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Balancing Brain Communication Links

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Abstract. This paper traces the communication links within the brain and between the brain and the muscles and discusses the need for balancing and integration of these links. It shows how learning problems and stress and pain problems can be related to the performance levels of these communication links.

Communication within the brain:

Our brain is a collection of separate parts that must learn to work together. To help explain this, neurophysiologist, Dr. Paul Maclean, who heads the federal government laboratory of brain evolution, has developed the concept of an evolutionary "triune" brain structure (ref. 3), as shown in Figure 1.

At the top of the spinal cord we have a brain stem. At one time in the evolution of vertebrates this was all the brain the organism had. It is often called the reptilian brain. Most of our automatic and instinctual responses (fight or flee, etc.) come from the reptilian brain.

Also found on the back side of the brain stem is the cerebellum (see figure 3), a very old part of the brain from an evolutionary point of view that is responsible for the subconscious coordination of all muscle movements.

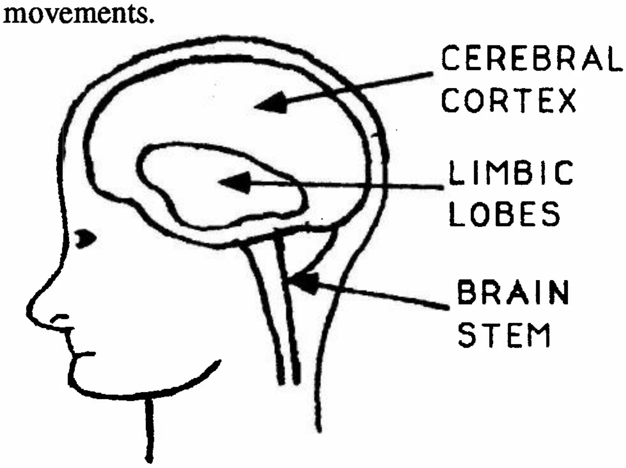

Figure 1

On top of the brain stem, deep within the cerebral cortex, is found the next step in evolution, the primitive mammalian brain, often identified as the limbic lobes. The mammalian brain is found in all mammals including the most primitive mammal. This is the seat of our emotional responses.

As mammals became more highly evolved, they developed a cerebral cortex surrounding the mammalian brain. This is where our logical thinking, voluntary muscle control, centers for vision and other senses are located. When you look at a frontal view of the brain, it looks like a giant walnut. The brain has a deep notch running from front to back. It looks like half a shelled walnut. (See Figure 2)

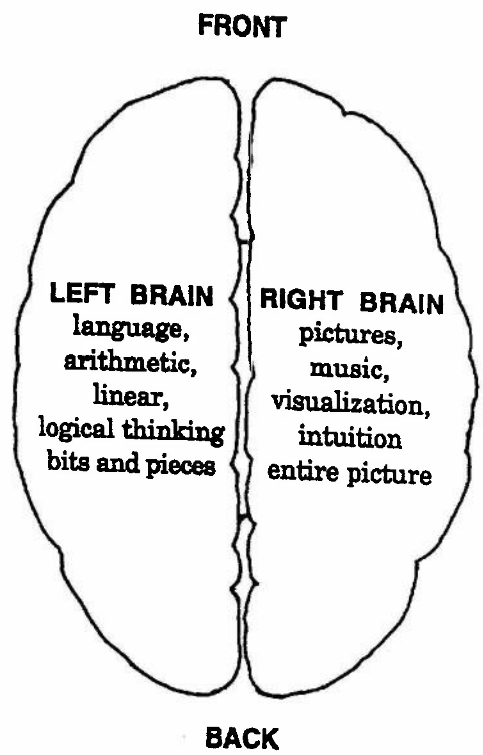

Figure 2

Thus in the cerebral cortex we have what are called left and right brain hemispheres. The neurons running between the body and the brain cross over in the medulla (a part of the brain stem, see figure 3) so the left hemisphere is associated with the right side of the body and the right hemisphere with the left. Between the two hemispheres we have a narrow communication bridge that we call a corpus callosum.

We need to communicate between these two halves of the brain for many activities. The left hemisphere we can call the linear logic language hemisphere; the right brain is the visual and integrating hemisphere. The left brain is reductionist and sees our world as little bits and pieces, and the right brain sees the big picture. Artists and creative people generally work out of their right brain. Accountants, and other people who do detailed things, usually work out of their left brain. Western culture is primarily left brain oriented and eastern primarily right brain oriented

Think of a simple task like reading. First of all you are scanning a page back and forth with your eyes. When your eyes are over on the left side you are activating primarily the right brain, and when your eyes are on the right side you are activating primarily the left brain. So you are switching the visual motion back and forth through the brain visual center line.

When you are looking at symbols and forming them into words, your left brain, the accountant, thinks "c" plus "a" plus "t" = "cat", and "j" + "u" + "m" + "p" + "s" is "jumps". To make sense, to integrate the idea of "cat" and "jumps" you have to go to the right brain. It is the right brain which creates the meaning and produces the concept of a cat jumping. So one major problem in dyslexia is lack of communication between the left brain and the right brain hemispheres.

The cerebral cortex extends over the entire top of the brain from front to back. The logical thinking takes place in the front, the voluntary muscle control and sensations in the middle, and the visual integration centers in the back. So here we are looking at the need for front-back integration.

We also have to be able to communicate between our rational brain in the cerebral cortex, our emotional brain in the limbic lobes of the mammalian brain, and our instinctual brain in the brain stem. These are located one on top of the other; so we are looking at up-down integration.

What we strive to do with our brain integration exercises (see References 2 to 5) is to do a three dimensional integration. We have the **right-left integration** of the two hemispheres of the cerebral cortex, the **front-back integration** that integrates the frontal, parietal, and occipital lobes of the cerebral cortex, and finally the **up-down integration** that goes from the cerebral cortex through the mammalian brain to the reptilian brain and brain stem. Thus we have all these forms of communication going on. For optimal thinking and optimal behavior, we want to integrate the communication between the various parts of the brain in a 3-dimensional manner.

Information organization and memory

The old conventional way to organize information is with a hierarchical structure. Common examples of hiarchical structures are conventional outlines, organization charts, and catalogues. We start with a source subject. It splits at the first level into various subjects and then each subject may split again at the next level, etc. Diagrammatically a hiarchical structure may look like an upside down tree. In a hierarchical structure when we want to go from a point one or more levels down to another subject on another branch, we have to go back up to all the levels and back down again.

The brain does not work this way. It works by association. The Internet is a good example of how the mind works by way of association. As you "surf the net" from "link" to "link", you may find many different facets of information, all linked by the thread of association. You do not have to work in an "orderly fashion". When someone says something, you might think, "That reminds me of ..." Or somebody might be eating a apple, and you might think, "That reminds me of the time I fell out of an apple tree and hurt my leg." That's jumping across from one memory site to another. That's association, and the brain works by association.

Some of the associations are very functional, but frequently when we have a problem in our performance, we find some associations are dysfunctional. For example Hap has a throat problem which may or not bother him, but he has associations that may aggravate his throat problem when trigered. When certain things happen, his throat will become stressed and he has difficulty speaking. There is an emotional coupling there, and to clear his throat problem permanently he may have to figure out how to break that emotional coupling and association. So the mind works in this way by association. We work to defuse dysfunctional associations. This is another level of communication taking place in the brain.

Brain-muscle communication

The final thing we want to talk about is communication between the brain and muscle structure. When a person wants to raise their right arm, they send a message from the left side of their brain down to their right arm telling it to move. The signal goes by what we call the efferent nervous system, goes down the spinal cord and out to the muscles, telling some muscles to contract and others to relax. How does the body know when to stop?

Suppose we want to touch our nose. How does the body know when our finger gets to our nose. We don't do very much thinking about it because we have an automatic feedback system, an afferent nerve chain going back to the brain. So we have a message going out to the arm muscles, and a message coming back, a feedback system. We have a two-way communication. There are two different sets of nerves to do these functions, the efferent and afferent.

What you have in the muscles to generate the feedback signals are proprioceptors. The ones we primarily use in the muscles are called spindle cells. Muscle fibers tend to be long spaghetti-like masses that contract. Spindle cells are also like long thin cells that are mixed in with the muscle cells. When the muscle gets shorter, the spindle cells shorten up and send a message back to the brain saying that the muscle is getting shorter. Then again there is a communication going on here. When we have muscle aches and pains, limited range of motion occurs because this communication is not happening properly.

This is another level of communication. What was happening was that muscles have to work together, they have to communicate. (Some muscles have to relax when you use other muscles. (Examples: Biceps/Triceps or Quadriceps/Hamstrings.)

This coordination takes place in the cerebellum, an adjunct to the brain stem, our reptilian brain. It works like this. When you decide to make a voluntary movement, you send a signal from the front part of the cerebral cortex to the cerebellum by way of the pons. The cerebellum then sends directions to the muscle control centers in the back part of the frontal lobe of the cerebral cortex. Then the efferent nerve system carries the signal from here to the appropriate muscle groups. The proprioceptors then send signals back to the brain with the afferent nervous system. They enter the cerebellum by way of the medulla and appropriately modify the signals the cerebellum is sending to the muscle control centers in the frontal lobe.

When the cerebellum is not sending the appropriate signals to the muscle control circuits, the muscles do not interact properly, and you may experience pain and limited range of motion due to overly

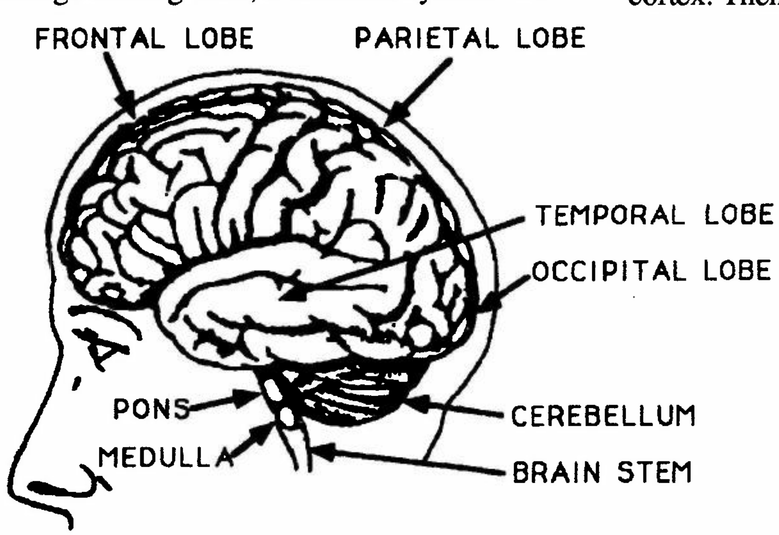

Figure 3
(adapted from a Three In One Concepts graphic)

tight (hypertonic), weak (hypotonic), and reactive muscles. If these conditions persist long enough they can lead to secondary problems such as tendonitis, neuritis, herniated discs, and damaged joints. The stress and pain can be released by re-establishing the body-mind and brain-muscle communication through balancing weak, reactive and frozen muscles so that the cerebellum now sends the optimal messages to the muscle control centers in the cerebral cortex.

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