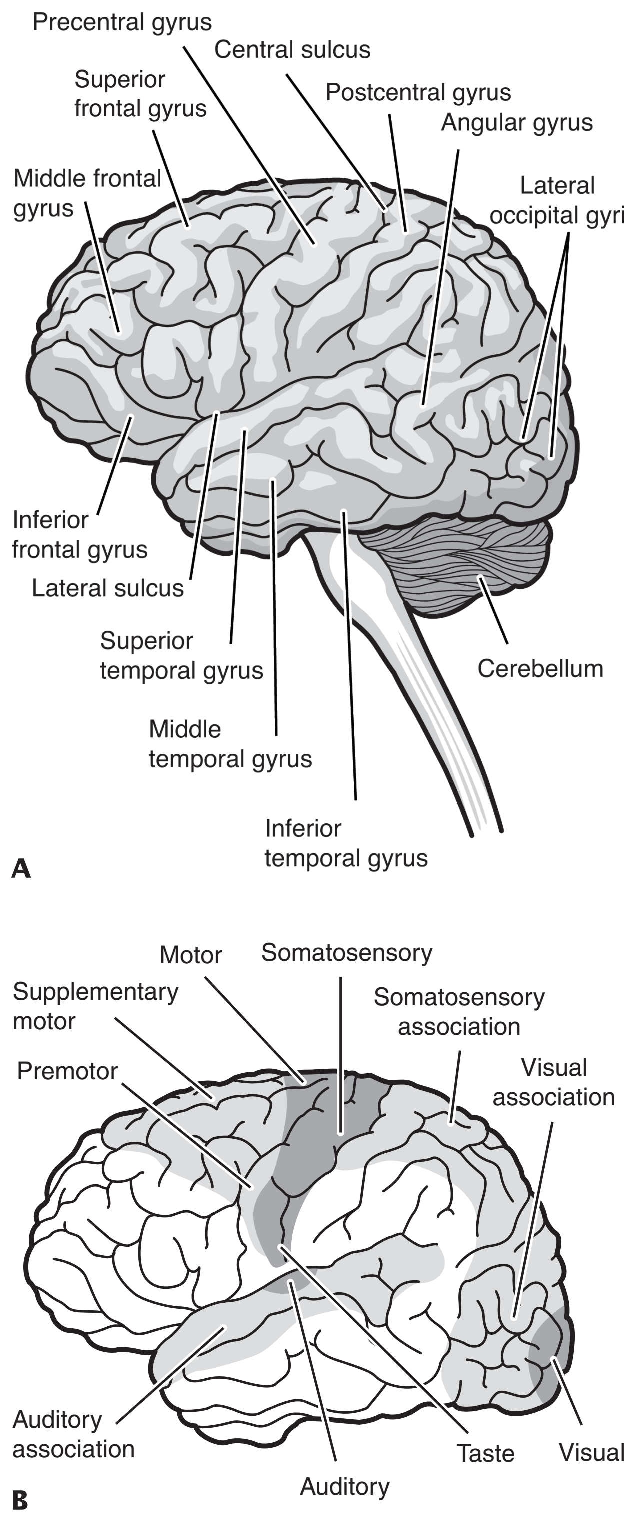

Figure 1–8. A. Lateral view of the brain with structural landmarks. **B.** Lateral view of the brain with primary functions and secondary association areas.

skills are dependent, in part, on the temporal lobe. The left temporal lobe contains Wernicke's area, which is critical to language comprehension. Damage to the temporal association cortex may lead to difficulty identifying and categorizing auditory stimuli. The main functions of the temporal lobe include hearing ability, memory acquisition, visual perceptions, and categorization of objects. Individuals who have lesions in this area may demonstrate the following deficits:

- difficulty recognizing faces (prosopagnosia)
- difficulty understanding spoken words (Wernicke's aphasia)
- difficulty identifying and verbalizing about objects
- disturbance with selective attention to what is seen and heard
- short-term memory loss
- interference with long-term memory
- increased or decreased interest in sexual behavior
- inability to categorize objects
- persistent talking (right lobe damage)
- increased aggressive behavior
- poor selective attention to what is seen or heard

The ability to understand written and spoken language occurs primarily in Wernicke's area, and the ability to produce speech movement occurs primarily in the frontal lobe (Broca's area). These two areas communicate with each other constantly via bundles of neurons that are subcortical white matter pathways known as the arcuate fasciculus and superior longitudinal fasciculus. These pathways also pass through gyri at the rim of the sylvian fissure (angular gyrus and supramarginal gyrus), which are also very important areas for processing language.

The Parietal Lobes. The parietal lobes are located between the occipital lobe and the central sulcus. The most anterior part is the postcentral gyrus where the axons carrying sensory information terminate. The parietal lobe receives and evaluates most sensory information including touch, pressure, pain, temperature, and taste. Sensations from the body are represented at various parts of the postcentral gyrus. A person with parietal lobe damage may demonstrate the following deficits:

- inability to attend to more than one object at a point in time
- inability to name an object (anomia)
- problems with reading (alexia)
- inability to write words (agraphia)
- word blindness (inability to recognize words)
- difficulty with math (dyscalculia)
- difficulty drawing objects
- difficulty knowing left from right
- lack of awareness of specific body parts
- inability to focus visual attention
- difficulty with eye-hand coordination
- impaired perception of touch
- unilateral neglect
- inability to manipulate objects

The Occipital Lobes. The occipital lobe is located at the posterior part of the brain. It is primarily responsible for processing visual information. The retina receives visual input in the form of light flashes, shapes, and shading. This input is then transmitted through the optic nerve to the thalamus and then to the primary visual cortex in the occipital lobe. If the visual cortex is damaged, blindness or a partial visual field cut can ensue. For example, damage to the left hemisphere often impairs vision in the right visual field. A small focal area of damage or lesion can lead to a small blind area or scotoma. Although the neural information is initially meaningless, the association areas of the cortex transmit stimuli to other parts of the brain for analysis. The medial and lateral surfaces of the occipital lobe help with such visual associations. This secondary area of the occipital lobe is important to visual processing for recognizing objects and visually discriminating.

Damage to the occipital lobe may include, but are not limited to, the following:

- defects in vision, such as visual field cuts
- difficulty locating objects in the environment
- difficulty recognizing drawn objects
- inability to recognize movement of an object