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# Social Inclusion and Exclusion: How Evolution Changes Our Relational and Social Brain

*Chiara Fante, Sara Palermo, Vincenzo Auriemma  
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## Abstract

Belonging to social groups is an important need for human beings and social exclusion has a significant psychological impact on individual wellbeing. Social neuroscience has clarified the similarity of the neuronal substrate between physical pain and social pain during the experience of social exclusion. Pain is the oldest signal that something is wrong for our brain, and the anticipation of pain motivates a move away from perceived dangerous or noxious stimuli. The Evolutionary Theory of Motivation (ETM) considered group affiliation as an adaptive goal that supports the individual's adaptation to the environment; however, invalidating experiences may induce avoidance of its pursuit. In this perspective, social exclusion could thus be considered as the result of failures at one or more levels of the human motivational systems. This chapter attempts to understand the neuroscience findings on social exclusion in this theoretical framework.

**Keywords:** social inclusion, social exclusion, social pain, social brain, Evolutionary Theory of Motivation, cooperative system

## 1. Introduction

Within this chapter, we will deal with a discourse that is increasingly treated only in part, excluding modern and, above all, interdisciplinary theoretical approaches. Social discourses on emotions often appear more fitting but less “attractive”, as they are difficult to verify empirically without adequate cooperation between the sciences. Therefore, our interest is to bring out a focal point, emotion, understood as the emotional capacity of living beings, to be considered in all its aspects and understood as a social emotion. Starting from this premise means considering relationships full of emotions, both positive and negative. However, it will be necessary to deepen some aspects, perhaps little known by the less accustomed to this type of topic, such as the processes of social exclusion, rather than evolutionist theories. These aspects are fully part of the logic of social action dear to Max Weber. Even in the literature, we have many examples of these aspects, some evident others to paraphrase - for illustration the social exclusion that emerges, with brute force, in *The Scarlet Letter*, rather than Orwell's speeches about the eye that constantly watches over society. Therefore, the first step will be to deepen these first two aspects, inserting them in scientific and empirical discourses.

Based on these premises, this chapter is a first attempt to link the neurosciences findings on social inclusion and exclusion with an evolutionary theory of human motivation.

## **2. Social inclusion and social exclusion**

Human beings have a fundamental need to belong to social groups [1] and to be accepted by other people [2, 3]. The intergroup emotions theory [4, 5] defines the role of emotions in relationships between groups: inter-group behaviour is thus driven by emotions that are uniquely social, feeling emotions like other group members, involves a further involvement and sense of belonging [6]. Emotions can be positive and negative that characterise the experience based on perceived intensity [6]. For instance, social exclusion has a significant psychological impact since it expresses the subjectivity of the individual's experience with possible consequences such as anxiety and depression [6]. The emotion felt during the experience of social exclusion is very strong and intense, it represents a real pain characterised by separation and rupture from the social group [7], by social exclusion we mean being kept out, or rather excluded, left alone or isolated from other people [8]. The experience of social exclusion is also called social pain. When people express the emotions and the emotional state they feel when they are excluded, the words often used refer to wounds, broken hearts, ruptures. Pain is a complex subjective experience involving many aspects: the physical sensation associated with a sensation, the negative or unpleasant subjective feeling. The anticipation of pain motivates a move away from dangerous or noxious stimuli, and the memory of a pain encountered in the past can be a powerful and motivating force for the immediate experience of pain [6].

## **3. The brain and the social exclusion**

Social neuroscience studies the neural basis of the psychological processes that exist between the brain and social interactions, through neuroimaging techniques such as nuclear magnetic resonance (MRI), functional nuclear magnetic resonance (fMRI), transcranial magnetic stimulation (TMS) [2, 3, 9, 10]. Authors have begun to investigate the similarity of the neuronal substrate between physical pain and social pain during the experience of social exclusion [10]. Eisenberger et al. [10] conducted a study on social exclusion using fMRI to determine whether the regions activated by social pain were similar to those activated by physical pain. The affective component of physical pain deals with signalling a negative state and motivating the behaviour to reduce it. The affective component of physical pain is processed, in particular by the dorsal portion of the anterior cingulate cortex (dACC) and by the anterior insula. The anterior cingulate cortex (ACC) functions as a neuronal alarm system that monitors conflicts and identifies when an automatic response is inappropriate or in conflict with the intended goal [10]. In humans, ACC is activated by the noise of crying babies [10]. The dACC is a structure known to be activated during the experience of physical pain, which has also been found to be activated during social pain [10, 11]. For this reason, pain is the oldest signal that something is wrong, and activates this brain region [10]. In particular, the dACC is associated with suffering rather than with the sensory component of pain [10]. The most famous neuroimaging study on social exclusion is conducted by Eisenberger et al. [10], the participants are scanned in the fMRI setting, while participating in an interactive virtual session of the game, Cyberball. The game

consists of playing virtually with two other players to pass the ball. In truth, no other participants were present in the simulation of the game but it was a computer program, which was given a story of circumstance to make the identification of the participants truthful to make them believe they were playing with other people. The game of Cyberball is recognised to be able to manipulate effectively feelings of inclusion and exclusion [11]. In the first session of the game, the participants were included in the dribble while in the following round they were partially excluded through the game [10]. When participants in the experiment realised that they had been excluded from the game, and seeing that another participant was not excluded, the researchers noted an increase in dACC and anterior insula activity, a circuit very similar to that typically seen in studies on physical pain [10, 12–15]. But why are social exclusion behaviours still enacted today? Social exclusion allows man to live and evolve selectively, surrounding himself with people similar to him who share closeness, similarity and identification to better adhere to group norms. The social exclusion mechanism allows the protection and maintenance of the same group in which to identify oneself.

According to some approaches to the study of human motivation, human beings are motivated to stay in groups and to create a sense of belonging [16]. From an evolutionary perspective, social inclusion can be considered an adaptive goal that supports the individual's adaptation to the environment; however, invalidating experiences and learnings may connect the pursuit of adaptive goals with the perception of danger and prevent its achievement [17]. This point of view may be an interesting perspective to view the neural basis of social inclusion and exclusion describe above.

#### **4. The evolutionary theory of motivation**

The Evolutionary Theory of Motivation (ETM; [16, 18–20]) is a theoretical model developed in a clinical context from a cognitive- evolutionary framework and currently represents a common ground for different approaches, not only concerning psychopathology. This evolutionary perspective suggests that the Motivational Systems developed by every human being are based on innate and universal dispositions that can be defined as predispositions to act towards specific goals, selected by evolution. They should not be regarded as fixed patterns of action, but as tendencies to pursue particular forms of interaction with the environment, including the social one [20]. According to the “Triune Brain Theory” [21, 22], human motivational systems can be organised into three hierarchical levels, corresponding to the different needs that emerged from the evolutionary process: survival (Brain Stem or Reptilian Brain), interaction with other group members (Mammalian Brain) and “epistemic” needs (Neo- Cortex Brain). The most archaic motivational system may be called ‘*non-social*’; its primary aim is the maintenance of homeostasis, defence and exploration of the environment. This system is based on the activity of neural networks located in the Brain Stem and basal ganglia. It is common to all vertebrates and does not require interaction with other members of the species. With the appearance of the limbic system during evolution, new motivational thrusts that regulate social interaction can be identified: the ETM postulates the existence of “Interpersonal Motivational Systems” (IMS; [16]) that operate in all mammals, including humans. Each of these systems has a different neuro-functional representation [23] and aims to achieve a specific adaptive goal (**Table 1**).

This second level is therefore made up of systems capable of regulating communication between members of a social group, starting from birds and mammals that



Attachment system	Search for protective closeness and help
Caregiving system	Protection and comfort offered
Sexual system	Reproduction and formation of sexual couple
Ranking system	Definition of social rank (dominance and submission)
Cooperative system	Sharing of goals, alliance

**Table 1.**  
*Interpersonal motivational systems and their goals (modified by [16]).*

can recognise conspecifics. The formation of cohesive social groups has therefore required the emergence of systems that organise the different emotions and consequent motor actions into typical sequences for each goal [24]. The IMS are specific for each critical situation that can be faced using an appropriate interpersonal position and are activated or deactivated according to the achievement of the goal. The activation of IMS produces unconscious mental activity and implicit relational knowledge [25, 26], which represent the first level of consciousness, definable as “Protoself” [27]. Moreover, the activation of each motivational system, the achievement of its goal, and the obstacles posed by the environment result in the construction of memory patterns capable of modulating subsequent experiences [16]: while pursuing a specific goal, assessments aimed at maintaining survival and a state of minimum security are necessary [28]; the achievement of the evolutionary aim might be hindered by implicit memories learned in an interpersonal and social context [16].

The third hierarchical level involves epistemic motivations supported by the activity of neocortical circuits and concerns intersubjectivity (Stern XX) and the construction of meanings:

*“The new evolutionary goal directs an individual to attribute meaning to his/her life by giving order, consistency and unity to the knowledge possessed and incarnated through the activation of the oldest limbic and non-social motivational systems to harmoniously organise his/her vision of self, others and the world ([29]; pg. 2)”.*

Through the emergence of Neo-Cortex, all pre-existing goals and motivations related to social interaction can become conscious and objects of verbal thought [20]. Among Motivational Systems, there is a recursiveness of information flows that bidirectionally links the archaic level with the more recent evolutionary levels. Each system processes information from the previous levels (bottom-up pathway) and the higher levels send excitatory or inhibitory signals to the lower level systems (top-down pathway; [24]). Furthermore, recognising Jackson’s Theory as a theoretical framework of reference [30], the ETM suggests that the more recent structures, which have control over the more archaic ones, are the most sensitive to ‘dissolution’ in the face of environmental events. The consequent manifestations of a switch-off in the higher brain functions would therefore be ascribed to the activity of the lower ones: this would become clear in the case of traumatic, life-threatening situations [16]. At this point, it may be interesting to consider the impact that the loss of safety conditions has on the functioning of the neural circuits supporting social behaviour. As Porges’ Polyvagal Theory makes well clear [31], the ability to identify a secure environment and a safe conspecific is a necessary skill for mammals to switch-off their brainstem-regulated defence systems and to engage in social interaction with group member. This mechanism requires a complex regulation of the autonomic state through the vagus nerve [32]. For the human being, therefore, states of safety are a key pre-condition for relational involvement and for

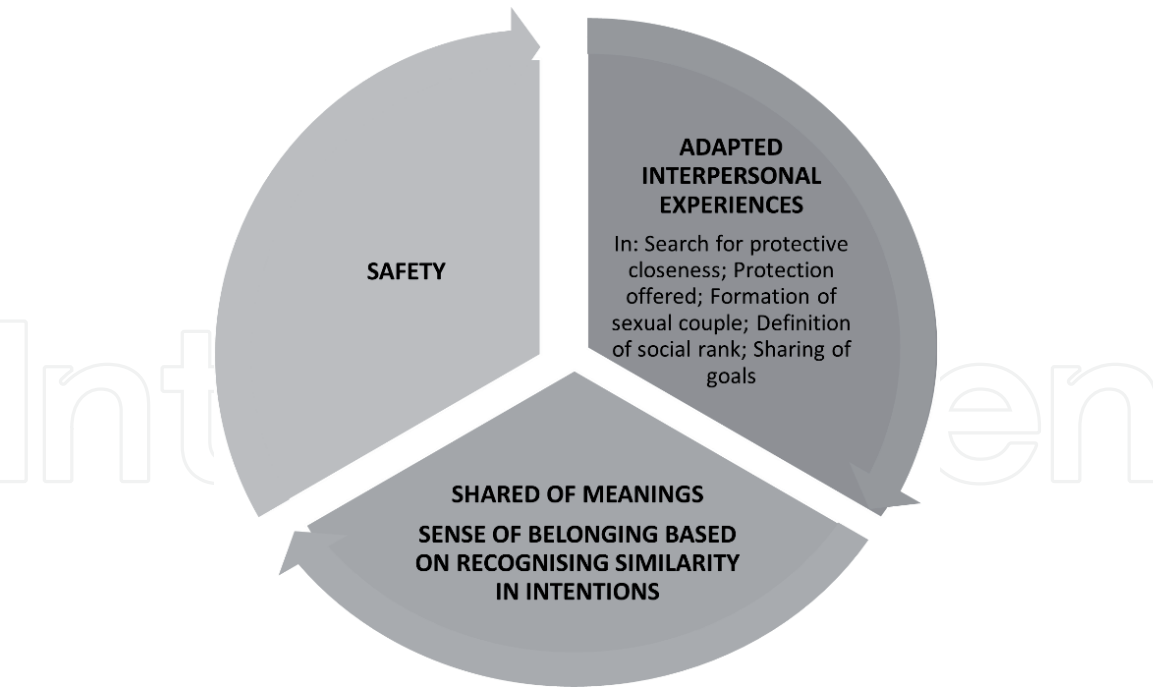
getting access to higher brain structures, which enable the building of conscious Self- narratives.

#### **4.1 The cooperative system and the emergence of intersubjectivity**

While systems of supply and demand for care, the formation of a sexual couple and competition for social rank are present in almost all mammals, only in a few species it is possible to identify a system that regulates cooperative behaviour between group members [33] and, from the perspective of ETM, this system reaches a unique complexity in humans being [20]. The cooperative system is triggered by the perception of goals that are more easily pursued sharing actions of at least two members of the group, in contrast to situations where access to resources is limited and competition is necessary (rank motivation system). The emergence of social groups in the course of the evolutionary process would then make it possible to maximise survival by sharing resources and by organising relationships of submission and dominance. The definition of social status is associated with the suppression of destructive aggressive behaviour towards members of one's species. Indeed, although activation of the social rank system involves some type of intra-specific aggression, it is manifested with "ritual agonistic behaviours" [34]; this mechanism is observed in simple vertebrates and consequently does not require the intervention of limbic structures, which are evolutionarily more recent [24]. Even though the best-known explanation of cooperative behaviour is 'reciprocal altruism' based on the idea that it represents a conditional strategy based on individual benefit [35], the ethologist Michael Tomasello has identified behaviours that are not supported by personal advantage in the human being. For example, children at 18 months show helping behaviours to strangers without getting any benefit for themselves [36] and at 12 months actively search for shared attention with an adult on the same object only for the mutual sharing purpose [37]. This finding suggested that intersubjectivity may have emerged as an enhancement of the ability to cooperate with other group members in the evolutionary process. The possibility of actively sharing attention with the other would create the basis for intersubjectivity and for recognising oneself as similar to the other, not only based on morphological similarity (already guaranteed by our Mammal Brain), but also on intentionality [38]. Intersubjectivity, as an emerging motivation in development, would enable language development and make it possible to share experiences [16]. Furthermore, *"the highly developed cooperative/altruistic system in humans that coevolved with intersubjective abilities is instrumental in building mutuality, trust, and hope"* ([19], p. 892).

#### **5. ETM and social inclusion: some preliminary considerations**

Currently, ETM represents an important theoretical framework in the clinical context to study psychopathology and to develop approaches that emphasise the importance of cooperation in the psychotherapeutic relationship [39]. However, ETM is a comprehensive evolutionary-based theory of human motivation and then it can represent an interesting map to analyse social phenomena such as inclusion and exclusion. In this theory's view, briefly outlined above, the individual social inclusion might be considered as the result of the achievement of evolutionary goals and some environmental conditions can support it (**Figure 1**). First of all, it is only the feeling of a safe environment that guarantees relational engagement and exploration (Brain Stem; [40]); on a neurobiological level, the perception of threat can trigger the archaic defence system, inhibiting the activation of higher brain areas.



**Figure 1.**  
*A potential mapping of social inclusion conditions in the ETM context.*

This adaptive survival strategy makes it impossible to pursue evolutionary higher goals that require interaction with others members of the group.

Moreover, social security is a key condition for the emergence of mentalisation and can be provided by different types of social relations, each linked to specific motivational systems [28]. Then the social and family environment should support the achievement of our ‘limbic goals’ in safe conditions: seeking protective closeness in case of distress, offering support to another perceived as vulnerable, establishing clear hierarchical positions without destructive aggression and sharing resources to pursue common goals (Mammalian Brain). Finally, validating experiences related to the pursuit of interpersonal goals and the resulting implicit knowledge can sustain the development of higher conscious cognitive skills, such as sharing experiences and creating a sense of belonging with others who, despite differences, we recognise as like ourselves (Neo-Cortex Brain). In the framework of ETM, experiences of social exclusion could thus be considered as the result of failures at one or more levels of the human motivational systems: impossibility to feel security in one’s environment, inability to have good relational experiences related to limbic goals (e.g., adapted cooperative and competitive experiences), and failure to share meanings and to develop a deeper sense of belonging that is not only based on individual similarity and physical proximity. These repeated experiences can induce social pain and suppress the pursuit of group affiliation and of social inclusion.

## 6. Conclusions

Exploring such complex topics using multiple points of view must become an attitude for all modern sciences. It is starting from the particularity and exclusivity of each one, from neuroscience to sociology, from biology to psychology, that we can face the challenges presented here and in the future. The thought immediately goes to the monitoring and management of the post-pandemic situation, since currently the tendency is to focus on the short to medium term effects. Increasingly, it is emerging that Covid-19 infection can have major consequences, even months

after recovery. The international scientific literature has included them in what is called Post-Covid or Long-Covid Syndrome. Addressing aspects of social exclusion becomes a necessity. This challenge can only be met by collaboration between disciplines, psychobiology and psychology, sociology and neuroscience. Only in this way we will have a complete interpenetration of the hyperplexities and questions that we are not able to highlight alone.

## Funding

This research was supported by PRIN 2015 PER-FORMARE IL SOCIALE. Formazione, cura e inclusione sociale attraverso il teatro, principal investigator (PI) Prof. Bernardi.

## Conflict of interest

“The authors declare no conflict of interest.”

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