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Emotions and Cognitions in Social Relationships: A Neurosociological Approach

Emociones y Cognición en las relaciones sociales: un enfoque desde la neurosociología

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Abstract

Neurosociology is a new approach aimed at integrating social and biological sciences. In this paper, first we used Alan Fiske's theory (1992) of elementary forms of social relationships as a nexus between sociological studies of groups and group-based emotions and relevant neuroscientific findings. Then, we identified types of social situations that generate basic emotions (happiness, anger, sadness, and fear) within particular relationships. Individuals participate differently in these situations. Therefore, they are expected to differ in their emotions and cognitions, as well as in their underlying neural activity. Finally, we considered social affiliation and social hierarchy corresponding to communal sharing and authority ranking social relationships to demonstrate the logic of neurosociological research.

Keywords: Emotion; Cognition; Social Relationship; Social Affiliation; Social Hierarchy; Neurosociology

Resumen

La neurosociología es un nuevo enfoque que busca integrar las ciencias sociales y biológicas. En este artículo, primero aplicamos la teoría de Alan Fiske (1992), de las formas elementales de las relaciones sociales entendidas como un nexo entre los estudios sociológicos de los grupos y las emociones grupales, junto con hallazgos de la neurociencia. Luego, hemos identificado tipos de situaciones sociales que generan las emociones básicas (alegría, ira, tristeza y miedo) dentro de ciertas relaciones particulares. Las personas participan de forma diferente en estas situaciones. Por lo tanto, se espera que difieran en sus emociones y cogniciones, así como en su actividad neural subyacente. Por último, hemos considerado la afiliación social y la jerarquía social que corresponde al intercambio comunal y el ranking de relaciones sociales para demostrar la lógica de la investigación neurosociológica.

Palabras clave: Emoción; Cognición; Relación Social; Afiliación Social; Jerarquía Social; Neurosociología.

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Introduction

Advances in science can be stimulated by the emergence of new research tools and methods as well as by the transmission of concepts and theories from other disciplines. Recent findings in brain research have led to the appearance of a new research area — social neuroscience— based on the integration of social psychology and neuroscience (e.g. Todorov, Fiske, & Prentice, 2011; Decety & Christen, 2014). Social neuroscience is now a well-established and respected scientific discipline, with its own journals, scientific societies, and university departments. Beyond social psychology, however, attempts to introduce neurocognitive and affective processes into a broader social science agenda are still infrequent and fragmentary.

Here, we focus on the integration of neurocognitive and sociological research within the field of neurosociology. Although the term can be traced back to earlier works of Warren TenHouten (1997), more systematic attempts to approach the problem have been made only recently (Franks, 2010; Franks & Turner, 2012). We briefly discuss some promising paths of argumentation linking the fast-growing body of knowledge of social neuroscience with more traditional sociological issues.

Causal chains linking neurocognitive and affective processes with the constitution of the society are twofold. The first type of causal chain is a representational one, consistent with the constructivist tradition in social science. Individuals' responses to situations are conditioned by their perception of the social world and their "definition of the situation." Social perception is now actively studied within the field of social neuroscience, and many neural pathways are now evident. The second type of causality links neural organization to the "objective" conditions of life typical for different societies, cultures, institutions, or social

groups. Both types of research are considered in the current article.

Given that the first line of investigation is now significantly more informed and elaborated than the second, we take it as the main focus of this article. We use Alan Fiske's theory of elementary forms of social relationship (Fiske, 1992) as a starting point for understanding relations between cognition, emotion, neural organization, and social institutions. At first, we consider Fiske's theory in relation to emotional experience and types of social actions. Then, we analyze two specific types of social representation (social affiliation and social hierarchy), corresponding to communal sharing and authority ranking relationships. Considering these issues, we also sketch the possible logic of the neurosociological study of social issues.

Elementary forms of social relationships and basic emotions

Fiske has postulated that people construct and participate in one of four forms of social relationships: "communal sharing," "authority ranking", "equality matching," and "market pricing." He argued that these modes of organizing social life are endogenous products of the human mind, generated by universally shared models of social relations; they are manifestations of elementary mental models (Fiske, 1992: 690).

In *communal sharing* relationships, people "treat each other as all the same, focusing on commonalities and disregarding distinct individual identities" (Fiske, 1992: 690). Such social relationships are reflected in interactions with close relatives, mother-children relations, intense love, and in nationality identification. *Authority ranking* relationships are based on "a model of asymmetry among people who are linearly ordered along some hierarchical social di-

mension" (Fiske, 1992: 691). For instance, such relationships include both one between manager and employee in a hierarchical organizational structure and one between spouses in patriarchal family cultures. *Equality matching* relationships are based on "a model of even balance and one-for-one correspondence" (Ibid: 691), as in relations with acquaintances and colleagues. *Market pricing* relationships are based on "a model of proportionality in social relationships; people attend to ratios and rates" (Ibid: 691-692). Fiske notes that this type of social relationship is always "organized in terms of cost-benefit ratios and rational calculations of efficiency or expected utility" (Ibid: 692). The social interactions at the stock exchange and in a credit bank are often realized in the framework of market pricing relationships.

Alan Fiske is not the only researcher who proposed generalizing a typology of social life. We could go back to the prominent sociologist Max Weber and his theory of the types of social action. Although their approaches have different background, conceptual and methodological roots, we can make a parallelism between Fiske's market pricing relationship and Weber's goal rational action based on eagerness to achieve goals by applying the most effective instruments. Emotions can be introduced into each theory as a feature of social relationships or social actions for deeper understanding of the social life.

Weber's types of social action can be differentiated in accordance, inter alia, with emotionality. Goal rational actions are emotionless, while affective actions are the most emotional. Traditional and value rational actions lie somewhere in between.

It should be noted, however, that Weber was mistaken in proposing the opposition of emotions and rationality: Barbalet (2004) and others in recent sociological studies on emotions cast doubt on the correctness of Weber's idea. They argue that emotion contributes to rationality according to two approaches. In the first approach, emotions support rationality by providing it with salience and goal-formation; and in the second approach, emotions and rationality are seen to be continuous (Barbalet, 2004: 29; 38-54). Weber's mistake is also confirmed by relevant neuroscientific findings, including the results of direct brain research on emotions in rational decision making (e.g., Damasio, 1994). Neuroscientific findings pose a different source of verification concerning the close connection between emotion and consciousness. This idea has recently been supported by many researchers (e.g., Tsychiya & Adolphs, 2007; Roberts,

2009) who have investigated the neural structures underlying simultaneous emotional and conscious experience. The conclusion of a common neural basis for consciousness and emotion is mainly drawn from the investigations on brain lesions, especially in the amygdala and anterior cingulate cortex. Specifically, when these brain areas are damaged, abnormal emotional reactions are observed (e.g., atypical ability to recognize emotions by facial expressions) and conscious processing is abnormal (as is observed in neuropsychiatric diseases such as autism, schizophrenia, anxiety disorders, post-traumatic stress disorder and others). The connection between consciousness and emotion is also revealed in studies of minimally conscious states (e.g., Giacino et al., 2002). In these studies, the expression of emotions is considered to be one of the criteria for conscious state versus coma or some form of vegetative state.

Taking these findings into account, we can conclude that rational social actions, based on conscious processing, always imply emotional regulation. The opposite, however, is not true: unconscious actions are not emotionless. Emotions with different intensity are always present in social actions.

The above-mentioned idea is very useful for further suggestions concerning emotions in social relationships. In every social relationship, certainly the full spectrum of emotions is present. At the same time, different emotions are presumably more salient in different social relationships.

Emotions play an important role in social life. As Lambie and Marcel (2002) note, the importance of emotional experiences for understanding each other and for normal social life is demonstrated in science fiction, where robots, as a rule, lack emotions completely or do not show the same emotions as humans, leading to tensions between people and robots. In cognitive science and psychology, the main emotional experiences in human life are referred to as *basic emotions*. The identification of several emotions as basic is often motivated by their evolutionary role for human survival (e.g., Ekman, 1999). It is also emphasized that basic emotions play a major role in the development of later-appearing emotions and they therefore form a subset distinct from other emotions (e.g., Campos et al., 2010: 102). In various lists of basic, culturally universal emotions, happiness, anger, fear and sadness are most frequently included (for a sociological review on basic emotions see Turner, 2007: 2-12).

We set aside the discussion about the number of and criteria for the identification of basic emotions

(e.g., Scherer, 2005; Campos et al., 2010) as irrelevant to the purpose of revealing connections between emotions and social relationships. However, we take the findings concerning connections between emotions and modes of cognitive processes seriously (e.g., Subramaniam et al., 2009; Roberts, 2009). Individuals realize at every moment one of the possible modes of thinking, awareness, reflection, conscious, non-conscious cognition, and others in accordance with emotional experience. Thus, the features of cognition correlate with emotions. Ekman directly points to this relationship. He says that “specific emotions regulate the way in which we think, and that this will be evident in memories, imagery and expectations” (Ekman, 1999: 55). Subramaniam and colleagues (2009) have shown that positive and negative emotions determine insight and analytical modes of decision making, respectively.

Let us now consider the emotional specificity of different types of social relationship. By definition, in a communal sharing relationship, individuals share the emotions of their group, being happiness, anger, or other. In this relationship, individuals’ emotions are equated.

On the contrary, in an authority ranking relationship, emotions are unbalanced and differentiated according to relative position. While establishing hierarchical relations, the individual in the lower position tends to be emotionally deprived and the individual in the higher position is rewarded emotionally.

In accordance with the logic of an equality matching relationship, any emotion should be reflected by interacting individuals. Any imbalance in interpersonal exchange in this type of social relationship leads to emotional tension.

A market pricing relationship implies the maximization of positive emotion by means of trade. Emotional reward is especially high when the value received exceeds the expected value.

In Table 1, we relate anger, fear, sadness, and happiness to the social situations in which these emotions appear. These emotions are strongly differentiated from each other and each individual can identify them introspectively. In addition, they show differences in mental processes and underlying brain activity, and also in individual reactions and social behavior.

Table 1

Social situations, in which the basic emotions appear, according to the type of social relationship

Social relationships	Emotions			
	Happiness	Sadness	Fear	Anger
Communal sharing	Trouble-free in-group relationships Ingroup success	Any failure of the group	Identity threat Threat to group well-being	Threat to ingroup status Violation of group norms
Authority ranking	Dominating or elevated social position	Subordinated or demoted social position	Risk of status loss Negative motivation (threat of negative sanctions)	Competition among peers
Equality matching	Equality maintenance	One-sided exchange (asymmetrical interaction)	Possible reputational loss as the result of inability to respond adequately	Unwanted exchange
Market pricing	Received utility is equal or exceeds expectation	Disagreement about price	Inability to pay a heavy price	Violation of a contract, deception

Source: Prepared by the authors.

Thus, emotional experiences depend strongly on the features of the individual's or group's position in a particular relationship. At the same time, emotions contribute to social behavior, specifically to the willingness to maintain or change the type of social relationship. Generally, individuals are inclined towards emotionally rewarding types of relationships and/or types of social situations. Interestingly, in an experimental situation, happier people were disposed to positive social bonding (e.g., chatting with close friends) after experiencing negative emotions (due to simulated financial loss) in order to smooth negative emotional consequences (Sul et al., 2013). Such observations contribute, in particular, to the hypothesis that happier people are more inclined towards the communal sharing social strategy than to others.

Given the neuroscientific idea of the connection of emotions to specific brain activity, the search for neural mechanisms underlying behaviors within social relationships embedded in different emotions is a promising neurosociological strategy. Applying the neuroscientific findings to the sociological domain, we can potentially reveal the basic neural triggers of different types of social behavior. For example, neuroscientific research has demonstrated that fear, sadness and disgust inhibit hunger and sexual drives, and that the satisfaction of these needs leads to happiness, while thwarting the satisfaction of those drives can cause anger, despair, or sadness (Damasio, 2003: 50). The basal forebrain, ventromedial prefrontal cortex, amygdala, and brain stem nuclei are now identified as emotion triggering sites. Damasio adds that for an emotion to occur, the site must cause subsequent activity in other sites, i.e., emotion results from the concerted participation of several sites within the brain (Ibid: 59). As people of diverse social groups possess different abilities to satisfy their needs, we can propose that they are differentiated by the set of emotions they experience. Individuals and groups also differ in the frequency and type of situations they encounter. Each situation induces different emotional and behavioral effects, as well as underlying neural mechanisms. From this, we can hypothesize differences in neural organization between members of various social groups.

Another natural and promising path for neurosociological research is laboratory experiments in collaboration with neuroscientists (for discussions see von Scheve, 2011; Shkurko, 2014). Unfortunately, at present such experimental studies aiming at identifying neuroscientific mechanisms in relation to social

relationships are scarce (Iacoboni et al., 2004). In such experiments, for example, we can simulate situations for different types of social relationships and identify neural activity underlying the observed relationships. By comparing neural activity in correlation to the emotion before and during stimulated relationships, we can potentially elucidate the neural mechanisms of emotional and behavioral changes in different social contexts.

Neurosociology of social affiliation

At the individual level, the participation in social relationships is mediated by the representation of social structure, in particular, in a form of social categorization. With regard to the social structure, two types of social categorization can be distinguished: social affiliation and social hierarchy. The first one produces social identity, that is, identification with a particular social group or category; and the second one stratifies social agents according to perceived inequality in the distribution of valuable resources. These two types of social categorization correspond to communal sharing and authority ranking relationships in Fiske's theory.

Social categorization implies that others are or can be perceived as members of a larger collective unity rather than as individuals. Features associated with the social group are then applied to an individual. Social categorization is considered to be an effective cognitive tool facilitating navigation in the social world and behavioral responses to situations.

Social categories differ in their cognitive and affective contents. Examples of social categories include "an Argentinean", "a football fan", "a taxi driver", and "an old man." Each of them is associated with some contents such as "speaks Spanish", "knows the names of football players", "yellow cab", and "is on a pension". Such categories and their associated contents are numerous and the study of particular social institutions makes it necessary to study all these contents.

However, many different categorizations have much in common so that many social relations are regulated by rather universal mechanisms. First, when we classify the social world, this classification is typically egocentric, that is, we identify ourselves with one of the categories within a certain classification system. Moreover, our reactions to "our" group or category versus "others" are very similar, irrespective of the nature of the category. This idea is at the heart

of both social identity and self-categorization theories (Tajfel et al., 1971; Turner & Reynolds, 2003). The idea of social categorization eventually leads to a hypothesis of a very abstract and universal form of social classification —the basic binary distinction between “Us” and “Them” (Shkurko, 2013; in press).

Despite discussions on the nature and mechanisms of such an elementary categorization, there are similarities in the construction of social identities. Studies in social cognitive and affective neuroscience reveal how social categorization modulates human cognition, emotion, and behavior.

Both psychological and social neuroscience experiments reveal emotions and cognitions to be modulated by the perceived category of “others.” In general, the emotional valence of a stimulus depends on its perceived social status: those associated with one’s own group trigger neural pathways processing positive emotions, while outgroup stimuli trigger more negatively valenced emotions. Although it may seem trivial, a detailed knowledge of the neural mechanisms is still necessary and useful for a deeper understanding of socially based emotions. In particular, several emotions are shown to be processed differently in the brain in response to various social categorizations.

Fear is probably the most investigated emotion in social neuroscience. Its neural processing is strongly associated with activity in the amygdala and has been shown to be modulated by the target’s social category. Outgroup targets trigger greater activity in the amygdala, most notably in the case of racial category (Hart et al., 2000; Cunningham et al., 2004; Wheeler & Fiske, 2005).

The status of the target also modulates neural processing of empathy. Ingroup members typically prompt greater activity in the temporoparietal junction, often associated with empathy (Adams et al., 2010; Cheon et al., 2011).

Another socially based emotion is gloating, involving reward processing in the brain: an outgroup member’s loss is perceived as one’s own gain (Takahashi et al., 2009). In a study by Hein and colleagues (2010), football fans observed and manipulated painful events involving their own and enemy team fans. While observing friends’ pain involved an empathic response, the response to foes’ pain involved activation in the dopaminergic pathways.

The brain also responds differently to emotionally valenced faces of people from different social groups. Faces with angry, happy, and other emotional

expressions are processed differently for ingroup and outgroup members (Chiao et al., 2008; Vrtička et al., 2008; Hoehl et al., 2010).

Such social categorization is not limited by such a simplistic binary opposition as the ingroup/outgroup distinction, though. More elaborate classification systems exist and correspond to specific emotional and cognitive content. For example, within the so-called Stereotype Content Model, two dimensions of social categorization are proposed: competence and warmth. Harris and Fiske (2007) suppose that the four types of social categories produced by the combination of these dimensions correspond to four specific social emotions:

Envy: directed toward targets with high competence and low warmth

Pride: corresponds to targets with high competence and high warmth

Pity: directed toward targets with low competence and high warmth

Disgust: directed toward targets with low competence and low warmth

In a well-known fMRI study, the authors tried to find differential neural correlates for these four category types. The most interesting finding was a specific neural response associated with the low competence/low warmth social group (e.g., homeless individuals). Activity in the mentalizing-related neural network typical for other social groups is absent in the case of the low-competence and low-warmth group. Instead, the perception of this group was associated with activity in the insula —a brain area that also fires in response to disgusting stimuli. In terms of social categorization, this is a sign of the so-called “dehumanization” process: some social agents cross the ultimate boundary between “human” and “not human”.

The examples mentioned above are descriptive ones. They have their own value as steps toward a better understanding of social perception. A specific neurosociological agenda appears when we try to link the neurocognitive and neuroaffective machinery to social institutions.

Although social categorization has long been studied within social psychology and social neuroscience, here our interest is its more complicated sociological aspects. The general logic of the neurosociology of social categorization is as follows:

1. Within a categorization schema, every cate-

gory is associated with particular cognitive and affective content.

2. Various cognitive and affective contents involve different neural pathways with differing behavioral responses.

3. Multiple categorization systems can potentially be applied to individuals.

4. Societies in general and particular social contexts differ in the priority and salience of social categories.

5. Social categories are distributed socially. Consequently, corresponding cognitive and affective contents —with their behavioral effects— are distributed socially as well.

6. Both institutional design and neural architecture contribute to each other's constitution and functionality.

Understanding the neurocognitive and affective nature of social representation can also shed light on the differences in human behavior observed in structurally similar situations within different institutions, societies, and cultures. Take, as an example, the family as a basic social unit. Although there are numerous studies revealing differences in the types of families, their structures and functions within different cultures or historical epochs, there are also important cognitive and affective mechanisms of family category processing. Several studies show how members of a family are perceived in individualistic versus collectivistic societies (Harada et al., 2010; Ng et al., 2010). One interpretation is that these differences rise from manipulation of the self-other distinction in such a way that the eventual concept of the family can be constructed in very different ways: either by the inclusion of others into the self-concept, or by rational calculation of possible alliances.

These two modes of categorization differ in their emotional content as well. The first one features communal sharing relationships with relevant emotions such as happiness and empathy. The second one is characterized rather by market pricing relationships with reward-related emotions. Both can produce similar behavioral effects. The difference in cognitive and affective processing is crucial for understanding how the social world is constructed and for predicting individuals' attitudes, values, responses to situations, as well as possible institutional design.

Neurosociology of social hierarchy

Unequal distribution of resources, leading to authority ranking relationships, is probably the most important information an individual must obtain. Knowing the status of oneself and others is crucial for choosing individual strategies in various realms of social life, be that mating behavior, consumption, or scientific publication. Representation of one's own position and the position of others in the social hierarchy is thus an evolutionarily useful mechanism. Beyond the ingroup-outgroup distinction, social hierarchy operates via binary opposition and is a relational form because any individual may be considered as taking a high or low position when compared to those who are lower or higher. Similarly in market pricing relationship, decision-making studies show that what matters is relative value, not absolute (Kahneman & Tversky, 1979). Emotional reaction to the outcome of a decision depends on its expected value: if you gain more than expected, you feel positive emotions, and if you gain less, you feel negative ones, even if the value is the same.

Social hierarchy can be treated as a general form due to its applicability across various resources. Political power, economic capital, reputation, as well as physical strength, intellect, or skills are all various dimensions of social ranking. An individual may rank high in one dimension but low in others. The question is whether these different types of resources can be processed in a similar manner and have a common cognitive and affective basis.

What are the cognitive mechanisms underlying representations of social hierarchy? There is evidence that understanding social hierarchy may be similar to or even based on the representation of other interval variables, e.g., numbers. Studies (Chiao et al., 2009; Yamakawa et al., 2009) show both behavioral and neural evidence that social status information is processed by the mind and brain in a similar manner as the estimation of physical or numerical distance. This is compatible with the intuitions of social scientists about "social space" (Bourdieu, 1987), in which social positions are measured in terms of distance. Understanding one's position in the social world by measuring distance may not be mere metaphor but a true cognitive mechanism of social perception. The role of emotions in this mechanism can be hypothesized in two ways. First, emotions associated with taking high or low position within authority ranking relationship appear as the result of social distance measurement.

Another possible role of emotions may be related to the dopaminergic system known to be involved in learning processes. Dopamine, an actively investigated neurotransmitter, plays a key role in encoding the so-called prediction error—a difference between actual and expected value. When one's measure of social rank turns out to be wrong, an updating process probably involves this dopaminergic system and dopamine-related emotions (e.g., those associated with pleasure).

Another dopamine-based mechanism likely to be involved in the representation of social hierarchy deals with the reward-processing system. Obtaining a high position is considered as a reward, and the change in one's relative position is considered via win-or-lose opposition. Both behavioral and neuroscientific studies indicate that personally relevant social hierarchy contexts involve the reward-processing system (Kishida et al., 2012; Zink et al., 2008), in contrast with allocentric contexts, in which estimation of social hierarchy is personally irrelevant (Farrow et al., 2011). This reward-related aspect of social hierarchy sheds light on the aforementioned multidimensional nature of stratification systems. The fact that various types of rewarding stimuli, such as food, money, social rank, attractive faces, etc., involve the same dopaminergic system (e.g., Alves et al., 2011; McClure et al., 2004a; Lin et al., 2012) leads to the hypothesis of a common neural currency. This common neural currency is able to serve the general hierarchy-related form of social categorization by converting various types of hierarchies into one interval variable of reward.

Representing inequalities in resources, social hierarchy is known to be crucial for modulating approaching/avoidance behavior, both in animals and humans. In social interaction, a target's perceived position modulates allocation of attentional resources (Zink et al., 2008; Deaner et al., 2005) and behavioral strategy, including behavioral inhibition in low-ranked agents (Anderson & Berdahl, 2002; Maynard Smith, 1974). Broadcasting one's relational status significantly affects cognitive performance (Kishida et al., 2012), probably due to inappropriate allocation of cognitive resources (Derks et al., 2008).

Throughout social science research, inequalities and social status have been linked to motivation, life and labor styles, migration, health, as well as educational, marital, and reproductive strategies. However, the cognitive and neural mechanisms underlying the long-term effects of taking a high or low position, beyond the immediate social situation, remain mysteri-

ous. The fact that subjectively low socioeconomic status is associated with negative self-estimation, poor health and health-related behaviors (e.g. Demakakos et al., 2008; Reitzel et al., 2011), and even with particular brain markers (Gianaros et al., 2007), goes far beyond contextual reward-related comparisons. We assume that repetition and reinforcing of such situational downward or upward comparisons can produce long-term somatic and health-related effects.

Imagine a researcher taking a high position in a local community, both administratively and by reputation. He or she may well benefit from being a "boss" in many social situations on a daily basis. This person is dominant in social interactions, perceptions, and evaluations. At the same time, the researcher may recognize that in other contexts of comparison, he or she is not on the top. In comparison with the global scientific community, and especially with what is called the research core, he or she is probably low-ranked. To avoid disappointment, this person may choose the strategy of staying in the local community and may even refrain from submitting an article to a high-ranked journal. Thus, the researcher rationally arranged life in such a way as to maximize rewarding situations derived from high rank. However, the very choice of this strategy is a choice within a categorization system in which this researcher is low-ranked. Moreover, this particular categorization system should be available at all times, in all situations to which his or her position as a researcher is salient. Although daily contexts involving downward comparisons and strategic upward comparisons are structurally equivalent (albeit inverse), it seems they must be processed differently by humans. Alternatively, one system could simultaneously work in opposite directions, being both emotionally positive and negative.

This example differs from a three-agent situation in which one is simultaneously presented with high- and low-ranked individuals. We predict that in this case, the subject's behavior would be governed by upward comparison. In the type of situation exemplified above, there is an interaction between two categorizations within one hierarchical axis, one of which is more in the background and the other one in the foreground. This interaction can probably be traced to the difference between immediate and delayed rewards (Kim et al., 2012; Kable & Glimcher, 2007; McClure et al., 2004b). The question for further empirical research is whether representation of social hierarchy is purely relational or, instead, it is better described by content-free but absolute scales, in such a way that

relational position, determined by contextual comparison, interacts with the effects of a context-free state of dominance or submissiveness, as supposed by Anderson and Berdahl (2002).

The “objective” side of social hierarchy also has its specific neural pathways and mechanisms. People from low and high social strata differ in their conditions of life; moreover, data suggest that these environmental changes direct brain development and functioning differently.

Indeed, people from lower strata often live in a more stressful environment, facing more risk and uncertainty in their lives. Such an environment constantly affecting the brain shapes the neural architecture, especially in the areas associated with cognitive control. Stress affects several brain areas including the prefrontal cortex, which is associated with cognitive control, and the amygdala, associated, inter alia, with emotional response (Arnsten, 2009; Cools & D’Esposito, 2011).

In the model developed by Davis in accordance with Tilly’s theory of durable inequality, specific conditions of life typical for people from lower social classes modulate social behavior through stress-related pathways (Davis, 2013). Stressors are proposed to release dopamine—the neuromediator crucial for many neurocognitive and affective processes. The prefrontal cortex is inhibited by dopamine release, and this weakens cognitive control and decreases the value of time-delayed reward. At the same time, dopamine increases activity in the anterior cingulate cortex, thus increasing the expected value of a stimulus and stimulating risk behavior. Finally, in the limbic part of the social brain, dopamine stimulates aggres-

sive emotional reactions. In sum, the effects of stress-related dopaminergic pathways include greater attention toward the immediate environment and decreased value of long-term goals and rewards.

It is worth noting that the stress-related mechanism described above can only be applied to those situations in which lower-ranked social groups indeed live in a more stressful and uncertain environment. In some societies, however, less privileged groups live in poor but stable and more or less secure environments, not associated with greater daily risk and stress. In such a case, different neurosociological mechanisms should be proposed.

Conclusion

Social life occurs across different social situations, which are organized according to communal sharing, authority ranking, equality matching, and market pricing social relationships. People facing these different social situations experience relevant emotions and cognitions. We assume that people are involved in these social situations with different frequencies. Therefore, they correspondingly experience the relevant cognitions and emotions with differing frequencies. Neuroscience reveals neural mechanisms that produce behavioral effects for different emotional experiences. These findings allow for a detailed and systematic explanation of the linkage between social structure and individual neural organization. Such explanations constitute a primary focus of the emerging field of neurosociology.

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Plazos.

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