



The Brain and Cognitive Abilities

Brain Changes and Differences

Brain changes cause changes in a person's cognitive abilities.

Cognitive abilities include a person's ability to:

- Think
- Understand what they see or hear
- Figure out how to do things
- Remember
- And many other cognitive functions

Even though everyone, healthy or not has their own unique set or pattern of strong and weak cognitive abilities, the pattern of cognitive abilities that are strong or weak looks particularly unusual in a brain disorder.

When the brain disorder is an irreversible dementia, most cognitive abilities keep getting weaker over time.

Dementia is a gradual decline in a person's ability to think, including the ability to remember and understand, due to brain changes. The brain changes are severe enough to affect the person's ability to perform tasks in everyday life.

A person with an irreversible dementia goes through stages that occur as the brain changes that damage brain cells increase and spread throughout the brain.

Each part of the brain controls specific cognitive abilities. As the brain changes affect each part, the person starts to lose the cognitive abilities that part of the brain controls.

Dementia

There are more than 100 different disorders that can cause dementia. The most common cause is Alzheimer's Disease. Other causes include:

- Dementia with Lewy Bodies (where there are abnormalities within the brain cells called Lewy Bodies).
- Frontotemporal Dementia (where the frontal and temporal lobes of the brain are especially affected).
- Vascular Dementia (where there are mini-strokes throughout the brain).

In each disorder that causes an irreversible dementia, the parts of the brain are affected in a different order.

In Alzheimer's Disease, all the parts of the brain described below are affected. As the brain changes affect each part of the brain, creating changes in that part's cognitive abilities, the brain cell damage in the parts already affected increases in severity, so that the cognitive abilities already impaired continue to decline even more; they get weaker and weaker.

It is important to remember that each person with dementia has their own unique set of cognitive strengths and needs at any given time. We need to look closely to discover what those strengths and needs might be.

Emotion and Behavior

Brain changes cause cognitive changes, including changes in a person's ability to think, understand, remember, and respond. These cognitive changes cause changes in a person's emotions and behavior, including distress and distressing behaviors. Most distressing behaviors result from brain changes and cognitive changes, not from manipulation, "meanness", or "ornerness".

When we try to identify and support a person's cognitive abilities, we will likely be much more effective in addressing their emotions and behavior as well. This is because we will have a better understanding of why a person is feeling a certain way or engaging in a particular behavior. Trying to change a person's behavior without understanding their cognitive abilities is usually frustrating, inefficient, and emotionally challenging.

The Brain and Cognitive Abilities

The brain has two halves, one on each side called the (left and right) hemispheres that are almost mirror images of each other. Each side has 4 parts called lobes. For each lobe on the right side there is a similar lobe with the same name on the left side. The right side of the brain controls the left side of the body, and the left side of the brain controls the right side of the body.

In dementia, the lobes on both sides of the brain are usually affected.

When a part of the brain is affected, the same cognitive abilities are impaired, no matter what disorder is causing the dysfunction to that part of the brain (dementia, stroke, head injury, brain disorder at birth, etc).

The information in this handout applies to all brains in general (healthy or not) and all types of brain disorders. We refer to dementia, especially Alzheimer's Disease because all of the areas of the brain described here are affected. In other brain disorders, only some of the areas are affected, depending on the specific brain disorder. A person's cognitive abilities depend on their own unique pattern of strengths and weakness of various parts of their brain and on the type of brain disorder they might have.

Hippocampus

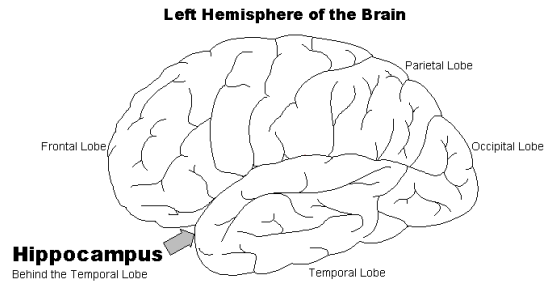
The hippocampus is a brain structure tucked up inside the brain behind the temporal lobes.

The hippocampus helps you:

- Remember what just happened. For example, it lets you know what you just said, what you had for lunch, or that your daughter just visited.
- Know what to remember and what to forget.

When the hippocampus doesn't work well, you may:

- Repeat a question or concern.
- Forget something someone just said.
- Forget that a daughter just visited.
- Be surprised and angry when someone begins to take off your clothes, because you forgot you just agreed to take a shower.



Temporal Lobes

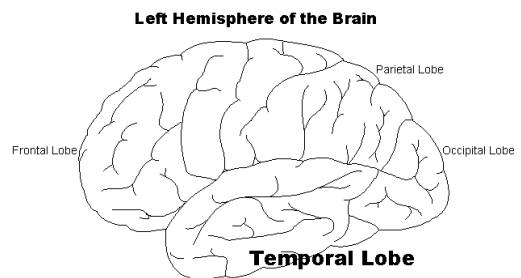
The temporal lobes are parts of the brain located on the sides of your head.

The left temporal lobe helps you:

- Understand language.
- Speak.

When the left temporal lobe doesn't work well, you may:

- Make nonsense sounds.
- Use the wrong words.
- Substitute a similar word (e.g. "pip" for "pen").



- Use fewer words because you can't think of the words to use.
- Say "Yes" when you mean "No".
- Not understand what someone tells you or asks you to do.
- Use swear words without realizing it.
- Take longer to understand what someone is saying or to speak.

Parietal Lobes

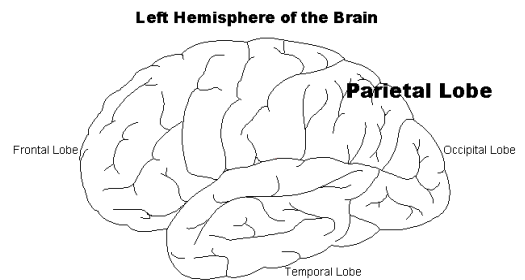
The parietal lobes are parts of the brain located above and behind the temporal lobes.

The right parietal lobe helps you:

- Locate and arrange objects in space relative to yourself and to each other.
- Notice everything in your visual field or space.

When the right parietal lobe doesn't work well, you may:

- Work hard to put an arm into an armhole of a shirt. (This may not be obvious to yourself or others.)
- Put a glass down on the top edge of a plate, instead of beyond it, and spill what's in it.
- Have difficulty responding to stimuli in the left part of the visual field.
- Have difficulty tolerating clutter, many objects, and movement in the environment.
- Feel angry, frustrated, stressed, or fatigued from all the confusing stimuli in the environment.
- Respond better when someone approaches from the right (or from the front if both parietal lobes don't work well, as is likely the case in dementia).
- Resist stepping into a tub or shower because you aren't sure:
 - How high the side of the tub or edge of the shower is.
 - Where your feet or hands should go.



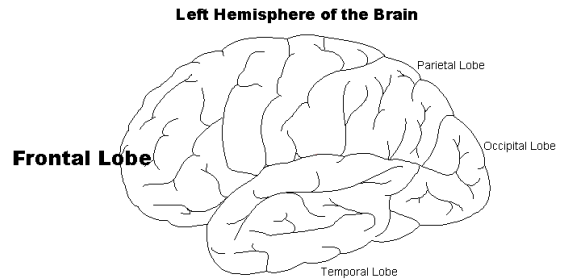
- How deep the water is.

Frontal Lobe

The frontal lobe is a part of the brain located at the front of the brain:

The frontal lobe helps you:

- Handle more than one thing at a time.
- Know what to focus on.
- Sense how much time is passing.
- Switch attention from one idea or task to another.
- Know when a task is done.
- Keep focused on a task until it's done.
- Control impulsive responses to thoughts and desires.
- Identify the order of steps for a task.



When the frontal lobe doesn't work well, you may:

- Have difficulty focusing on a task and paying attention to what is going on.
- Be overwhelmed when someone talks and touches you at the same time.
- Have difficulty following the logic of an argument.
- Need the most important words said first in a sentence.
- Need short, simple words and sentences.
- Refuse a bath because you can't think of how to do it.
- Leave a shower before you're done because you think you've been there long enough.
- Be unable to stop from striking or grabbing someone because you can't control impulses or switch gears quickly.

More about the Brain and Cognitive Abilities

Caring Sheets

You can find more detail about the information in this handout on the websites cited at the end of this handout. Posted on the websites is a series of handouts called “Caring Sheets: Thoughts and Suggestions for Caring” (CS) distributed by the Michigan Department of Health and Human Services as part of their Dementia Care Series. CS #1 describes the organization of a healthy brain. CS #2 describes the effects of brain dysfunction on specific cognitive abilities and behaviors, and in particular changes to the brain and cognitive abilities in dementia. Other caring sheets suggest intervention strategies, and others describe various types of dementia in detail.

Support Strategies (Interventions)

An important concept to note about the brain is that when a part of the brain becomes dysfunctional, the cognitive abilities that part controls (or at least plays a major role in) change. This often results in emotional distress and behavioral changes. Learning how to adapt or to compensate for changes in cognitive abilities, can help a person perform tasks more easily and successfully, and to feel more competent and comfortable.

Since changes in cognitive abilities can sometimes be subtle, it is usually helpful to know where the brain dysfunction is, so that the cognitive abilities likely affected can be identified more easily. Supportive strategies can then be developed to address the changes in cognitive abilities that are related to the dysfunctional parts of the brain. Focusing on specific cognitive abilities can increase the efficiency of developing effective support strategies and can avoid the trial and error method of choosing strategies to try.

Brain Organization and the Individual

Each of the left and right hemispheres of the brain is divided into four regions called lobes. Three of the lobes were addressed in this handout: the frontal, temporal, and parietal lobes. The fourth lobe is called the occipital lobe and is important for vision. Two additional major structures of the brain (the cerebellum and brain stem) are not addressed here. These and other important structures that are buried deep within the brain are often affected in dementia and are the focus of current research to better understand their effect on cognition and behavior.

The cortex is the surface of the brain. It looks a little like noodles stuck together. This is where the most sophisticated cognition (that is, higher intellectual thought processes) takes place. In this handout, we focused on the cognitive abilities of the cortex.

Each lobe and hemisphere plays a major role in its own set of cognitive abilities. We listed only a few of these cognitive abilities in this handout. Other areas of the brain play a role in all of these abilities as well. There is a complex overlap and interaction of these abilities among lobes and between hemispheres that varies from one person to the next. In addition, each lobe and hemisphere communicates with each other in complex ways, which also vary from one person to the next. This outline of the general

location of various cognitive abilities in the cortex, within each lobe and hemisphere, therefore, is oversimplified and generalized.

The organization of cognitive abilities also depends upon a person's structural dominance, as is partially evidenced by their hand dominance. In this handout, the person described is assumed to be right handed. Left handed persons are usually similar to right handed persons. Some left handed persons, however may have abilities controlled by both hemispheres or more rarely by the hemisphere opposite of what is listed here. For most right handed persons, major damage to the left hemisphere causes the right side of the body to be weaker and altered in its ability to feel, notice, or recognize stimuli on the right side; and major damage to the right hemisphere of the brain causes similar effects on the left side of the body.

The amount of brain damage required in each lobe to create cognitive and behavioral changes depends upon the individual brain, person (including for example, age and general health), and circumstances.

As a person ages from birth to old age, each lobe and hemisphere becomes increasingly specialized in the cognitive abilities it performs. When part of the brain is not working well, the rest of the brain tries to take over the abilities associated with the dysfunctional part. The older the brain is, the more specialized each lobe and hemisphere has become, and the more difficult it is for other parts of the brain to take over the affected abilities.

In disorders that cause dementia such as Alzheimer's Disease, while compensation or repair mechanisms may be at work, the pathological changes appear to spread more quickly than the ability of the other parts of the brain to take over the lost abilities. In less progressive disorders, such as some strokes, even brains that are quite advanced in age, seem to recover abilities more easily than they do in dementia.

Cognitive Abilities, Emotions, and Behavior

Each person's brain (healthy or not) is different from everyone else's. Therefore, each person's cognitive abilities are different from everyone else's, especially which cognitive abilities are strong and which are weak.

A person's cognitive abilities can also vary from moment to moment and over time. This means a person's emotions and behavior can also vary moment to moment and over time.

We always need to watch a person carefully to discern how well their cognitive abilities are working at any given moment, and therefore which support strategies will likely be the most helpful.

We must also remember to focus on cognitive abilities that are working well and even becoming stronger, as well as those that are weak (which can be relied on and which need support).

Because brain functioning is often affected by outside sources, there are certain triggers that can cause momentary changes in cognitive abilities, emotions, and behavior. Such triggers can often be easily "fixed" to reduce or prevent these momentary changes.

Some triggers of momentary changes in cognitive abilities, emotions and behavior:

- Pain with or without movement
- Hypersensitivity to touch, sound, smell, taste, and visual stimuli, such as light
- Temperature fluctuations in the air, water, and inside the person's body (possibly due to the body's reduced ability to control its own temperature)
- Sensory changes with age or otherwise (hearing, vision, touch, smell, taste)
- An unmet need or desire
- Feeling overwhelmed
- Feeling alone, frightened, or worried
- Feeling sad
- Confusing cues
- A need for more information or repeated information
- Not knowing what to do next
- Something in the environment (e.g., change, something interpreted as scary or aggressive, too much noise or visual stimulation, unfamiliar people or objects)
- Fatigue
- Hunger (or perhaps high or low glucose levels in the blood)
- Needing to use the toilet or feeling discomfort in the abdomen
- Dehydration
- Infections, especially Urinary Tract Infections (UTIs) in older adults
- Medications (type, amount, timing, etc.)

Websites for Caring Sheets

1. The Michigan Mental Health and Aging Project in Lansing, Michigan:
<http://www.lcc.edu/mhap>
2. Improving MI Practices website by the Michigan Department of Health and Human Services (MDHHS):
<https://www.improvingmipractices.org/populations/older-adults>
3. Michigan Department of Health and Human Services (MDHHS):
http://www.michigan.gov/mdhhs/0,5885,7-339-71550_2941_4868_38495_38498---,00.html