

Thinking Medicine Metaphorically

Present medicine has reached an amazing technical-scientific development and is on the verge of a potential revolution due to the convergence of cellular genetics and manipulation, nanotechnology, biosensors and informatics. The doctor-patient relationship has not followed a similar development, and one of the major criticisms to current medical practice is its poor "humanism". There are great difficulties in reestablishing the doctor-patient relationship. Primary health care structure, even in egalitarian systems with family doctors, gives rise to short visits and a practice divided in myriad mini subspecialties. In other systems, the problems are even greater. On top of these limitations, a negative aspect is the scarce relevance granted to medical education besides technical-scientific matters, restricting creative ideas or proposals tending to solve these problems. For the necessary re-elaboration of our thoughts and practice, we must profit from the rich resources provided by psychology, linguistics, communications and human sciences in general. This letter is directed to travelling through some of the territories belonging to the metaphor universe to explore whether the unexpected advances in this area in the last decades can help us in the path of our self-education.

THE METAPHOR AS A BASIC TOOL OF THOUGHT

Metaphors were traditionally considered a rhetorical-poetical resource not contributing to the essence of concepts or thought, an ornamental and decorative element of language. A revolutionary redefinition of the metaphor concept arose in the eighties. Working independently in cognitive linguistics, Lakoff and Johnson (1) and Reidd, (2) postulated that metaphors are essential elements of language and thought. Following explanations have been drawn from these authors.

What is a metaphor?

Let us begin with a functional description.

Metaphors enable understanding an idea or conceptual domain in terms of a different domain.

When speaking of our life experiences, for example, phrases such as "the pathway we choose... the traveled roads...we move today towards..." are frequent. Life is explained by means of a structural metaphor: **life is a journey.**

In this case we understand an abstract existential domain such as life by means of a more defined domain of space and movement, the journey.

The first phrases we enunciated use different met-

aphorical references submitting to a structural metaphor, **life is a journey**, which summarizes a series of associations between both concepts. If we understand this structural metaphor, we can interpret metaphors referring to this domain even though we have never heard them before: he arrived at a crossroads... he got lost in this short-cut... the storm carried him to a bad harbor...

These references are not decorative or poetic, but essential to understand aspects of life. We cannot think the complex elements of our reality without metaphors, and the more abstract the problem, a larger number and "layers" of metaphors will be necessary. Thus, when we refer to time, life, love, partner, emotions, symptoms, aims, sense, values, good and evil, health, medicine, cardiology, and diseases we constantly do it with metaphors.

Some characteristics of metaphors

Irreversibility

When we declare that time is gold, the gold allows us to understand some aspect of time (cherished-valuable). The reverse is never possible: gold is not time, same as a journey is not life.

Sense of metaphors

The metaphorical process goes typically from the most concrete to the most abstract, and not in the reverse sense. Concrete refers to greater proximity to the body development, its physiconeural experience and its interaction with the environment. In the two mentioned examples, there is no doubt that we have experiences of journeys and gold, with greater relation with our senses and body than the more intangible concepts of life or time.

Structural metaphors

A relevant aspect of these investigations is the search for structural metaphors. Technically, linguists assemble together expressions referring to a specific subject (e.g. time) and name structural metaphor the common conceptual root that allows its understanding. For example, when we speak about time it is frequently said that time is gold....he wasted his time...he invested many hours....he took advantage of that morning...he squandered his best years.....not a penny of my time...

We can understand any of these statements because they refer to a familiar structural metaphor: time is a commodity

There are extensive lists of structural metaphors

collaboratively explored by linguists. (3) These are some examples of structural metaphors:

The brain is a machine: his gears creaked, he lost a screw

A social organization is a plant: our society has deep roots... it nourishes from...the fruit of our activity...the sap of society

A social organization is a body: the vertebral column of the movement... the armed appendage of militant activity... a party parasite...

Metaphors are a matter of thought and not merely of language

This statement is crucial at this first stage of metaphor exploration: metaphors allow thinking about a subject, they are not linguistic resources but conceptual tools. When we associate life to a voyage, we generate a map of correspondences leading us to assume that our life is analogous to the conditions that characterize a voyage. If life is a voyage it has a sense, destination, velocity, obstacles, crossroads, detours, risks, categories, beginning and end. When we think about a subject as a structural metaphor, this approach necessarily highlights some features and hides others, which may be considered from other metaphorical points of view. "Knowing a structural metaphor is to know a group of maps applied to the pairing between destination (what we want to describe) and source (what allows us to describe it).

Opposite metaphors to think complex subjects

If we ask ourselves what is love (couple relationship), we can resort to multiple structural metaphors. Love is a voyage, magic, war, a society of pairs, a refuge, possession, among others. Since the predominant way of explaining a domain defines the reality we dwell on, it is possible that if two persons that become a couple have opposed conceptual frameworks, they will find difficulties in strengthening their bond.

Who poses the question wins the debate. Metaphors in politics

The conclusions about a problem will depend on the metaphors that allow us to think about it, so he who sets the title of the debate has all the advantage to win it. In a conflictive subject such as abortion, establishing a debate with the title "the rights of the unborn child", is opposed to "the rights of a woman over her body", and forwards the beliefs of the person who frames it and the possible conclusions.

Lakoff published a small fascinating book, Don't think of an elephant, (4) to explore the metaphors underlying the Republican thoughts in the United States, and recently a new book with the purpose of building metaphors to convey the central ideas of Democratic thinking. (5)

The author frames a question to explore the metaphors of Republican ideas: How can a person feel respectable if he sustains that it is not correct to favor

the admission of the poor or minorities to the university, who claims that each person should be in charge of providing the money to pay for his healthcare and if he doesn't have it, it's his problem, or that the United States has the right to invade countries to improve democracy?

The answer is quite clear. The Republican concept relies in at least two metaphorical layers: 1) society (the world – the country) is a great family, and 2) the family model: the State should behave as a severe and demanding father. If a son does not work it is good to punish him or that he suffers hunger to make him learn from experience; helping him excessively weakens him, he must open his way in the world on his own. Able people are responsible for educating and establishing the rules for those who do not find their way, with severe and even painful measures. In this conceptual model, the metaphor of the Democratic Party is that of an affectionate, tolerant father.

Metaphors do not explain why the United States has invaded Irak, but allows understanding why so many of its inhabitants admit an intervention even at the cost of hundreds of thousands of lost lives, thinking that they benefit a postponed country which has not yet learnt the virtues of democracy.

A recent declaration of Obama summarizes the repercussions this way of thinking has had on politics:

"When I think about what we've done well and what we haven't done well, the mistake of my first term was thinking that this job was just about getting the policy right. And that's important. But the nature of this office is also to tell a story to the American people that gives them a sense of unity and purpose and optimism, especially during tough times." (6)

As we can see, the purpose of imposing a story is not exclusive of a line of thought or a peculiarity of our country, but maybe a universal rule of politics.

THE CONCEPTUAL METAPHORS THAT ALLOW US TO THINK ABOUT MEDICINE

What is a disease?

In another letter I have discussed the implications of the adopted health-disease definition on the medical point of view. (7) In essence, there are at least two opposed visions:

The one we might call naturalist claims that a disease is a kind of internal state with impaired normal functional capacity, that is, with reduced capacities below their typical functional ability. Thus stated, it is postulated as tangible and statistical.

The other vision, which we might call functional or evaluative defines a disease as the incapacity- inability of achieving the necessary and sufficient objectives for minimum happiness. Each view implies a different way of interrogating the patients, and conditions the studies we request and the therapeutic recommendations in many clinical circumstances.

Even though science has separated from literature creating a language that pretends to be precise and ob-

jective, (8) a large part of scientific creativity depends on the ability of postulating metaphorical models to complex, incomprehensible phenomena. (9)

In the case of diseases, it is true that disease does not exist as an objective phenomenon, but only people who suffer similar complaints which we can group by their characteristics. We frequently use ontologic metaphors, that is, we provide that behavior with self-living and even human characteristics. Thus, diseases acquire intention, aggressiveness, personality and other multiple correspondences with human characters. (10)

What is medicine?

Table 1 shows some of the metaphorical analogies to explain medicine. (11, 12)

Let us play a little with the consequences of adopting some of these structural metaphors.

Table 1. What is medicine?

Medicine is:
A war
An art
Doctor-patient / mechanic-car
Priesthood
A space where a suffering person and another one who intends to help him meet

Medicine as war

This metaphor is essential to the biomedical model, and requires two conditions: to provide an independent entity to the pathological phenomena calling them diseases and consider the therapeutic resources as weapons. We fight cancer, defeat AIDS, etc. The associations with war have commendable effects in some planes: we doctors share the same army and face powerful enemies, generating motivation, optimism, comradeship and transcendental objectives. Other correlations are more questionable: according to this point of view, patients are not the real focus of medicine, just the battlefield between physicians and disease. Patients have a passive role, with the aggravating circumstance that as in any war one must assume reasonable losses. Other negative features are the gender bias, given the usual association of soldiers-militia as men, and the limitations to conceive the care of terminal patients.

Medicine as art

There is no doubt that the practice of medicine has some correspondences with art: it requires a long technical training, benefits from intuition and creativity, must be applied to each patient with the commitment of an artist in each of his creations, and in every case it is an activity that rises above the mechanic's craft. It is impossible to hide the negative associations: medical art does not produce lasting works, but necessarily short-lived ones. It implies an active executor

on a passive substrate: patients thus go through the clay-canvas-marble categories in the artist's hands and instruments. As a logical consequence, it favors the physician narcissism and the bronze pathology.

Doctor-patient as car-mechanic (technical-hand-made repairs)

This is perhaps the least humanistic of the proposed views, where the body is considered as a machine requiring services and repairs. It is frequent in doctor-patient dialogues, in which many health problems are necessarily simplified. For example: you have a blocked coronary artery; this is like a pipe we will try to open with a system that removes the obstruction. Or, when explaining the heart it is difficult to use another metaphor than pump, with its valves, supply systems, muscular motor, and electric system. Admittedly, this view does not include all medicine, but is one of the medical metaphors we dwell upon daily.

Its limitations and non-correspondences are obvious: it is dehumanizing, it is impossible to know all the patient's pieces for which we will surely find a replacement, we cannot disassemble and assemble it again, and much less declare complete destruction and replace him for a new patient, as a taxi. It has been pointed out that this approach necessarily favors surgical procedures or interventions in general.

Medicine as priesthood

This metaphor is also frequent for medical practice and the analogies are remarkable: patients trust in body and soul, they bare their souls as they share their anguish, secrets and "sins". Doctors must understand their suffering and the patients' losses as relatives, and try to console them.

Abraham Verghese (13) has developed a series of concepts about this vision of medicine. He states that a disease can always be viewed from two different dimensions: a physical deficiency and a spiritual rape. It is not enough to cure the physical deficiency. He postulates a didactic example to explain this concept: some thieves breach at gunpoint into a house and steal a series of objects. Some hours later, the police capture the thieves and recover the stolen goods. The robbery is cured, but those who have suffered it are not healed: the feeling of spiritual rape, the fear and other negative emotions will last many days or even leave permanent marks. To help elaborate this spiritual rape is to adopt the role of Healer, coincident with the priesthood metaphor. "We should not be just doctors, but ministers for their healing... willing to cross the traditional medical-industrial complex threshold and start getting involved with the patient, his life, his family and their own histories. (14) It seems clear that it is almost impossible to adopt this attitude in daily practice and it is possibly inconsequential in most of the activity, but it has a peculiar charm and accompanies the most transcendental moments in the life of every doctor.

Medicine is a space where a suffering person and another one who intends to help him meet

This proposal refers to a meeting between peers, who will have to create a bond and a series of characteristic and unique agreements to this specific relationship. (15) It is a much more relaxed view, as it does not assume artistic gifts or priestly vocations. Nevertheless, this meeting between peers does not mean a real equality: the doctor obviously has a deeper knowledge of health problems, and sometimes takes up total control of a case (resuscitation- surgery under anesthesia). This concept, however, is scarcely used and should be explored, particularly in an era of great availability of information and frequent medical lawsuits. The encounter means an association created to solve problems as a whole, with shared responsibilities and open listening.

Which is the best metaphor of medicine?

The complexity of medical practice generates the need of multiple structural metaphors that necessarily correspond to partial aspects. None of them can embrace the dimension of medicine, which would turn the others useless. The key is that in each clinical condition and each patient we understand which of these metaphors we usually “dwell upon”, what conditions our diagnosis and presumably rational conducts. To express it with some humor, if we wake up in a priestly day we will make diagnoses and recommend conducts differently than in an artistic, mechanical or warlike day. Self-diagnosing our attitude in the face of patients and disease is useful to understand and improve our practice.

METAPHORS OF DISEASE

Susan Sontag generated a passionate debate on the cultural use of metaphors associated to diseases. In her book *Disease and its metaphors*, (16) she explored the socio-cultural view of tuberculosis up to the discovery of its etiological agent and antibiotic cure, as well as of cancer. Her main concern was the stigmatization of the person who suffered the disease. Phrases such as: “if he has cancer it is due to some psychological conflict” and “if he suffers tuberculosis it is because of his consumptive character”. Patients thus become culprits of the diseases they suffer, almost criminals as in the hilarious *Erehwon* utopia. (17) This criticism is substantial and sound, but has a limitation. As we will see later, the metaphors we dwell on condition or associate with certain emotional states of biological functioning, which are related with diseases. It is possible to share Sontag’s spirit to avoid stigmatizing and blaming the patient, but keeping an open mind to understand the relationships between emotions-culture and diseases. (18)

Coronary disease and cancer metaphors

We can explore some coronary disease metaphors from a socio-cultural point of view.

A good example is the famous William Osler description in 1910: “Who develops angina? It is not the delicate, neurotic person the one who develops angina, but the robust person, strong in body and mind, the enthusiastic and ambitious man who indicates that his motor is at full speed.” It is a male disease, of important people that make the greatest effort contributing to social wealth, and are valued members of society. Although epidemiological studies have shown that coronary disease is associated with lower educational levels, and affect women in a great proportion, though 7 to 8 years later than men, these Oslerian concepts persist in our imagination.

Many authors have comparatively explored the social view towards cancer and coronary disease. Table 2 summarizes some review concepts. (19)

The author emphasizes that cardiologists declare that they understand and master coronary and atherosclerotic disease in general, but it is painfully easy to see that they only delay its development, which causes 30% of death in the population in spite of the great advances they claim. Cardiovascular disease is viewed from this perspective as paradigmatic of our socioeconomic system, while cancer appears as disruptive, perhaps by a dual mechanism: one symbolizing a questioning of the social order through the inability or unwillingness of cells to act in a disciplined manner contributing to order and productivity. A kind of unregulated, postmodern, whimsical and anarchic individualism. This socio-cultural reading highlights the female association with cancer and the male association with coronary disease, which may prejudice some of the observed gender bias in their treatment and prevention.

Metaphors of the future and medical rhetoric

In a recent article I have summarized the correlation between positive expectations and optimism with cardiovascular prognosis. (20) In different contexts it has been observed that people with higher scores develop

Disease	Cancer	Coronary disease
Metaphorical parallelisms	Hidden emotions	Stress
	Nature	Culture
	Irrationality	Rationality
	Anarchy	Order
	Woman	Man
Modern cosmologic division	Mystery	Power
	Demanding	Predictable
	Threat	Safety
	Fear	Trust
	Sacred	Profane (mechanic)

Table 2. Qualitative comparison between the socio-cultural view towards cancer and coronary disease (19)

over the years less cardiovascular disease, and when this is present they reach a higher survival rate, (21) a concept that enjoys popular agreement. It is not easy to explain the mechanism of this association, from behavioral (greater self-care, medication adherence) to biological aspects. In this background, lower reactivity to stressful situations has been documented: people with higher scores of wellness and optimism have less adrenergic activation, lower fibrinogen and C-reactive protein increase, decreased levels of cytokines, and of salivary and plasma cortisol, these last markers of stress level. (22)

The optimistic personality has multiple determinants that go beyond the physician's control; however, the metaphorical scenario of the future of the disease is in our hands. Thus, we can describe hypertension as a serious health threat, which implies the need for a strict diet, permanent alert and controls, and medication for life. One of the advertisements on the subject in English effectively said: Do not let this "Silent Killer" take you away from your family and friends. Thereby, we induce to dwell in the ontological metaphor of hypertension as a murderer lurking for a small mistake. In contrast, it can be described as a condition of cardiovascular physiology that may predispose to problems if not treated, but which is nowadays in medical hands and is easily controlled with drugs. This condition allows an ordinary life and an almost normal diet avoiding salt excess. The proposed metaphorical scenarios are indeed very different: hypertension as a threatening, aggressive entity or as a functional condition controllable with medication. The objective to achieve is the same, to reduce the hazard of living with high blood pressure, and the metaphors used will be more or less effective according to the nature of the patients and their context. Undoubtedly, the second approach creates a more optimistic scenario, which may be associated with a more peaceful life and a lower state of apprehension. Few studies have assessed the manner in which medical problems are described and the influence this has on their evolution. In other words, the metaphors of the future and their clinical impact. In some cases it has been reported that lowering the level of fear and anxiety can contribute to fewer medical visits and a faster return to active life. (23)

METAPHORS AND THE BODY

In the first part we have discussed that metaphors explain a more abstract domain through correlations with a more specific domain, accepting as concrete the closeness to bodily experiences. These experiences have elucidated the striking similarity of basic metaphors that in linguistic research appear to be universal and transcultural. In general, in almost all languages, that which is good is warm, positive, bright, and smooth. The difficult part is cold, down, dark and rough. It explains a complex evaluative dimension (good-bad) across domains of temperature, position in

space, luminosity or surface characteristics. The neural theory of language suggests that the universality of these metaphors arises from similar experiences of our bodies in the world. (24) From a childish bodily experience each of these metaphors is associated with rewarding emotions, positive or alternatively negative or threatening, building the correlation map. Kovecses (25) has thoroughly investigated the metaphors on emotions in different languages. A very well explored example is a conceptual metaphor on anger: the angry person is like a container about to burst. Within the framework of this structural metaphor we can understand a phrase like: smoke was coming out of him, prick him and he bursts, I almost exploded, he raised pressure and if not held....., he erupted in insults, he is like boiled milk. This conceptual metaphor is recorded in Anglo-Saxon languages, Latin, Chinese, Japanese, Zulu, Slavic languages (Polish) and Hungarian.

The enunciation of a neural theory of language

The discovery that metaphors are an essential part of thought and their striking transcultural similarity with regard to emotions and basic aspects of life has led to a unifying approach called neural theory of language

This theory proposes that metaphors are constructed by mappings corresponding with basic bodily experiences, most of which are universal. Of course the higher layers of metaphors like "time is money", refer to a particular way of production and circulation of goods that is characteristic of some cultures, and that would be meaningless in peasant cultures.

For this theory, mind and language are "neurally embodied" i.e., they operate on the basis of body experiences mediated by neural circuits. In 1997, S. Narayanan (26) published a PhD dissertation that had a great conceptual impact, postulating a computational model for the neural theory of language. The proposal is that all human cognition, even in the highest level of the most abstract reasoning, depends and uses resources so concrete and "low-level" as the sensorimotor system and the emotions.

Experiments on emotions, metaphors and neural circuits

I will share some experiments published in first level scientific journals, which seem to confirm the neural theory and will help us to understand it more deeply. Although not strictly belonging to the subject, we will start with two studies that explore in one case the specificity of emotional states and in the other the characteristics of emotional empathic perception.

Emotional specificity and empathy

A crossover study was performed in 12 healthy volunteers in whom two films which generated disgust were exhibited in two different dimensions: one projected people eating disgusting foods and the other, scenes

with surgical incisions, blood, and organ exposure. (27) The brain activity was evaluated by dynamic nuclear magnetic resonance (NMR), and also the gastric and cardiac autonomic response. Exposure to spoiled meals generated a higher gastric effect, nausea and activation of the right anterior insula whereas surgical scenes generated a greater cardiac parasympathetic effect and a predominant activation of the left anterior insula. Clearly each emotional circuit, in this case disgust, has a specific recording in the brain and a different autonomic pattern.

The second study was a display of scenes in which actors are exposed to three types of odors: unpleasant (which produce a reaction of disgust), neutral and pleasant. Looking at the scene where the actor smells something unpleasant, volunteers activate the disgust processing area, the insula, as documented by NMR. The study was conducted by the Rizollati group, discoverer of mirror cells and firm Nobel Prize nominee, and carries a very didactic title: we are both disgusted in my insula, thus demonstrating that the neural basis of perceiving an unpleasant smell or of somebody else perceiving it are the same. (28) To understand the expressions of other people we reproduce in our body the necessary neural circuits that activate the experience of this situation, enabling us to recognize it. We think based on our bodily experiences, to understand a face we copy it with microexpressions and tour the neural circuit of that emotion. (29)

Experiments and neural theory of language: Hot, warm and reliable

In a neuroscience study, the task was to qualitatively assess the attitude of filmed people. Inadvertently when entering the room the teacher pretended to have difficulty opening his case, and asked the volunteers to hold the glass he was carrying in his hand. In some instances the glass contained a cold liquid and in others a warm liquid. Researchers found by NMR that those exposed to cold contact developed a greater activation of the insula (disgust). In the evaluation, the volunteers who had had contact with the warm glass evaluated the people being filmed as warmer. (30) Essentially speaking, the concept of hot that leaves a certain perceptual area activated becomes warm when trying to evaluate an attitude or character. Another similar experiment, using a negotiation game, in which the confidence level was evaluated, showed that the warm glass generated a more confident attitude than the cold glass. (31) Specialists in the new field of neuromarketing suggest that serving customers with a warm coffee will improve confidence and sales. (32)

The authors interpret the findings as confirmatory of the “embodied” characteristic of mind functioning, i.e. primary concepts concerning the physical experience (cold) underlying the more abstract metaphorical concepts of social bonding. In other words, to understand the concept of “cold” attributable to the character of a person, we tour the neural circuit of

the physical cold experience which produces disgust in the insula. What is even more intriguing is that “the concepts of physical and social warmth are to some extent interchangeable in everyday life, and that this substitution reflects an unconscious self-regulatory mechanism.” (33)

Tactile sensations and social judgment

Through a series of experiments, we evaluated the influence of incidental tactile sensations and their influence on social judgment and decisions.

- a) Heavy and important: a group of volunteers is given two curricula that are fully equivalent in merit. One of them has a concealed material that increases the weight. In a statistically significant extent higher scores are given to the heavier curriculum. (34)
- b) Hard or soft: in a price negotiation exercise in a school of economics, the negotiators are randomly sitting on hard or soft chairs. The hard chairs are associated with increased rigidity in negotiations (no price reduction, no conditions accepted).
- c) Rough or smooth: having made contact with rough surfaces compared to smooth surfaces renders the interpretation of social contact as more difficult.

The conclusion of these experiments, reported in Science, is that tactile sensations unconsciously modify the conceptual perception and social judgment of complex aspects of human interactions. The relationship with the neural theory of language is clear: to evaluate a curriculum, the activated perception of heavy in the brain translates into a significant value judgment, i.e., to assess the importance, the neural circuit covers all the perceptive areas showing increased activity or sign at that moment and then integrates them into a common interpretation.

Objects and rough people

In an NMR experiment volunteers are asked to touch smooth and rough surfaces. It is observed that the brain triggers an area of the insula and operculum with the rough perception. Then a conversation begins about rough people or rough days (Figure 1). The reference to the word rough activates the same area as the sensation of a rough surface. (35) The brain interprets the metaphor “rough days” through the body neural circuit of the rough experience in the tactile perception. It is surprising that a familiar metaphor continues using somatosensory circuits at its sole reference as probable requirement for its interpretation.

Dirty and sinful, clean and moral

Four experiments were performed to evaluate whether the concepts of unethical and dirty are similarly processed. (36) The fourth experiment is exciting. A group of paid volunteer students were invited to concentrate on recalling immoral experiences of their lives, something very wrong they had done. Afterwards, a distraction survey was conducted by randomly invit-

ing only half of them to wash their hands. When they were leaving, they were informed that a student was doing a research project but lacked funds, requesting free collaboration. The willingness to cooperate was conditioned by hand-washing: 73.9% of those who had not washed their hands accepted, and this was reduced to 40.9% in those who had washed their hands (Figure 2). This experiment shows that physical cleansing alleviates the upsetting consequences of unethical behavior, turning the critical threat to moral self-image less severe. Pontius Pilate, Lady Macbeth, and perhaps baptisms and ritual baths, appear to have a strong neuroscientific support.

Summary of neuroscientific studies and the neural theory of language

The summarized experiments help us penetrate the essence of this theory, which states that we can understand the metaphors of language through the use of neural circuits, allowing us to reproduce in the body the more concrete level that has resulted from bodily experience, and which corresponds to the abstract metaphorical level. We have seen examples of moral disgust - dirty and guilty, hard and severe, heat and warm, rough and difficult.

Quoting verbatim: "We are neural subjects. Our brains take cues from the rest of our bodies. What our bodies are and how they work in the word shape the concepts we can use to think. We cannot think merely anything, only what our embodied brains allow. "*"

METAPHORS AND PSYCHOSOMATIC DISEASES

Just as our body is instantly activated through circuits and sensorimotor maps helping to understand the language and experience in the world, our body biology also has a direct relation with the conceptual metaphors we "dwell upon". We have discussed the specific lower reactivity to stress of those living a state of well-being and optimism, and there is a vast litera-

ture on negative emotional conditions and modification of various body thresholds to immunosuppression, impaired platelet aggregation, cortisol levels, and many other modifications. Emotional states are highly specific and essentially biological. This is well researched for basic emotions (anger, fear, disgust), but much less for social (guilt, shame) and complex (difficult to define in words) emotions. (37)

A key to understanding the construction of complex emotions has been provided by a study that has investigated the sense of group exclusion (social). The authors examined the neural correlates of a situation where through a group game the exclusion of one of the participants was induced. The hypothesis was that the brain foundations of social pain (exclusion) are similar to those of physical pain, which was confirmed by neuroimaging. (38) In the accompanying editorial, a lead-

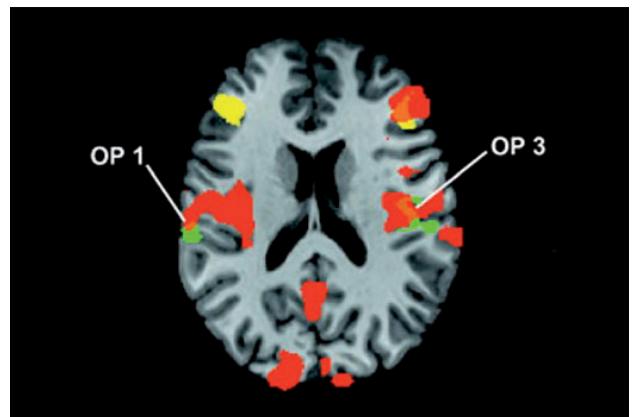
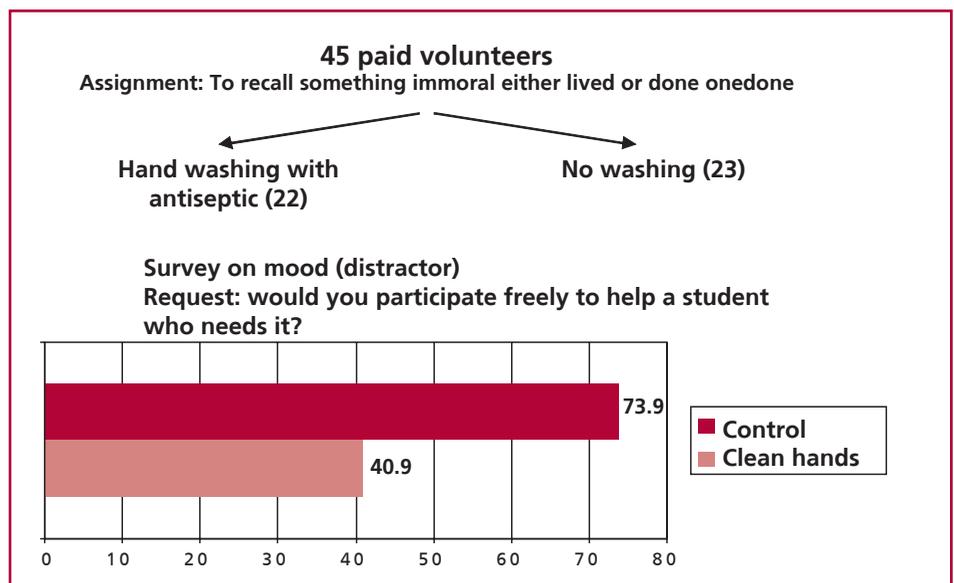


Fig. 1. The activity of feeling rough surfaces plotted in red and yellow is recorded with dynamic nuclear magnetic resonance. Then the activity of discussing a rough day is analyzed and the activated area is green, superimposed on one of the areas of tactile perception of roughness. Reproduced with permission of reference 35.

Fig 2. Summary of the experiment on the influence of hand washing and moral self-judgment (see explanation in the text). (36)



ing affective neuroscience researcher wrote: "Shall we find perhaps that the feeling of 'broken heart' (loneliness, separation, isolation, discrimination) is born in the rich autonomic circuits of the brain limbic system that controls cardiac neurodynamics?"(39)

Can we try to relate heart disease with metaphors?

Metaphors referring to the heart are very numerous in all cultures. (40) The heart is central in metaphors about emotions such as love, anger, anguish, pain, and it is very likely that there is a relationship between cardiovascular disease and the metaphorical "interpretation" of complex emotional situations.

Acute coronary syndromes have a strong relationship with chronic psychosocial factors and acute triggers of negative emotions. Argentine authors have described an emotional pattern in the recent life history of patients with myocardial infarction, which is associated with a situation experienced as degradation and shame, intolerable, requiring an immediate repair that is impossible to achieve, and guilt difficult to attribute. (41) In an as yet unpublished research we have found that in about 50% of patients with recent myocardial infarction histories of this type of emotional experience can be collected. (42) The way to relate the emotional situation, necessarily expressed metaphorically given its complexity, with the pathophysiology of the acute coronary syndrome (vasoconstriction, platelet aggregation, prothrombosis, inflammation) (43) is exciting and so far unexplored.

FINAL SUMMARY AND CONCLUSIONS

Advances in understanding the role of metaphors and the neural theory of language provide rich material for thought and medical practice. I will attempt very schematically five conclusions to delineate areas where it may be relevant.

Think of the metaphors we use to define the medical task, its correspondences and its consequences.

Understand from a sociocultural perspective how we consider our patient's disease and its possible stigma.

Characterize the emotional situation that the patient dwells on both in his previous personal history and in the new scenario presented by the disease.

Enrich the research of pathophysiological mechanisms for acute ischemic heart disease, through the exploration of the metaphors and biology of complex negative emotions.

Provide input to develop rhetoric with medical metaphors that generate scenarios in the minds of patients and families to contribute to their healing.

The development of new metaphors on disease and suffering, based on the perception of new similarities, "can give a different meaning to the experience, that is, to create consistency in highlighting certain features and hiding or dimming others, thus leading to new realities". (9) In any case, knowledge of research which has shown that metaphors are basic tools of thought and that language is built upon our body experience in the world provides concepts that cannot fail to enrich the medical point of view.

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* Feldman, in his book From Molecule to Metaphor: A Neural Theory of Language, Bradford, 2006, postulates that one of the great difficulties in making computers think like humans is the embodied nature of thought. The "body" structure is obviously different, but it is not impossible to build a computer that can learn or invent concepts and correspondences derived from self-perception of states in its circuit (pleasant or unpleasant in some sense). Undoubtedly, its metaphorical creativity will result different from that of humans.

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