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AIMS AND SCOPE

Contemporary Hypnosis is the official publication of the *British Society of Clinical and Academic Hypnosis*, published on a quarterly basis. The intention of the journal is to provide a forum for the presentation and discussion of theory, research, and professional practices in the field of hypnosis, with the general aim of furthering scientific understanding of the phenomenon and promoting informed and responsible use of hypnotic procedures.

The subject matter of the journal is defined by the practices, phenomena, theory, and research associated with the term 'hypnosis' since the middle of the nineteenth century. Articles on topics related to hypnosis will be considered in so far as they help to further the understanding of the nature and function of the basic phenomena; such topics might include, for example, physiological processes, sleep and dreaming, altered states of consciousness, imaginative processes, including imagery, absorption, and fantasy, role-playing, compliance, and obedience. *Contemporary Hypnosis* also welcomes research papers, case studies, reviews, etc., relating to the professional employment of hypnotic procedures in clinical, educational, occupational, forensic, medical, and dental work.

Contemporary Hypnosis is essential reading for anyone interested in contemporary research, ideas, and clinical practice in the field of hypnosis.

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EDITORIAL COMMENTARY (extract)

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In a theoretical report Antonelli and Luchetti (2010) continue the fascination of the implications of mirror neurons for psychotherapy, see also Balugani and Ducci (2010) in this Journal. Mirror neurons are pre-motor neurons that both monitor the execution of actions and monitor the actions of others. Here Antonelli and Luchetti consider relations between mirror neurons, hypnosis, and empathy (Gallese, 2007), with implications for the behaviour of the therapist in the therapeutic alliance. The focus on the interactive synchrony between patient and therapist is an issue which has received much attention in Contemporary Hypnosis through the pioneering experimental work of Eva Banyai, S. Varga, and colleagues in Budapest (Banyai,1998; Varga et al., 2006, 2008; Varga & Varga, 2009), providing an evidence base for theoretical speculation. Antonelli and Luchetti embed their application within Ericksonian hypnosis (Erickson, 1989) with particular concern for the therapist's respect and acceptance of the patient's nature.

"Accepting the nature of the patient, who is not required to change or assimilate a new neurobiological programming. Thus, the therapy is tailored to the patient's measure. In this regard, empathy is already a form of therapy, similar to hypnosis. True empathy, in the therapeutic sense, requires strict authenticity in its interventions (genuineness, honesty, sincerity), and, when used with awareness, is a practice which allows one to fully grasp the presence of another's state of mind and to establish contact. The observation of observation allows practitioners to identify and differentiate themselves to maintain their own identity. It requires the overcoming of narcissism. In contrast, the mirror neuron system could explain why behaviors on the part of practitioners such as commiseration, consoling, encouragement or stimulation, reassuring or an unfeeling positive redefinition of the complaint are unhelpful for the purpose of therapy, if not frankly harmful, when they are artificial."

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MIRROR NEURONS AND EMPATHY: PROPOSAL OF A NOVEL PARADIGM FOR HYPNOSIS

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ABSTRACT

Mirror neurons are becoming topical and their relevance for clinical hypnosis is immense. The gap between empirical certainty and biological evidence is narrowing and new perspectives are opening up for the understanding of man and thought.

This paper seeks to explore the relationship between mirror neurons, empathy, and hypnosis, and accordingly propose a novel paradigm for hypnosis, starting from the analysis and commentary of the relevant literature from Medline, PubMed, and Embase databases as well as from monographs and expert opinion.

The mirror system appears to unite a wide array of phenomena within the same neuronal system, ranging from elementary behaviour such as facilitating responses to higher cognitive functions, imitative learning and action, and language understanding. Mirror neurons can help us to understand the neuronal basis of empathy and bridge the gap between the sciences of biology, psychology, philosophy, sociology, educational theory, and anthropology.

The discovery of mirror neurons provides strong evidence in favour of long-recognized concepts of modern clinical hypnosis regarding the significance of the therapeutic relationship. The mirror neuron system paradigm gives us the opportunity to fully reappraise a more anthropologically correct form of medicine based on human agents before technical agencies. These studies represent an opportunity for practitioners of hypnosis to reflect on a novel paradigm, which may be more unifying than previous ones, on the basis of the natural functions of the human being.

Key words: mirror neurons; empathy; hypnosis; imitation; learning; therapeutic relationship.

INTRODUCTION

The earliest studies in support of the existence of a mirror system in humans can be considered those of Gastaut and Bert in the first half of the 1950s, which analyzed electroencephalographic changes occurring during the projection of a film (Gastaut & Bert, 1954). Their results were confirmed towards the end of the 1990s by Cochin who studied the perception of motion through the spectral analysis of electroencephalograms (Cochin et al., 1998). However, the neurophysiological research which led to the identification of mirror neurons was carried out in the 1990s, following an almost serendipitous observation of macaques by Rizzolatti and co-workers. While recording the activity of individual neurons in the premotor macaque cortex, the researchers observed that many cells in this area fired

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not only when the animal performed a determined action but also when the animal observed another monkey or the experimenter performing the same task (Rizzolatti , Fadiga, Gallese, & Fogassi, 1996; Gallese et al., 1996).

Initially, a motor artefact was surmised: somehow the monkey performed the observed action by way of imitation. However, subsequent experiments demonstrated that the macaque remained perfectly still. It was later hypothesized that the monkey could prepare its motion without carrying it out, but in this case the neurons involved would have to fire also when macaques prepared other motions without the benefit of prior observation as, for instance, when preparing to reach out for proffered food.

The discovery of mirror neurons in monkeys has stimulated the search for a similar mechanism in humans (Rizzolatti, Fadiga, Matelli, Bettinardi, Paulesu, Perani, & Fazio, 1996). Perception, action, and cognition could no longer be conceived of as discrete functions (Keysers & Gazzola, 2006). Similar neurons were thus identified in the human brain and found to be endowed with an array of even richer and more diversified functions (Rizzolatti et al., 1999).

The aim of this paper is to explore the relationship between mirror neurons, empathy, and hypnosis, and accordingly propose a novel paradigm for hypnosis, starting from the analysis and commentary of the relevant literature from Medline, PubMed, and Embase databases as well as from monographs and expert opinion.

CHARACTERISTICS OF MIRROR NEURONS

The mirror neuron system of our species, besides being able to comprehend the actions and intentions of others, is also the basis of our ability to reproduce intentionally observed actions or to learn new ones.

In animals, mirror neurons could help to interpret the actions of other individuals without engaging a complex cognitive process, simply by the interaction of observed and codified action. With passive activation, they signal to the organism an action similar to a self-performed action thus allowing the observer to obtain an experience analogous to that of the actual performer of the action.

In humans, mirror neurons can help us to understand the neuronal basis of empathy, altruism, learning, intentionality and its comprehension, communication, and language development, thus bridging the gap between the biological and psychological sciences and providing a link between philosophy, sociology, educational science, and anthropology.

The human mirror neuron system is far more complex and extensive than its animal counterpart model (Rizzolatti et al., 1999). It codifies transitive and intransitive motions, the sequence that makes up the motor action, and it is also activated when the action is mimed and involves multiple cerebral regions, including those concerned with language. It seems also to mediate the comprehension of the actions and emotions of others as well as intervene in the ability to learn by imitation. Learning involves observation, the coding of gestures by the mirror neuron system, followed by a complex reworking process, still unknown, which involves the frontal lobe.

A unifying theory, based on neurophysiology, has been proposed (Iacoboni et al., 2005) to account for the ability to comprehend the acts and emotions of other individuals. This skill, which is present in our species and in an unequal measure among primates, would discharge a critical function for individual survival and achieving success in complex social situations. The basic mechanism which allows us to grasp another person's mental experi-

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ence is not a concept-dependent process mediated by an explicit instance of reflecting but, rather, represents an inward simulation which allows the reproduction of observed events via the mirror neuron system (Gallese et al., 2004). Put differently, this represents the brain's ability to couple directly the experience of phenomena in the first and the third person.

IMITATION AND SIMULATION

According to some researchers (Iacoboni et al., 1999), the components of the basic circuitry of imitation are the areas of the superior temporal sulcus and of the mirror neuron system (the infero-posterior frontal gyrus, the ventral part of the adjacent premotor cortex, and the rostral part of the inferior parietal lobe). Imitation learning appears to derive from connections between this nuclear circuit and the dorsolateral prefrontal cortex and perhaps other premotor areas. Imitation, as a form of social mirror reflection, would seem to proceed from the connections of this nuclear circuit with the limbic system.

Simulation is defined as the cerebral ability to link personal experience directly with observation in the first or third person on the basis of peculiar characteristics of the mirror neuron system. When the activation of the cortical motor or visceromotor centres is followed by the activation of other centres downstream, a specific behaviour develops which can be either an action or an emotional state. It is only when the cortical centres are activated but uncoupled with their peripheral effects that the observed action or emotion can be said to be comprised among simulations (Gallese & Goldman, 1998). The authors underline how in the observer, in parallel with the sensory description of social stimuli, an activation of the internal representations associated with those actions, emotions, and sensations occurs, as if the observer was exactly carrying out those actions or experiencing those emotions and sensations. The meaning of other people's experience is comprehended primarily in an automatic and pre-reflexive way, by means of a mechanism sustained by mirror neurons and other multimodal resonance phenomena leading to the activation of an embodied simulation: 'I see something with which I am in resonance and which I take possession of in an experiential way.'

Actions devoid of emotive charge can also be included without the realization of their corresponding motor representations, and those mechanisms are also involved in emotion recognition. The acknowledgement of other people's emotions remains on a fundamentally different basis from that of inner simulation because it does not generate experiential knowledge.

MIRROR NEURONS AND EMPATHY

Empathy is the process through which we represent other people's behaviour within our own selves—the instrument of our understanding of lives which are foreign to us. The concept of empathy implies the integration of diverse individual aspects such as perceptions, experiences, emotions, non-verbal communication as well as language, relationships, worldviews, and historical data. It is therefore broader than the mere concept of sympathy which involves an aptitude, such as that of sharing life, enjoyment, or pain.

Following Edith Stein's original definition in the early years of the last century, empathy connotes a kind of action in which we grasp the lived-in experience of others (Stein, 1989). The main components of, and synonyms for, empathy include sharing, taking part

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in, understanding, becoming one with, identifying oneself with, getting in touch with, and communicating with. Certainly, true communication is established only when there is the will within the subject to exchange something or to share together. According to some authors (Rossi & Rossi, 2006), the neurological basis of empathy is paradoxically confirmed by the findings of research on the mirror neuron system in autism. In autistic patients, especially among children, reduced function of the mirror neuron system is present (Iacoboni & Dapretto, 2006). It is too early to conclude whether this diminished function is the pathophysiological basis of autism or is a mere correlate of this disorder among the many from which these patients suffer. This neurophysiological alteration, however, might explain why autistic persons cannot participate in other people's lives. Their inability to tune in to the surrounding world may be due to a lack of understanding of the open gestures of others.

The mirror neuron mechanism may be able to explain how it is possible to reproduce within the observer the same emotional state as occurs in the observed subject (Gallese, 2003; Carr et al., 2003): through the direct mapping of the sensory data within the motor structure which generate the same emotion within the observer. Clearly, it is also possible to understand someone else's emotions through cognitive elaboration with decoding of the received sensory data mediated by a logico-deductive process. However, this pathway is longer and is not conducive to empathy but to knowledge of the non-experiential kind.

An exemplary demonstration is provided by the reaction of disgust, which probably proved important for the survival of individual members of a species. Experiments with macaques, substantially borne out by human studies, have demonstrated the activation of the anterior insula in response to olfactory or gustatory stimuli and that a particular area appears to be selectively activated with exposure to substances with a disgusting smell (Wicker et al., 2003). Brain imaging studies show that the same sector of the anterior part of the insula is activated upon observation of facial expressions of disgust and that the extent of such activation depends on the expressive intensity of the observed facial expression. In common with the motor neuron system, the insula contains neuron populations that are activated both with direct exposure to the olfactory stimulus and with the observation of the facial expression of others. Some structures of the insula also appear to be implicated via a mirror mechanism with empathy for observed pain.

A functional MRI experimental study (Singer et al., 2004), clarifies how some structures of the anterior insula and the rostral part of the anterior cingulate cortex (which are also involved in the perception of pain and in the correlated visceromotor reactions) are implicated in the experiencing and perception of disgust while also appearing to mediate empathy for pain. According to that study, the neural substrate for the empathetic experience of pain does not involve the whole pain neuronal matrix, but only the part of the neuronal network associated with the affect quality of the experience and not its sensorial qualities.

Conversely, other authors (Avenanti et al., 2005; Avenanti et al., 2006) have showed a sensorimotor aspect of empathy for pain, with an involvement of the sensorimotor cortex in the internal simulation of other people's pain. The same group of investigators (Bufalari et al., 2007) has found that the sight of tactile and painful stimuli on the hand produces, in the observer, amplitude modulations of a short latency component (P45) of somatosensory evoked potentials. Such modulations are analogous to those produced by real tactile and painful stimuli, and are linked to sensory but not affective judgement of others' pain. Given the evidence of an involvement of the primary sensorimotor cortex, and also its cru-

cial role in extracting somatic attributes from social interactions, the hypothesis appears more concrete that in the empathetic experience of pain some basic sensory dimensions such as intensity, localization, and diffusion may be shared between the self and the other. Danziger studied patients with congenital insensibility to pain who lack the experience of a common pain stimulus, in order to understand if these subjects can become aware of other people's pain (Danziger et al., 2006). Their degree of imagined pain situations, when verbally described to them, shows these patients possess a semantic knowledge of other people's pain which is no different from that of control subjects. They also tend to deduce pain from facial expressions in the same measure as controls. However, when they are requested to assess situations which induce pain through video images devoid of any pain-correlated visual or auditory clues, they show wider response variability and score a significantly lower pain estimation index, while they further differ from controls with a lower response to adversative emotional stimuli. In these patients, judging pain deduced from facial expressions and from pain-causing events is strongly linked to inter-individual differences in empathetic sensibility, whereas this correlation between pain judgement and empathy was not evidenced among control subjects. The study results suggest that a normal personal experience of pain is not necessary to perceive and feel empathy for other people's pain. In the absence of a physiological mechanism of a response-evoking corpus of previous pain-causing experiences in the body, other people's pain could be severely underestimated, especially when emotional clues are lacking, except in the case when the observer is endowed with sufficient empathetic skills to fully recognize in others the experience of suffering.

Taken together, these data seem to confirm that humans understand the emotions of other humans through a direct mapping mechanism that involves those parts of the brain where visceromotor responses are generated (Rizzolatti et al., 2006).

EMPATHY AND MODERN HYPNOSIS

In a previous work (Antonelli, 2005) we gave an operational definition of hypnosis, which was considered as a state of consciousness determined by a particular relationship imposed on sensory perceptive dynamics (i.e., the body). In the attempt to blend all the elements of this construct, the above definition was synthesized in the mathematical formula H = S/R x B, where H is hypnosis, S the state, R the relationship, and B the body. It was not a question of strictly providing a formula, but of representing in a symbolic way what is fully evinced by the human mirror neuron system. Hypnosis is a phenomenon inseparable from sensorial perceptive aspects as well as their central motor representations (body), which in turn influence the interdependent components of brain functioning (state) and of resonance between the subject and the operator (relationship). This allows the emergence of a new property of the central nervous system: the hypnotic experience.

Recently, refined experimental designs have been developed in order to identify a neurophysiological correlate of the 'hypnotic' state, and several speculative models have been proposed. Current theories on the mechanism of hypnosis imply a transfer and a positive counter-transfer, a state of empathy, and an interactive synchrony between the hypnotist and the subject. The role of the relationship is therefore emphasized not only for the success of the hypnotic induction but also as an essential factor of the phenomenon itself. In other words, hypnosis may be considered a particular kind of human interaction, and the

hypnotic relationship a container in which affective/emotional aspects and cognitive elements coexist.

Empathy would appear to be at the basis of what has been called the 'rapport zone' in the historical literature of hypnotic induction (Rossi & Rossi, 2006). Rapport zones are areas of disinhibition or increased activity in the brain, which are responsible for the efficacy of verbal suggestion in facilitating classical hypnotic phenomena. Such increased activity in the rapport zones during the segmentalized hypnotic state is what neuroscientists today would describe as the activation of selective portions of the sensory-motor mirror neuron system in complex cognition and cultural transmission (Morrison, 2002).

Milton Erickson is considered the father of a new hypnotism, the principles of which have metaphorical correspondence with the neurophysiological evidence of the mirror neuron system (Erickson, 1989). The operation of the mirror neuron system is reminiscent of the analogous use of automaticity, automatisms, involuntariness, and dissociation in the literature of hypnosis. Erickson, for example, would sometimes facilitate the induction of therapeutic hypnosis in 'resistant' subjects by surrounding them with highly suggestible subjects whose trance behaviour could be observed by the resistant subject. Erickson, in fact, was thereby activating and utilizing the mirror neuron systems of resistant subjects to facilitate their hypnotic induction.

In particular, the analogy between Ericksonian hypnosis and the mirror neuron system seems to be based on three points:

1. The therapeutic alliance, which is the major specific factor for the outcome of therapy, rests on the experience of being fully seen and fully understood, thus enabling the perception of belonging.
2. The observation of others, when viewed from the neurological perspective, is sufficient to activate the mirror neuron system.
3. The respect of others is fundamental, both in the etymological sense of *respicere* ('look over' as well as 'regard') and in that of accepting the nature of the patient, who is not required to change or assimilate a new neurobiological programming.

Thus, the therapy is tailored to the patient's measure. In this regard, empathy is already a form of therapy, similar to hypnosis. True empathy, in the therapeutic sense, requires strict authenticity in its interventions (genuineness, honesty, sincerity) and, used with awareness, is a practice which allows one to fully grasp the presence of another's state of mind and to establish contact. The observation of observation allows practitioners to identify and differentiate themselves to maintain their own identity. It requires the overcoming of narcissism. In contrast, the mirror neuron system could explain why behaviours on the part of practitioners such as commiseration, consoling, encouragement, stimulation, reassurance, or an unfeeling positive redefinition of the complaint are unhelpful for the purpose of therapy, if not frankly harmful, when they are artificial.

It is not necessary that a novel paradigm should substitute another and, if hemispheric laterality has lost some of its importance, it still provides a metaphor of the conscious and unconscious mind of scientific value. It is easier to understand, now that we can avail ourselves of more sophisticated analyses, that one cerebral hemisphere is too vast a unit to discharge a homogeneous functional role. However, the demonstration that something changes between 'before' and 'after' hypnosis remains valid, and it is this discontinuity that

is currently recognized as a crucial element of the therapy: the brain under hypnosis functions differently.

Mirror neurons are becoming topical and their relevance for clinical hypnosis is immense. The gap between empirical certainty and biological evidence is narrowing and new perspectives are opening up for the understanding of man and thought. It is probable that the problem of ego-differentiation in the child also may find an explanatory hypothesis in the solving of this issue (is it I who acts or the others who act?), given the fact that there are two practically identical neuronal activation pathways for action in the first and third persons.

The mirror neuron system appears to couple within the same neuronal mechanism a wide variety of phenomena, ranging from elementary behaviours such as a facilitating response to superior cognitive functions, learning by imitation, understanding of action, or other cognitive functions such as the understanding of language.

The initial question in Danziger's study, 'Is pain the price of empathy?' (Danziger et al., 2006), finds its reply in the evidence that empathy is the price to pay for the recognition of pain and the starting point for helpful therapeutic intervention, as demonstrated earlier by Erickson, who with physical and sensory limitations could comprehend and help others to develop what he himself was unable to accomplish.

These studies represent an opportunity for the practitioners of hypnosis to reflect on a novel paradigm, which may be more unifying than previous ones, on the basis of the natural functions of the human being. We are not opening a new track, but one hitherto unrecognized by biology, and we have a paradigm emphasizing connectedness and motion.

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