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Commentary on “Toward a Neuroscience of Empathy: Integrating Affective and Cognitive Perspectives”

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EMBODIED SIMULATION AND EMPATHY

The article by Douglas Watt provides a thorough and thought-provoking review of the contemporary neuroscientific accounts of emotion and empathy and proposes an integration of the affective and cognitive views on these topics. A first distinctive feature of Watt's approach to empathy is the relevance—or even primacy—he attributes to attachment as the key factor in evoking empathic responses toward others. According to Watt, empathy is fundamentally a protective and nurturing response to suffering in another. A second feature of Watt's model is the supposition of a “global gate” controlling the activation of empathic responses.

This global gate is admittedly “poorly understood”; however, it is proposed that global gate computations are variations of attachment-related approach mechanisms, whose role should consist in determining the extent of “resonance induction” for the empathizing subject.

In the present commentary I first focus on Watt's definition of empathy, by discussing his proposal that the notion of empathy should incorporate the intrinsic motivation to relieve the distress of empathized others. I then challenge Watt's claims that the neural mechanisms underpinning emotional contagion “remain elusive” and that the shared neural representations instantiated by mirror neurons and related mirroring mechanisms in the human brain qualify as a late developmental outcome of voluntary and highly cognitive strategies.

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Empathy, embodied simulation, and mirroring mechanisms

Watt's definition of empathy seems to merge within it two distinct aspects: (1) the capacity to grasp others' affective states; (2) the capacity to feel concern for others' affective states. In my opinion, the second aspect can be better qualified as "sympathy" and therefore should be left out of the discussion of empathy and the neural mechanisms possibly underpinning it.

One can empathize with others—that is, directly understand their affective state—without necessarily being compelled to sympathize with them. It can be argued that in order to be a sadist one needs to be fully aware of the harm to and pain provoked in the victim of the perpetrated insult or violence. This would imply the capacity of empathizing with the victim, obviously without experiencing any concern for those harms and pains, but actually deriving pleasure from it.

To empathize with others means to directly grasp the meaning of the emotions and affective states they are experiencing while attributing these states to the other. I posit that the empathic process *is not* in the first place the outcome of an inference by analogy. It is the product of a direct matching between what the other is expressing by means of ostensive behavior and what we would feel were we expressing those affective states ourselves. This notion of empathy is not new. It has a long philosophical history.

The affective dimension of interpersonal relations has attracted the interest of philosophers, because it has been recognized as a distinctive feature of human beings. As pointed out by Stueber (2006), the notion of empathy emerged during the second half of the nineteenth century as the convergence of two independent philosophical traditions: the hermeneutic tradition of the philological sciences, which primarily focused on the notion of *Verstehen* [understanding], and the discussion within aesthetics, which indeed introduced the notion of empathy.

"Empathy" is a later English translation (see Titchener, 1909) of the German word *Einfühlung*. Robert Vischer introduced the term in 1873 to account for our capacity to symbolize the inanimate objects of nature and art. (On the relationship between empathy and aesthetic experience, see Freedberg & Gallese, 2007.)

Lipps (1903) extended the concept of *Einfühlung* to the domain of intersubjectivity, which he characterized in terms of *inner inhibited imitation* of the perceived movements of others. In Lipps we already see the formulation of empathy as something radically different from an inferential and theoretical stance toward others' minds.

Phenomenology has further developed the notion of *Einfühlung*. A crucial point of Husserl's thought is the relevance he attributes to intersubjectivity in the constitution of our cognitive world. Husserl's rejection of solipsism is clearly epitomized in his fifth Cartesian Meditation (Husserl, 1977, English translation), and even more in the posthumously published *Ideen II* (Husserl, 1989, English translation), in which he emphasizes the role of others in making our world "objective." It is through a "shared experience" of the world, granted by the presence of other individuals, that objectivity can be constituted. According to Husserl the bodies of self and others are the primary instruments of our capacity to share experiences with others. What makes the behavior of other agents intelligible is the fact that their body is experienced not as a material object (*Körper*), but as something alive (*Leib*), as our own experienced acting body. Neuroscience today shows that the scientific investigation of the "*Körper*" (the brain-body system) can shed light on the "*Leib*" (the lived body of experience), as the latter is the lived expression of the former.

From birth onwards the "*Lebenswelt*," our experiential world inhabited by living others, constitutes the playground of our interactions. Empathy is deeply grounded in the experience of our lived-body, and it is this experience that enables us to directly recognize others not as bodies endowed with a mind but as *selves* like us.

The relationship between action and intersubjective empathic relations became even more evident in the works of Edith Stein and Merleau-Ponty. In her book *On the Problem of Empathy* (1912), Edith Stein, a former pupil of Husserl, clarified that the concept of empathy is not confined to a simple grasp of the feelings or emotions of others. There is a more basic connotation of empathy: the other is experienced as another being to oneself through an appreciation of *similarity*. An important component of this similarity, according to Stein, resides in the common experience of action.

Merleau-Ponty in the *Phenomenology of Perception* (1945, p. 215) stresses the importance of the reciprocity of our actions and those of others for the constitution of meaningful interpersonal bonds.

The shared intersubjective space in which we live from birth enables the constitution of the sense of identity we normally entertain with others. When observing other acting individuals, and facing the way they act and the emotions and feelings they display, a meaningful embodied interpersonal link is automatically established.

The discovery of mirror neurons in monkeys (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Rizzolatti &

Craighero, 2004; Rizzolatti, Fadiga, Gallese, & Fogassi, 1996) and of mirroring mechanisms in the human brain (see Gallese, 2001, 2006, 2007; Gallese, Keysers, & Rizzolatti, 2004) shows that the very same neural substrates are activated when some of these expressive acts are both executed and perceived. Thus, we have a *subpersonally instantiated, we-centric* common space.

The hypothesis I am putting forward is that a common underlying functional mechanism—embodied simulation—mediates our capacity to share the meaning of actions, intentions, feelings, and emotions with others, thus grounding our identification with and connectedness to others. This occurs in a mandatory, unconscious, and predeclarative fashion. Besides and before being mind readers, we are fundamentally behavior readers (Gallese, 2001, 2003a, 2003b, 2005, 2006, 2007).

That said, it is arguable to conflate, as Watt does, the activation of the mirror neuron system (MNS) with the instantiation of conscious “cognitive contagion” typically reflecting more conscious imitation.” The evidence suggests exactly the opposite. It is true that the overlap of activation in the self/other experience conditions can be modulated in terms of the brain areas involved both by the cognitive demands imposed by the type of tasks and by the particular mental attitude of individuals (see Singer & Frith, 2005). However, the activation of the MNS—with the single exception of voluntary action imitation—appears to be automatic and nonconscious. The MNS instantiates a neurophysiological mechanism probably underpinning the variety of emotional contagion behaviors reviewed by Watt, which seem far less mysterious than he postulates (see next section).

Why does the MNS appear to be involved in so many aspects of social cognition? Because the activation of the multiple and parallel cortico-cortical circuits instantiating mirror properties underpins the multilevel connectedness of individuals within a social group. Such connectedness finds its phylogenetic and ontogenetic roots in the social sharing of situated experiences of action and affect. The MNS provides the neural basis of such sharing. The merit of this hypothesis is that it enables the grounding of social cognition into the experiential domain of existence, so heavily dependent on action (Gallese, 2007; Gallese, Keysers, & Rizzolatti, 2004; Rizzolatti & Craighero, 2004).

When we witness the intentional behavior of others, embodied simulation generates a specific phenomenal state of “intentional attunement” (see Gallese, Eagle, & Migone, 2007). This phenomenal state in turn generates a peculiar quality of identification with other individuals, produced by the collapse of the others’ in-

tentional relations into the observer’s ones. By means of embodied simulation we do not just “see” an action, an emotion, or a sensation. Side by side with the sensory description of the observed social stimuli, internal representations of the body states associated with these actions, emotions, and sensations are evoked in the observer, “as if” he/she would be doing a similar action or experiencing a similar emotion or sensation. Let us now specifically focus on the role of the MNS and embodied simulation in our capacity of understanding the emotions expressed by others.

Mirroring emotions

“Emotion” is a word. It designates and refers to a multidimensional aspect of our life. To experience an emotion can be described as subjectively living “inner body states” of varied intensity that can surface, with different degrees of explicitness, as ostensive behaviors, often localized to specific body parts, like the face.

The word “emotion” is plurivocal: we normally employ it to designate a variety of phenomena ranging from background affective states or moods, to reactive experience to external stimuli (the so-called basic emotions), and to social affects such as jealousy, pride, guilt, and shame. Adolphs (2002) emphasized that it is possible to simultaneously conceive of emotions as discrete entities and temporary intersections within a continuum of states defined in terms of motivation and alertness. In fact, the complexity and polymorphic nature of the states rubricated under the heading “emotion” has led scholars to argue against the utility of using this word to refer to a unitary phenomenon (see Griffiths, 1997).

One possible way to overcome these difficulties might consist in considering emotions primarily from the *output or expressive side*. As proposed by Dumouchel (1995), the universality of emotions resides in the universality of the social bonds they help to constitute. According to Dumouchel (1995), being in a given emotional state (say, being angry at someone) is not an intrinsic psychological property of a subject, but the relational property of an individual within a given social context. This means that the expression of emotions constitutes a system of social communication with the main purpose of facilitating social coordination. Facial and bodily movements reveal preferences about available behavioral options.

Furthermore, a systematic reciprocal correlation between the bodily expression of emotion and the way in which emotional information is interpreted has been repeatedly observed. For example, it has been shown

that when individuals assume emotion-specific body postures or facial expressions they experience emotional states and evaluate external events in a congruent fashion (for review, see Niedenthal, 2007). In fact, the coordinated activity of sensorimotor and affective neural systems results in the simplification and automatization of the behavioral responses that living organisms are supposed to produce in order to survive. The integrity of the sensorimotor system indeed appears to be critical for the recognition of emotions displayed by others (see Adolphs, 2003), because the sensorimotor system appears to support the reconstruction of what it would feel like to be in a particular emotion, by means of simulation of the related body state (Damasio, 1994, 1999). The implication of this process for empathy should be obvious.

It must be emphasized that it is indeed possible to witness the expression of a given emotional state displayed by someone else without explicitly relying on the propositional description of that state. It is precisely this unmediated, embodied simulation-based direct form of emotion understanding that I am addressing here.

Empirical support for a tight link between embodied simulation and our perception of the emotions of others as displayed by their facial expressions is rather robust. When people observe pictures of emotional facial expressions, they show spontaneous unconscious and rapid electromyographic responses in the same facial muscles involved in the observed person's facial expressions (Dimberg, 1982; Dimberg & Thunberg, 1998; Dimberg, Thunberg, & Elmehed, 2000; Lundqvist and Dimberg, 1995). Individuals showing strong automatic facial mimicry also display high levels of empathy (Sonnyby-Borgstrom, 2002). It is likely that this rapid and automatic activation of facial muscles is triggered by the mandatory activation of the MNS.

Furthermore, in an fMRI study Carr, Iacoboni, Dubeau, Mazziotta, and Lenzi (2003) showed that *both observation and imitation* of the facial expression of emotions activate the same restricted group of brain structures, including the ventral premotor cortex, the insula, and the amygdala. The perception and production of emotion-related facial expressions both impinge upon common neural structures whose function could be characterized as that of a mirror matching mechanism. Voluntary imitation of the expression of emotions, however, does not necessarily produce the subjective experience of the emotion one is imitating.

In an fMRI study we specifically addressed the issue of how the first- and third-person experience of a particular emotion are mapped in the human brain. To that purpose, we scanned the brain activity of healthy par-

ticipants during the phenomenal experience of disgust (by having them inhale disgusting odorants) and during the observation of the same emotion as displayed by video clips of other individuals dynamically expressing it with their facial expression. The results showed that witnessing the facial expression of disgust of others activates the left anterior insula at the same location activated by the first-person subjective experience of disgust (Wicker et al., 2003). The anterior sector of the insula receives rich connections from olfactory and gustatory structures and from the anterior sectors of the ventral bank of the superior temporal sulcus, where cells have been found in the monkey to respond to the sight of faces (Bruce, Desimone, & Gross, 1981; Perrett, Rolls, & Caan, 1982). The anterior insula thus appears to link gustatory, olfactory, and visual stimuli with visceral sensations and the related autonomic and visceromotor responses.

Clinical cases also show that when the anterior insula is damaged, both the subjective experience of disgust and the capacity to recognize this emotion in others are seriously impaired (Adolphs, Tranel, & Damasio, 2003; Calder, Keane, Manes, Antoun, & Young, 2000).

This suggests, at least for the emotion of disgust, that there is a *we-centric dimension* in the experience of a given affective state and that it is underpinned by the activity of a shared neural substrate. When I see a given facial expression, and this perception leads me to understand that expression as characterized by a particular affective state, I do not accomplish this type of understanding through explicit inference by analogy. The other's emotion is constituted and directly understood by means of an embodied simulation producing a shared body state. It is the body state shared by the observer and the observed that enables direct understanding.

I think Watt is right when emphasizing the role played by different variables in gating the induction of emotional empathy. He is also right in underlining the relevance of individuals' personal history in modulating and controlling the induction of empathic responses. All these aspects have so far been poorly investigated and should in the future become one of the main targets of investigation of affective neuroscience.

I also fully agree with Watt on the crucial importance of the social intersubjective dimension for affective neuroscience. However, I am afraid that the emphasis Watt puts on attachment, viewed as the main source of the "global gate" controlling the activation of empathic responses, is perhaps excessive. Suggestions that this might not be the case come from considering the relationship between secure attachment and the

autistic spectrum disorder (ASD). It is well documented that the majority of ASD children, in spite of their impairments in reciprocal social interaction and communication and lack of empathic responses to the behavior of others, develop secure attachment and show typical attachment behaviors such as proximity seeking and contact maintaining (Rutgers, Bakermans-Kranenburg, van IJzendoorn, & Van Berckelaer-Onnes, 2004). Recently, Rutgers, van IJzendoorn, Bakermans-Kranenburg, and Swinkels (2007) reported the similarity between children with ASD and typically developing children in terms of observable secure-base behaviors in a natural setting.

On the other hand, several studies reported the severe problems that autistic children experience in the facial expression of emotions and their understanding in others (Hobson, Ouston, & Lee, 1988, 1989; Snow, Hertzog, & Shapiro, 1988; Yirmiya, Kasari, Sigman, & Mundy, 1989). Hobson and Lee (1999) reported that autistic children score much worse than healthy controls in reproducing the affective qualities of observed actions. Furthermore, McIntosh, Reichman-Decker, Winkelman, and Wilbarger (2006) showed that, unlike healthy controls, individuals with ASD do not show automatic mimicry of the facial expression of basic emotions, as revealed by EMG recordings. Finally, in a recent fMRI study, Dapretto et al. (2006) specifically investigated the neural correlates of the capacity of imitating the facial expressions of basic emotions in high-functioning ASD individuals. The results of this study showed that during observation and imitation autistic children did not show activation of the MNS in the pars opercularis of the inferior frontal gyrus. It should be emphasized that activity in this area was inversely related to symptom severity in the social domain. Dapretto et al. concluded that "a dysfunctional mirror neuron system may underlie the social deficits observed in autism."

In conclusion, the lack of empathic engagement displayed by ASD children seems to depend more on defective embodied simulation, possibly underpinned by malfunctioning and/or altered regulation of the MNS (Gallese, 2006; see also Oberman & Ramachandran, 2007), than on insecure attachment.

Conclusions

The model of empathy proposed by Watt aims at integrating affective and cognitive dimensions. The more primitive affective dimension is considered to basically overlap with emotional contagion, while the cognitive

dimension is spelled out within the standard framework of folk-psychology-based theory of mind. Both dimensions reportedly become integrated by means of the supervision of attachment.

I think the evidence on the human MNS and the related functional mechanism of embodied simulation urge some caution about drawing a sharp line between the affective and cognitive dimensions. Furthermore, the neural candidate mechanism underpinning emotional contagion is not so mysterious, since what links receptive and expressive aspects of emotion appears to be the mirroring activation of we-centric, partially shared neural circuits.

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