Acquired Language Disorders

A CASE-BASED APPROACH

Third Edition

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Introduction

New and experienced clinicians may find it challenging when attempting to integrate theoretical knowledge and research into clinical practice. We have noted that it isn't until the clinician actually encounters a person with a specific disorder that academic knowledge and practice coincide. Given our years of experience as both 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 acquired language disorders (ALD). To further our goal in making ALD come to life for the reader, we have developed a model that depicts the individual's language and cognition following a cerebrovascular accident or other neurologic event. We refer to this as the ALD Target Assessment Snapshot, and each of the 15 cases that we discuss has a corresponding figure within the chapter.

Our classroom experience has clearly demonstrated that students benefit from the graphic features of the Target Assessment Snapshot because it facilitates a concrete understanding of the linguistic and cognitive characteristics of each case. This model, combined with salient features of the various disorders, case analyses, and treatment considerations, connects theoretical knowledge with practical application. In our opinion, this case-based approach matches the needs of speech-language pathologists practicing in health care today.

How the Book Is Organized

Each chapter includes a fictional person based upon an actual case that was treated in a health care setting, private practice, or home health environment to exemplify a specific acquired language disorder. These case scenarios were developed based on actual patients who the authors or their colleagues have evaluated and treated. 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 not only the basic pathophysiology of a disease process associated with an acquired language disorder, but also the functional effects it may have on a person's life. For purposes of anonymity and confidentiality, the patients' names and identifying information have been changed.

Special Features

The 15 cases in this book offer a comprehensive overview of the assessment process, major aphasic syndromes, including 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 therapeutic approaches for individuals with ALD currently in use and new trends in therapeutic intervention with the ALD population.

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

- **Characteristics** of the disorder including neurologic correlates
- **Case Scenario** providing a brief overview of the case history
- **Diagnostic Profile** including language expression, speech production, auditory comprehension, reading, written expression, cognition, and behavioral symptoms of the case
- The **Target Assessment Snapshot** presents a visual representation that captures the type and degree of language impairment as well as any areas of cognition that may be affected.

- **Functional Analysis** consists of a narrative that succinctly summarizes the case and helps the clinician understand the impact of the disability on daily life.
- **Critical Thinking/Learning Activity** poses questions designed to help the student or clinician develop problem-solving and practical skills necessary to maximize the patient's progress.
- **Treatment Considerations** provide areas to consider for rehabilitation based on the patient's strengths and weaknesses, individualized to his/her psychosocial context. General therapeutic objectives are also provided.
- **Therapeutic Goals with the A-FROM Model (Aphasia: Framework for Outcome Measurement**) is based on the International Classification of Functioning (ICF), disability and health (World Health Organization, 2001). For each of the 15 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 *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 acquired language disorders. The physical appearance of the model depicts a schematic relationship between language

Normal Communication Embedded within
Normal Cognitive Functions

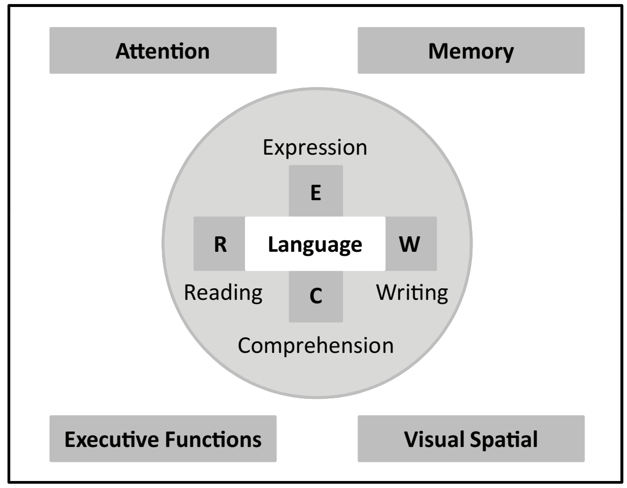

Figure I–1. The Acquired Language Disorders Target Model.

and cognition as well as the relationship among functional language modalities.

There are five primary domains of the ALD Target 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. Although as speech-language pathologists we are clinically oriented to the Language domain, we must not neglect the other four cognitive areas of functioning because they are integral to functional communication.

For an individual who has normal communicative functions, the lettered squares (E, C, R, and W) remain attached to the rectangle containing the word *Language*. For an individual with an acquired language disorder, the lettered squares separate from the *Language* rectangle, reflecting the level of impairment for that domain. The numbers 1 to 4 are assigned to further reflect the level of severity with 1 being normal (typical) and 4 being severely impaired. For each type of acquired language disorder, the pattern is different. For example, in a person with an expressive nonfluent aphasia (Broca's), the E square and the W square are placed on or outside the circular border with the subscript 3 or 4 to indicate more impaired functioning. Depending on the acquired language disorder, any or all of these language modalities may be impaired at varying degrees. This ranges from normal, to mild-moderate, to moderate-severe, to 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 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 bisecting 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 cognitive-linguistic changes pertinent to that specific case.
- The value of the case-based approach to ALD is that it facilitates comparisons among types of patients. This optimizes more accurate decision-making for planning treatment. 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 neurologic, cognitive, linguistic, and functional aspects of each patient to formulate a complete picture for treatment.
- PowerPoint slides are provided to supplement the text and support lectures.
- Many current 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 his or her own patient profile.

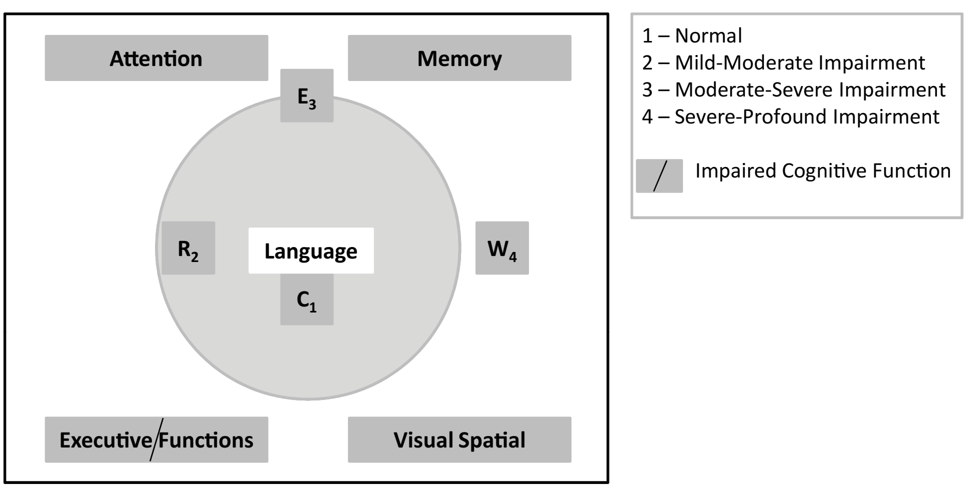

Figure I–2. The key to understanding the Acquired Language Disorders Target Model.

- Each case includes a set of personal goals pertinent to the patient. In addition, a diagram of the Aphasia: Framework for Outcome Measurement (A-FROM) depicts areas 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 acquired language disorders is provided.
- This book offers a detailed summary of many formal and informal assessments and treatment programs for those with ALD.
- There are 15 case-based acquired language disorders, each with assessment and treatment considerations, to facilitate class discussion and clinical problem solving.
- 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 the various acquired language disorders.
- Functional treatment can be easily planned using the *Functional Communication Connections* worksheet.
- A *Test Your Knowledge* examination is also provided using seven case-based examples.
- The 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* (Kagan et al., 2008).

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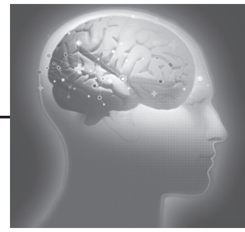
Evelyn Klein and James Mancinelli dedicate this book to the people with acquired language disorders and their families whom we have treated. Their courage and determination are inspirational.



Chapter 1

AN OVERVIEW OF NEUROANATOMY AND NEUROPHYSIOLOGY RELATED TO ACQUIRED LANGUAGE DISORDERS (ALD)

The Neuron

The brain has more than 100 billion neurons, or nerve cells. These structures comprise the building blocks of the nervous system and are its functional "work horses." Each neuron is composed of a body, referred to as the soma; filamental extensions 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 chemical input, 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).

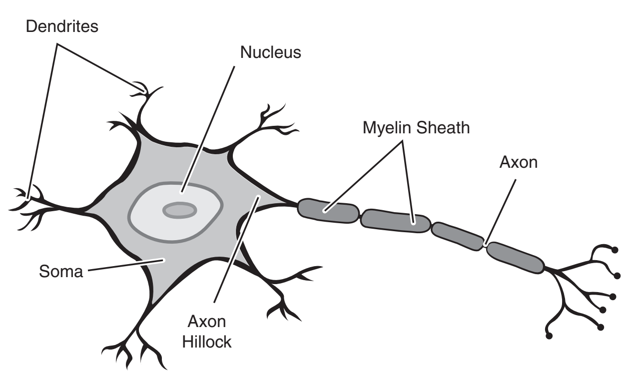


Figure 1–1. Neuron.

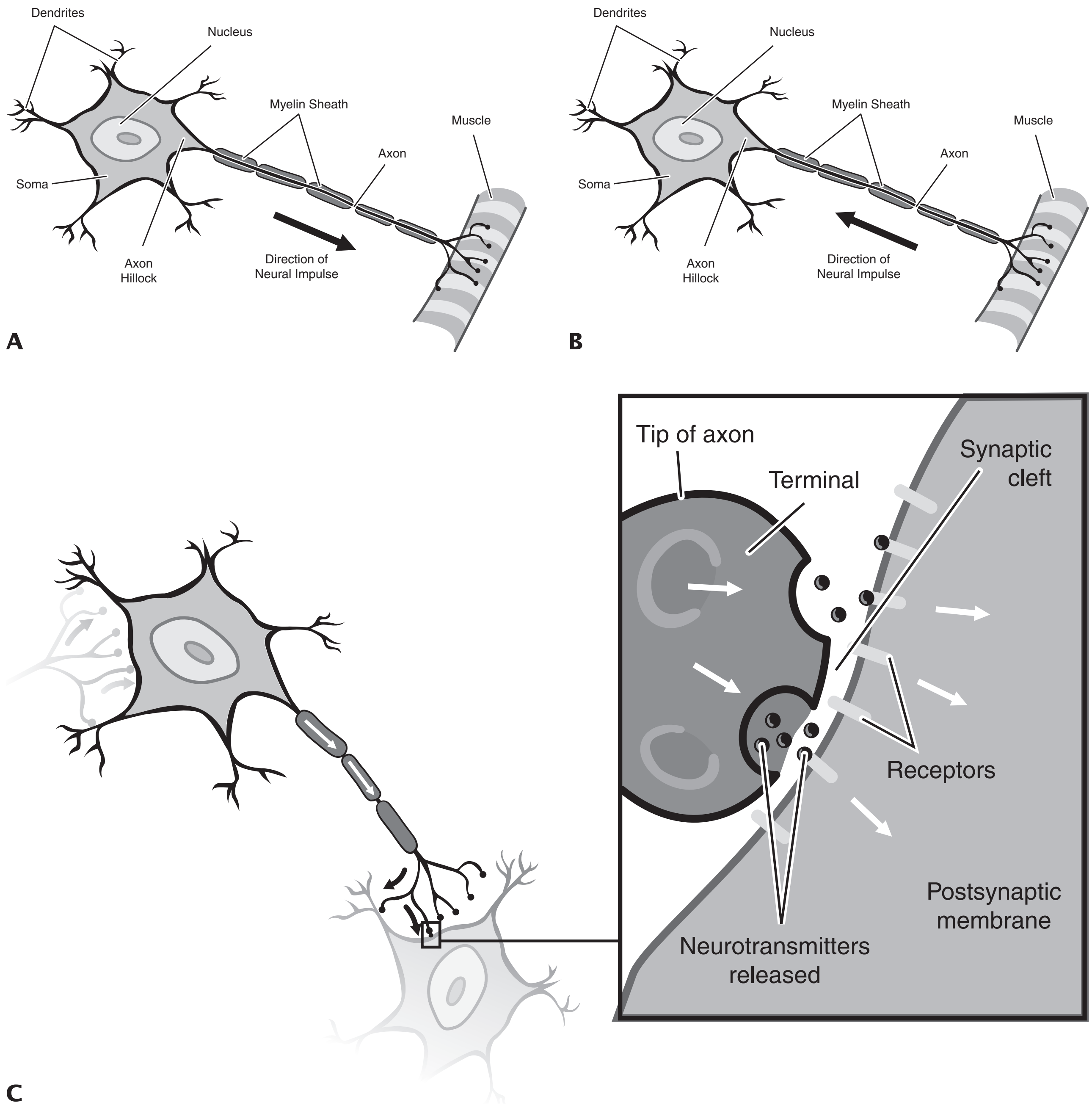


Figure 1–2. **A.** Motor neuron. **B.** Sensory neuron. **C.** Events at synapse.

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, 2002). Each neuron releases neurotransmitters at the synapse, which is where the bulb of the axon makes contact with the

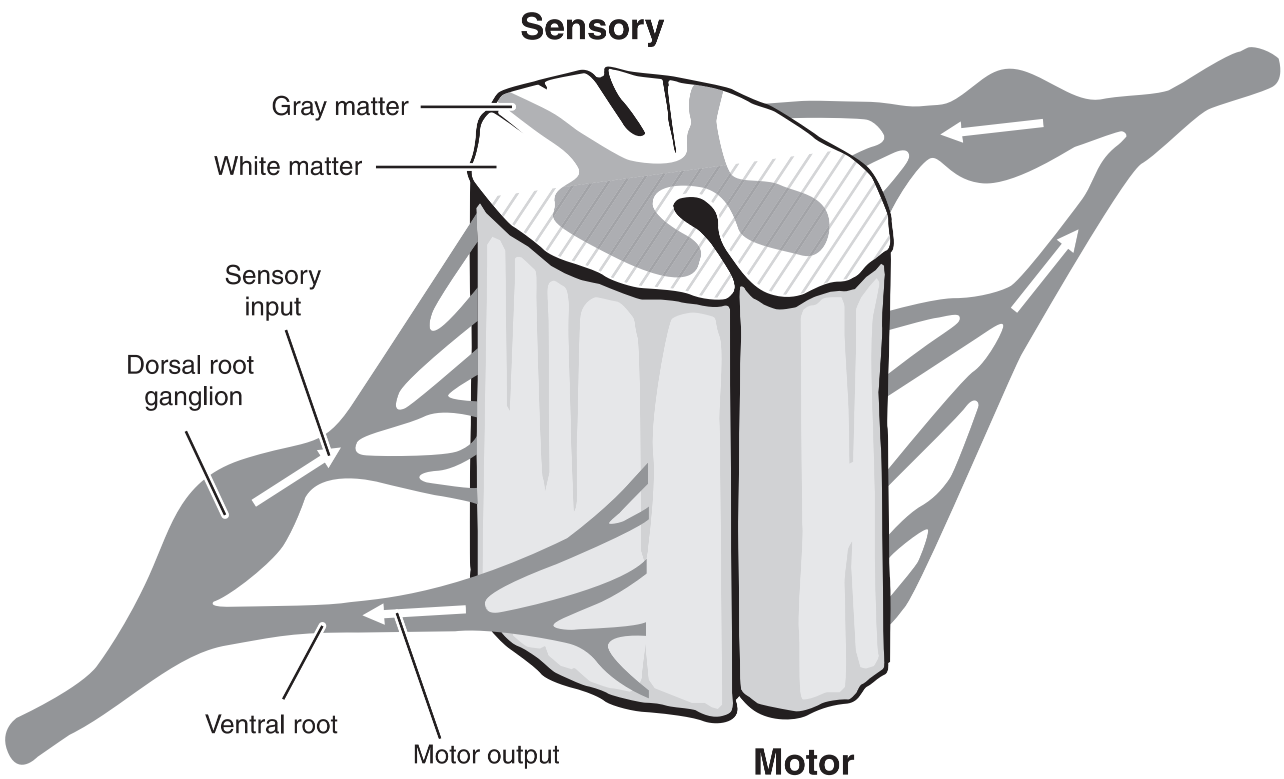


Figure 1–3. Spinal cord cross-section.

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. A pituitary peptide such as endorphin is opioid-like and functions 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).

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.

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). During brain development in childhood, neurons create new connections with other neurons. At birth, the brain weighs about 350 grams (12 ounces) and is about 1,000 grams (2.2 pounds) at 1 year old. For an adult, the brain weighs approximately 1,200 to 1,400 grams (2.6 to 3.1 pounds) and does not have the ability to create new connections with other neurons, as most neurons cannot be replaced. 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. Between the arachnoid membrane and pia mater is the subarachnoid space. This space contains blood vessels and cerebrospinal fluid (CSF).

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. 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 (Figures 1–4 and 1–5).

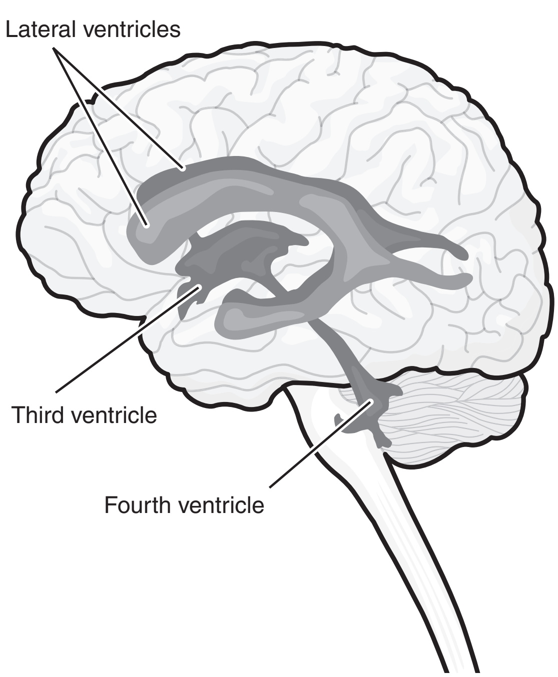


Figure 1–4. Ventricles.

Cerebral Cortex

The cerebral cortex is also referred to as the cerebrum and it composes the largest part of the brain. It is involved in complex thought and executive functions, learning, personality, movement, touch, vision, and 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 information away from the brain to the periphery. These axons form tracts, and the tracts take the information to their intended destination. Two neurologic 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 cortical association 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 providing 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

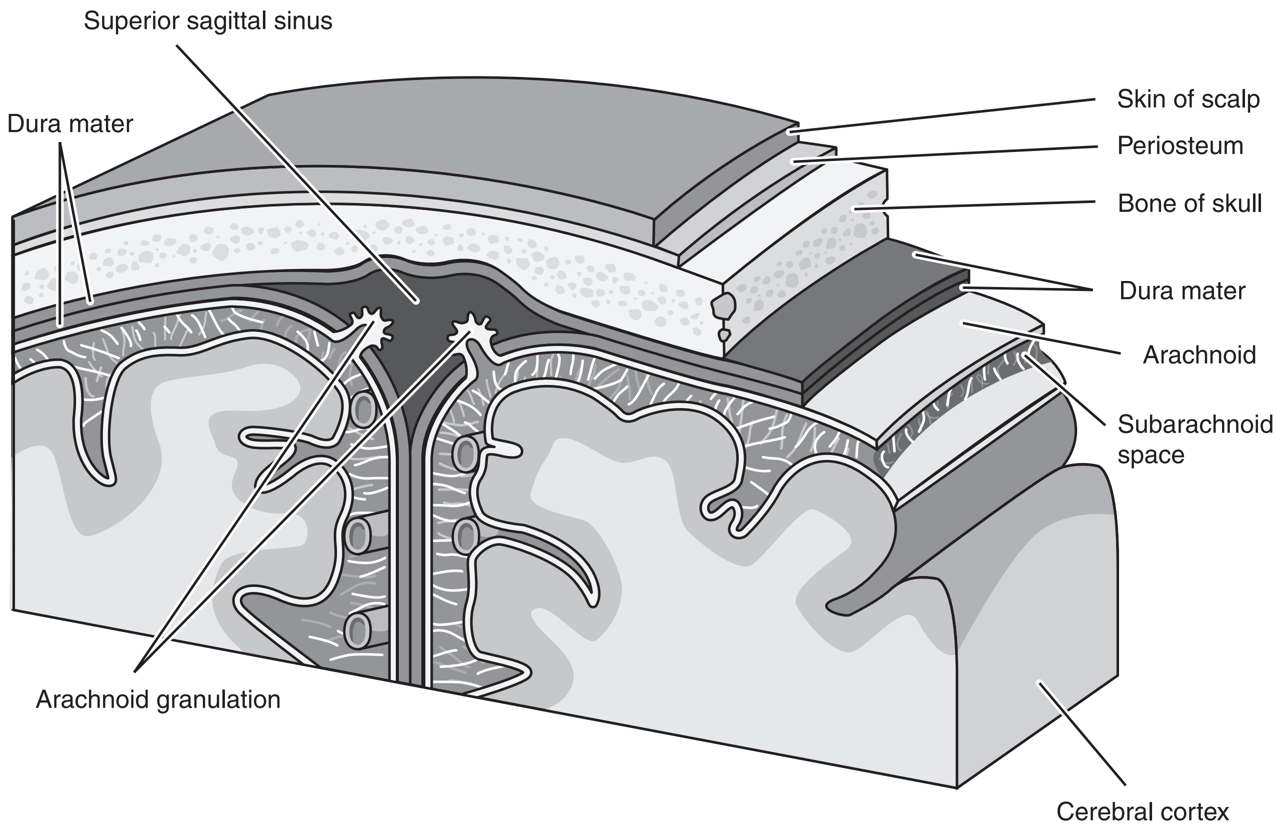


Figure 1–5. Meninges.

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.

The following website provides an overview of midsagittal brain structures and functions: http://www.psych.ualberta.ca/~ITL/brain/ (Figure 1–6). This figure illustrates structures of the subcortex and cerebellar, and brainstem regions.

Lobes of the Brain

Each hemisphere is composed of four lobes: the 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 paralysis or lost 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: http://www.stanford.edu/group/hopes/basics/braintut/ab4.html. The lateral views provide further detail of the structural landmarks and functional association areas of a cerebral hemisphere (Figure 1–8).

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

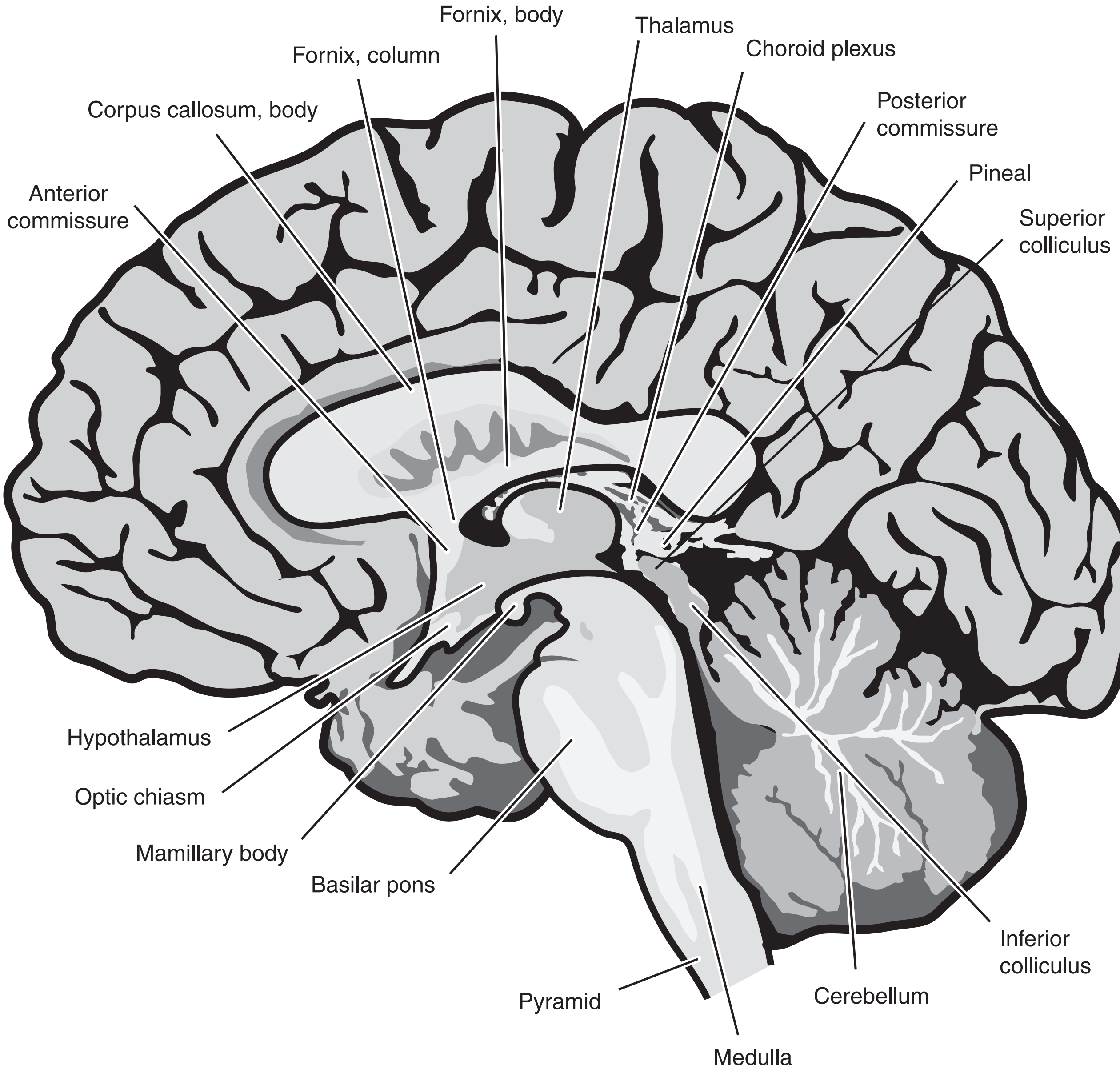


Figure 1–6. Midsagittal view of the brain.

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 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.