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Understanding the Complexity of our Patients: The Neurobiology of Intuition

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It is not only the medical dysfunctions (that patients suffer from) that show a high degree of complexity. The physician–patient relationship is also a much more complex story than meets the eye. However, unfortunately the opinion that the physician–patient relationship is basically a trivial matter seems to be widespread, not only outside of medicine but also within our profession. Consciously or unconsciously, many physicians still believe that a patient's visit to the doctor's office is like dropping off a broken-down car at the garage. The owner gives an account of what's not working, the chief mechanic then inspects the vehicle, finds the defect, delivers his diagnosis, gives an estimate on the repair costs and then carries out the job, after receiving the go-ahead from the customer.

Contrary to what you now probably assume, I wouldn't call this comparison completely wrong. Today we find that numerous fields of activity within medicine come in standardised chunks where we in fact act like in the example of the garage. In itself, nothing is wrong with that. Just think about the work in a cardiologist's catheterisation lab, the gastroenterologist's endoscopy lab or the work in a surgical operating theatre. But these are, as I have said, isolated moments of our work as doctors. Before a patient ends up in the cardiology or endoscopy lab or in the operating theatre, your average person from the street who has a medical problem meets a doctor, usually a general practitioner, who initially has no idea what is wrong with his patient. This encounter between family doctor and patient generally determines whether the patient travels down the right road in our complex health care system. In other words: whether he ends up feeling better or worse than before.

Naturally, there are many reasons why patients can take the wrong road within our health care system after the initial contact with the doctor. Today I'd like to treat one reason in more detail. For the patient, the ailment he or she experiences with their own body occurs in a *personal context*. This personal context bears relevance for us as doctors since it influences how the patient presents his condition. The patient's interests, desires and fears can distort the presentation of their ailment so heavily that we as physicians reach the wrong conclusions, if we only listen to what the patient explicitly tells us. However, ever since the medical profession has been around, experienced doctors know how to remedy this problem: By using their intuition! Doctors should not just listen with both ears to what the patient can explicitly tell them. They should also use their "third ear" to hear what the patient may not be able to express with words but what the doctor can extract from nonverbal cues. It has been only about 15 years since we have known that this "third ear" has a solid, neurobiological foundation. This "third ear" is none other than the neurobiological *mirror neuron system*.

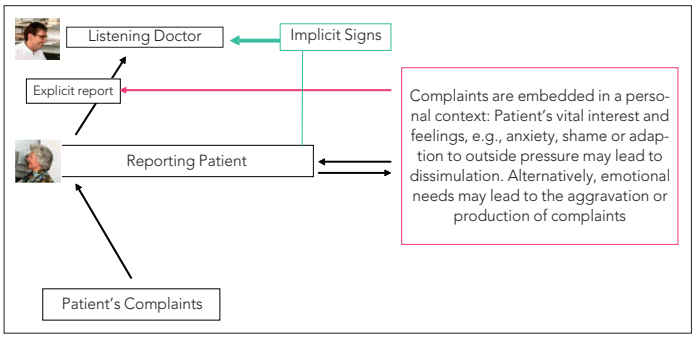

Figure 1
Messages from the patient reaching the doctor.

Mirror neurons were discovered in the early 1990s by a research group led by Giacomo Rizzolatti at the University of Parma in Italy. To start with, mirror neurons are normal nerve cells that, like other neurons, control motor actions, sensory perceptions or emotional processes in one's body. However, in addition, mirror cells also become active when actions or perceptions, for which they are responsible in one's own body, are observed (or otherwise perceived) in another subject. Mirror neurons convert perception into (simulated) action. Since mirror neurons, when active, produce an embodied response that mirrors the process that is being observed in another person, they intuitively inform a person about the inner state of another person. Mirror cells are able to actually initiate a process in one's own body that is being observed in another person.

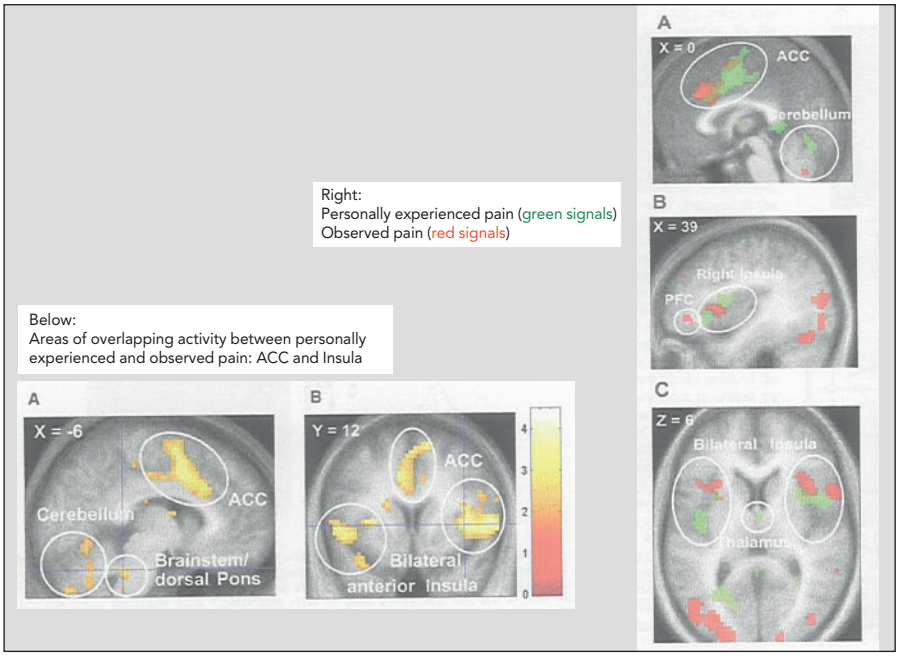

Figure 2
"Your pain is my pain": empathy neurons in the insula and ACC. (Singer T. et al., Science 2004;303:1157)

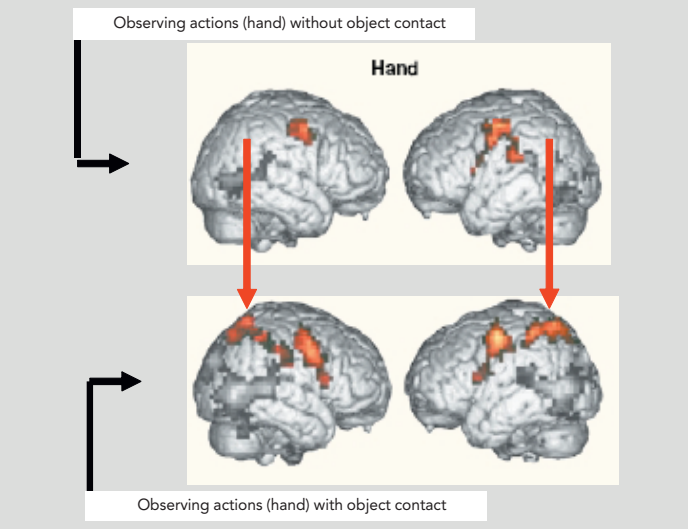

Figure 3
Observing actions: Activation of mirror neurons in the observer's cortex. (Rizzolatti et al., Nat Neurosci. 2002;2:661).

In an elegant study, Tania Singer used functional magnetic resonance imaging (f-MRI) to show that female probands who received a significant pain stimulus on one of their arms, activated neuronal networks that belong to the brain's so-called pain matrix. When looking at the image (fig. 2), please notice the green signals in the area of the anterior cingulate cortex and the insula. In a subsequent second sequence of experiments, the women were spared the pain but were asked to observe how their partners received the very same pain stimulus that they had been exposed to. The instant the men received the pain stimulus the pain matrix in the women once again lit up with activity, which you can see as red signals in this image. In an additional analysis, Singer could show that these weren't networks located closely together but that it was exactly the same neuronal networks that had reacted in both situations. What had been shown here was, no more and no less than, the existence of a neuronal system for empathy.

Mirror neurons are located in different areas of the brain. Giacomo Rizzolatti's group discovered them in the motor cortex. Neurons in our motor cortex not only become active when we do something ourselves but also when we merely watch someone else doing something. In the upper part of the image you can see the result of another f-MRI study. Motor networks in the observer's brain become active when watching another person moving his or her arm, as if he or she wanted to throw a ball. If the person being watched really has a ball in their hand and throws it, somatosensory nerve cells in the observer's brain additionally kick in (please notice the red arrows, fig. 3). The observer's mirror neuron system not only simulates the motor aspect of an act being observed but also the sensory inputs associated with it. This is the reason why we we're not only able to empathise with a person's actions when we watch them performing them but also intuitively sense what this action feels like.

Let me summarise: The mirror neurons in our motor system let us understand intuitively what the actions of other persons mean. Mirror neurons in our somatosensory system provide intuitive input on what other humans feel. When we are around someone who's vomiting then we might feel a bit sick ourselves. The reason for this – and this has been also shown experimentally – is that our own disgust centres in the insula region become active when we see someone who feels nauseous. After all, we all know that we are not only able to intuitively sense other people's emotional state but that there is a tendency for other persons' emotions to become contagious, a phenomenon known as "emotional contagion". This would also be impossible if we did not have any functioning mirror neurons. I have said before that the mirror neurons let us feel intuitively what's going on in someone else. In fact, we find that this system works without us having to put in any effort. Mirror neurons spring into action pre-reflexively. No intellectual operations are necessary. If the mirror neuron systems doesn't work – for example in persons with autistic disorders –, then all intellectual feats are of no avail.

How do the mirror neurons in our brain "know" what's going on in other humans? Well, this has already been elucidated, too. Neurobiological mirror phenomena are not telepathic events, but require us to be able to perceive another person with at least one of our five senses. I want to demonstrate this using the example of optical perception, since the most detailed studies exist on this subject. When we see a human our visual cortex initially receives a photographic impression. The information from the visual cortex is then forwarded to the posterior part of the temporal lobe. Networks exist in this area that do nothing but decode – that is interpret – other peoples' body language. Here, among other things, the gaze, the mimical expression and the movement pattern of other humans are analysed with respect to their meaning. This information is passed on to the inferior parietal lobe from where the signals are then directed to the peripheral parts of the mirror system. This process takes less than a second and occurs permanently. It is, so to say, *online* during every second we're awake.

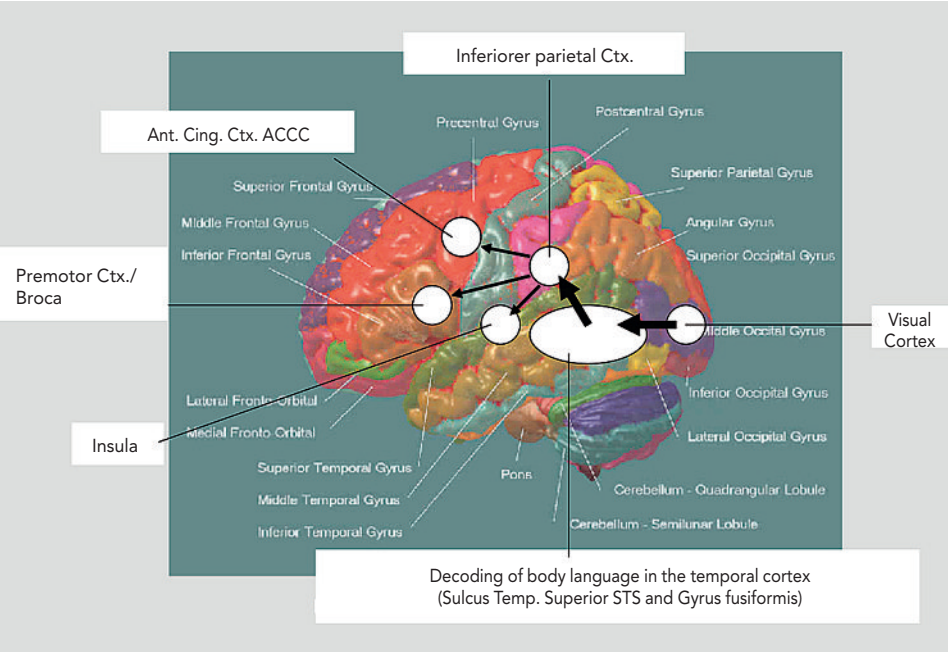

Figure 4
Feeding information into the mirror neuron system: automatic decoding of body language.

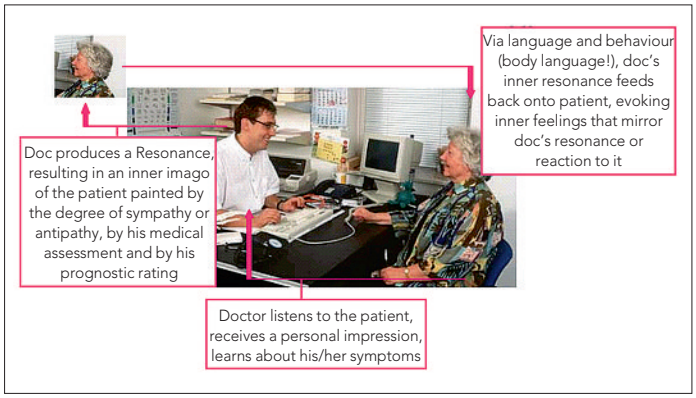

Figure 5
Implicit resonances between the patient and his/her doctor.

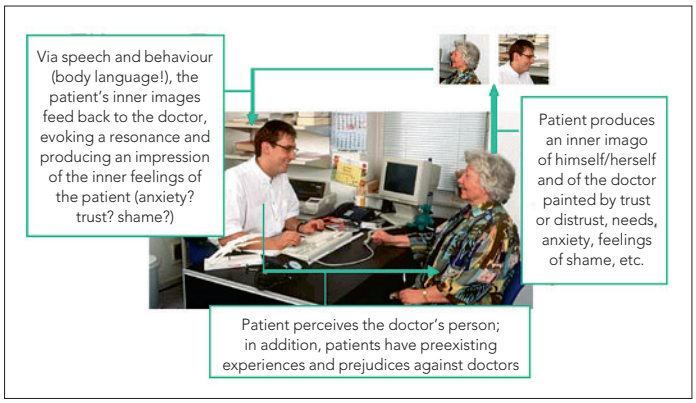

Figure 6
Implicit resonances between the patient and his/her doctor.

The mirror system, thus, mainly processes signals that result from other people's body language. This brings us back to the physician–patient relationship and the question posed at the outset: what is the neurobiological basis for the ability of our "third ear" to hear, or intuitively perceive, even such things that the patient did not explicitly say? Emotional contexts, that all humans are caught up in, prevent patients from saying what they actually want to say, because they are embarrassed for example. What happens during such a moment? The patient will hesitate or switch the topic out of the blue to distract the listener. Doctors who do not have their eyes permanently glued to the computer monitor while the patient is speaking but who keep an eye on their patients and have their intuitive perception turned on, will, right when the patient conceals something, sense a signal inside themselves that something is missing or is left out on purpose. This intuitive sensing is the prerequisite for responding empathically to the patient in such a moment. For example, the doctor could ask: "Is it possible that there's something you find hard to say? If you want to, you are free to talk about anything." – And lo and behold, something might surface that turns the diagnostic process in a completely different direction.

You probably now, intuitively, feel that this subject is too broad. We could spend half this congress talking about it. However, I would like to conclude. The aim of my presentation is reached if I was able to alert you to the intuitive, discrete signals that good doctors can detect in their patients – in addition to the rational, medical analysis that self-evidently also needs to be at the centre of our profession in the future. If a doctor sees a patient, he should be aware, in any case, that complex events are set in motion, whether he likes it or not. By perceiving his patient and listening to him, the physician becomes subjected to mirror resonance that is triggered by the patient. The physician's resonance to his patient creates an inner image in the doctor. Even if he tries really hard not to let the patient know this, the patient will sense, from the doctor's body language, what the resonance looks like, that he – the patient – generated in the physician. Without the doctor speaking about it explicitly, intuitively important information reaches the patient on questions such as: "Does the doctor care about me? Does he have hope? Will he be able to help me? Does he believe that my life is still worth living and meaningful despite this perhaps incurable disease?"

However, the same thing happens the other way around: There is a resonance in the patient as well. An image of the doctor, an imago, is formed in the patient, too. A physician who opens up to his patients can sense this. Intuitive perception will thus give him answers to other important questions such as: "Does this patient trust me? Will he really agree to a therapy? Or do I feel that he right now agrees with me merely pro forma but will later in fact do exactly the opposite?" Of course these were only some very trivial examples that were simply intended to illustrate the basic point. The truly important hidden or concealed information that we can sense in our patients is mostly of a very private nature. It requires us to build a relationship with our patient that provides space for an amount of trust which is as large as possible, that then facilitates openness. If these prerequisites do not exist, if we let this medical skill of intuitive perception degenerate, then many medical procedures will go in a completely wrong direction.

Reference

1 Bauer J. Warum ich fühle, was du fühlst. Intuitive Kommunikation und das Geheimnis der Spiegelneurone. Heyne Taschenbuch, 2006.

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