

Brain to Mind - Cognitive and Emotional Journey within the Human Brain

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Abstract

The two fundamental functions of the human brain are the processes related to the domains of emotions and cognition. Under certain conditions, the rational part of the brain can be completely overtaken by the emotion-controlling centers of the brain. The “fight and flight” phenomenon seen in intense emotional behavior, was described as “amygdala hijacking” by Daniel Goleman [1] and “neural hijack” by LeDox [2,3]. The co-activation of both systems is always required to be carried out by any activity in day-to-day life. Both systems develop in every individual through social conditioning in the early years of development and growth of a child. Despite the scope for their integrative development and applications, there are many individuals all over the world, who resort to aggressive emotional responses because of the fact that they are not cognitively trained for emotional control, which is subserved by the frontal-subcortical circuits of the brain. It is also true that many such individuals do not possess cognitive maturity to rationally process social discomforts generated by spiritual-religious, cultural, personal conflicts, which could be amicably resolved through mature cognitive processing, which could help to emotionally adjust with the differences in their world views and lifestyles. Throughout human history, people have resorted to violence and war mainly for the sake of establishing their material gains and/or belief systems. Self-acceptance of emotionally supported and socially conducive ideas can help one to believe and accept the fact that supernatural forces controlling the self and the world outside are mere ideas and beliefs generated by our own brain. The religious dogmas and belief systems are basically the ideas created in our brains by self-suggestions, for the sake of supporting and helping people in stressful and conflicting conditions. When this basic fact is personally understood and accepted by the individuals, even though it may not be scientifically easy to be tested and proven, it will bring peace and harmony to the individual and to the world at large.

Keywords: Brain; Mind; Cognition; Emotion; Self-Molding

Development of mind in the human brain

Creation of the human mind in the brain and by the brain have been the issues that encouraged the first author to write a recent series of about twenty theoretical papers. Creation of mind in the human brain and by the brain have been the topics that Mind is a functional state of the brain cells by which they learn to perceive and recognize objects and events by the process of differentiation of sensory inputs, learn to store these inputs as information, and remember to store the inputs as information, and remembers the information of such past events, which help the brain assemble the same as information using language, which the brain has acquired overtime during the developmental periods and later, by which it acquires knowledge or understanding of the occurrence of the event in its temporal and spatial

sequence. Cognitive functional states have been identified with neural cells even in animal brains. Cognitive and emotional responses contribute unique mental processes, which are unique functions that constitute modulation of the drive into emotional responses to all inputs into the brain, by specific brain areas. They make self-estimate of these inputs, which are experienced as emotional arousal or subjective experiences by the individual or the animals. Emotional arousal is needed at a minimum level for the initiation and continuation of any related action or response. The emotional arousal with personal experiences and all the information acquired and stored within the brain help the individual to create a self-image, which the individual identifies as self and reports the self as "I" in all interactions with others in the world. Each individual has been learning a language for expressing oneself, and for creating self-awareness, for communicating own experiences and thoughts to others in the world, and we have developed the skills for documenting all those thoughts or ideas, so that they could be externally stored, allowing others to read and come to know of the ideas stored and reinstate the same at different places and time.

An important aspect of the presence of experiences or acquisition of experiences by a person is the trust or faith one develops in the experiences as each experience is personally encountered reality, acquired by the person. One learns to develop faith in the experience and accepts it as a real occurrence, as it is a personal encounter with reality. The faith or the belief one develops in own experiences that a person has undergone allows the person to accept it as real. The associated emotional effects that may be produced in the person may also be stored in the brain and its recall helps the person mentally recreate the earlier experience. Faith or belief becomes another strong emotional and intellectual self-experience in a person, which allows one never dare to doubt or question the authenticity of the occurrence of the event, which rendered the experience to the person. The nature and the process of cognitive judgments and emotional experiences that occur in the brain have been extensively researched and identified over several decades.

Independent emotional and cognitive brain processing

The brain structures contributing to different functional states have been independently identified, which explained the independent emotional experiences and responses made by one without considering the values of the cognitive decisions that may simultaneously be made. Emotional experiences and responses may occur in isolation, when the cognitive significance of the external changes or responses may occur in a different brain location. Several studies [2-7] have supported the presence of sensory inputs into the amygdala through the hippocampus, leading to the occurrence of emotional experiences and response, without neurocognitive processing taking place at the prefrontal lobes. This was considered and explained as "neural hijack" by LeDoux [2,3]. That emotional experiences and expressions could be produced without being conscious or aware of them, without perceiving the inputs and the presence of these experiences and reactions were the most astonishing discovery made during this period [2,3,5-10]. Cognitive processing that may be later carried out may be used by the individual for the justification of the violent activities that may have been already carried out with the presence of emotional experience. The 'neural hijack' facilitated the production of fear, during the experiences, and expressions of associated emotions, which was called the 'preattentive emotion' [2,3]. These findings further revealed that emotional responses and experiences occurring as fear, anger, flight and freeze during the preattentive emotional state, which could have had independent origin from the amygdala. LeDoux revealed that the direct small path from the thalamus to amygdala and hippocampus could serve direct activation and production of survival related emotional responses, based on familiarity of memory provided by the hippocampus, instead of complex perceptual analysis and decision that could take place in the sensory-frontal circuits. This would mean that a stimulus can elicit such survival related or aggressive responses directly from the amygdala, even when the stimulus has not reached the primary sensory cortex. Emotional experiences and expressions in the preattentive state, would be impulsive, when they are not preceded by conscious thinking or decision making. Several studies cited above have shown the astonishing involvement of the amygdala in deciding alarming features of emotional responses and experiences. It was noted that negative interpretation of facial expression was associated with activation in the right ventral amygdala, whereas positive interpretations were associated with activation of the ventral medial prefrontal cortex. A patient with parietal lobe lesion may produce visual neglect, and would still respond to a visual emotion provoking stimulus, when the activation of the related response is associated with the direct activation in the amygdala and the orbitofrontal cortex [11]. Pessoa [12] opined as well as demon-

strated the presence of preattentive emotional responses from the amygdala, though supportive evidence could not be found in the earlier studies for a preattentive emotion. It is important to note that only a few types of emotions may elicit a direct response from the amygdala, especially when the stimulus is not perceived by the individual. The neural network responsible for preattentive emotion is considered the structural basis of experiences, which the individual may not consciously report. Training in social conditioning of a growing child is therefore an essential early training needed for a growing child for providing the opportunity for making use of his or her prefrontal contribution for learning to make decisions and accordingly carry out activities or behavioral responses. Such training would also prevent the occurrence of such preattentive emotional responses, which may cause intense social calamities for many persons.

Origin of arousal and actions

Arousal or drive is provided by the medial parts of the cerebral cortex, which forms the Anterior Cingulate Cortex (ACC) [13-16], which lies above the corpus callosum, and interconnects the two cerebral hemispheres. The Ascending Reticular Activating System (ARAS) in the brainstem area [15] serves the arousal-awareness functions of the brain, which is connected to cortical and subcortical areas. Cortical areas support essentially the neurocognitive processes [17-22] and the limbic system supports emotional arousal. The responses are supported by the structures in the limbic system and the connectivity [23,24] within the system. Motor programming and movements are associated with the basal ganglia and its connections [25,26]. The neurocognitive control functions are carried out by the thalamo-cortical systems [25], which connect the thalamus with various prefrontal areas through the basal ganglia, forming different functional systems. The neurocognitive functions, in general, include at the reception level, sensory reception, attentional processing, and working memory [27,28] and at the interpretation level, they are associated with anticipation, perceptual processing related to the creation of mental imageries, perceptual integration, and initiation of motor activity leading to actions. At the motor level, they include motor programming and executions with autobiographic and episodic memories, and finally the processing leads to encoding, and transcoding needed for awareness and communications using language and related higher cognitive functions. Several hundred research studies have been conducted and published after the early trials [29], which revealed the significant networks within the brain for the neurocognitive, emotional experiences, and motor execution - especially execution of aggressive behavior. Imaging studies, specifically the fMRI studies, have revealed activation and connectivity of emotion processing networks in healthy individuals [30-34], as well as changes in various emotional regulation disorders [35-38].

Thinking and awareness

Focusing the mind for creating continuous awareness on a specific theme of choice in a visual or auditory mode has been practiced for a long time, and it has been defined as meditation. Meditation may be practiced in a spiritual mode or nonspiritual mode, and it is essentially a method of focusing the mind or information processing of the brain. Mental focusing on a specific theme enhances the related awareness and emotional effects, which may be verbally and nonverbally molded by focusing on the mental activation. Physiological functions like respiration, heart rate, etc. become stable and attain a uniform rate during the practice of meditation. Verbal encoding of visual experiences is a favorite mental function in many individuals. Several studies [39-43] have demonstrated that activation of the primary visual cortex itself, along with visual association areas in the brain, take place during remembrance of visual information or recreation of visual imageries. Thoughts get focused on a specific theme and help to mold awareness on the specific focused theme, which may be that of the verbal reproduction or verbalization of imageries in visual and other sensory modes. Encoding may also help the individual to explain the purpose of the encountered visual stimuli and how it may affect the interests of the person, who is witnessing the visual stimulation or part of the activity that may be taking place. Such focused thinking is indeed important for scientific creativity, as well as for spiritual modulation of the mind. Faith or belief is an extraordinary mental state, which one learns to develop when one realizes that an idea or knowledge is realistic and supported by an external or internal physical condition, which could be physically verified. However, the mental state of faith may develop based on the reasoning one may create by assembling the concepts of various positive characters and imagining divine explanations, though one is not able to carry on with any physical or what we call scientific methods of reality test-

ing for proving the physical presence of such universal force. Faith, which is mentally developed as an emotional force within, may serve immense strength to the individual, supporting the actions and responses of the individual. Every person may choose to invest all his or her capabilities on this mental force, on which the person has developed faith and has been investing in all devotions. The belief and the faith in the force one builds within, become a source of immense strength, as the person believes in the infinite strength of the force, which one considers is the source of support for him or her, as well as the universe, has come from a supreme spiritual force. As faith has always been an emotionally loaded experience, human beings everywhere on the earth mentally created a physical presence for the source and identified it as a spiritual entity. This was the most significant product of the creative mind of man, which helped each human being, who could entertain the concept and emotionally dedicate all activities of own life, as the culmination of the decisions of the spiritual source, which one's mind entertained and carried out in life. As the source of faith is not a physical reality, which could be physically perceived or contacted, man developed the concept of the existence of a spiritual source. Worshiping this concept has been the most powerful mental engagement for investing all personal resources of mental capabilities, and receive in turn, personal gratification and physical and psychological supports and strength from the intense mental resources. Individuals considered the source of personal faith in the spiritual entity and have been worshipping the force. Millions of people have been engaging in this mental activity, entertaining the spiritual thoughts, and have developed corresponding emotional responses. They have structured the activities of their life, by worshipping the spiritual force and thereby providing spiritual goals for their life. They have been developing immense mental strength, consider it as divine strength within, spiritually molded, which help them to face all complexities of life in a positive manner. Taking the complex spiritual path, humans could raise the moments of their life with purposes, above what the physical realities could offer, which affected all living beings deciding the spectrum of activities and goals of life for the life span. They choose to shape the pattern of their living and social engagements in such a manner that their biological systems could transfer several of their strong life habits and acquire a lifestyle through practicing specific living pattern and transferring the same to the next generations.

Self-molding

Each person has the choice to self-mold his own life, as well as encourage and even force such molding on other individuals, with love, or opposite emotional effects, as per the choices each made which may be based on the judgments drawn on the experiences encountered in life, or accepting the advice provided by those who want to spread love or violence and withdrawal of these who could not agree with their notions of life. The value systems that one has been sharing in the early years of growth, for shaping responses to the external needs, and for self-evaluations and explanations during witnessing and experiencing external events, and for taking note of the consequent changes within own body, encourage one to choose a similar method for handling external problems at later stages in life. Love for others always provides one with immense personal strength and rendered all activities and some of the self-suggestions related to intense personal desire for fulfillment may become highly personally acceptable [29]. Strong self-suggestions may have self-hypnotizing effects in the individual, who would experience the presence of events or materials as suggested in the self-suggestions. Such strong self-suggestions were common in the past several hundreds or thousands of years, especially when people in general thought that they were under the direct control of a higher spiritual force which controlled the entire universe. People generally attributed this spiritual capability as the supreme force of the universe, and each person considers that he or she is blessed to live, sharing happiness and strength with other individuals. The human brain also has the immense potentiality to mold all the emotional effects and create a superior mental state, which one would consider beyond the physical limitations of the world. This has been helping each individual to become devotional with such grand inner force. The human mind also has the immense potentiality to gather self-induced suggestions until one acquires the capability to create a mental image of the same using own neural system. The mental state of each individual becomes so powerful that the individual would mentally accept the mental strength provided and supported by all real sources in the world. The different complex mental and structural methods used for strengthening the mental forces became the major source of emotional and intellectual interests. The mental strength achieved by the personal divine beliefs and practices always helps the acquisition of larger mental capabilities, that may help individuals in structuring and shaping their lives, resulting in extensive and intense mental developments and their effects in enriching their functional capabilities. Eminent individuals with extensive mental developments have been a source of support to younger

individuals who have been engaged in mental developments and the growth of societies. Most of the human beings have been making use of socially supported methods for interactions within the social groups, based on the belief of presence of a spiritual power in the world, and they also made use of love and affection as the chief emotional resources and life methods associated with these emotional resources, for all interpersonal and social interactions. On the other hand, there have always been sections of people present, on the earth, who did not have the capability and opportunity for understanding the immense mental effects of love and affection, and their applications, as the major methods for interactions, who choose have been those of violence and aggression for social controls and most of their social and personal interactions.

There have been large numbers of people, across the world, who used their mental involvement at the spiritual level for resorting to violent methods for dealing and interacting with people in the society, who may not have consented with their lifestyles and practices in life. Such violent groups of people have been present over the earth in various locations, who have been responsible for both violent acts, opposing those who have been engaged in peaceful personal and social actions and working for providing peace, love and happiness to others who have been suffering in life. The human mind has been viewed as a virtual reality or a functional creation of the brain, and several related aspects have been already conceptualized [29]. We have not received any evidence or indication of the presence of human beings or similar living beings on any other planet in the universe, though we have no evidence or reason to consider that such presence must not be present.

Violent and terrorist activities have been frequently sponsored by groups of individuals for the protection of their own social and spiritual beliefs and practices, and these terrible activities have been present for several hundreds of years on the earth. It is astonishing and fearful that people think that they must terrorize other individuals belonging to different cultural backgrounds or spiritual beliefs, for the sake of strengthening and protecting their own spiritual conceptualizations and worshiping methods. They have been carrying out these activities claiming that they are carried out for their spiritual needs, as they consider that some of their spiritual leaderships have encouraged such actions. Their actions and verbalization of practices in this manner have often been considered unacceptable by other groups of people. It is unbelievable that these people believe that their spiritual lords are watching the violence that they engage in and support their aggressive actions. There are also many who possess intense merging of their neurocognitive processing methods and positive emotional effects created within them. Such integration occurs with the generation of helpful, positive actions and responses, and it may serve indeed as an immense personal strength of an individual. The ability to mentally strengthen such force and become dependent on that force are present in all, though all may not make use of it in a creative manner. We may consider such ability, as result of acquisition of divine strength in the individual, by which we could take the mental creation to the height of its glorious capability. Voluntary development of such mental capabilities would enhance the creative abilities of the individual and the mental presence of a spiritual force would then become immense personal strength of the individual. The intellectual decline in human being is considered a normal happening in old age, though one may be able to deal with the presence of such decline, by the use of aids supporting the individual. Music and positive emotional responses may work as natural aids for the presence of positive and creative mind of a person, which could become the essential reviving/revitalizing components of life in the life of an individual. However, there is no remedy or alternative to death, though human qualities and characteristics could be genetically transmitted to the next generation of individuals. "I" ceases to exist by death, a reality which every living person has to accept. However, one could become a creative individual and several qualities and self-suggestions made by the person could become self-hypnotic, and the strong suggestions made by the person may induce generations of individuals living with him and those who may follow to accept the induced lifestyle and ideas of life. Despite the fact that the mind is functionally produced and that the mind has created functions and there are many needs within the individual to carry out those functions, the mental products are understood only by the mind, and not by the logical material realities of the universe. The logical scientific relationships are indeed used by the mind for understanding and creating new realities. However, this is possible only if the frontal cortex has developed its functions well in a person, which could take over the meaning and the explanations of the sensory inputs and help create logics for assembling sensory-motor contacts in the world.

There cannot be a choice of preference either for neurocognitive processing or emotional experiences and expressions. Such preference may only cause destruction of humanity. Emotional experiences are immensely important for each individual, without which life may have no significant meaning. Only positive emotions, derived from love and affection are the ones which alone could support them and help them to live with others. Arousal and drive are essential needs for living and acting or responding. Cognitive processing methods are what have helped them to grow and help them become scientific so that they could explain the structure and the functions of the components of the universe and learn to master them for controlling and creating new facilities and functions, which help their living. We must learn to avoid emotional experiences and expressions in each individual that support violence and destruction of others. Human beings have developed different cultures and lifestyles, all of which have facilitated the experiences and expressions of love and its behavioral effects, supporting others who may need support and help for their living.

Conclusion

The brain is the seat of all mental functions including cognitive and emotional processes. Development of mind in the human brain involves a multi-level process resulting from a complex interaction among genetically acquired capacities and traits, learned and stored information from upbringing, and the brain's input-output processing faculties and networks. Cognitive and emotional molding occurs in each individual based on his/her unique biological makeup and socio-cultural environment. Belief systems, including religious dogmas, are acquired by the individual through an ongoing process of cognitive and/or emotional molding. Our emotions can "hijack" the rational thinking process in many individuals while facing "fight-flight" situations. Such hijacking process can also lead to violence and terrorism, if there was an inappropriate psychological molding during human development, especially during formative years. Aggressive and violent manifestations of human behavior can only be mitigated through proper education and self-understanding of how our brain acquires information and how we become conditioned to the same information. While positive molding can result in constructive behaviors and well-being, negative molding through irrational dogmas can cause destruction to ourselves and the society at large. Reframing the acquired concepts and ideology, through positive molding, can be an option to bring peace and harmony to the self and the world.

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