

## CHAPTER 4: FROM EMPATHY TO COMPASSION IN A NEUROSCIENCE LABORATORY

1. For a summary of the 32 studies on empathy with regard to pain, see Lamm, C., Decety, J., & Singer, T. Meta-analytic evidence for common and distinct neural networks associated with directly experienced pain and empathy for pain. *Neuroimage*, 54(3), 2011, pp. 2492–2502.
2. The increase of a positive reaction through compassion is associated with an activation of a cerebral network that includes the areas of the median orbitofrontal cortex, the ventral striatum, the ventral tegmental section, the nuclei of the brainstem, the nucleus accumbens, the median insula, the pallidum and putamen, all areas of the brain that were previously associated with love (especially maternal love), feelings of belonging and gratification. In the case of empathy, the areas are the anterior insula and the median cingulate cortex. Klimecki, O. M., *et al.* (2012), *op. cit.*; Klimecki, O., Ricard, M., & Singer, T. (2013), *op. cit.*
3. Felton, J. S. Burnout as a clinical entity—its importance in health care workers. *Occupational Medicine*, 48(4), 1998, pp. 237–250.
4. For a neural distinction between compassion and empathy fatigue, see Klimecki, O., & Singer, T., “Empathic distress fatigue rather than compassion fatigue? Integrating findings from empathy research in psychology and social neuroscience.” In Oakley, B., Knafo, A., Madhavan, G., & Wilson, D. S., *Pathological Altruism*, Oxford University Press, 2011, pp. 368–383.
5. Singer, T., & Bolz, M. (eds.) (2013), *op. cit.*; Klimecki, O., Ricard, M., & Singer, T. (2013), *op. cit.* The most recent publication is Klimecki, O., Leiberg, S., Ricard, M., & Singer, T. Differential Pattern of Functional Brain Plasticity after Compassion and Empathy Training. *Social Cognitive and Affective Neuroscience*, 2013.
6. This expression designates a study that observes over a course of months, or even years, the evolution of subjects.
7. Bornemann B., & Singer, T., “The resource study training protocol.” In Singer, T., & Bolz, M. (eds.), *Compassion: Bridging Practice and Science*, 2013, a multimedia book [e-book].
8. Klimecki, O. M., *et al.* (2012). *Op. cit.*
9. At the neural level, the researchers observed that training in empathic resonance increased activity in a network that is involved both in empathy for another’s pain and in one’s own experience of pain. This

network includes the anterior insula and the anterior medial cingulate cortex (MCC). Singer, T., & Bolz, M. (eds.) (2013), *op. cit.*

10. More precisely, these regions include the orbitofrontal cortex, the ventral striatum, and the anterior cingulate cortex. As to the training, our participants received courses on the notion of *metta*, a word that means “altruistic love” in Pali. The instructions the participants received were mostly concentrated on the aspect of kindness and benevolent wishes (“May you be happy, in good health, etc.”). The training included one entire day spent with a teacher, followed by daily group practices, one hour every evening. The participants were also encouraged to practice at home.
11. Klimecki, O. M., *et al.* (2012), *op. cit.*
12. Lutz, A., Brefczynski-Lewis, J., Johnstone, T., & Davidson, R. J. Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLoS One*, 3 (3), 2008, e1897.
13. Christophe André, *Feelings and Moods*, Polity Press, 2012, p. 250.