**Cultural competence and brain research: learning towards interconnectedness**

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The brain - is wider than the sky -
For – put them side by side –
The one the other will contain
With ease – and you – beside

The brain is deeper than the sea –
For – hold them – blue to blue
The one the other will absorb
As sponges – Buckets – do

The brain is just the weight of God –
For – heft them – pound for pound
And they will differ – if they do –
As syllable from sound -

Emily Dickinson (1886)

Source of picture: Getty Images

## 1 Introduction

This poem still stands the test of time. Given recent discoveries these days, we may wonder even more about our brain that we did before. Although the scientific knowledge about how our brain functions now quickly accumulates, there are still many fundamental questions to be solved. Is the physical brain the only cause for our consciousness? Do we have a free will? Do we have a central supervising unit in our brains that provides us with a strong sense of self. …..? These fundamental questions are not answered yet[i]. The brain remains a mystery to us.

This does not alter the fact that many scientific discoveries have unveiled how specific processes work inside our brain. These shed light on our social and psychological possibilities and limitations. Consequently, the new knowledge helps to know our possibilities when it comes to 'cultural competence', 'dealing with cultural differences' or 'global interconnectedness'.

In this article the value of scientific brain knowledge will be explored, resulting in recommendations for developing cultural competence.

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## 2 The scientific perspective in this article

For the purpose of this article I limit myself to what has been scientifically discovered. It is safe to depart from what we know in the materialist sense: the only thing we are able to measure. Scientific research of the past decades made us step back from the view that the brain is an organ that provides a kind of hierarchy in which all the information derived from perception is processed and passed on to some decision making core that selects the best response. Instead, the human brain is organized in *a modular fashion, consisting of specialized circuits to efficiently perform specific functions*[ii]. Although these modules themselves often have a kind of hierarchical processing, *the organization between modules lacks intermodular hierarchy*[iii]. No single module has the controlling power!

Given the vast number of neurons (100.000.000.000) that share or pass on information in their network and the parallel activity within and across modules, facilitating enormous amounts of simultaneous activity, the human brain is an extremely complex system. Modules may "reinforce" or 'weaken' each other's messages, decisions may be based on 'compromise' or 'winner take all' principles. From system theory we know that complex systems, such as our brain, have unexpected emergent properties that are greater than the sum of its parts. The emergent brain properties may be consciousness, a free will, the intuitive feeling of 'interconnectedness' or hunches about new social possibilities even when these are unequalled to previous experience.

Reasoning along these lines, we may suppose that different brain modules may be identified that are relevant for the cultural competence of human beings. These work simultaneously and none of them has the final 'say' in the decision making. Nevertheless, the emerging possibilities may be fascinating.

## 3 The cultural brain: five unique mechanisms

So what are the modules in our brain that we use when we deal with human culture? The relevant modules may be found when we compare human beings with the 'number 2' – brain species: the almost extinct chimpanzee. Looking at mere quantities and the much larger frontal cortex, scientists long believed that our rational capabilities gave us the crucial advantage. But looking clearer into the ecological gap and the distinct brain design the social cognition capabilities of human beings seem to have mattered more: "*many of the unique cognitive skills possessed by humans may, in fact, reduce to a small number of primary adaptations centered in one specialized feature of the mind: the processes that give rise to social cognition*"[iv].

Because of this Homo Sapiens developed culture, enabling us to 'behave socially' in groups that were so large that it was impossible to know every single individual. Since the spread of men from the cradle of mankind in Africa, some 100.000 years ago, our brains have not changed significantly in the evolutionary sense, but from then on, they made the much quicker cultural 'revolution' possible. Groups with a maximum of several hundred became tribes, tribes became clans, clans became peoples, countries, International alliances. Where will it end?

Hofstede's definition of culture[v] directly applies: *The collective programming of the mind*, distinguishing one cultural group from the other. Our minds could only be 'culturally programmed' through processes of learning. This required a mind that had the ability to learn from others and the

motivation to teach others. Along with this went the motivation to unlock knowledge[vi], so well illustrated with the question of a two year old child, starting with 'why?' Chimpanzees never came this far.

In line with this, Mitchel and Heatherton (2009)[vii] propose four distinct additional software-components and systems that make our brain so unique:

1. A stable and coherent sense of self
2. The ability to keep track of the mental states of others
3. Self regulation among large groups of unrelated individuals
4. Detection of social (in-group and out-group) threat

Remarkably, the authors do not mention the possibilities of speech that are rooted in our brain. Spoken language as well as inner speech increased our (social) possibilities enormously. Think for instance about the 'why' question mentioned in the introduction. According to Kolk (2012)[viii] speech enables us to steer our thoughts and behavior. He describes it as the interface between our consciousness and the unconscious processes in our brain. It helps us to 'manage ourselves'.

Another element that distinguishes Homo Sapiens from chimpanzees is the character of the resting state default mode network[ix], the system of modules in our brain that become active when we are at 'wakeful rest'. This state correlates with 'mind wandering', for which human beings, different from chimpanzees, seem to add language and conceptual presentation. It is supposed that this network, absorbing so much energy that it should somehow be useful for survival, helps us to be open for other minds and new social possibilities[x]. Recent research indicates that meditation influences this network, creating a 'new default network', diminishing mind wandering, coupling primary nodes in a potentially beneficial way[xi]. Although this area still needs research before drawing conclusions, it is added to the unique additional software that helped us to become cultural beings.

## 4 Self consciousness

The social importance of self consciousness is clear: without a stable and coherent self, others cannot count on him or her! However, there is no specific 'self spot' in the brain. Mitchel and Huntington[xii] mention three areas (or modules) of known importance to self consciousness. One specific brain region is active when we are involved with *introspection and knowledge about our own stable personality traits and dispositions*. When people are engaged in judging themselves – as opposed to others – or give an own opinion, the ventral part of the medial prefrontal cortex (vMPFC) always appears to be active. The more relevant an item is for an individual, the more active this area becomes.

Another brain network *keeps track of our own actions*. The interparietal sulcus (IPS) 'tags' our own action as opposed to others' actions. If someone has the sense of performing an own action, relative to others, the IPS plays a role. From behavioral studies it appears that these own actions are better remembered than others' actions. This illustrates the importance of the self concept.

Together with memories of all kind of events (situated and associated with many other brain parts), the IPS and the vMPFC enable us to develop an 'autobiographical self'. In this way, we can explain who we are and what people may expect from us, even to people that we have not met before.

A fourth module, not mentioned by Mitchel and Huntington, is 'the feeling of self', a concept developed by Damasio[xiii]. Our brains contain first and second order body maps with the help of which we know where our body begins and ends. This information becomes remapped in the Anterior Insula (AI)[xiv], enabling us to consciously feel our emotions that – in the view of Damasio and many others - are connected with body conditions[xv]. In other words, the AI provides us with a feeling of self.

Language has proven to be very important to regulate emotions. When an individual designates his or her own emotions, such as fear (based in the amygdala), the emotion becomes less powerful and less overwhelming[xvi]. This even happens when this is only done with inner speech. Strong emotions may be controlled in this way. In the example of fear for instance the amygdala become less active when we designate the feeling. The AI and the self judging role of the vMPFC are keys to this process.

## 5 Keeping track of the mental and emotional state of others

### 5.1 Theory of Mind (ToM)

People develop 'theories' about the mental state of others: they are able to develop ideas about the perspective of others, upon which they come to grips with what the other may want or need. To think from the perspective of others is quite a challenge for the brain. The following example[xvii] illustrates this:

> *A child gets a (cardbox) tube with smarties and opens it. To his/her surprise, the familiar smarty-tube does not contain smarties, but a pencil. When asked what he or she expected to find, the child answers 'smarties'. Then the crucial question was: "What would your friend expect to find in this box?" Normal children of age five and older, would understand that their friend would expect to find smarties as well. Younger and autistic children, however, would reply that their friend would expect to find a pencil: After all, there really **is** a pencil in the box. They cannot step back from reality as they see it.*

The kind of imagination, requiring a person to step out of his or her own perspective, is referred to as 'Theory of Mind' (ToM) or *"mentalizing"*[xviii]. When doing this our Medial Parietal Cortex is active, a place where our episodic memory is based. When people mentalize they seem to make a distinction between 'similar' and 'non similar' others. Here, the MPFC plays an important role. It appears that the ventral part (vMPFC) lights up whenever *'similar others'* are involved. The more dorsal part lights up when *'non similar others*' are involved. From the perspective of cultural difference, this reminds of the crucial distinction between in-group and out-group.

In case of the 'non simulationist mentalizing' the Temporo Parietal Junction (TPJ) has a stimulating role: the TPJ helps to distinguish between ourselves and the other. The TPJ is linked with the experience of a self in the own body, since its malfunctioning leads to Out of Body Experiences (OBE)[xix], where the 'self' seems to be somewhere else.

## 5.2 'Mirroring' the other inside our own brain

Only since a few years we know that our brain contains specialized neurons that mirror the actions, expressions and emotions of others[xx]. The principle is simple and beautiful.

> *When someone smiles, say person A, the area of his brain that is specialized in this facial movement is activated. When person B sees this person smile, his mirror neurons become activated in the very same areas in his brain. It is as if person B effortlessly smiles inside, without physically expressing it, because his motor-neurons in the same area are not active. However, imitation would be easy since the mirror and motor neurons are so near and closely connected in B's brain. Normally, B will automatically smile in return. In this way, we learned expressions and movements by imitation from the moment that we were born.*

Alongside the smiling movements babies learn to associate emotions with the smile. Normally, these are pleasant and happy feelings. Remember the positive response to a baby's first smile! In this way our 'smile movement area' became connected with our reward system releasing dopamine, making us feel happy. Equally the baby learned to connect the sound of smiling with the mirror neurons in the movement area, and, consequently, the sound became connected with the feeling.

The advantage of the mirror system is that we directly 'copy' a smile inside ourselves when we see or hear a smiling person and along with this all the feelings that we would connect with it. The same is true for other expressions or movements. We even use the mirror system to 'read' the other's intentions, because mirror neurons may be specialized in specific environmental contexts: laughing at people, for instance, is very different from laughing with others. The mirror system gives us a direct feel for the other.

Mirror neurons have been found in the motor-cortex, the somatosensory cortex (feeling the body) the Anterior Insula (conscious emotion) and the Anterior Cingulate Cortex (responsible for strong feelings such as disgust, being in love).

Iacoboni extends his system of mirror neurons with 'super mirror neurons'[xxi]. These are found in areas of the frontal cortex and contribute to more complex processes of imitation. For instance, when we are primed with information that is connected with professors, we actually become better in math than when we are primed with information connected with soccer hooligans. In other words, good examples may influence our behavior in a positive way. These 'super mirror neurons' may also suppress imitation of examples that we somehow less favourable. When adults see a person smile they might not smile in return, depending on the context.

## 5.3 Empathy and analytical orientation compete in our brain

Both the Theory of Mind ('cognitive empathy') and the system of mirror neurons ('emotional empathy') enable us to be empathic. It is a certain state of mind that is relation oriented. Analytical work appears to compete with this orientation. A recent pivotal study (2012)[xxii] showed that we cannot be both empathetic and analytic at the same time. When the analytic network is engaged in a task, our ability to appreciate the human cost of our action is repressed. And the other way around: When the brain fires up the network of neurons that allows us to empathize, it suppresses the network used for analysis.

At rest, our brains cycle between the social and analytical networks. But when presented with a task, healthy adults engage the appropriate neural pathway. From cultural theory we know that some cultures are more relation oriented than others. Hofstede, for instance, distinguishes collectivist cultures, in which a personal relation oriented attitude is more important, from individualist cultures, in which people have a task orientated attitude. Task or relation: it is the one or the other, the winning network takes all, the networks may be used serially, but not parallel.

## 6 Self control in large groups

Imagine a stadium filled with 50.000 chimpanzees. Given the few numbers of chimpanzees left in the world, it seems like a cynical example. However, the question remains: What would happen without internalized cultural values and norms? Fear, sexual excitement and power conflicts would not be checked. The stadium would be a very dangerous chaotic place: a powder keg easily lit by the smallest spark!

An important building stone for human self control is the Anterior Cingulate Cortex (ACC). This area has a role in internal cognitive control. It monitors our decisions, actions and performance. It detects conflicts and is active while processing a proper response. The ACC also follows the occurrence of unwanted thoughts. The Dorsal part of Lateral Prefrontal Cortex (DLPFC) is very active in actually suppressing unwanted thoughts. In general, the importance of LPFC regions for the regulation of social emotions is a robust finding[xxiii].

An interesting finding is the *self regulatory collapse* also known as then *'what the hell effect'*. It operates for instance when people, following a diet, let go their good intention and suddenly eat a lot. In these cases, the short term direct reward expectation wins from the more rational long term reward expectation. When this happens, the left amygdalum and the nucleus accumbens (NAcc) light up and take over from the LPFC regions. These two lie deep in our emotional brain.

The amygdala are crucial for emotional processing, and judges situations especially with regard to possible threat. The nucleus accumbens is part of the reward system: a neuronetwork that is responsible for steering our behaviour, based on the expectation of reward. The 'what the hell' network competes with the ACC/DLPFC network that controls our behavior: the winner seems to take all.

## 7 Detection of social threat

### 7.1 Internal social threat (in-group)

Neuro imaging research on social rejection makeS clear that our brains have a system that detects inclusionary states[xxiv]. With this system people are able to benchmark their interpersonal relationships with others. The feeling of being rejected correlates highly with the dorsal part of the ACC, so this area plays a crucial role in the benchmarking. Once the rejection is felt, people may default to a form of self control (see 6), or may seek rewards in another way, in order to compensate for the rejection. Compliments are indeed very rewarding, the reward resulting from the release of dopamine. Dopamine conditions and rewards us, with a key role for the nucleus accumbens,

releasing dopamine in our brain, while other brain parts, such as the amygdala and prefrontal cortex, are closely involved[xxv].

### 7.2 External social threat (out group)

The amygdala – we have two of these small brain organs - play a central role in the detection of threat. When it comes to social threat, especially the 'out group' is threatening. Studies involving pictures of black or white people, homeless people, ugly people, stigmatized people make clear that primary biologic relevant stimuli, such as faces, scent and taste play a crucial role in the development of fear for others – strangers. These basic stimuli relate to hard wired circuits that protected us from danger in the course of the evolution.

The amygdala are infamous for their role in the development of PTSD, post traumatic stress disorder. In this case the amygdala learned to connect a stimulus, observed during a traumatic experience, with danger. Later, even when the danger is not there anymore, it appears to be very difficult to disconnect the amygdala from the stimulus (extinction learning). The amygdala especially respond to fearful and angry faces, fear being the most important. At the same time, context information before seeing an angry or fearful face, highly influences its activity. For instance, seeing a fearful face with the knowledge that this person just saw a mouse will not activate the amygdala very much.

The amygdala play a role in a learning process in which other brain parts are involved, such as the hippocampus (memory) and the vMPFC (ventral medial prefrontal cortex). The amygdala use facial expressions and other information about the situational context in order to predict what may be expected, based on previous experience[xxvi].

It is interesting to note what happens when situations are *ambiguous* - have a surprising element - such as seeing a surprised face. In this case the vMPFC and the amygdala communicate intenserly. The vMPFC may provide a regulatory override so as to judge the expression in a positive way. Since the vMPFC is also involved in self relevant processing (see 4: self consciousness), it is assumed that we default to a 'self relevant hypothesis testing mode'[xxvii], for which the vMPFC uses contextual information with much more precision than the amygdala can.

The right amygdalum seems to be involved in the processing of surprised faces in an unclear context, the left amygdalum processes the information when the context is clear, be it positive or negative. This indicates that ambiguity creates a specific neuronetwork.

## 8 The default mode network (DMN) and meditation

### 8.1 The default mode network

For a long time, it was assumed that the brain became less active when someone had nothing to do in particular, except for entering a useless daydreaming world. Like a computer on ´stand by´. But this proved to be incorrect. When people are at rest, some parts of the brain may stop functioning, but new areas become very active and almost use the same amount of energy compared with performing a focused mental task[xxviii]. The moment action is required, the default network quickly dissolves, to continue later when we have nothing to do and once again are at wakeful rest.

*The areas involved in the default network are the (1) medial temporal lobe, that is known to integrate emotions and memory, (2) Posterior Cingulate Cortex (PCC), that discerns emotions and self relevant information, (3) the Temporo Parietal Junction (TPJ), distinction between self and other see 5), the MPFC (assessment of self and others, see 4 and 5).*

These brain areas together form the resting state Default Mode Network, in short the DMN. Raichle (2009) states that this system likely reflects a fundamental property of brain functional organization, bringing *balance in opposing forces in our brain, enhancing the precision of a wide range of processes*[xxix]. In ways yet to be understood, *"it leads to represent intrinsically a best guess (…) about the environment and (…) to make predictions about the future"*[xxx] [xxxi]. The network sculpts communication pathways in our brain, thus opening new social possibilities, and has been connected with higher-order social cognition tasks such as attributing mental states to others[xxxii].

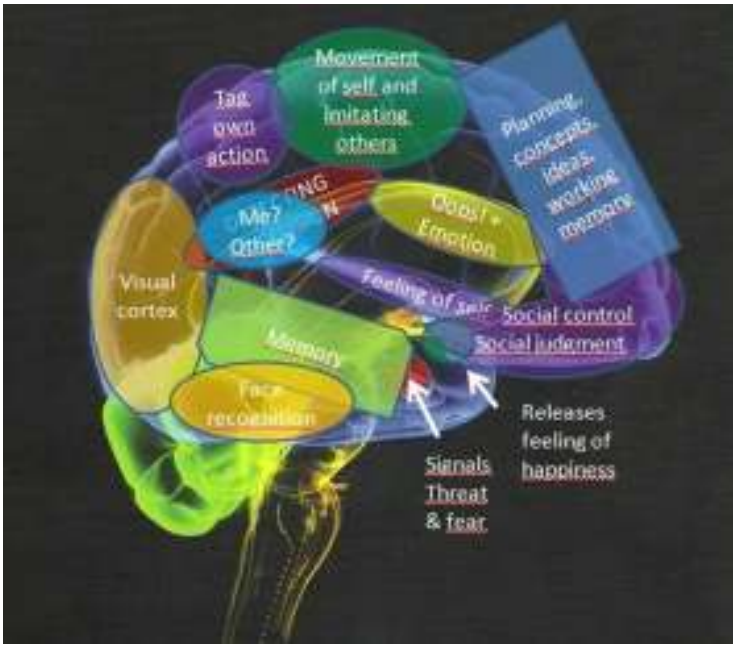
## 8.2 Meditation networks

So daydreaming seems a useful activity. However it should be within limits: mind wandering does not always make people happy[xxxiii], too much of it correlates with feelings of depression. Since many meditation techniques focus on 'wakeful rest' without daydreaming, researchers are interested in researching this network. A recent study[xxxiv] suggests that meditation has an own particular network, partly overlapping with the DMN: *"….meditation practice may transform the resting state experience into (….) a more present centered default mode*". The researchers found that some 'task positive' regions are involved, in part creating a new network, leading to the conclusion that meditation may combine several areas in a beneficial way.

Indeed, specific meditation techniques are known to be a safe and effective strategy for dealing with work stress and depressive feelings[xxxv]. *Compassion meditation* modulates the empathic process, through voluntary regulation of one's emotional responses[xxxvi]. It increases activity in the right amygdalum, making us more sensitive for facial expression. On the other hand the '*mindful attention*' technique seems to structurally reduce activity in the right amygdalum[xxxvii]. As we saw, the right amygdalum correlates with ambiguous unclear situations (see 7.2).

# 9 Conclusion and implications

A summary of the brain parts that are relevant for cultural competence is given in the mindmap handed out during the workshop. The brain parts may be seen as 'building blocks' or modules may be used in different combinations, each of which may have different outcomes. In theory, the possibilities of module combinations are impressive. In practice, people use specific combinations, depending on what the context seems to need.



This article opens a range of possible hypotheses for developing cultural competence, and may be a source of inspiration for professionals in cross cultural training. Some of the recommendations are more or less straightforward and obvious, such as the competence to designate our own feelings, or the use of positive examples (e.g. Nelson Mandela) in order to stimulate specific future behavior. Others may be more complex and less obvious, still requiring investigation.

The brain modules and their function sometimes seem to relate directly to specific cultural dimensions: the extent to which a person is inclined to avoid uncertainty may be traced back to, for instance, the activity in the amygdala. Specific regions involved with 'similar others' may be more developed in one culture (collectivist?) than in the other (individualist?). It will be a matter of time before we are able to measure cultural orientations and cultural competence in the brain, whether we like it or not!

It seems crucial that some module-combinations do not (easily) combine with others, such as the analytical network and the empathic network. Since both are needed, especially in heterogeneous groups, trainers would need to carefully design their courses, using the networks serially. Equally the 'acitivity' network 'shuts down' the default network – one could hypothesize that a trainer demanding constant activity of participants would reduce chances of seeing new social possibilities.

The patterns in our brain differ greatly depending on whether we judge someone to be part of our in-group or out-group. Empathy for out-group people is much more difficult, because the out-group triggers strong emotional patterns signaling danger. Only through contextual information about these strangers we may learn to control these emotions. Global interconnectedness would require us to feed the 'in-group' network in our brain with information, and make our felt in-group as large as possible.

Different meditation techniques have different outcomes, but may certainly be used to manage this process, especially when it comes to dealing with ambiguous situations. We might become more sensitive to strangers, and less influenced by cultural stress. The choice of meditation technique matters and depends on what a person seeks to achieve.

## 10 Recommendations

In general, it seems wise that professionals in the field of cross cultural research and training are on top of the new insights that brain research provides us and blend it with their existing knowledge. They may even try to influence the research agenda, parting from hypothesis that can be tested.

More specific recommendations for training cultural competence are given below and relate to the five areas described in this article.

*Be self conscious*

- Know yourself. Develop a firm and coherent self image of which cultural competence is part and make explicit 'where you want to go'.
- Visualize and read about role models that cover the cultural competence you want to develop;

- Learn to designate your own feelings in order to be able to control them 'when times get rough'.

*Understand the other*

- Be well informed about other cultures, if possible travel and become friends with individuals of other cultures. This provides you with the required rich context information so as to mentalize adequately and overcome (even unconscious) feelings of threat;
- Do not only read about others, but observe them from nearby, using all senses so as to stimulate the system of mirror neurons;
- Take time for empathy, both cognitive (ToM) and emotional (mirror system). 'Cognitive' talents may focus more on emotion, 'emotional talents' on cognition. Share interpretations in a safe environment.
- Design training situations in a such a way that time for analysis (of cultural difference) and time for empathy are balanced (serial, not parallel).

*Control yourself*

- Experiment with new behaviour in a safe environment (e.g. roleplay with in-group or in safe training situation), before applying it in the 'real world' – experiment with 'what the hell behavior' in order to know yourself;
- Beware of the 'what the hell effect' in real life. When in doubt, be cautious, 'authenticity' may wait. Remember that mistakes will especially damage long term relations with people who consider you as an 'out-group';
- Take time and use your in-group to share your emotions and express your frustration, however, beyond the comfortable blaming of the out-group: postpone your judgment and think about what your role model would do.

*Work towards social inclusion*

- From the start, set the conditions for empathy and relation orientation in heterogeneous groups. This implies that that analysis and action should not be too dominant in a beginning training situation. Start from a shared feeling of connection, this makes people use the 'similar other' network. Only then explore differences and challenge people;
- Try to make your in-group larger, using new perspectives and criteria, look for similarities with other cultures;
- Immerse yourself with rich, multiple person and 'strange' context information so as to learn judge ambiguous signals adequately – trainers could design rich context settings in which participants learn to deal with ambiguity;
- Visualize good examples of culturally competent heterogeneous groups;
- Give compliments to the outgroup (even when not 100% meant they seem to work!) these give a message of being included and make people feel safe.
- Humor (laughing together), well chosen music, synchronic movement, touching (when culturally accepted) and even yawning should be encouraged: through our mirror system these give a in-group feeling of safety and connectedness;
- Only give negative (but constructive) feedback in a safe environment. Good examples often work better. Building on these, it may be sufficient to trust peoples' 'in built' self correction.

*'Do nothing'*

- Take time for wakeful rest and/or meditate (mindfulness) in between the actions
- Compassion meditation may help to enlarge your sensitivity for others
- The mindful attention meditation technique helps to reduce (cultural) stress

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**End notes and literature**

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[vi] Mitchel J.P. and T.F. Heatherton (2009) *Components of a social brain* article in Gazzaniga et al (2009) 'The cognitive neurosciences' p 953 – 960

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[xvi] Kahn (R.) (2006) 'Onze hersenen' (our brains) Balans uitgeverij

[xvii] Taken from Kolk, Herman (2012) *'De vrije wil is geen illusie: hoe hersenen ons vrijheid verschaffen*' ('Free will is no illusion') Amsterdam: Bert Bakker

[xviii] For the modules involved in mentalising, I again refer to Mitchel J.P. and T.F. Heatherton (2009) *Components of a social brain* article in Gazzaniga et al (2009) 'The cognitive neurosciences' p 953 – 960

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[xxi] Iacoboni refers to the famous research of Ap Dijksterhuis *"Why we are social animals: The high road of imitation as Social Glue"* in Hurley and Chater *Perspectives on imitation*'volume 2, pp 207 – 20

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[xxiv] Same article

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