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Not So Easy to Define Emotional Brain

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Emotion is a vague concept and is difficult to define like Alvarado et al. explained in their research in 2002. It has the particularity of being idiosyncratic, that is, particular and specific to each individual like showed by Picard et Al. the next year. As a result, several definitions and roles have been given to emotion. As early as 1879, Charles Darwin, founder of the theory of evolution, defined it as the ability of the living organism to adapt and survive. He sees her as innate, universal and communicative. From a behavioural point of view, emotion is perceived as a "motivator", an entity that influences an individual's choice in response to an external or internal stimulus [1-4]. From a socio-cultural point of view, feelings are the response given to an interaction with ourselves and/or with others [5-9]. An emotion exists in both the personal and social dimension of the individual. It would be this capacity for adaptation and change, this link that shapes our relationships and puts us in interaction with the other [10]. Recent studies in neurobiology have shown that emotions are a mixture of several biochemical, sociocultural and neurological factors [11,12]. They are reflected in specific reactions: motor (muscle tone, tremors...), behavioural (inability to move, agitation, escape, aggression...), and physiological (pallor, blushing, increased pulse rate, palpitations, feeling unwell...) [2,13-18]. They would be the basis of our physiological and behavioural reactions. In the light of these definitions, the concept of emotion appears to be polysemic. It is indeed difficult to give a clear and unambiguous definition of emotion. However, experts agree that the plurality of definitions of emotion does not alter its central role in any behavioural analysis. It is closely and permanently linked to our decisions and actions. Emotions affect our daily behaviours, choices and perceptions. They make communication more effective and give it a high level of impact. In addition, emotions play a key role in any learning process by influencing the learner's ability to memorize, retain information and focus. During the acquisition of knowledge, emotions affect the human mind at different levels. Recent studies have shown that emotions and cognition are closely linked [16,18-22]. This is why it is difficult to approach the cognitive aspect without referring to emotions. The theory of William James & Carl Lange Choquart in 1887 states a differentiation of emotions according to bodily modifications: to each emotion corresponds such modification. A Finnish study published on 31 December 2013 in the journal Proceedings of the National Academy of Sciences produced the first body map of emotions. To produce this map, researchers conducted a study with 773 volunteers from Finland, Taiwan and Sweden. Volunteers participated in five experiments to test their sensory reactions to certain emotions: from a stimulus, the parts of the body in which their sensations were strongest were identified and mapped. During the first experience, participants listened to words

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in their mother tongue. During the second and third experiments, they viewed images and films. In the last two experiments, participants had to recognize different emotions from faces and body temperature maps. The results were averaged to produce the first body map of emotions. Cannon-Bard's theory refutes this theory. According to this theory, it is the physiological activation that will determine the emotion. So the emotion here appears before there is a cognitive evaluation. The theory of Walter Cannon and Philip Bard in 1929 explains that emotion is first and foremost a cognitive phenomenon. We feel the emotion in our brains before we have the physiological and somatic effects. Stanley Schachter and Jerome Singer's theory in 1964 interprets an emotion according to environmental conditions. Individuals interpret visceral activation according to the stimuli of the environmental situation and their cognitive state. Feelings, which can also be called emotions, are quite complex phenomena, involving many parts of the brain [23,24]. Nevertheless, the most widespread opinion in psychology/neurosciences is that feelings/emotions originate mainly in areas of the brain that are evolutionarily old, and that are found not only in humans, but also in other mammals and animals with less developed brains than ours. These areas of the brain (the limbal system, which includes the amygdala) are located in the centre and lower part of the brain, while the outer part of the brain (the cortex) appeared later in evolution, and is responsible for the most complex cognitive functions, often typically human [25,26]. Lately we have begun to focus on the areas of the brain involved in controlling feelings. More specifically, we study brain activations that support the regulation of one's own emotions, using brain imaging techniques, such as functional magnetic resonance imaging (fMRI) [27,28].

So, in summary, there is not one part of the brain that controls feelings, but rather a whole series of prefrontal cortical areas (in the front part of the brain, above the eyes) that are involved in controlling feelings and regulating emotions. These prefrontal areas accomplish this task by inhibiting, i. e. braking, the areas of the brain that generate emotions, and which are located more in the middle and lower part of the brain. It is interesting to note that the prefrontal cortex is the most developed part in humans compared to other primates and mammals, and that it is also the last to complete its development in ontogeny (i.e. in the development of each of us from childhood to the adult stage).

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