

NEUROSCIENCE APPLIED TO REASONING AND CREATIVITY

By Dr. Néstor Braidot¹

Professional success comes from constant learning.

*How to improve our brain abilities in order to generate
creative and diverse thinking.*

Brain hemispheres, reasoning and creativity

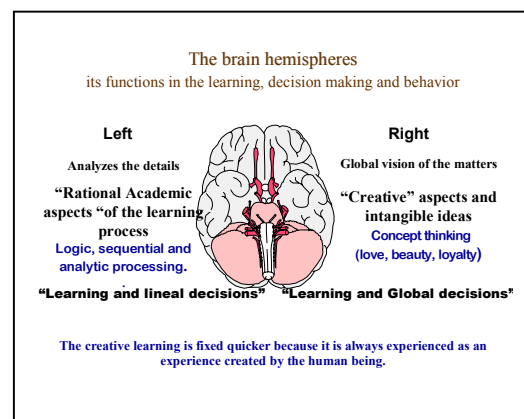
The human brain divides the tasks into two hemispheres; it is the union of two minds².

The functioning of one of them is the mirror of the other. Normally they are connected by a number of fibers, which allow a permanent dialogue between them.

Ongoing research suggests that the information that reaches the brain for its elaboration enters into one hemisphere, which will immediately send it to the other through the callosum corpus. For example: the visual information that is generated in the left half of each eye goes to the right hemisphere and vice versa.

The neural routes of the body also end on the opposite side of the brain. For instance, most of the auditory information is elaborated on the contrary side of the brain related to the ear that receives the information. The olfactory sense is the exception since the smells and odors are processed in the same side of the nasal nostril that captures the olfactory information.

This means that the information which is received in one half is available for the other instantly and the responses that are produced are in harmony. However, it is important to know that there are differences between them; each half has its



¹ Director de BrainDecision Center / Profesor de la Universidad de Salamanca.

² Roger Sperry received his Nobel prize for the discovery of split brain.



own strengths and weaknesses, and its own ways to process the information as well as different capacities.

*The **left hemisphere** is calculator, communicative and is able to build complicated plans, while the **right** one is more emotive, conceptual and has holistic thoughts.*

The general disposition of the hemispheres quite coincides with the ideas generated in literature:

- *The left hemisphere is analytic, accurate, numeric, logic and sensitive at the same time while the right hemisphere is more imaginative, the day dreamer, and processes the information in a more integral, conceptual and holistic way. That is to say, instead of breaking it into pieces, this side relates it more to the sensorial perception than to the abstract knowledge.*
- *The right hemisphere captures globally the information while the left one concentrates on the details.*
- *The right hemisphere distinguishes images in complex context; recognize the outlines at first sight while the left hemisphere decomposes the complicated schemes in parts.*

The information perceived from the environment is separated in different parallel ways inside the brain getting a different treatment in each one of these ways. Each hemisphere will perform the tasks and activities for which it is better prepared according to its way of functioning: holistic or analytical.

“In most of the right people (97 %) the left hemisphere is specialized in language and in other tasks that involve a serial processing of the information, while the right hemisphere performs the non verbal processes that include dimensional visualization, mental rotation of the objects and understanding of face expressions”.³

Evidences show that the patterns of this brain asymmetry could differ in both sexes depending particularly on the maturity rhythm of them.

Different experiments which involved children of several ages show that at an early age -for example at the age of six-, boys perform tasks and games related to their dominant brain, that is to say dominance of right hemisphere in the left hand and vice versa, while girls do not demonstrate the bilateral differentiated representation of superiority of one hand respect to the other until they reach the age of 13.

In conclusion, boys reach a brain specialization degree before girls. From another point of view, girls have a more holistic awareness, a more integrated brain, in for a longer period.

³ E. Kandel, Jessell y Schartz, “Neurociencia y Conducta”, Prentice Hall 1997, p.632

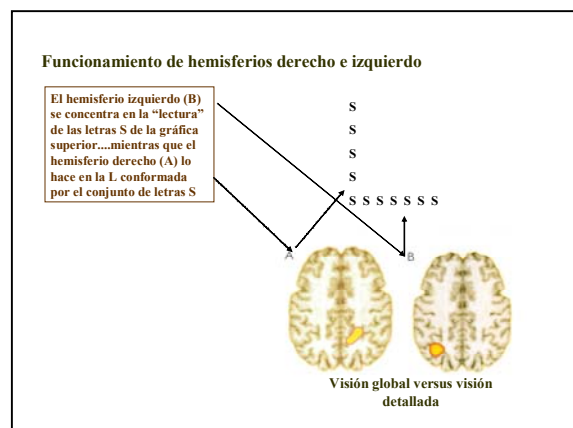
These differences are sustained by the physiological differences that exist between both hemispheres. If we open the hemispheres, we would find a mixture of gray and white matter. Central bodies of cells compose the gray matter of the brain and they are located fundamentally in the cortex that has just a few millimeters of width. The white matter is under the cortex and faces of axons that are “filaments” or strings of cell bodies, which transmit messages, form it.

The distribution of the white and gray matter is not regular. The right hemisphere has more white matter, while the left one possesses more gray matter⁴.

This distribution is significant because it demonstrates that the axons of the right hemisphere are longer than the ones of the left hemisphere and consequently, they connect neurons that are, in average, further away than the others. This means that the right hemisphere is better equipped than the left hemisphere to make associative and derived conclusions as a result of possessing several modules of simultaneous activity for that.

These neural connections of the longer way explain why the right hemisphere tends to produce wide and versatile concepts (although vague and diffuse) helping to integrate sense stimuli with emotional stimuli, as it occurs when we evaluate art or we understand the sense of humor.

On the contrary, the neural net of the left hemisphere is formed by a dense and crowded number of neurons with short and tight connections, providing a better training for a more detailed work which requires concentration and depends on the straight and close collaboration between the brain cells dedicated to similar functions.



An important part of the human behavior (either buyer or member of a working team or decision maker of an enterprise) comes from the right hemisphere. We perceive millions of stimuli minute by minute. Nevertheless, we are conscious only of a few of them, a little percentage that “remains fixed”. The rest goes in and out of our brain, leaving no mark behind.

Some evidences of the effects of the brain partition into hemispheres

If any of these stimuli or surrounding information is sufficiently outstanding, they could create an instantly emotional response in the right hemisphere although

⁴ R. C Gur et al, “Differences in the distribution of gray and white matter in human cerebral hemispheres”, Science, 207:44-36, 1226-8



they are not sufficiently important to generate the conscious perception in the left one.

These so called “semi-perceptions” are responsible for those sudden and strange undesired irritations or the unexplained eventual melancholia that people suffer from time to time.

The division between the two hemispheres is evident for instance, when someone contemplates art. The frequent expression in front of a masterpiece “ I like it but I don’ t know why”, not necessarily indicates ignorance about it but simply that the masterpiece or work is being observed by the right hemisphere and not analyzed carefully and “explained” by the left hemisphere.

Even advertising is frequently designed to exploit the differences between the two hemispheres. The emotional one is address the right hemisphere due to the easy and simple way in that it is impressed. The rational one addresses to the left hemisphere, that always show a “ rational and critic attitude”.

The adverts that use more visual techniques than words, more emotional plots than rational ones, are precisely addressed to cause an impact in the right hemisphere although they are not registered by the left hemisphere, as it occurs with the words in a message that require “ to be rationally analyzed by this left hemisphere”.

At this point, it is interesting to analyze that in general people rarely admit that they have taken an arbitrary decision.

. “In a well-known experiment, a group of women have to choose some nylon tights. Once they were asked about their elections, they gave detailed, careful and sensible explanations related to the differences in color, texture, or the quality of the material, without taking into account that the tights were identical. The reasons for choosing them in fact were rationalized explanations built to explain an emotional behavior, that has no rational explanation”.⁵

It is interesting to consider that many times we give “rational “explanations to our “irrational behaviors”, even knowing that we are betraying ourselves. For example, many times government makes decisions that are “objectively irrational” and however, no one would admit it. On the contrary, they rationalize “the logical fundamentals” of those decisions in order to justify their actions.

The three brain levels. Thinking cortex, limbic brain and reptilian brain

It is interesting to analyze now the structure of the brain and the intervention in the decision making process and in the behavior.

⁵ Michael Gazzaniga, “*Nature’s Mind: The biological roots of thinking, emotions, sexuality, language and Intelligence*”. Harmondsworth, Penguin Books, 1992).

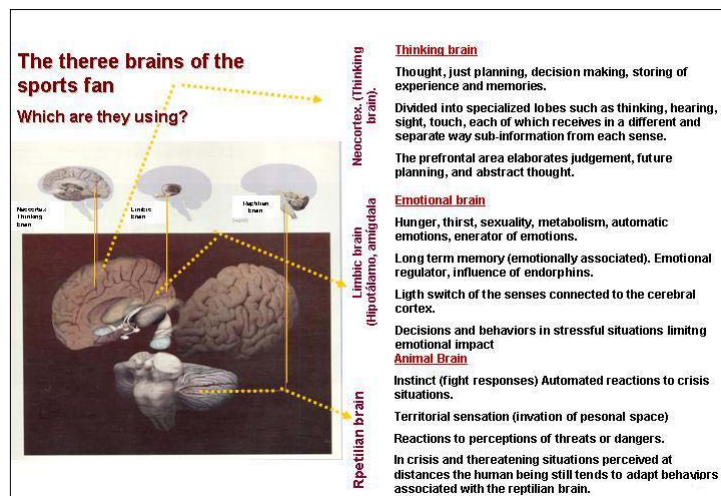
In this sense, if we split the brain with a front to back line, separating the two hemispheres, we will find under the cortex a complex fan of modules, tubes and chambers, each one with its function and interconnected by axon strings as if it were a complex wire line-block. This is the cortex or the thinking brain.

Most of the modules are gray while the bands which connect them, the axons, are clearer because they are covered with a substance called myelin, which isolates and facilitates the electric connectivity among the neurons.

Under the wrinkled cortex -and as a division between the mass of the modules which are under it- it is possible to observe a curved band of white tissue which is the callosum corpus, bridging the two hemispheres. It transfer information from the right hemisphere to the left one and vice verse, so as they behave like one most of the time.

The limbic system formed by all the modules that are under the callosum corpus is the oldest area of the cortex, known also as the mammals' brain, due to the fact that it appears among the mammals.

This part of the brain and also the oldest areas, which are even under the limbic - that is to say the reptilian brain- is unconscious, although it is deeply connected with an unconscious part over them (the cortex) and permanently transfer the information upwards.



For example, emotions, which are our most basic brain reaction, are generated in the limbic system, apart from most of the vital impulses of human being. The thalamus, for example, is a real transmitter that directs the information generated to the correspondent parts of the brain.

On the other hand, the hippocampus performs a very important function in the long-term memory while the tonsil, which is in front of the hippocampus, is the one that perceives and generates fear.

If we continue going down, we would arrive to the so-called brain stem or reptilian brain. It is the oldest part of the brain and its name, reptilian, comes precisely from those antecedents. In fact, its shape is similar to the reptiles nowadays.



The brain stem is basically formed by nerves, which run all the body upwards by the spine cord carrying the information to the brain. Cell groups from the brain stem determine the alert degree of the person and regulate the vegetative processes of the body such as the breathing, heart beats, blood pressure, etc..

The importance of the study of these three levels consists in considerate the differences in the reactions, responses or decisions when one or the other brain level is predominant.

An instinctive decision, practically unconscious of the reptilian brain differs from the emotive reaction from the limbic or from the thinking and relaxed cortex⁶. If we compare the three different levels, we could distinguish three different business behaviors.

The lector has to consider which one of these is the most accurate.

⁶ There are several researches that demonstrate the different reactions of humans in these situations. See "Consumers during crisis: responses from the middle class in Argentina", in *Journal of Business Research*, In Press, Available online 28 July 2004 Leon Zurawicki and Néstor Braidot

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