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Neuroscience, education and mental Health

Neurociencias, educación y salud mental

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Summary

The following article presents a series of investigations, reflections, and quotes about neuroscience, education, and psychology. Each area is specialized in some matters but at some point they share territory and mutually benefit one another, and help us to increasingly understand the complex world of learning, the brain, and human behavior. We hope them to be of interest and a promoter of new thoughts.

Keywords: Neuroscience, triune brain, mirror neurons, learning, reading, mental health, sense of humor.

Resumen

El siguiente artículo presenta una serie de investigaciones, reflexiones y citas sobre las Neurociencias, la Educación y la Psicología. Áreas cada una especializada en ciertas materias, pero que en algún momento se encuentran y comparten territorio, se nutren entre ellas y nos ayudan a entender –cada vez más– el complejo mundo del aprendizaje, el cerebro y el comportamiento humano. Esperamos que sea de interés y dé impulso a nuevas reflexiones.

Palabras clave: Neurociencias, cerebro triuno, neuronas espejo, aprendizaje, lectura, salud mental, sentido del humor.

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Introduction

Neuroscience and the Homo Sapiens.

We have always been told that the man is Homo sapiens, a man who knows, a wise man. Whoever says that forgets that the man by nature (and evolutionary chronology) feels first and then thinks. The man is a "feeler", emotional rather than wise. We see it both in the history of mankind and the ontological development of every human being. Feelings (such as fear, joy, anger and pain) are first and then higher cognitive processes (such as imagination, analysis, deduction and reason) will appear.

Based on the neuroscience, a successful developing field, we know about the different brains we have. Paul MacLean (1913-2007), a famous American neurologist, proposed the theory of the triune brain, composed of the *reptilian* brain, which regulates the basic elements of survival; the *paleomammalian* brain (limbic system) involving the emotional experiences, and the *neomammalian* brain (neocortex) that allows the interpretation of events and decisions made thoughtfully. Unlike the vast majority of inferior mammals, human beings have three brains.

> The triune brain theory conceives the person as a being composed of multiple interconnected and complementary capabilities; hence its comprehensive and holistic character that helps explain human behavior from a more integrated perspective, where the thinking, feeling and acting fit together in a whole, influencing the performance of the individual, both in personal and work aspects as well as professionally and socially. (Velásquez et al., 2006, p. 232).

Laboratory studies show that brain areas more related to humanity and civilized behavior are directly related to the frontal lobe, responsible for judgment, impulse control and planning, among other functions, and these areas appear activated mostly as we grow; on the contrary, in the child

and adolescent there is a predominance of limbic areas (LeDoux, 1999). An additional fact: some studies have found that there is damage in frontal and prefrontal areas in the brains of serial murderers and schizophrenics (Gil Verona, 2002).

The facts of growing, learning, socializing and maturing have relation with a good brain performance and, especially, with the neocortex areas. Furthermore, it is being studied how verbal and psychological violence would be delaying the normal development of the brain during childhood (Mesa-Gresa, 2011). This makes sense since infants and children hurt this way then have problems with their self-control, learning and emotional balance. Neuroscience shed light on the interesting and complex psychological world.

Male Brain and Female Brain.

Scientific studies have been giving some light on the complicated world of genders and gender relations. Trying to explain certain differences between men and women has been the task of psychologists, sociologists, anthropologists, and sexologists and now neuroscientists (Ledoux, 1999; Iacoboni, 2009).

We can see how there are significant mental and behavioral predispositions by gender. So for example, child hyperactivity and aphasia (language impairment) occur more in boys than in girls; depression is mostly suffered by women; and schizophrenia, autism and psychopathic personality disorder occur more in men (Aamodt & Wang, 2008; Bragdon & Gamon, 2005). Why do these situations happen? Is it because of bad luck, fate or the stars? Of course not. Science, especially neuroscience, is providing other interesting answers. Answers that do not rule out (and often complement each other) family and sociocultural (learning, treatment, customs) aspects.

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A few decades ago it was proved that the corpus callosum (area connecting the two brain hemispheres) is thicker and larger in women than in men. It was found that women use both hemispheres for almost everything and that the man brain produces testosterone since it is in the womb, that is, since he is a fetus. Furthermore, the hypothalamus is almost twice the size in men than in women.

Following these patterns, we note that emotionalism and organization are usually female characteristics, while violence and corruption are mostly male. Women have better emotional memory, while men do better on tests of mathematical reasoning and mechanical-spatial tasks. Men are better able to focus on one task at a time; while women can perform more tasks simultaneously. The subject is long, but these are just a few examples (Ledoux, 1999; Santana Martinez, 2010; Aamodt & Wang, 2008).

By this we are not stating, as it could be erroneously interpreted, that one gender is better than the other or certain qualities or problems are unique to men or women. On the contrary, knowing each other better at a mental, gender and behavioral level could be helpful in the process of personal development and social coexistence.

The Discovery of Mirror Neurons.

In 1996, the Italian neuroscientists Giacomo Rizzolatti, Leonardo Fogassi and Vittorio Gallese, who were studying planning and motor control, placed electrodes in the brain of a monkey. They noticed that when one of these animals watched the other perform an action, some of its neurons (in the motor area) reacted. It is said that, at first, they thought it was an error in measurement or equipment failure. After verifying everything was fine, they found an enormous scientific discovery.

Then, almost by accident, as many important discoveries also occur, they found a group of neurons called *mirror neurons* or *specular neurons*. This name is given to a certain kind of neurons that are activated when an animal or a person observes an action performed by a similar. That is, it is enough to observe another doing something so that, similarly to what happens in their brain, in our brain these neurons are also activated. Such neurons were observed first in primates, then they were found in some birds and, in the same way, in humans (Iacoboni, 2009).

Later studies showed that mirror neurons are activated not only when we see someone performing a particular action, but it is also enough to imagine it; for example, when we imagine doing something like climbing a tree. It appears that, to some extent, the brain does not differentiate what is real from what is a product of imagination.

The discovery of mirror neurons allows us now to understand why when we see others yawning, laughing or crying there is this sort of "emotional connection" (if any) with these people, producing a "contagion" that reproduces in us those behaviors (also yawning, laughing, and maybe, crying).

This neuroscience discovery provides a better evolutionary and cerebral explanation for a number of aspects such as learning, imitation, identification and empathy, among others, so important for life and, above all, for social life. It is also likely that these neurons circuits are not activated or are deficiently activated in psychopaths, schizophrenics, in the most severe autistic and mentally retarded people (Iacoboni, 2009; Santana Martinez, 2010). Neuroscience continues providing us with answers.

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The Book and the Cell Phone.

We propose the following exercise. Place a book and a cell phone close to a child, then check which one of these two objects this child chooses. Chances are they end up choosing the cell phone, which is nothing unusual since it is a device that allows interaction, has sound effects, images and games. This is where an adult comes into the picture. As adults and rational people we know that the main aspect humanity needs in its development process is the word, the verb, the argument. Reading and writing are uniquely human tasks that allow us to adapt, socialize and solve many problems. As adults we seek, that humans, since childhood, learn the importance of reading and the pleasure of it. This will allow us to get closer to civilization, understanding and culture. But nowadays children at a very early age, some even babies- have access to cell phones, tablets and TV, and learn to use them well before reading. We see how their brains are getting used to not to read, limiting their imagination, verbal development, ability to analyze and organize ideas (Sartori, 2004).

During a recent media interview the writer and professor Jorge Eslava, reminds us that *"a good reading is an experience of intelligence and imagination, and also of sensation. I think that developing reading in children cultivates and shapes their spirit" (*Eslava, 2015, p. 7). Meanwhile, for psychologist and writer Pilar Gonzalez Vigil, *"reading develops children's imagination. Now it is known that, thanks to neuroscience studies, our brain does not differentiate between what we imagine and what we experience in reality. Therefore, in their minds, readers live the story with the characters"* (Gonzalez Vigil, 2015, p. 7). In these two comments we see that promoting the habit of reading is fundamental in people. Like any good habit, it should be promoted since childhood since a child will not do it by himself/herself. A child will go for the cell phone (given to him/her whenever requested) or for the TV (which is on at all times), on the contrary, we should get him/her closer to texts, books in creative, fun and loving ways. Reading (especially

from an early age) promotes attention, imagination, creativity, and empowers abstract thinking and language development (Beltran & Seinfeld, 2012). Other people consider that reading leads us to learn many other things like tolerance and even moral lessons. Meanwhile, writer Marco Aurelio Denegri considered it "the only healthy vice". He says: "It is oddly a medicine that satisfies a vice, a healthy vice. The only healthy addiction: reading" (Denegri, 2011, p. 70).

Peruvian Consumerism.

It starts from unnecessary technology to TV programs that stupefy people.

> *"The danger of the past was that men became slaves. The danger of the future is that man may become robots"*
> Erich Fromm

"The world today is a Popeye world ", says the psychologist Claudio Garcia Pintos in his book *La vida es una moneda* (Life is a coin). It reads as follows:

> Strength comes in the form of a beer, sleeping pills, pills to have a greater sexual vigor, latest generation phones and amazing cars that show our social level, etc. We believe that we are what we have, what we show off, what we do. We buy, eat, take, but the needle is still not found. (Garcia Pintos, 2010, p. 90).

At present a person (child or adult) keeps on consuming little things, creating something odd: this person gets addicted, and from that point forward they cannot consume any less of those. This person will need an equal or greater amount of these things in order not to suffer from the corresponding withdrawal syndrome and thus they will continue befuddled. It is said that nobody is forced to stop doing what the law does not forbid, and there is no law prohibiting the numbness and dumbing down of people or spreading filth, as it is done by many of the mass media (especially when

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it is approved by the people: meaning rating); therefore, the nefarious circuit continues. We have investigated this point in a previous work (Arboccó & O'Brien, 2012). Behind all this there are petty interests, monopolies and power groups and a void social conscience. It is more convenient to have a mass (of voters, readers, viewers, and listeners) numbed, confused, idiotic, ignorant and fearful; so they will be more manageable and will be "less dangerous". Nowadays we are already seeing young people's low level of reading comprehension. It is also true that this problem has several causes.

Finally, let's remember a reflection of Mario Vargas Llosa in *La civilización del espectáculo* (The Civilization of Entertainment):

> The obsessive acquisition of manufactured products that keeps goods manufacturing active and growing, produces the phenomenon of "reification" or "objectification" of the individual, that is, Individual who is devoted to the systematic use of objects, often useless or superfluous imposed by fashions and advertising. In these way people are emptying their internal life of social, spiritual or simply human interests by isolating and destroying their consciousness about other people and themselves. (Vargas Llosa, 2012, p. 16).

Homo videns.

"*We live the culture of ignorance"*
Giovanni Sartori

In his book *Homo videns: la sociedad teledirigida* (Homo videns: the remote control society) (2004), the Italian political scientist Giovanni Sartori analyzes the danger of exposing children (he calls them the video-children) to trash television, and gives us a series of statements and statistics which could be taken into account in many social realities. These statements and statistics are properly posed and founded in his book. For instance, it indicates that a child absorbed by the TV, it is a child that does not read. TV radically changes and impoverishes the cognitive apparatus of the Homo sapiens. A child who during his/her development only sees images is reduced

to be a man who does not read; and later an adult who will only respond to audiovisual stimuli (Sartori, 2004). Furthermore, he reminds us that the act of seeing is atrophying the ability to understand. The number of people who read is rapidly decreasing, and what is worst is that (in today's world) "it is no longer necessary to read".

In his research, Sartori points out that a young person, before finishing his adolescence, will have observed hours and hours of trash TV (Sartori, 2004). That child will then become an adult with deficient capacity to read and will only respond to audiovisual stimuli. Among the psychological mechanisms in response to trash TV are: identification with certain characters, imitation, indirect deterioration of certain topics when treated superficially and without professional advice, incorrect association of certain stimuli (violence-daily, woman-sexual object, happiness-consumerism, homosexuality-disease, couple's love-suffering, among others); desensitization to other people's pain; and vulgarity. The huge social influence of TV and other media exponentially multiplies the negative effects of this type of messages (Sartori, 2004).

Thus, we are witnessing how the media contributes to the construction (and destruction) of ways of being, models of individual and collective behavior. We think that this is how poor, uneducated and sensation-dependent (imagines, sounds) models are formed. In this way stimuli linked to thought (reason and logic) are put aside.

Reading as a protective shield.

"Reading what we are passionate about will be the only thing that will help us tolerate existence"
Ernesto Sábato
"Reading is a weapon of resistance to animality"
Jorge Eslava

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"You're not depressed, you're distracted", says to us the Argentine singer Facundo Cabral. We remembered him a few months ago when we visited another edition of the Lima Book Fair. Today we talk about bored children and teenagers (adults too), children and youth with attention and concentration problems, and depressed people. I wondered why?, if there is much to read, many worlds to know (through reading), maybe we are not sad -as Cabral said- but we are inattentive, distracted, looking at the wrong places, looking for things where we don't have to, receiving stimuli sent by the media that actually don't stimulate but deteriorate us cognitively and affectively. (Sartori, 2004).

Have you ever heard the phrase *pain is inevitable, suffering is optional*? We think suffering is part of life, not just because life is all about regrets, but because sooner or later we will have to face unavoidable and *extreme situations*. For example, a disease, the death of a loved one, separation, climate shocks, epidemics, economic crises and other contingencies involving being alive. Interestingly death is what seems to give meaning to life. Knowing that our life will come to an end not knowing when gives us three possibilities: I freeze or get demoralized, I get stuck, or (this is the best one) activate my creativity and try to do something for myself today. Today, because I do not know if I will be alive tomorrow. Today I can decide to live, learn something, read, meet someone, walk, forgive, etc. If I were eternal, or had full assurance of living 3500 years, I think that everything or almost everything would be so boring and lethargic. The awareness of one's finitude can encourage me to live better, work, study, improve my relationships, love what I do, avoid unnecessary pain and face many things with a sense of humor.

Reading is a rewarding hobby. If it becomes a habit, we believe it can become a protective shield against some societal ills. This is a vaccine against stupidity, boredom, vulgarity and fear. In this shelter we let our imagination

fly, enhance our concentration, stimulate our thinking and language skills, as well as our intelligence in general and level of knowledge.

Going back to the subject of suffering, we believe that there is a normal, necessary, healthy suffering, from which we can even learn something, emerge stronger, more dignified and empowered (Frankl, 1991). I also believe that there is so much sterile, neurotic, stupid, soap-opera-type of suffering. Moreover, many people do not read, but watch soap operas and other programs called "trash TV" (Arboccó & O'Brien, 2012).

Mental health and sense of humor.

"Humor is the highest manifestation of the individual's adaptation mechanisms"
Sigmund Freud

"The intellectual power of a man is measured by the amount of humor that he is able to use," said the philosopher Nietzsche (2007). It takes a while to develop the habit of laughing at oneself, especially when a person comes from a home where this was not frequent, or it didn't happen at all. For example, when a patient at a doctor's office begins to face his/her problems in calmer way, sometimes taking distance from worries to put things in perspective; and they are able to laugh at their setbacks, weaknesses, flaws and neurosis, it is a sign the psychotherapeutic process is working.

Having a sense of humor doesn't exactly mean to be the funny one or the clown the group. Sometimes, people wear a mask to cover some pain or dissatisfaction. Therefore, when there is a lack of authenticity they cover it by making a face or a joke. The sense of humor is an attitude towards life, oneself and others. To life itself.

Psychologist Marta Guberman reminds us of the decongestant and purifying power of laughter: *"Laughter has a cathartic effect. Perceiving how ridiculous a situation is gives the person enough detachment to understand*

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it. Humor can enable a person to critically diminish the importance of all kinds of experience or situations" (Guberman, 2013, p. 139). This ability to laugh at oneself and life makes pain less intense, as Victor Hugo said: *"Laughter is the sun that drives winter from the human face"*.

All current psychological tendencies acknowledge the value of humor on the mental health of people. Good mood and sense of humor are directly linked to mental states such as motivation, joy, performance and social closeness. Neurophysiologically, our body produces large amounts of substances such as endorphin, vasopressin and oxytocin, all of which relieve pain and increase the feeling of pleasure, promote closeness, and stimulate physical contact. *"Laughter is a valuable exercise for health"*, this was affirmed by Aristotle centuries ago, without neuroscience at the time.

Thus, sense of humor is an important topic that has been long being studied by the sciences. And, apparently, it is a serious subject. (Alemany & Cabestrero, 2008).

Teaching for Life: An Example.

Looking for information on the web about education in other places, we found information about teachers in countries like Finland where education is more valued than here. We found out that...

> Finnish teachers have a high degree of autonomy. Their national curriculum proposes general guidelines on the contents of classes, but each school and school board can adapt these guidelines to their particular situation and even experiment with new methods. Teachers spend at least two hours a week to self-improvement, and must participate annually in training sessions to improve their competencies. (Caro, 2014, p. 1).

All psychopedagogic theories should be able to adapt to each school's situation. It is a nonsense to try that a class in Lima is the same as a class in a school of the jungle of Peru; or that the same school working material can be similarly used in Miraflores as well as in a school of the highlands of Peru. The context surrounding each one creates different demands and possibilities. Let's proceed,

> Unlike their American or Norwegian peers, just to mention two examples, pedagogues in Finland distrust standardized tests. They prefer daily assessments that allow them to check students' progress and adapt their class according to each student's needs. Interestingly, when their students participate in international assessments, such as the Programme for International Student Assessment (PISA), tend to get the best grades on the planet, along with other world powers in education such as South Korea, Singapore and Japan. Moreover, besides the traditional academic activities, elementary schools curriculum include other equally important activities such as art, music, cooking workshops, woodworking, metallurgy and other manual skills. Finnish people believe that, during their childhood and adolescence, students should find out what their passion is, appreciate work and grow in harmony with their communities instead of being loaded with abstract knowledge of science and humanities. (Caro, 2014, p. 1).

In short, Finland's purpose is to teach for life, while here we continue to teach subjects which often make no sense for students, wasting hours, efforts and reducing their interest.

Finland news regarding education are encouraging. Good things should repeated, copied and it is even better if they can be improved. We all agree that preschool education is the key for the students' future performance. Therefore, having access and quality education at this level is a priority. Let's analyze it. At age 4 and 5, less than a half of the Finnish

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children attend kindergartens. They do not start attending school until age 7. However, two years later, their scores on the PISA assessment are better than the rest of the evaluated countries. It would seem a contradiction, but it is not. During the first six years of primary school, children have the same teacher in almost all subjects. This teacher ensures that no student is excluded. It is a way of strengthening their emotional stability and security. There are no numerical grades until the fifth grade since they do not seek to encourage competition or comparisons among students. Professor Nora Bär tells us that, according to Pasi Sahlberg, a professor at the University of Helsinki and director general at the Finland Centre for International Mobility and Cooperation, the "Finnish way" is not based on rigor and competition, but collaboration, creativity, equal opportunities and training of educators (Bär, 2013). They use a cooperative and group approach. In addition, besides the traditional academic activities, primary schools include other equally important activities such as art, music, cooking workshops, woodworking, metallurgy and other manual skills.

Bär points out that classes (in groups that do not exceed 25 students) usually are held between 9 am and 3 pm. School also provides books and lunch that should cover 30% of the nutritional needs. It also provides educational support for those who need it.

> For this reason, teachers are considered the key to Finland's educational success. They are selected from those who get the highest grades in secondary school and they are required to have a Master's degree. In that country of just over five million people, teaching is one of the most prestigious professions and, despite the requirements, it attracts the interest of almost 25% of the students" (Bär, 2013, p. 1).

An important fact is that in Finland, more than 90% of students continue studying and more than 50% of the population participates in adult education programs. Only 8% of Finnish students do not finish their

compulsory education. It is important to highlight the fact that education is free from kindergarten to university and it includes classes, food and study materials.

Finland's success is based on three aspects: family, school and society (Government), promoting social and cultural resources (libraries, play centers, movie theaters). All three institutions are linked and work in a coordinated manner. Family occupies a central place in the academic performance of children. In this country, parents are convinced that they are primarily responsible for their children's education, ahead of teachers, and that they complement the effort made in school. We wonder if in our country, parents have it just as clear or they rather wash their hands when talking about their children's low grades. According to reports, 80% of families in Finland goes to the library on weekends. It is the same here? In fact, how do many Peruvian homes have something similar to a library? Let's analyze it and do something about it.

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