

Implications of changes in social cognition in the general rehabilitation process of patients with traumatic brain injury

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ABSTRACT

Social cognition can be understood as the operation of cognitive processes applied to relationships, modulating the behavioral response of human beings in a social group. **Objective:** From this perspective, this paper aims to review concepts of social cognition and its changes in victims of traumatic brain injury with lesions in the frontal region and the implications on the subject's affectivity, as well as the influences on the overall rehabilitation process. The relevance of the study is based on the fact that there is now a growing number of people affected by neurological injuries and who are victims of their implications. **Method:** For this purpose, the methodology used was a review of the literature that encompassed Brazilian books and articles on the topic published between 1994 and 2011. **Results:** The discussion aims to contribute to a better understanding of the loss of neurological involvement, which thereby enables more collaboration with the rehabilitation process and a better quality of life for these patients. **Conclusion:** We concluded that changes of social cognition and affectivity bring several ramifications regarding the development of the rehabilitation program, hence it is relevant in these cases to consider neuropsychological rehabilitation as a process that promotes the re-establishment of social relationships. The role of the psychologist is in helping to build coping strategies for the current condition of people who have suffered this involvement, seeking to provide them a better quality of life.

Keywords: cognition, craniocerebral trauma, rehabilitation

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INTRODUCTION

The *Medicina Física e Reabilitação do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo* (IMREA - HCFMUSP) (Physical Medicine and Rehabilitation Institute at the Clinics Hospital, University of São Paulo School of Medicine) attends to people with various types of disabilities such as amputations, spinal cord injuries, and degenerative and neurological diseases. Among these, the present study focuses on the neurological affliction caused by Traumatic Brain Injury (TBI).

TBI may cause different cognitive, functional, and behavioral deficits, among other symptoms. Neuropsychology, a science that studies the interface of the brain with mental activities, seeks to evaluate and treat these alterations, as well as their extension into the daily life of the patient, their emotional repercussions, and changes in the family dynamics.

Social cognition is included among the various cognitive and/or functional alterations that may occur among people with neurological afflictions, stemming from brain injuries and their possible influences on the overall rehabilitation process.

OBJECTIVE

The objective of this work was, through a bibliographic review, to revisit the concepts of social cognition, considering the aspects of affection and their alteration in TBI victims with injuries in the frontal region, as well as the implications of these alterations in the rehabilitation process.

METHOD

The methodology used was bibliographical review, considering domestic books and articles on the theme, published between 1994 and 2011.

RESULTS

Social Cognition

Neuropsychology is a science that has been studied in its diversity and complexity for a long time, and it is founded mostly by diverse fields of knowledge, among them medicine (neurology, neuroanatomy, and

neurochemistry),¹ physiology, and psychology.

During the 20th century these fields branched out into other areas of research, one of which became neuropsychology.¹ This science is defined by a field of knowledge interested in establishing the relationships between the functioning of the central nervous system (CNS) and the cognitive functions and behavior, as much under normal conditions as under pathological ones. It has a multidisciplinary nature, supported by neurosciences and psychology, and it seeks to treat cognitive and behavioral disorders stemming from alterations in the functioning of the CNS.²

From this perspective, parallel to studies on human development, one of its aspects is to investigate social behaviors that, in their turn, include social cognition.

Initial studies on social cognition date back to the end of the 1960s and the beginning of the 1970s, in which are found different definitions for the theme. One of the pioneer definitions points out that social cognition refers to the way a person perceives and understands other people.³

Later on, the term cognition started being evaluated also as the cognition of oneself, including the way individuals think about others, the way they consider their own thought when in the company of others.³

Another more complete definition that expands the concepts presented until then considers that social cognition also involves the understanding of the relationships between our own feelings, thoughts, and actions as well as the relationships between these subjective factors and the corresponding factors in other people.⁴ This characteristic implies that the understanding of social interaction depends on our organization of social concepts and aptitude to integrate and coordinate perspectives.

Currently, from the perspective of human development, the definitions about this theme indicate that social cognition is the capacity to reflect and understand emotions, interactions, and relationships between people.⁵

Such processes are possible because social cognition is a set of neurobiological activities that make it possible for human beings and animals to appropriately interpret social signals and thereby respond to them appropriately.⁶

We can then infer that social cognition is directly related to the cognitive process that develops the appropriate conduct to respond to other individuals of the same species.⁶

Social cognition also refers to the abilities of identification, manipulation, and adjustment of behavior in accordance with information that is socially relevant, detected, and processed in a determined environmental context.⁷ It is a mental process on which the dynamics of living in society is based. This involves the aptitude of the human being to perceive the intention and disposition of the other in a determined context. This includes abilities in the areas of social perception, attribution, and empathy, and reflects the influence of the social context.⁷

It is possible, therefore, to understand social cognition as the functioning of cognitive processes applied to relationships, modulating the behavioral response of human beings within a social group.

The development of the social cognition processes and cognitive modulation involve some anatomical structures. The main ones are: the amygdala, the ventromedial prefrontal cortex, the insula, and the right somatosensory cortex.⁶

The amygdala intervenes preparing a cognitive evaluation of the emotional content of complex perceptive stimuli and recognition of facial expressions. In addition to this aspect, the amygdala is necessary to have the ability to understand other individuals, as well as to understand other points of view or attribute an intention to a person.⁶

This structure sends references to the primary sensory areas before the cortical representation of the stimulus occurs. Thus, it must regulate, in a directed way, what the sensory cortex processes, in addition to modulating the direction of the attention to dangerous stimuli.⁶

The somatosensory cortex and the insula provide the capacity for empathy or the ability to recognize what the other person feels. This capacity is measured by the ability to reproduce in our own organism a similar emotional state.⁶

The ventromedial prefrontal cortex allows an integration between the perception of an emotion and the response it triggers, whether a complex behavior prepared by the orbital neocortex, or an autonomic or motor response (including attention) through the intervention of the amygdala.⁶

Otherwise, the right somatosensory cortex and the insula allow a correct manipulation of the information needed for the interpretation and expression of facial emotions and, especially, of the eyes (a task it performs jointly with the amygdala).⁶

It is also significant that the basal nuclei, by having the largest interconnection with the ventromedial prefrontal cortex, acts on the pairing of social signals with the appropriate social context.⁶

With these anatomical structures in perfect functioning, it would be possible then, for people to recognize and understand facial expressions and organize their impulses and decision-making, as well as organize and interpret the signs of a group.

Another point to be considered in this study is the proposal that highlights the need for affection and social cognition to be intertwined in the human social life. This perspective makes it possible to understand and investigate various aspects of the socio-cognitive development in social relationships, including those that impact on socio-emotional bonds.⁴

The development of social cognition requires the active participation of the individual in his or her development. This perspective allows one to reflect on how a person perceives the stimuli received from the environment and what happens to that person.⁴

It is possible to observe that the field of neuropsychology undergoes the constant expansion and adaptation inherent to human evolution. In the present study, one of the branches dialoguing with social cognition is the influence of emotions and feelings. Neuropsychology is the branch of neurosciences in which the cognitive and behavioral sciences intersect and blend. In addition, neuropsychology has branches that reach many other facets of knowledge,⁸ such as the emotions, a theme that will be addressed below.

Emotions and feelings

As seen previously, one of the conditions for the good development of social cognition is the recognition of emotions and feelings, ours as much as those of others.

Phylogenetically, emotions can be considered as psycho-physiological phenomena of adaptive value. They serve to designate our positioning in the environment, our closeness to other people, objects, actions, and ideas, and the avoidance of others.⁹

In other words, emotions represent an important role in the development of social cognition, since it is through them that it is possible to perceive the feelings that other people awaken in us, as well as to reflect on what we awaken in other people, within a determined social context.

To understand the neurobiological bases of emotions it is possible to think of two complex processes, but which interact between themselves; one is a physiological process, a set of peripheral, autonomic, endocrine, and skeletomotor responses to particular stimuli, that take information to the lower brain areas, including the amygdala, the hypothalamus, and the brainstem. This system prepares the body for the appropriate behavior and action. The other is the cognitive process, which consists of a paired body experience, being regulated by the upper brain areas, including the cingulate cortex and the frontal lobes.¹⁰

These responses are defined by: acute somatic reactions, momentary, triggered by significant stimuli. Thus, emotion is an intense emotional state, short lived, generally occurring as a reaction of the individual to certain internal or external excitations, conscious or unconscious.¹¹

Emotions are frequently accompanied by somatic reactions (neurovegetative, motor, hormonal, visceral, and vasomotor), more or less specific.¹¹

Within this perspective, emotion would favor social interactions and would therefore have a regulating role in human evolution. To understand this result, it is necessary to know the process of how emotions occur.

An emotion is a sequential process, which starts with the appearance in the mind of an emotionally-competent stimulus. These images (stimuli that are neural signals) are presented in the various sensitive regions that map out their characteristics.¹²

In the next phase, signals connected to the sensory representation of the stimulus are sent to various places in the brain, especially to places capable of triggering emotions, called emotionally-competent stimuli.¹²

For example, the signals that represent a threatening object in the visual cortices are communicated in parallel with various neural projections to other regions of the brain. Some of these receptor regions such as the amygdala go into action when they detect a certain configuration of signals that targets other regions of the brain, thus continuing the chain of events that will become an emotion. By itself, the emotional reaction may reach some useful objectives: hiding quickly from a predator or demonstrating anger towards a competitor.¹²

Some neuroanatomical structures participate in the triggering of emotion. These include the amygdala (located deep in the temporal lobe), part of the frontal lobe called

ventromedial prefrontal cortex, another frontal region in the cingulate cortex, and in the supplementary motor area.¹²

As indicated, for the emotion process, in addition to neuroanatomical aspects, it is necessary that the parallel neurochemical aspects to this functioning also occur. Some hormones are present in the emotion process, such as, oxytocin and vasopressin (both peptides); these are examples of molecules released under hypothalamic control with the help of the posterior portion of the pituitary gland. In the same way, neurotransmitters such as dopamine and serotonin need to be available for the occurrence of certain behaviors (for example, behaviors whose experience is felt as rewarding and pleasant).¹²

It is noteworthy that even considering the neuroanatomical, neurophysiological function in an evolutionary process for the development of emotions, each organism will respond to a stimulus in accordance with its individual history related to that stimulus.

Another point to be considered is the importance of awareness in the singular process of emotion, which does not depend on a state of awareness to occur, however, awareness provides an amplified protection strategy.¹³ In other words, feeling emotional states, which is equivalent to saying that we are aware of emotions, provides us a flexibility of response based on the specific history of our interactions with the environment, which will favor social interaction processes.

Although innate mechanisms are needed to put the ball of knowledge into play, feelings offer us something extra.

As we have seen, when an emotion occurs, there are bodily changes (visceral, musculoskeletal, and neural). At the moment these changes occur, we know of their existence and can monitor their evolution continuously and also become aware of these bodily changes. This continuous monitoring process, this experience of what the body does while we think about specific topics continue to develop, and it is the essence of a feeling.¹³

Feelings are stable and affectionate configurations; in relation to emotions, they are less intense and less reactive to passing stimuli. Feelings are commonly associated with intellectual issues, values, representations, and in general, they do not result in somatic concomitants. By nature they are much more mental than somatic.¹¹

A feeling depends on the juxtaposing of an image of the body with an image of some other thing, such as the visual image of a face or the auditory image of a song. This

process is completed with alterations in the cognitive processes, which are induced by neurochemical substances.¹³

“Juxtaposition” is understood here as the process in which the body itself appears after the image of this “something else” is formed and remains active, and these two images remain separate, in neural terms. Damásio points out the possibility of a “combination” rather than a “mixture.”¹³

It is also possible to think about the existence of qualifying states in the feeling process.¹³ These qualifying states may be sudden and sometimes even undesirable. If there is no motivation in the process of feeling, a physiological alteration can occur, however neutral, in psychological terms.

In this sense, the relationship of a feeling with a determined object is based on the subjectivity of the object’s perception, on the perception of the body state created by the object, and on the perception of the changes in style and efficacy of thinking that occurred throughout this process.¹³

This proposal indicates that a relationship between a person or situation is established with a state of the body through a representation that occurs in the brain. This sensation may come from the brain activity, and with intermediate signals from the body and signals from the entity that causes the emotion, which, therefore, would influence the social cognition process.

Another relevant aspect to be considered is the fact that emotions are not the cause of feelings, they occur in parallel. The same brain agent that motivates body alterations informs another brain region (possibly the somatosensory system) about the type of alteration that will be requested of the body.¹³

Feelings would then have a more mental role in human questions. They are related to the individual experience and are therefore influenced by their context such as the culture in which the person is inserted, as well as the social group in which he or she develops.

We also must think about the decision-making processes, which in the past were seen only as rational. With the current concepts, it is possible to understand these processes as influenced directly by emotional processes. The emotional signal marks options and consequences with a positive or negative charge. This charge reduces the possibilities of decisions and increases the probability of our decisions remaining in agreement with the experiences we had in the past.¹²

In order for this pairing of experience to occur with the cognitive development of the

feeling process, it is fundamental that the neural systems and structures responsible for the integrity of this process be preserved.

It is possible to think about the neural circuits involved exemplifying: when the circuits of the posterior sensory cortex and the parietal and temporal region process a situation that belongs to a certain conceptual category, the prefrontal circuits that detain memories relative to this conceptual category become active. After the activation of the brain regions that triggered the emotional signals such as the prefrontal ventromedial region, there is an activation due to a connection between the category of the situation and the respective emotional and feeling responses that happened in the past.¹²

Our feelings correspond to two processes. One of them would be the alteration in the neural representation of the states of the body in course, since the substances that triggered the feelings also act on the various neural circuit networks whose patterns of activity represent the body. The second implies that the cognitive modes, by which our thoughts operate, also are influenced by these substances.¹³

Another aspect to be considered is that feelings have the power to call attention to the emotions that created them and to the objects that triggered those emotions, as well as call attention to the consequences of an emotive situation, and this is more likely to happen when inserted in a social context.

Damásio points out that emotions occur in the theater of the body. Feelings occur in the theater of the mind.¹³

Feelings are fundamental to the development of social cognition, and understanding the mechanisms by which they unfold allows us to identify their implications when compromised by a neurological affliction such as TBI, for example, an integral part of this study. To better understand the subject, it is important to give a brief description of Traumatic Brain Injury (TBI).

Traumatic Brain Injury (TBI), frontal lobes and associated injuries

Traumatic Brain Injury (TBI) is considered to be any injury that provokes an anatomical injury or functional compromising of the scalp, cranium, meninges, or brain.¹⁴

TBI can be classified by types, with two fundamental ones: open (or penetrating) and closed. The first type is characterized by the production of more discrete or focal deficits. It is less frequent and happens when the head is penetrated with force by some object.¹⁵

The second type more likely causes generalized or diffuse impairment. In this case, the brain damage can be produced at the point of impact (coup injury), or on the brain area of the opposite side, due to the movement of the brain inside the cranium (contrecoup injury). The phenomena of acceleration, deceleration, or rotation of the brain inside the cranium can also effect the neuronal connections (diffuse axonal damage). The nature of the damage will depend on the magnitude of the acceleration, as well as on the direction of the head movement, at the moment of impact.¹⁵

There are two possible classifications of brain injuries: focal and diffuse. Focal injuries generate specific alterations in the functions whose mediations are made by the injured area.¹⁵

The diffuse injuries are small and spread throughout the brain and are associated with the initial loss of consciousness and, in general, lead to a coma state with variable duration.¹⁵

The patient may present only focal injuries, some diffuse ones, or a combination of the two.¹⁵ This will be determined by the type of trauma undergone.

TBI sequelae have a dramatic effect on the patient and his or her family, their community, and to the professionals who tend to them.¹⁶ According to the objective of the present study, the functional characteristics of the frontal lobes will be focused on, as well as injuries associated with them, which is justified by social cognition as well as affective circuits being located in these regions.

Frontal lobes have an important participation in the regulation of mental activity.¹⁷ In relation to the ventromedial prefrontal cortex, patients with injuries in orbital areas present more difficulty in inhibiting their impulses. The medial orbital cortex is related to the “social self.”¹⁶

An injury in this area brings disturbances to the social conduct of individuals. Based on a study with injured patients, researchers describe also that a prefrontal injury impairs decisions and social reasoning.⁶

Prefrontal cortex injuries may provoke important deficits involving cognitive functions, affection, humor, social behavior, movement, personality, and conduct.¹⁸

An injury to the ventromedial prefrontal cortex may cause failures in the use of somatic or emotional signs to guide a person’s conduct. Thus, a person will seem unaware of the future consequences of his or her acts and will act according to immediate perspectives.

Damage to the orbitofrontal region results in a lack of social inhibition, emotional ability, misjudgment, or inappropriate happiness; it is called a state of exaggerated euphoria.¹⁸

Individuals who suffer injuries in cerebral regions responsible for emotions and feelings lose the capacity to control their social behavior.¹² Thus, the capacity to make decisions is strongly compromised, especially in situations of great uncertainty, such as with financial investments, friendships, and marriage, among others.

People afflicted by this type of injury break social contracts. This type of injury makes a person incapable of maintaining his or her social status, and they may lose their financial independence. They are rarely violent, and in their rupturing of social contracts, they tend to not disrespect the law *per se*, although they may certainly disrespect social conventions. However, the general command of their lives is affected. Consequently, they need other people's help for their well-being and even to survive.¹²

Another characteristic of this type of injury is the change in the personality of these individuals. Their capacity to plan activities is compromised in the short term as well as in the long term. As for social relationships, they have difficulty deciding whom they can trust. They lack the sense of what is socially permissible, sometimes in a highly embarrassing way. They do not observe certain social conventions and may also not observe certain ethical rules.¹²

In summary, injuries to dorsolateral regions create deficits, especially in the control, regulation, and integration of cognitive activities. Their symptoms include difficulty focusing and maintaining attention, lack of motivation, delayed answers, trouble with operational memory, lack of mental flexibility, difficulties with constructional and organizational strategies for tasks, with reasoning, and with executive functions, among others.¹⁸ All of these indicate the relationship between the frontal areas to diversified functions, and this study highlights the emotional operational memory in which, as well as in the dorsolateral prefrontal cortex, resides the cognitive representation of the goal of an action in the absence of its immediate triggering (which everyone knows as working memory), "in the ventromedial prefrontal cortex is the emotional representation of the goal of an action, in the absence of its immediate triggering."⁶

In view of the aspects shown here, the psychology professional needs to make the most detailed evaluation possible, so as to create a rehabilitation plan for people with frontal affliction and social cognition alteration. Neuropsychological rehabilitation in victims of frontal afflictions will be discussed below.

Neuropsychological rehabilitation

Neuropsychological rehabilitation is of fundamental importance to develop the physical, mental, functional, and/or social potentialities of the patient afflicted by a neurological injury. This is part of the general rehabilitation treatment for a person with TBI sequelae.

The concept of general rehabilitation is that of a process developed by a multiprofessional health team, with limited duration, whose purpose is to help a person with deficits to reach an excellent physical, mental, functional and/or social level, so as to fulfill current life goals.¹⁹

After the triage process, when the patient starts the general rehabilitation program at the IMREA, he or she receives the following evaluations: Medical, Nursing, Physiotherapy, Occupational Therapy, Social Service, Nutrition, Speech Therapy, Physical Conditioning, and Psychology. In the Psychology Service a psychodiagnosis is made, which, for hemiplegic patients, yields a cognitive and emotional evaluation concerning their functional, social, and family deficits.

A differential psychodiagnosis is a scientifically-based procedure consisting of interviews and the use of instruments and tests to elucidate the case, and in the presence of neurological alterations, a neuropsychological evaluation is necessary in which cognitive, emotional, and behavioral aspects are verified.

A neuropsychological evaluation is a very complex model of psychological evaluation, because it demands from the professional not only a solid foundation in clinical psychology and familiarity with psychometry, but also specialization and training in a context where it is fundamental to know the nervous system and its pathologies.²⁰

When a neuropsychological evaluation is done on a person with TBI whose frontal lobes were afflicted, it presents some specificities such as the difficulty in evaluating the associated disturbances, which is related to the fact that many times they involve deficits

in the processing of one or more aspects of behavioral integration and expression, revealing itself more evidently in the daily life activities of the individual and showing itself in subtle ways in a formal neuropsychological evaluation.¹⁸

In this way, the evaluation of patients with frontal dysfunction must contain specific tests that are sensitive to deficits associated with that region. The examiner must be attentive to the strategies developed by the patient to solve a proposed task, mainly because many tests present no difficulty to these patients. The analysis must be directed much more towards how the patient responds to the stimulus shown than to the result, *per se*.¹⁸

With the help of these instruments to evaluate diversified functions, it is possible to survey data on their influence on the social cognition of a person. Once these evaluations are correlated with the way the individual performs tasks and with the interview with family members, we can evaluate the impact of this person's cognitive social alterations on his or her daily life.

With the data and neuropsychological evaluation analysis, it is possible to plan the objectives of the rehabilitation program.

When we speak about neuropsychological rehabilitation, we must take into consideration that our patient is an individual who, in addition to suffering from a physical disability (hemiplegia, for example), also suffers from cognitive and/or behavioral alterations.

Cognition concerns processes related to knowledge, understanding, learning, perception, memories, judgment, and thought.²¹ When a person suffers from cognitive impairment, it is important that he or she undergo the rehabilitation process. Cognitive rehabilitation can be understood as a process whereby people with cerebral injury cooperate with health professionals, family members, and members of a broader community to treat or alleviate cognitive deficiencies resulting from neurological damage. The objective of cognitive rehabilitation is to enable patients and family members to live with, deal with, get around, reduce, or overcome the cognitive deficiencies resulting from neurological injury.²¹

Although cognitive rehabilitation is one of the components of neuropsychological rehabilitation, the latter seeks more than the rehabilitation of cognitive deficits and emotional and psychosocial problems

stemming from cerebral injuries; these must be approached in neuropsychological interventions.”²²

According to Wilson it is known that these problems (emotional and psychosocial) are intimately related. Emotions can interfere in the manner of thinking and behaving, and cognitive deficits may be exacerbated by anguish and psychological suffering and may cause behavioral alterations. Psychosocial difficulties may also cause emotional and behavioral problems and anguish can reduce the effectiveness of neuropsychological rehabilitation programs.²²

One of the ways to implement a rehabilitation program that seeks the active participation of the patient is to use goal planning to create treatment programs.²² This strategy allows for a treatment to be developed according to the individual needs of the patient afflicted by neurological injury and his or her family members.

Although the emphasis on neuropsychological rehabilitation is frequently directed towards cognitive deficits, the emotional and psychosocial circumstances must be taken into consideration in the rehabilitation process.²² Another aspect to point out in neuropsychological rehabilitation is that the recovery process after an affliction is complex and encompasses many factors, ranging from neurophysiological to psychosocial.

From this perspective, we must consider that the brain goes through transformations over time and a series of functional changes take place that cannot be ignored.

In the field of rehabilitation, one of the properties to be considered is the neuroplasticity process. Currently, the questions related to the brain and its development are more connected to an ecosystem than to a machine.²³ This change in perspective would be related to an evolution of the neurosciences and cognitive science.

Neuroplasticity is defined as an adaptive change in the structure and function of the nervous system, which occurs in any phase of ontogeny, as a function of interactions with the internal and external environment, or even as a result of injuries that effect the neural environment.²³

Within this school of thought, neuroplasticity would be multidimensional, since it delimits the relationship between structure and function because it is an adaptive response, but also as an essential organizational structure of the brain that keeps itself active, in various degrees, throughout life.²³

There are some possible types of plasticity that go from inherent plasticity to development to what occurs after brain damage.

Plasticity after brain damage refers to the configurations of cerebral reorganization after the functional losses consequent to injuries in cortical areas.²³

An effective rehabilitation process stems not only from a comprehensive scientific postulation, but also it is necessary to conciliate with rational strategies and cooperative attitudes that help individuals with brain injuries to deal with the differences in the most autonomous, creative, and constructive way possible.²⁴

We must, then, consider the aspects studied, as well as use compensating strategies such as calendars or bulletin boards.

The new rehabilitation models seek to conceive the patient as a whole, involved in a sociocultural and psychosocial context through which he or she forms a unique identity. The physical aspects must not be separated from the cognitive and emotional aspects.¹⁶ It is essential that the patient have an active participation, that the rehabilitation process make sense to this patient, and that it can be implemented into his or her daily life.

As mentioned before, a person who suffers an affliction in the frontal region shows alterations in different cognitive and behavioral spheres. This is why the neuropsychological rehabilitation of that person must be based on the delimitations traced in the individual evaluation and must consider the difficulties found in the patient's daily life.

It is also fundamental that, starting from the neuropsychological evaluation, the differential diagnosis be taken into account, for it seeks to investigate whether the deficits shown by the patient at the moment of evaluation appeared after some affliction or already existed in the prior history of the patient.

A person who suffers alterations in social cognition suffers all the implications that go with it in the many ambits of his or her life, in the social, emotional, and occupational relationships.

Victims of a frontal affliction evolve with different levels of cognitive and behavioral disabilities such as attention deficits, psychomotor agitation, regressive behaviors, irritability, and emotional ability, which depend on the gravity of the TBI.²⁵

A rehabilitation program proposal for a person with impaired frontal lobes must contemplate the following aspects:²⁵

- Guidance familiar with the behavior management strategies for reducing psychomotor agitation, memory disorganization, and irritable and impulsive behaviors;
- Modification of the environment with control of the stimulation sources;
- Keeping the patient's familiar objects in the environment for personal orientation;
- Promoting every attempt to communicate and offer simple instructions;
- Always identifying ourselves by name, speaking slowly, and pausing frequently. It is important to position oneself in front of the patient and request visual contact;
- When the patient repeats (perseveres with) the same sentence or activity continuously, try to divert his or her attention to a different activity or subject.

Neuropsychological rehabilitation also considers medication treatment with psychotherapy (individual and/or group and family).²⁵ Individual care seeks to organize the patient's routine, helping in the planning of new activities (strategies to decompose tasks), as well as giving emotional support to improving self-perception and behavior control. Later, group work trains social abilities and the perception of inappropriate responses, with the feedback of other participants in the proposed activities.

Rehabilitation also encompasses the professional ambit, evaluating the individual and psychosocial contexts of each individual. It is noteworthy, however, that an early neuropsychological intervention seems to provide a constant learning as to the gradual changes in cognitive and behavioral functioning in the initial phase of recovery. Thus, it helps in preparing the patient and family members for dealing with the rehabilitation process in the long term and its stages, for it foresees change and helps in the adjustment of expectations and in the management of anxiety. This intervention also stimulates the organization of a structured routine and the use of environmental adaptation strategies, which may minimize dysfunctional situations and behaviors in the future.²⁵

The aspects shown so far, corroborate the rehabilitation program of a TBI victim with frontal injury and who suffers from altered

social cognition, since the deficits of this function directly impact the social relationships of the patient. A clinical case discussed in the literature will be presented as follows.

Presentation of the Phineas P. Gage case

*"The affective life is the psychological dimension that gives color, shine, and warmth to all the human experiences. Without affectivity, mental life becomes empty, tasteless."*¹¹

A classic case discussed in the literature about social cognition is that of Phineas P. Gage. Gage was 25 years old and worked as a civil construction foreman in a railroad. While performing his tasks at work, Gage suffered an accident with an iron bar he was using, for there was an explosion and the iron bar perforated his head through his left face, pierced the base of the cranium, went through the anterior part of the brain, and exited at high speed through the top of the head.

Reports at the time said that after recovering from the injury, Gage suffered a significant change in his personality, that is, his disposition, his tastes, his aversions, his dreams, and his aspirations were different from before the accident.

The change in his personality was so radical that his friends did not recognize him and his bosses had to let him go shortly after his returning to work. Gage could touch, listen, feel, nothing was paralyzed, he had only lost sight in his left eye, due to the anatomical affliction. He had no speech or language difficulties. However, he became capricious, irreverent, used obscene language, which was not his habit before. Gage was not Gage anymore.¹³

The case illustrates the aspects pointed out about the concepts of social cognition and affectivity at the time. After an accident, in which Gage suffered injury to his frontal structures, he did not behave like he did before the accident, his social relationships became compromised, as well as his affections.¹³

Social cognition is involved in all the social processes of human relating. For this to occur, the interrelation of many higher functions is necessary.

At the beginning of this study the interconnection of neuroanatomical structures with social cognition was discussed. These structures participate in the processes that involve the frontal regions of the brain and their specificities.⁶

Some aspects of social cognition stand out such as "the capacity to monitor the perfor-

mance of a series of actions or to evoke the order of occurrence of a sequence of events, essential for the development and execution of plans and actions"²⁶ since injuries in these regions may create deficits in the awareness of self (conscious activity), in moral behavior (awareness of social norms), initiative, intention, in forming plans and programming actions, abstract thought and judgment, and also includes integrative functions, motivation, recent memory, selective attention, and planning.²⁶

Once these characteristics are compromised, the way in which the individual positions himself before daily situations and interpersonal relationships will be also compromised.

Among the neuroanatomical systems and structures involved in the social cognition processes, many are involved in the development of emotion and feelings, understood here as affectivity. Once there is an injury to these systems, both aspects are compromised.

The study of emotions evaluates the reactivity, regulation, and interpretation of the emotional states.⁸

Emotional interpretation must be the core of adaptive capacity. A person who cannot discern whether the other is sad or angry, or demonstrates his or her own emotions, will make his or her interpersonal relationships confused and conflicting. Thus, social relationships and decision-making are based on the cognition-emotion.⁸

For a long time, emotions were considered entities distinct from reason, and would therefore not have a significant role in making decisions. However, through research and studies in the field of neuropsychology, it was possible to understand that affective processes are as cognitive as other functions. Consequently, emotions can be investigated and questioned as their to repercussions in decision making, as well as its role in social and interpersonal relationships.

The behavior appropriate to a context interprets the information of the environment and adjusts the action, inhibiting what is considered socially inappropriate.⁸ The frontal lobe functions are indispensable for social cognition. It is possible to think, for example, about the importance of the orbitofrontal cortex that modulates the socioemotional behavior.⁸

As already mentioned, ventromedial prefrontal cortex injuries keep the patient

from showing the "feeling" of a socioemotional situation, although he or she has the cognitive knowledge of its meaning (the person knows, but does not feel). This situation compromises decision-making and empathy.' The dorsolateral prefrontal cortex is involved with both metacognition and moral sense."⁸

As implied in the rehabilitation process, victims of neurological afflictions to the frontal regions will probably show impulsive behaviors, emotional ability, misjudgment, attention deficit (especially selective), memory problems (operational and emotional), and executive dysfunctions including low motivation and, therefore, the patient must be constantly encouraged as far as the gains achieved during the course of his or her rehabilitation process.

In victims of altered social cognition, the rehabilitation process must include: activities that favor new neural networks²⁴ in accordance with the principle of neuroplasticity and that provide functional enrichment in their daily and interpersonal activities; the use of compensating strategies (agendas, and calendars, etc.) and family guidance related to the "personality change" of this patient; and activities that relate to his or her daily situations.

In the field of neuropsychological rehabilitation, individual psychotherapy seeks to favor the self-perception of emotions and behaviors, so that the patient is more aware, in his or her daily life, of the TBI deficits generated.

The new rehabilitation models propose a holistic vision of man, which seeks to unite the diverse aspects of the individual's life, instead of separating the physical aspects from the cognitive and emotional ones, a factor that justifies the need for more articulation between the different kinds of knowledge involved.¹⁶

It must also be considered that the team work be cooperative, for everyone's attitude is in evidence, respect for the patient, capacity for solidarity and empathy, mutual interest, and relating. The psychology professional is part of the interdisciplinary team, and assumes a critical perspective in relation to the rehabilitation of the people who have suffered some physical and psychological affliction; that is, he or she considers the totality of the patient's life as well as the specifics of the rehabilitation process. The goal is to help the patient to face his or her current situation so they can

act and transform their conditions and social relationships thereby favoring a better quality of life.¹⁶

Social cognition is a function that perpetuates all human relating. When compromised, it becomes an impact factor for the patient and family, for it involves a personality change in the person who suffers this affliction. To rehabilitate, in these cases, is directly related to the ability to learn to learn, including the patient's own affections.

CONCLUSION

Neuropsychology is a constantly expanding field, as much in clinical aspects as in the research ambit. In view of this constant development, we have the possibility, as health professionals, to pay attention to these new fields of investigation, as well as to the many forms of human suffering.

Social cognition is a function that is present in all the human relationships. When that is compromised, there can be many impacts for the patients, including in the rehabilitation process. The reason is that, according to the literature, they present difficulties such as: non-cooperation in therapies, difficulty to interact socially, and unsuitable behavior (impulsiveness, exaggerated euphoria, misjudgment). For this the patient may show:

- difficulty adhering to guidance;
- attention deficit (which may compromise his or her participation in activities);
- compromised decision-making capacity (influencing his or her active participation in therapies), which would yield better results if clear and precise coordinates are provided, as well as reminders of those guidelines;
- difficulty in planning (immediate and future), necessitating an organized and structured routine;
- impaired motivation (which must not be confused with lack of interest);
- Memory deficit (especially operational and emotional), which means difficulty in organizing the facts and in the emotional representation of a determined objective in an action, in the absence of an immediate triggering stimulus, that is, affection, which normally would be a facilitator

in the rehabilitation process, but has been compromised here. This guidance helps in the adjustment of expectations and in the patient's anxiety management.

The patient who suffers altered social cognition has ruptured his or her social contacts; the person becomes incapable of maintaining their social status, which can compromise their independence, even financially. It is important to work with the patient's family in order to protect him or her and to develop whatever autonomy is possible.

In the rehabilitation process for TBI victims who suffer altered social cognition, the psychological treatment must strive for cognitive improvement, behavioral adjustment, and compensating strategies, as well as the active participation of the patient in the rehabilitation process so that it makes sense and is tailored to his or her daily life.

A person who has undergone TBI, which results in affective compromising, goes through a transformation in his or her various relationships. Thus, in these cases it is fundamental to consider the neuropsychological rehabilitation as a process that favors the re-establishment of social relationships, seeking the maximum possibilities in the various fields of the patient's life. In that sense, the psychologist takes a critical posture in relation to the rehabilitation of people who suffer some neurological affliction.

Another aspect observed in the development of this study is related to the need for more studies referring to the social cognition area, particularly the rehabilitation of patients with this impairment. There is a need for constant updating by the professionals who work in this area, since the field of human development and neuropsychology advances constantly, following the adaptive and evolving models of the human species.

We conclude that the implications of altered social cognition have effects, especially in psychosocial relationships. The role of the psychologist is to promote awareness of deficits this impairment brings, developing strategies along with the patient, family, and team, to face and transform the current condition, as well as to guide family members in relation to the patient's conditions, so that there can be improvement in the quality of life.

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