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## Leadership and neurosciences: Plausible talks?

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**This paper aims to analyze the perceptions of professionals from psychiatry, psychoanalysis, and psychology vis-à-vis the perspectives of specialists from the area of organizational studies on neuroscience and their implications on the Leadership construct, and to identify the contributions and constraints arising from the connections between both. A qualitative survey was carried out in the form of in-depth interviews with 18 Brazilian individuals belonging to the groups mentioned above. The survey indicated that neuroscience in Brazil might be characterized as an emerging field in its early stages of development. More significant contributions from neuroscience were reported by the members of the group involved with health care when compared to the group of specialists on organizational studies. The data also suggested that the ethical principles pertaining to the use of neuroscience within the context of organizations requires further discussion.**

**Key words:** Leadership, neuroscience, connection between different fields of knowledge.

### INTRODUCTION

One of the latest approaches to leadership has been founded on the investigation of leaders' behavior and performance based on the concepts of neurosciences. These studies assume that understanding the biological factors and neurological system of individuals may contribute to developing and forming effective styles of leadership (Boyatzis, 2008; Peterson, 2011; Lee, 2012). Researchers engaged in studies in this area presented a new perspective on individual behavior changes derived from the integration of neuroscience (studies on brain anatomy and physiology) and psychology research outcomes. Many of these studies start from the connec-

tion between the brain and the mind – human conscience, which thinks, feels, acts and perceives (Rock, 2007). In the last two decades, advances have been made in relation to understanding the cerebral systems and mechanisms that contribute to people's ability to live and deal with a variety of situations. Such studies are an attempt to demonstrate how neurosciences and the biological approach can give rise to relevant insights for research into human behavior in organizations and develop their leaderships (Lee, 2012). Nevertheless, studies show the need to go deeper, since this is a complex and undeniably contemporary topic.

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Therefore, this paper aims to analyze the perceptions of professionals from psychiatry, psychoanalysis, and psychology vis-à-vis the perspectives of specialists from the area of organizational studies on the associations between leadership development and neuroscience studies, and to identify the contributions and constraints arising from the connections between both. Based on this idea, the specific objectives to be investigated are as follows: 1. Perceptions of the professionals interviewed regarding the links between leadership development and neurosciences; 2. Principal contributions and limitations of the neurosciences with leadership development; 3. Main contemporary findings, advances and criticism of such approaches.

Recent studies in the area of leadership – and particularly papers addressing the connections between leadership development and neuroscience – served as the theoretical basis for this paper. In those terms studies were found to emphasize the understanding of human behavior from biological and emotional viewpoints (Waldman et al., 2011; Rock, Schwartz, 2007).

The study can be characterized as exploratory and qualitative considering the gaps in literature about the application of neurosciences in the field of leaderships. In terms of data collection, it is worth stressing that 18 (eighteen) semi-structured and in-depth interviews were conducted based on the profile outlined for the study.

Regarding the relevance of the study, it is understood that neuroscience methods can supplement conventional assessment methodologies used in studies on human behavior in organizations. Secondly, the neurological variables can provide further understanding regarding the phenomenon of leadership, to the extent that they could be used in processes of recruitment, selection and development of leaders. Thirdly, it would be interesting to go deeper into premises and ethical aspects linked to the application of neurosciences, considering their focus and operational systems (Waldman et al., 2011).

In short, there are reasons to believe in the potential of using neuroscience concepts in organizational and leadership studies, and to take into account their possible risks and consequences. However, what do professionals and researchers in Brazil involved in studies on the topic think? What do scholars and professionals involved with human behavior in organizations think? These were undoubtedly questions that motivate this study. But before moving on to describe the empirical findings, the following topic will address a review of literature on leadership and the current status of studies involving it and the neuroscience construct.

## **THEORETICAL REVIEW**

### **Leadership**

Leadership is a subject widely investigated in organiza-

tional studies, considering its complexity and importance for the performance of organizations. There are, consequently, a significant number of theories proposed to understand the topic. However, leadership research still encounters obstacles to evidence and generalization. Although it has a common core between the different definitions – ability to influence people, groups and collectives – a consistent theoretical preparation on the repercussion of this phenomenon in the organizational environment is not yet fully complete (Seters and Field, 1990; Bergamini, 1994; Jones, 2000).

In these terms, a critical understanding of these theories is important in the current context, where environmental and organizational factors demand new leadership profiles. Some examples of such elements worth highlighting are the separation of leadership as an exclusive managerial activity and the creation of new more flexible and organic organizational structures (Stalker, 1961; Vizeu, 2011).

This implies understanding leadership, considering more contemporary prospects, which have attracted little attention in the studies conducted during the 1980s. From the historic viewpoint, researchers found that by the 1970s special mention is made of three major movements of leadership studies: 1. The approach of traits (1940-1950); 2. Behavioral outlook (1950-1960); and 3. Situational leadership focuses (1960-1970) (Bergamini, 1994; Cruz, 2007; Vizeu, 2011).

Although such theoretical currents have contributed to advancing the studies on the subject, many of their results were inconclusive. Pfeffer (1977) points to problems relating to such investigations, namely ambiguity in defining the concept and equation about to what extent leadership causes a direct impact on organizational performance.

In response to such gaps, the notion of transformational leadership emerged in the studies by Burns (1978) and Bass (1985), and is considered, even today, to be one of the most important constructs in contemporary research on leadership (Howell, 1993; Podsakoff et al., 1996). Despite the importance of these studies, some critics reveal that the transformational theory has been concentrated on examining the effects of leadership on individual and organizational performance, in addition to stressing internal organizational factors. Thus, the existing studies have devoted little time to investigation the variables that impact the effectiveness of the transformational leader, including environmental factors, characteristics of the leader, and so on (Howell, 1993; Scott, 2003). One of the latest approaches on leadership is based on linking the topic with the field of neuroscience, detailed aspects in the topic given below.

### **Leadership and neurosciences**

Breakthroughs in the field of neurosciences for

understanding human behavior from a biological viewpoint are being recently included in leadership studies. In general, neurosciences focus on individuals' biological factors. Application of neuroscience techniques in leadership studies may provide insights for understanding the behaviors of effective leaders and, as such, intercession between the two fields is a potential route (Boyatzis, 2008; Waldman et al., 2011; Lee, 2012).

In the past twenty years, major progress has been made in understanding the brain systems and mechanisms that contribute to people's ability to live, deal with different situations and relate to each other in the different contexts of life. Such studies are an attempt to demonstrate how the neurosciences and biological approach can create insights for leadership studies (and vice-versa) (Lee, 2012).

Following this line, Rock and Schwartz (2007) stress that the performance of organizations depends on change in the behavior of individuals to face new challenges. But people's brains are "projected" to perceive transformation as a threat and, consequently, cling to old habits and ways of thinking. Recent advancements in brain research offer a new alternative for organizational innovation. There are signs that managers who understand neuroscience premises can encourage conscious change. This is organization transformation that takes into account the physiological nature of the brain and the mechanisms that predispose people to resist some leadership models and accept others.

From this perspective, what are the benefits of investigating the biological determinants of leadership, specifically variables associated with the human brain? First, assessments based solely on personality are limited both conceptually and empirically in terms of what they can reveal from effective forms of leadership. Moreover, neuroscience methods can supplement the traditional assessment methodologies used in organizational behavior studies (Waldman et al., 2011).

Thirdly, the neurological variables can provide further understanding why leaders do what they do. In other words, if the regions of the brain, like the neurological variables emanating from these regions, can be associated with leader behavior, then perceptions can be acquired with regard to this behavior. In fourth place, a neurological-based understanding of the leader's behavior could generate innovative mechanisms that could be applied to the leadership development processes. In short, there are reasons for the growing interest in understanding the neurological bases of a leader's behavior (Waldman et al., 2011).

The appearance of these recent studies, which address the relationship between mind and brain, can be attributed to American professor George Miller and the Swiss psychologist Jean Piaget. Both endeavored to understand the relationship between human thought and our grey matter, albeit from two very different lines of

research. Furthermore, both took a multifaceted approach by adopting the premise of cognitive neuroscience (Miller, 2003; Lee, 2012).

Miller is a psychologist that, among many other things, studied limitations of the human memory. Piaget, in turn, emphasized investigation of actions and mechanisms of child development. Notwithstanding Piaget's contributions, it was Miller who for the first time attempted to define the approach of cognitive neuroscience, defining it as the discovery of "[...] molecular logic of organic knowledge systems, i.e. the principles that, in addition to the principles of physics, chemistry, biology, and psychology, govern the behavior of inanimate matter in living knowledge systems" (Gazzaniga, 2000, p. 11).

Another top researcher in the neuroscience field is Portuguese-born Antonio Damasio, coordinator of the Brain and Creativity Institute of the University of Southern California. He has conducted studies that have helped identify the neurological basis of emotions, showing that they play a key role in storing information and in the decision-making process.

Damasio's work has given rise to a dialogue between neurosciences with the philosophy of the mind and language, especially with neurophilosophy defined as the philosophical study of the neurosciences. Therefore, according to the author, neurosciences are devoted to the interdisciplinary study of the mental processes or, in other words, the brain processes and neural networks in the complex interactive dimensions of the brain and mind with the cultural, physical and social environment.

Damasio also addresses a series of ethical and moral reflections on the technological innovations produced by neurosciences. Thus, he looks for a multidisciplinary and transdisciplinary perspective of the neurosciences and neurophilosophy with a view to overcoming possible reductionism of earlier studies through an interdisciplinary investigation of the phenomena in the light of the neurocognitive relationship between conscience, emotion and reason.

In fact, several concepts developed in the field of neurosciences strive precisely to emphasize the interdisciplinary approach in this field of investigation. The study by Kandel et al. (2003) not only highlights the notions of thought, learning and memory, but also labeled the construct as follows: "A combination of methods from a variety of fields – cell biology, system neurosciences, neuroimage, cognitive psychology, behavioral neurology and computer science – gave rise to a functional approach of the encephalon called Cognitive Neuroscience" (Kandel et al., 2003, p 382).

Investigations by those authors are founded on some premises: 1. In the same way as the combination of genes influences conduct, behavior and social factors can also act on the brain, modifying the expression of the genes and, consequently, altering the functions of the neurons; 2. Modifications in gene expression caused by

learning give rise to new patterns of neuronal connections.

In this sense, Lent (2005), a neuroscience physician and researcher, stresses the characteristic of the brain's "plasticity" with regard to this organ's capacity to modify as a result of the environment. Such changes may occur for drastic reasons, such as brain damage or for subtle reasons relating to everyday plasticity, that is, by learning, culture, or access to new information and situations.

From other inferences, it is understood that the human being's knowledge systems, such as memory, emotion and language, do not have a real meaning when taken from the context in which they are defined. This is social incorporation, meaning that it cannot have a memory system or any other kind of "knowledge system" without understanding the social environment in which it is developing (Lee, 2012).

Also, the brain's activity is only one part of an incredibly complex system that must be addressed in a social context for proper interpretation. Thus, the environment plays a role in the expression of these behaviors. In fact, an individual's history, in particular, also plays a key role in the executing certain leadership cognitions (Lee, 2012).

With the increasing studies in the field of neurosciences, some lines of investigation or "branches" of neurosciences have been seen to be emerging, which looked to add to the biological factors other important variables (social and organizational, for example). Nevertheless, the area of social cognitive neuroscience, according to Waldman et al. (2011), may apply more to the study of the leadership phenomena.

"Social cognitive neuroscience" is defined as an interdisciplinary field seeking to understand human interactions by the intercession of the cognitive, neural and social spheres. Moreover, it investigates the processes of the human brain that permit people to understand each other, understand themselves and interact effectively in the social world (Waldman et al., 2011).

Goleman and Boyatzis (2008), for example, studied the field of "social" neuroscience. The authors discovered that the leader-follower dynamics is not a case of two (or more) independent brains reacting consciously or unconsciously to the other. Instead, the individual minds, to some degree, merge into a single system. Great leaders are those whose behavior leverages the connection of the system of brains.

A construct indicated as suitable for assessing leadership is Social Intelligence, defined as a set of interpersonal skills built into specific neural circuits (and related endocrine systems) that inspire others to be effective. What is new in this concept is its biological grounding, by which it explains how to translate knowledge about the neurons in "socially intelligent" behaviors,

practices that can reinforce the neural links between the leader and followers (Goleman and Boyatzis, 2008).

Goleman and Boyatzis (2008), based on individual differences in the areas of the brain associated with emotional expressivity, empathy and emotional regulation, suggest that "emotionally intelligent" behavior has a neurological basis. The authors also state that there is a great difference of performance between the "socially intelligent" leaders and those that are not.

In this theory it is assumed that the basis of effective leadership is centered on the leaders' ability to form emotional links with their followers and direct emotions associated with motivation, enthusiasm and commitment to achieve the leader's vision.

Investigation in the field of social cognitive neuroscience may offer useful insights on how the brain can support leaders in their emotional bonds with individuals. Specifically, to help understand certain things that people do, namely, how to influence others; how to perceive their own and others' emotions, and how to take decisions on using their feelings to influence others (Goleman and Boyatzis, 2008).

Another emerging branch of neurosciences is the organizational, which can be seen as an applied form of social cognitive neurosciences that aims to analyze human behavior in organizational contexts. Studies have warned that the set of rules, habits and procedures in the organizational environment, namely, in the work context, influence the exercise of leadership. Therefore, this topic cannot be studied solely under the aegis of "social" neuroscience, since there are various organizations interfering in the system (Lee, 2012).

Such "advancements" led to the conceived notion of Organizational Cognitive Neuroscience (OCN): a view that combines several contemporary currents of thought that use neuroscientific methods and theories to study organizational issues (including leadership) (Lee, 2012).

The neural, social and organizational dimensions have so far been the focus of the existing theory about Organizational Cognitive Neuroscience. When researchers concentrate only on the neural level – without taking into account the organizational and social factors – they run the risk of ignoring important contextual factors about the phenomenon under study. Therefore, the focus is to investigate how leadership and neurosciences can interact, and if neurophysiological adaptations can influence human behavior in organizations and in exercising leadership (Lee, 2012).

Among these findings it was evidenced that social attitudes such as, for example, morality, empathy, reciprocal cooperation and even the perception of social status were highlighted as important in the process of organizational leadership. It was also seen that there is a distinction between the regions of the human brain that generate activation when someone records memories of interactions with resonant or dissonant leaders. Lastly,

some studies stress the role of a person's facial expressions in intergroup communication and leadership (Lee, 2012).

Neurosciences can provide some applications in the area of leadership development. For example, traditional methods of leader assessment could be potentially enhanced by means of examining a neurological profile. Moreover, by understanding the neurological bases of transformational leadership behavior, it may be possible to identify better alternatives for developing leaders in a more realistic and systematic way (Lee, 2012).

Despite the various efforts to bring leadership into line with the neuroscience field, strong criticism has already been found in literature. Ashkanasy (2013), for example, suggests that there is a series of problematic issues, both methodological and moral, in applying neurosciences to studies on leadership and, especially, when using neurological indicators to assess and select leaders. According to the author, the topic "NeuroLeadership" is becoming a new management fad.

On this matter, Ashkanasy (2013) argues that the concept of emotional intelligence is not as recent as it seems, since Salovey and Mayer (1990) introduced it to traditional psychology decades ago. These authors defined it based on four fronts, as ability: 1. to perceive emotions; 2. to assimilate emotional information in thought processes; 3. to understand emotion, and 4. to manage their own and others' emotions.

Shortly after Mayer and Salovey (1990) had introduced the idea of emotional intelligence, Goleman and Boyatzis (1998), after applying this concept to preschool education, published his famous book "Emotional Intelligence: Why it can matter more than IQ". According to Ashkanasy (2013), on this point, emotional intelligence moves from academic construction to a management trend. The author also adds that interest should not be on which measure of emotional intelligence individuals use, but rather on the fact that emotions play a major role in leadership, as well as other dimensions of human perspective feelings and behaviors.

Despite the criticism, academic interest in associating the field of neurosciences with the leadership phenomenon continues to grow, which could contribute to further criticism or elucidation of still ambiguous questions in the existing studies.

## METHODOLOGICAL ASPECTS

Considering the gaps in literature about adopting neuro-sciences in the field of leadership, the study herein can be characterized as exploratory and qualitative (Godoy, 1995; Eisenhardt, 1989; Bonoma, 1985). The recent and complex nature of the topic at hand requires a more open methodological approach, in which the conclusions available in the literature are not imposed.

Qualitative research is the method of choice when one wishes to garner in-depth knowledge over a given phenomenon from the perspective of individuals within the context in which it occurs (Godoy, 1995; Eisenhardt, 1989; Bonoma, 1985).

Another advantage offered by qualitative studies is that their outcomes are essentially descriptive, once the purpose of studies of this type is to produce a thorough understanding of the analyzed phenomenon. Therefore, qualitative research should be performed when there is ambiguity and uncertainty surrounding the chosen topic (Bonoma, 1985; Yin, 2005), as is the case of the association between leadership and neuroscience.

Eighteen interviews carried out in 2013 were used as the basis for data collection. Interviews are a significant source of evidence in qualitative research, particularly when one wishes to acquire an in-depth understanding of a complex social situation from the perspective of the parties involved (Eisenhardt, 1989).

Given the interdisciplinary nature of the studied topic, psychiatrists, psychoanalysts, psychologists, and specialists on organizational studies were invited to take the survey. The perspectives of individuals with different approaches to neuroscience were therefore captured. The study included a convenience sample of subjects with academic and/or clinical experience in neuroscience.

Content analysis, a systematic method used to interpret and describe content in information, was used to treat the collected data. Researchers seek to attain a deeper understanding of the text, examine its various dimensions, and construe inferences from it (Yin, 2005). Richardson (1999) adds that the oldest of the various content analysis techniques is category-based analysis, in which the various elements in the text are coded, categorized, and grouped into analogue blocks.

Based on these considerations, empirically obtained data were grouped into the following categories of analysis, which guided the construction of the data collection tool: 1. Concept of neurosciences; 2. Field of study and application; 3. Pointers; 4. Concerns about the progress of studies on the subject; 5. Contributions to other fields, and 6. Challenges in study and application. These categories also facilitated the coding and interpreting stage of the empirical data, as addressed in the following topic.

## ANALYSIS OF EMPIRICAL DATA

On the basis of the set of collected data, we now present in this item the findings and results of the interviews, considering the investigated categories of analysis.

### Neurosciences: in search of a definition

In the USA the 1990s were considered "the decade of the brain". At that time, researchers in medicine intensified their studies in order to more deeply understand how the brain apparatus and nervous system function. As a result of this interest, and allied to technological advances, the studies in the field of neurosciences gave an exponential leap (Interview 8).

However, in Brazil the subject only gained impetus in the years 2000 (Interview 8) in the area of medicine, as a result of emphasis on clinical treatments. It is only recently that neurosciences have been regarded as a link between other fields of knowledge (Interview 10).

In relation to the concept of neuroscience, empirical data reveal that it is generally understood to be an area focusing on investigating the human brain and the implications of its working and characteristics on human behavior:

When you talk about neuroscience you're talking about a scientific practice that studies the nervous system of all species, specifically that of the human being (Interview 5).

Neuroscience is the study of the nervous system so that it can consider a cell vision, systemic vision of the entire organism, the cognitive part that would be the information processing and a behavioral part that would help analyze the behavioral working of the structure of the nervous system (Interview 10).

This movement is also perceived as an attempt to explain human behavior based on the nervous system, corroborating ideas of Waldman et al. (2011) and Rock and Schwartz (2007). Understanding the brain, neurons and chemical processes, according to the respondents helps to get better understanding of a person's actions (Interview 7, 9, 10) and can also contribute to premature diagnosis of diseases, helping in treatments, minimizing symptoms and offering a better quality of life (Interview 9). Another characteristic of the field of neurosciences, emerging from the empirical data obtained, refers to the diversity of professionals that have devoted their time to its investigation and application. As a result, the use of its concepts is found in different areas, producing in turn different results. This is why the notion is commonly explained in the plural (neurosciences) (Interview 3, 4, 5):

Because some biologists are researching this, you have neuropsychologists researching, for example, how to stimulate the brain of children with genetic syndromes. You have physicians working along this line, chemists working on this. So a number of sciences eventually lead into what is known as neurosciences, in the plural (Interview 4).

Concomitantly, neurosciences receive information and contributions from other different fields. Hence recurring reports for the advance of research and applications on the issue of investments in multidisciplinary teams:

It involves a wide range of knowledge and also receives contributions from different areas. I am unable to think of neurosciences unless I think of a multidisciplinary team (Interview 2).

### **Field of study of the neurosciences: Current status and prospects**

Concerning the development of studies on neuroscience in Brazil, there are broad perceptions that it is an emerging field and under construction (Interview 2, 3). In the medical field, the studies and use of these concepts, however, are described as more advanced compared to

other fields of knowledge. It was possible to find, in fact, detailed reports on experiments involving the application of neurosciences in the diagnosis and treatment of serious diseases, with considerable progress from the clinical viewpoint (Interview 9, 10, 13, 14):

There are now studies to improve Parkinson's and other diseases that previously no one realized was possible. It's a very serious matter (Interview 9).

On the other hand, data indicate that the studies on neuroscience in the organizational context, the focus of this study, are still scarce and with inconclusive results (Interview 2, 11, 14). This finding diverges from recent studies that point to concrete applications in leadership development programs, as well as in selection processes and assessment of leader performance from profile examinations, based on neurological techniques (Lee, 2012):

Here in Brazil very few studies indeed on neuroscience are applied to the organizational field (Interview 2).

I think that neuroscience is more distant in applied social sciences, for example, in economics, administration, because in the clinical area, medicine and psychology it is easier for us to explain (Interview 14).

Nevertheless, some recorded perceptions point to neuroscience to be a promising field of study. This is if the investigation is conducted in accordance with scientific methods and aiming to integrate it with knowledge from different areas. Respecting such premises "[...] the possibility of applying its concepts and the potential results is enormous" (Interview 16).

This field of knowledge has come to stay. Neuroscience is not a passing trend. It has a very intense, concrete and abstractly very strong origin, which is the brain, the central nervous system, peripheral nervous system and which determines all behaviors (Interview 3).

Neuroscience is a field of knowledge with vast epistemological, theoretical, morphological and metric potential. And it will be able to provide people with answers, through means so far unused. These are the brain domains (Interview 3).

Moreover, other reports mention the consistency of the field studies, "inasmuch as it undertakes studies based on empirically tested knowledge". Besides being "a pragmatic approach, since its central object of analysis is the human brain, something concrete and real" (Interviews 4 and 8, respectively).

## Factors driving the organization of neuroscience studies

The interviewees were also asked about factors that have boosted the development of the studies on neurosciences. In response, two reasons were strongly emphasized: 1. technological advancements; 2. several possibilities of applying knowledge.

About the first, there is no doubt that technological innovation has helped advancements in the field of neurosciences. As reports demonstrate below, the development of equipment to visualize the brain in real time, to perform tests and examinations, among other purposes, has “furthered the possibilities of learning about the human brain and discovering diseases, to provide more adequate clinical care” (Interview 4):

It has made great progress over the years, principally as a result of the technological capacity to interpret, analyze and break down the nervous system. So today, computer, visualization and sedation resources for testing the nervous system have permitted much faster progress in this field of study (Interview 10).

Well, it's absurd to refute the dominance and future of neuroscience. It really has, with these new magnetic resonance and image techniques, been possible to check a series of unknown things and this undoubtedly is promising (Interview 18).

Another factor that has boosted neuroscience studies is the possibility of applying their results to various fields of knowledge. Thus, researchers from different areas – physicians, biologists, psychologists, psychiatrists, administrators – have increasingly used concepts from neuroscience to elucidate their practical and investigative questions (Kandel et al., 2003):

It [neuroscience] offers keys to know, address problems, improve learning and teaching capacity. To understand how the mind works in order to learn. To improve people's communication and, of course, you mentioned neuromarketing, also to understand how to sell, what to buy. I would say that it's not the noblest purpose of neuroscience, but is a possibility (Interview 4).

Despite the growing interest in neuroscience, many interviewees alluded to ‘fear’ or ‘concern’ when discussing it, as also described by Ashkanasy (2013). Empirical data have shown that individuals fear that studies in neuroscience take only one's biological dimension to explain the phenomena one experiences, thus producing a limiting view of human beings (Interviews 7, 11, 13, 14, 15, 16, 17):

The invasion of neuroscience troubles me. Chemical

reactions or cerebral processes cannot account for everything. I am concerned with the disappearance of the subject. For if I speak of a brain structure, I therefore exclude the choices of the individual, his/her history, experiences, projects, and desires. I believe things are much more complex than just the brain structure (Interview 7).

## Contributions of the neurosciences

With regard to neuroscience contributions to other fields of knowledge, empirical data reinforce yet again their importance from the viewpoint of medicine and clinical care of seriously ill patients. As mentioned earlier, the possibility of viewing the brain through new technologies enables a more “systemic” perception of the individual's brain apparatus, thereby facilitating diagnosis and definition of specific individualized treatments (Interview 3, 4, 9, 10, 14):

I noticed that psychotherapy alone wasn't coping. Because we work with emotions, we perceive symptoms that the person reports, but when you add neuroscience you're able to learn much more in depth about the client. Because we can see the chemical side. Not only the behavioral, emotional part, his subjective content, but also the objective part (Interview 9).

In this sense, interviewees add that more objective knowledge of the nervous system could help give people a better quality of life. For example, it helps medical or psychotherapeutic interventions to be much better conducted by knowing the individual's nervous structure:

Neuroscience applications can occur at cell level, as better knowledge of the nervous system would permit very often necessary surgical intervention, by medication or ability to prepare the individual to deal with congenital or acquired disabilities (Interview 10).

However, the application of neurosciences in the organizational field is mentioned as being more restricted. First, since it is a complex matter from the administrators' viewpoint, it requires knowledge that they generally do not have of how the human brain functions. It is then probable that the administration field is more prone to wrong conclusions, since the professionals in that area have fewer subsidies to proceed with criticism about the knowledge that is being generated (Ashkanasy, 2013).

Secondly, because neuroscience studies applied to organizations also fail to offer consistent insights for organization management, which would certainly take more time and investigation. Today, for example, the cost of procuring certain items of equipment to be used in the

companies would greatly exceed the possible benefits, substituting other techniques and or technologies.

From this perspective, many of the interviewees reflect pessimistic views regarding the use of neuroscience concepts in organizations. They understand that since applied knowledge in the organizational field is still insufficient, it would be very risky to use them and adopt them as true (Interview 4, 14, 15):

Because in fact, the level of knowledge we have today already allows us to say that for innovation to happen we must have an environment with free exchange of information and that people feel free to air their ideas. And we already know what to do to create such an environment. You just have to reduce the number of incompetent, ill-mannered and rude bosses. So, it is much easier to take steps to restrain this type of abusive leadership and change the environment than to spend a fortune on brain-tracking techniques (Interview 4).

Furthermore, reports suggest leadership as a process of social construction, involving a group of players within a context and, therefore, subject to various interfaces. Therefore, not only does the biological aspect influence the role of leaders but also a set of variables inherent to the leadership process (Interview 1, 11, 17). In this vein, it is worth resorting to considerations by Lee, Senior and Butler (2012), which indicate that when the investigation concentrates only on the neural – without considering the organizational and social factors - the researcher runs the risk of ignoring important contextual factors about the phenomenon.

Contradicting this view, some interviewees reported concrete applications of knowledge of neurosciences in the organizational field, either in work satisfaction surveys, improvements in productivity by reducing stress levels, or as an aid in personnel selection processes (Interview 3, 9).

For example, you work in human resources, you can do a survey with people trying to identify if they are satisfied with their job. People might say: yes, I'm satisfied with the job. But in their brain the answers are completely different: I'm being exploited, my salary's too low, I would like this other job. So this is what the brain could be saying but the voice is saying something else (Interview 3).

I use neurofeedback questionnaires for this kind of selection, for example, to get to know the objectives and symptoms. And I would record the person's brain, since I have a tool to do that. And so I could see what brain functions he has and in what way, emotionally speaking, he could act at that moment, so that could see in a situation of stress at work, how he would deal

with it (Interview 9).

Interviewee 9 reported different positive experiences with a technique called biofeedback or neurofeedback. According to her, professionals from the field of neuropsychology often resort to brain and organ visualization techniques. In neurofeedback, brain electric activity is captured by an electroencephalography device and shown in real time on a computer screen, usually for purposes of training individuals on how to control the activity of their central nervous systems.

These techniques may identify individuals with neurobiological disorders and enhance the psychological care provided to them. Specialists trained on the use of these techniques are certainly able to provide differentiated services to their patients. The combination of advanced technology and clinical care into a multidisciplinary approach enhances patient wellbeing and quality-of-life.

### **Challenges inherent to the study and application of neuroscience**

With regard to the challenges that the area has confronted, reports indicate that “improper use of neuroscience concepts by people that do not have in-depth knowledge of the subject has been detrimental to its image”, causing a series of mistaken perceptions of what neurosciences are and how they are applied (Interview, 3, 4, 9, 10):

First is that some people say they are neuroscientists and have never studied the subject or used the functions used by neuroscience for their work. Some people say they are neuropsychologists. The word *neuro* is in fashion. People use *neuro* without sometimes even knowing what it means. (Interview 9).

Another challenge concerns the use of knowledge of neurosciences with emphasis solely on the economic dimension. Such as the following reports reveal, “there are signs of stakeholders that attempt to take advantage of this movement, very often neglecting the needs of a human being”. In the case of the health area, the use of medication could possibly be reinforced as a solution for various problems, instead of seeking alternative treatments (Interview 13, 15):

I think that neuroscience must always progress, but it does not have to combine with economics or capital because that would spoil it. It's when someone wants to take advantage of this and impose a way of being, of reacting, that it's very bad (Interview 13).

Lastly, reports highlight ethical questions involved in the



use of neuroscience knowledge. For example, doubts are raised as to their undue use of information obtained - for example, brain images – by unscrupulous companies or individuals. Moreover, when learning of someone's characteristics based on biological aspects, there is the risk of typecasting, taking this perception as an absolute truth. Therefore, limitations and care in using concepts and instruments provided by neurosciences "must be investigated and defined by duly competent people" (Interview 3, 8, 12, 17):

To produce neurotechnology, new apparatus will help measure all this at a distance. We will be able to measure a person's brain without attaching apparatus. But there's one detail, there's the ethical issue, what would they think? It's raised a complicated issue (Interview 3).

You understand that this is complicated, don't you? There are genetic and behavioral studies that you regard as temperament. One of the things that I'm very afraid of nowadays is that you use knowledge of these things to make a selection, let's say "I don't want this! I don't want gays"... "I don't want someone with a temperament like this or that"... This knowledge can be for better or worse (Interview 8).

To sum up, the study indicated that the ethical principles related to the use of ideas from neuroscience in organizational contexts need to be further discussed. This is a discussion that should very much be held by the organizational studies scientific community.

Interviewees unanimously reported that future research efforts and the advancement of neuroscience require stronger connections between various fields of knowledge (Lee, Senior, Butler, 2012). Thus, permanent dialog should be established between business administrators, biologists, physicians, chemists, psychiatrists, psychoanalysts, psychologists, and other professionals working in this field through the establishment of multidisciplinary work groups.

### Final considerations

The results indicate that the field of neuroscience studies in Brazil can be characterized as emerging and under construction. The technological advances that have boosted investigation in the area are recent, after the 1990s.

Major advancements have also been made in medicine, compared to other fields of knowledge. On the other hand, in the organizational context - focus of this research -, results are still incipient and inconclusive. Nevertheless, perceptions are recorded with regard to "forming a promising field of studies". Nonetheless, some participants regarded it as "a promising area of study."

Other interviewees stated that neuroscience might potentially add to the leadership development methods currently in use at organizations. Additionally, neuroscience might provide additional understanding over the behavior of individuals in an organization and be used in recruitment, selection, and leadership development processes.

Some of the interviewees reported concrete applications of neuroscience in organizations. The uses ranged from workplace satisfaction surveys and productivity improvement efforts based on stress reduction to personnel selection processes.

Despite this growing interest expressions of "misgiving" and "concerns" have been recurring in the empirical data. Misgivings are, for example, concerned with studies on neurosciences that consider only the biological dimension to explain the researched phenomena and, "as a result, adopt limited views of the human being". It is also perceived that the costs of procuring equipment normally used in research and applications on the topic would still exceed the benefits.

In relation to recommendations, from the scientific research viewpoint, perceptions are unanimous about the importance of extending the connections between different fields to advance knowledge in neuroscience. This requires, however, setting up multidisciplinary working groups. Another important point was the consideration given to the ethical implications of neuroscience studies and neuroscience-based interventions, given the multifaceted nature of the topic, and the possible social consequences and impacts on human dignity and freedom.

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