

By Contribution

Emotional Dissonance: The Plastic Shield in Human Flourishing

Santhosh V. A & K. V Krishnankutty

Cognitive Psychology, with a group of brain scientists and sophisticated technology, has been successful in explaining many obscurities that persisted along with human intelligence. One such episode is the concept of emotional dissonance where substitute feelings prevent the authentic feelings to make human life flourish. After providing a generic view in the anatomy of emotions, a case oriented approach is taken for detailing the intricacies involved in the substitute emotional shield. The famous Conditioning effect to the most recent concept of Neuro Plasticity has been explored to investigate this plastic feeling. The possibility of using the advancements in brain science in restructuring the neural networks, which stand as an impediment to emotional intelligence, is also considered in the article.

Santhosh V.A. is Associate Professor, TKM Institute of Management, Kollam, Kerala, 691505. E-mail: santhosh_va@hotmail.com. **K.V Krishnankutty** is Professor, College of Engineering, Trivandrum 695016. E-mail: krishnankuttykv@gmail.com

Emotions: An Anatomic Review

Paul Ekman (1992), opines that we cannot choose the emotions which we have, reinforcing it by Daniel Goleman (1995) as a 'fait accompli' affirming the role of rational mind in controlling the course of reactions rather than generating it. A generic understanding of the nature and types of emotions and the related recent developments would add to clarity and logic. Emotions share the seat with intelligence in the brain where the former is commonly ignored by man in his busy schedule. In its simplest sense, emotion is quoted as how a person feels about something (Luthans 2005). William James (1884) states that emotions are no more than the experience of sets of bodily changes that occur in response to emotive stimuli in the world. This feel, experienced quite often in life, sometimes soothing and sometimes disturbing, has its own tale. Literally, there exists dozens of emotions in a human being categorized into different groups. Every major emotion can have many divisions and subdivisions making it difficult to list down. However the three major components that stand inevitable in a human emotion are the physiological changes

within the body, subjective cognitive states and expressive behaviours (Tangney et al 1996).

A widely accepted division has been put forward by Daniel Goleman (1995) who has contributed to the popularity of emotional science, coining Emotional Intelligence. Accordingly, basic emotions contain 'glad, mad, sad and fear'. Behavioural scientist Paul Ekman (1992) goes one step further to explain it as anger, fear, sadness, disgust, happiness and surprise. These can be observed in human beings, even in the early age.

Emotions beyond names and categories articulate serious meaning towards human progression.

Emotions beyond names and categories articulate serious meaning towards human progression. It gives different feel at different occasions with different intensity and frequency. A step that helped to unveil the intricacies involved in human emotions was the change among the scientists to concentrate more on cognitive psychology rather than behavioural or humanistic one. This led them to have more research on human brain and its role in human psychology. Gradually the researchers succeeded in making a concrete framework on cognitive neuroscience which helped them in uncovering not only the basic emotional anatomy but also the triggering base and exclusive pathways which these emotions have on their own.

Cognitive & Affective Neuroscience

The initial works of Harlow (1868), Darwin (1872) and William (1884) to the most recent contributions made by Ekman (1983), LeDoux (1986) and Damasio (2000) influenced the development of cognitive and affective neuroscience. The analysis made by the brain scientists on the working of the brain dramatically changed the perspectives of human mind. The process further developed when psychologists started showing interest in learning cognitive processes like memory, reasoning and problem solving. Aided by the developments in technology like Functional Magnetic Resonance Imaging (fMRI), Positron Emission Tomography (PET), the neuroscientists could go far ahead in this field. Evidences are now obtained on the important links between cognition and emotion (Forgas & Fiedler 1996), a relationship between feelings and thoughts which the cognitive scientist named as affective neuroscience. Affective neuroscience is concerned with the neural bases of emotions and moods. The field of study tries to explore the brain regions responsible for various emotions and the interaction of emotional processing with cognition, motor behaviour, language, and motivation. It uses functional neuroimaging, behavioural experiments, electrophysiological recording, animal and human lesion studies, and animal and human behavioural experiments for getting better understanding regarding emotions (Dalglish 2004).

Even when this science, with laboratory experiments and testable analysis, contributes much in the area of emotions, the future growth depends upon the emergence of new technologies and innovative methodologies. Researches conducted in this field are predicted to be enhanced in future by multiple methodologies, integrating functional imaging, pharmacology, TMS, psychophysiology, cognitive psychology, as well as the emerging field of behavioural genetics (Hariri et al. 2002).

Brain: The Emotional Trigger

Scientific studies proved that complex behaviours such as emotions are not based on a single area in the brain but the contribution of many areas working together. In the early stages of brain development itself, the pattern of glucose metabolism is fairly consistent with the highest degree of activity in primary sensory and motor cortex, thalamus, brainstem, and cerebellar vermis (Boulding 1956). The cingulate cortex, amygdala, hippocampus, and occasionally the basal ganglia also shows relatively high glucose metabolism (Chugani 1996) suggesting an important role of these limbic structures in neonatal interactions and possibly emotional development (Chugani 1998). Researches also state the important role of right cerebral hemisphere in emotional functions. The right hemisphere hypothesis (Mills 1912), one of the earliest models of emotional lateralization, emphasizes the critical role for the right hemisphere in all aspects of emotion processing. It also plays an important role in the expression of emotion

where, people with damage to the right hemisphere are less successful at expressing emotions (Borod 1993).

Each portion of the brain has its own key role to play, like the hippocampus is critically involved in episodic, declarative, contextual, and spatial learning and memory (Squire & Knowlton 2000). It also plays a good role in the formation, storage, and consolidation of contextual fear conditioning (Fanselow 2000). The prefrontal regions, than any other brain region, are responsible in the case of managing depression (George et al 1994). The anterior cingulate cortex (ACC), according to several theories, acts as a bridge between attention and emotion (Devinsky et al 1995). The left and right hemispheres play an important role in evoking positive and negative emotions respectively (Heller et al 1998). The limbic system, through its close connection with the rational brain, makes human development possible by bonding instinct emotional impulses with long term commitment (Goleman 1995).

There is accumulated evidence that the amygdaloid complex of nuclei such as amygdala, representing the central emotional management within the human brain, gives emotional (affective) tone to the input sensory information even before its conscious processing (Simic and Goran 2009). Amygdala, a part of the limbic system, plays an important role in regulating emotional responses, especially negative emotions (LeDoux 1992). Initial studies conducted by Kluver-Bucy (1937), Weiskrantz (1956) and other scientists proved amygdala as one of the

most important brain region for emotions and the processing of social signs of emotions including fear (Dalgles 2004). Even in modulating the storage and strength of emotions, amygdala plays an important role which was convincingly shown by James L. McGaugh and his colleagues at the University of California (LeDoux 2002).

Emotional Pathway: a Theoretical Overview

An incident triggering the brain signals and thereby changing physical and behavioural reactions of a person has been accepted and rejected by various knowledge nerves. William James (1884) relates bodily changes with emotive stimuli. The same is explained by James (1890) himself as “we feel sorry because we cry, angry because we strike, and afraid because we tremble”. Similar ideas were developed in parallel by Carl Lange (1885), leading to James-Lange theory of emotions. This theory, supported by researches conducted using modern equipments, further states that emotions are associated with patterns of physiological activity (Levenson 1992) and emotional experiences are somehow linked with facial expressions (Zazjonc & McIntosh 1992), bodily postures (Flack et al. 1999) and even tone of voice (Siegman & Boyle 1993).

The James-Lange theory was challenged in the 1920's by Walter Cannon (1927). Cannon and Bard (Bard 1928) argued that if emotions were the perception of bodily change, then they should be entirely dependent on having intact

sensory and motor cortices. The fact that removal of the cortex did not eliminate emotions, they proposed, must mean that James and Lange were wrong and thus came the first substantive theory of the brain mechanisms of emotion.

The Two Factor Theory (Sinclair 1994, Dutton & Aron 1974) states that the person affected by a situation will search the environment to choose the emotion to be experienced. The theory is supported by findings of research where a situation was created and response taken. Theories also states that an emotional reaction will follow an opposite reaction, like anger followed by calmness or happiness followed by sadness, as detailed in Opponent Process Theory of Emotions (Solomon 1982). Contributions of James Papez (1937) through the scheme for central neural circuitry of emotion, popularly known as ‘Papez Circuit’ and the detailed anatomic model developed by Paul MacLean (1949) are also some of the inevitable works in the field of emotional management. Even though a number of processes occur in the brain when an emotion has to be initiated, all the relevant parts in the brain get activated immediately making it a normal natural process.

Though the brain functions like a sophisticated super computer, complexities are involved in this marvelous natural system. One such agenda the brain encompasses, and which stands hidden, is the concept of substitute feelings. It is a phenomenon having psychological as well as biological explanations and plays a very important role in deciding the worth of a

human life. As human brilliance or cognitive advancement is not capable enough to unveil the complexities, substitute feelings stand unexplored all through the life of a human being.

Emotional Dissonance: A Case Analysis

A twenty five year old woman who came for counselling evoked the complexities behind this brain game. Working in an organisation after her post graduation in management, she was quite often appreciated by the employer for her good analytical thinking and decision making skills. Responsible for liaison work between the management and employees, colleagues accepted her as possessing high degree of intelligent quotient and reasonably well developed emotional quotient.

However, she used to get emotionally disturbed quite often with no obvious or observable reason. This disturbance was associated with certain events or persons in the past. Her own introspection revealed a retrospection of many events in the past which are of little relevance in the context. On her sitting through the session, she was successful in getting the awareness that the nature of emotions she use to end up with was a 'smile followed by inner grief' in almost all situations. She agreed that the situations, whatever be its nature, ended up with this smile followed by inner grief which she argued as rationale considering the circumstances prevailed at that time. A tedious counselling journey guided her to come out

of her discounting and be aware of the possible and more suitable emotions to be expressed appropriately. An analytical reasoning of this example explains that emotions that are expressed over a person/situation need not always be genuine. The questions to be answered here are "Do human beings have two kinds of emotions towards a common situation, authentic and programmed?" and 'Do these so called programmed emotions follow the same path with authentic feelings and produce the same results?'

An analytical reasoning of this example explains that emotions that are expressed over a person/situation need not always be genuine.

The answers to these questions are important as they act as a kaleidoscope in determining the emotional balance of a human being. Referring to the above case study, it can be assumed that every person has certain emotions that come out on situations, like a pre-programmed computer system. These emotions block the authentic ones to emulate. It may not be enough to call these emotions as habit, as its boundary is broader and deeper. Correlating the recurring worries with these plastic emotions increases the importance in navigating through its complexities. The different aspects regarding the occurrence of this phenomenon in human beings can be explained in the light of the concept of racket feeling (Berne 1972).

Racket Feeling

Racket feeling is a familiar emotion, learned and encouraged in childhood, experienced in many stressful situations and maladaptive as an adult means of problem solving (Stewart & Joines 1987). It can be any feeling like anger, hurt, guilt, scare, inadequate, righteous and even triumphant (Berne 1972). The most important aspect of such a feeling is beyond the threshold of awareness and stands as a rational means for problem solving.

Why such an 'out of the box' feeling comes in between a situation and authentic feeling and why is it out of awareness and difficult to control? Said simply, it would be the one for which there is parental permission. Different families have different scripts to play. The script is usually decided by the elder ones, which the younger ones are supposed to obey. There are families which give a childhood experience to their children by favouring one emotion to express and restricting the other. For example, there are families that discourage their little ones to be sad, but at the same time, encourage anger. Situations like getting no encouragement for anger but promoting its substitution with sadness are also not a rare case. Most of the decisions are seen to be gender centric.

Most of the decisions are seen to be gender centric.

For instance, in the case described above, the lady hails from an orthodox

family which never permits her to express feelings genuinely. She can cry even if she gets angry is the message from the parents. The result is, ending up with sad feeling in almost all situations added with a smile. The reason for smile along with racket feeling is because of a driver named 'please others' where a driver is a restrictive message that come from parents, which contain socially acceptable moral judgments and value statements (Woollams & Brown 1978). It includes Be Perfect, Try Hard, Hurry Up, Be Strong along with Please Me, the driver of the woman in the case explained. In short, the child registers certain parental messages during the early stage which seems to be appropriate in getting positive results.

Racket feelings are solely the result of parental message. Eric Berne (1972) portrays a central plaza with 36 houses and babies being ready to be born. The babies will be supplied to each house by spinning a roulette wheel i.e. if the spin stops at 17, the first baby will go to house no. 17. Eric Berne further states that each baby would develop different racket feelings depending on the house it is supplied to. For example, the parent's in house no. 17 giving permission for the baby to be angry and not to be sad would lead the baby to express anger when situation gets tough. Even if the spinning wheel comes with a different order and another baby comes to house no. 17, the feeling the baby gets will be the same. What matters here is the house and the permitted feelings over there and not the baby. This classic example of Eric Berne writes off any possibility of heredity or

genes to play a role in the formation of favourite feelings but sharpens the exclusive role of parents and parental messages for the same.

As the child progresses each stage in his life, racket feeling also gets stronger and would be accustomed with the new feeling and be guided positively towards its expression. This reinstating would permit him to justify the new feeling he has shown and be natural about it. A mere debate of the authenticity of the feeling expressed would fail in bringing awareness to the person concerned. As long as he is unaware of the concept of racket and fails to introspect towards his past to reach the stage where he identifies the parental instructions, racket feelings would seem to be genuine to him.

Racket feeling: Consequences

Racket feelings, being those that are not genuine, is non-healable and could bring longer worries to human being rather than authentic feelings which are expressed as a means of here and now problem solving (Stewart & Joines 1987). Racket feeling is a conditioned reflex (Berne 1972) which automatically peeps in when hooked by the situation. This reflex would act as a shield and prevents the authentic one to inherit, which a person could have had, as a suitable one in such a situation.

A girl who gets parental instruction like “girls can be sad but never angry”, when faced with a situation where she has to express anger will be bursting into tears as a reflex. Here sadness is the

racket feeling and anger the authentic feeling. The girl facing the situation with tears gets discounted with the authentic applicability of anger and all the biological and psychological systems would be so programmed as it accepts tear as the most suitable one to be applied. She never recognizes that tear is a shield preventing anger to come out. This plastic shield would not be decayed even after many years and would disturb her in several unexpected situations. At the same time, authentic ones when expressed completely, serves as a medicine given for a disease after proper diagnosis and helps the mind to get healed faster. It is these plastic feelings that make people suffer to come out of certain negative experiences which have no dominant role to play in their present life.

Substitute Feeling: Neuro Science Perspective

Another perspective of exploring substitute feeling is to critically analyze the brain and its functions. The advancement of brain science keeping every neuron within the observed limits of behavioural scientists opens different possibilities for the study of substitute feelings. An adult human brain with approximately 100 billion neurons produces unified experience and coordinated, organized behaviour (William & Herrup 1988). A neuron which contains a cell body, dendrites and axon communicates to other neurons by producing electrochemical impulses without any data loss in intensity and clarity. Each neuron is a store house of various learned experience. Evidences are also available on the

glial cells which are more in number than the neurons, playing a key role in the formation of synapses which is the essence of learning and storing long term memories (Carmichael 2002). Hebb (1949) explains learning as the strengthening of synapses between neurons which are repetitively activated simultaneously. A feeling or a behaviour is the outcome of such learning and long term memories. Learning thus becomes an important area to be explored with in the study of substitute feelings.

The Conditioning Effect

The famous behaviourist theories of classical conditioning by Ivan Pavlov (1927) and operant conditioning by BF Skinner (1953) were one of the revolutions in learning. Classical conditioning explains the relationship between stimulus and response, where neutral stimulus paired with unconditioned stimulus becomes a conditioned stimulus and elicits conditioned response. Operant conditioning, on the other hand, states that an individual's response is followed by a reinforcement or punishment which would in turn increase or decrease the possibility of further such occurrences.

Operant conditioning is concerned primarily with learning that occurs as a consequence of behaviour or result - stimulus (Luthans 2005). The occurrence of a behaviour as the result of reinforcement or punishment is applicable in the case of expressing feelings also. The child who elicits various feelings in his/her home receives reinforcement or punishment based on parental judgments on

those activities. After continuously being exposed to such results, the child gets programmed in such a way that feelings or behaviours expressed would be congruent with positive outcomes rather than negative ones. These feelings expressed would get concreted where it prevents the authentic one for ever. This principle stands as a base for human learning and generation of substitute feeling. The extension made in operant conditioning by Miller and Dollard (1950) by coining the word modelling, and the early theory of Watson (1924) on Law of exercise and association, also makes sense on the role of neuro science in substitute feelings. The person when learns to behave/express feelings based on reinforcement, the system (human body) takes the responsibility to make it natural, soothing and adaptable. It happens through minute changes in the neural network which is well explained by Donald Hebb.

Making Substitutes Homely

Hebbian Synapse is the increased effectiveness in a synapse as a result of simultaneous activity in the presynaptic and postsynaptic neurons (Hebb 1949). The same is described by Hebb (1949) as "when the axon of neuron A repeatedly or persistently takes part in firing cell B, some growth process or metabolic change takes place in one or both cells that increases the subsequent ability of axon A to excite cell B". This elicits the preliminary formation of substitute feeling. Even though the reason for such a change has not been completely explored by Hebb, he attributes it to the growth of terminal in axon A,

the dendrites in cell B or a chemical change in both axons.

A baby getting enough chance from the family for living with common favourable behaviour or feelings would be enhancing common cells and synapses and thereby stimulating certain behavioural patterns. These common patterns seem to the person as the comfortable rational option and further are developed as habits. Castelluci and Kandel (1974), in their research stipulates that habituation decreases the transmitter release by the presynaptic cells, leading towards a change in the synapse between the sensory neuron and motor neuron and decreases size of excitatory postsynaptic potentials (EPSP) elicited. A continuous hearing of engine sound of a train would lead towards lesser response. When the child gets parental instruction on the permissible feeling and continues to exhibit it, the feeling becomes natural and habitual as a result of changes taking place on both cells that continuously strikes. Here all other natural reactions following that feeling would be balanced, making it a homely one.

Neuro Plasticity: Boon or Bane?

A phenomenon through which behavioural anomalies including emotional dissonance persisting in a human being gets transformed is explained through the concept of Neuro Plasticity. The dogma persisted among neuroscientists on the stability of an adult brain was changed through this concept, where science now says that brain does indeed change throughout life (Gage 2003). The

concept, initialized by Polish neuroscientist Konorski (1948), explains that the plastic changes would be related to the formation and multiplication of new synaptic junctions between the axon terminals of one nerve cell and the soma of the other. It is the brain's ability to reorganize itself by forming new neural connections throughout life and adjust its activities in response to new situations or to changes in the environment (Goleman 2003). It happens through fresh connections between neurons or through the generation of new neurons.

For many years, people believed that the production of new neurons occurs only during development and stops before puberty (Rakic 1985). The generation of new neurons, termed as neurogenesis was observed in 1965 by Joseph Altman and Gopal D. Das of the Massachusetts Institute of Technology, in the hippocampus of adult rats in the precise hippocampal area, known as the dentate gyrus (Keivlpermann et al 2002). Now it is evident that thousands of new neurons are added to the mammalian brain every day (Hastings et al. 2000). A major shift in the perspective of this concept came when Peter Eriksson (1998) and several colleagues came out with the finding that the mature human brain does generate neurons routinely in at least one site, the hippocampus, an area important to memory and learning. Many scientists like Klintsova (1999), Kaas (1991), Merzenich (1993), Knudsen (1998) and Weinberger (1995) provided increasing evidence for central nervous system plasticity through their studies and thereby crumbled the dogma existed in neurogenesis.

Behavioural anomalies like emotional dissonance can be dealt with through valid and consistent interventions made in brain plasticity. Studies have proved that experience would enhance plasticity through increase in brain size, cortical thickness, neuron size, dendrite branching, spine density, synapses per neuron, and glial numbers and would bring approximately about 20% increase in the total number of synapses (Kolb & Whishaw 1998). Researches endorse the role of environmental enrichment in neural plasticity (Greenough & Volkmar 1973). The earlier and the longer the brain is exposed to an environment, the bigger the change induced in the brain (Elbert et al. 1995). A clinical intervention for a person affected with emotional dissonance by providing different experiences and enriched environment consistently could bring positive results. Tools like training programs or meditations can also be used, where beneficial plasticity can be brought in to human life by positively transforming neurons into entirely new network connections. Learning a new skill such as playing a musical instrument, learning to type, or reading Braille requires extensive practice, and this practice is likely instrumental in changing the neuropil in relevant brain regions (Kolb & Whishaw 1998). Studies have evidently proved the role of meditation in neuroplasticity. Alterations in patterns of brain function, changes in the cortical and changes in the connectivity among widespread circuitry in the brain were a few changes recorded as a result of different styles of meditation practice (Davidson & Lutz 2007). In fact, the concept of neurogenesis and

neuroplasticity is the only ray of hope in bringing emotional harmony. Taken positively, a person with substitute feelings going through valid intervention program gets every chance to come out of this intricate maze.

Tools like training programs or meditations can also be used, where beneficial plasticity can be brought in to human life by positively transforming neurons into entirely new network connections.

Neuro plasticity mostly acts as a bane rather than a boon to the normal life of a human being by increasing the possibility of substitute feelings to occur in greater frequency and intensity. Once the parental message is embedded in the brain, it seeks environments which suits its behavioural pattern and would discount (Stewart & Joines 1987) information relevant to the solution of the problem. Proponents of discounting hold that the process adds similar experiences and environments to the person concerned. It is through grandiosity, the exaggeration of some feature of reality, or contamination, the misperception of reality, or even exclusion, where different aspects of reality is ignored (Stewart & Joines 1987). This makes the person react more abruptly with his favourite feeling. Continuous expression of such feeling can lead the brain with related neurons and synaptic connections to change more and more tough with substitute feelings. The person who has got strong parental message use the plasticity of the brain to change, using the environments dis-

counted, in accordance with the feelings he is permitted to evoke. This makes substitute feelings more complicated and long lasting.

Conclusions

In spite of the advancements in brain science and psychology, human beings desist genuine expressions derived from environmental inputs. A potential alternative could be explored only with the help of determination and dedication on the part of the person concerned. An attempt to transform neuro plasticity into an optimistic kaleidoscope is a promising strategy. Scientists are expecting to figure out the sequence of specific inputs which changes the brain in desirable ways (Begley 2000). An outcome to this study would be to untangle the circuits which could even change the basic beliefs man encompasses in his life.

The school of neuroscience can now undoubtedly say that experiences and enriched environment could add more neurons and change neural connections and thereby reframe the human personality. Based on this concept, studies are now being conducted to explore the possibilities of its application in transforming all kinds of behavioural anomalies. The experiences simulated structurally, and the subject having gone through the process, could come out of the parental judgments and the neural connections leading towards substitute feelings. As emotional management is powerful enough to bring prosperity in human flourishing, importance is in clearing the filtering net which prevents expression of true emotions.

References

- Bard, P. (1928), "A Diencephalic Mechanism for the Expression of Rage with Special Reference to the Central Nervous System", *American Journal of Physiology*, 84: 490-513.
- Begley Sharon (2000), "Rewiring Your Gray Matter", *Newsweek*, 134/135, 26/1.
- Berne, E. (1972), *What Do You Say after You Say Hello*, New York, Grove Press, ch 8: 137 – 38.
- Borod, J.C. (1993), "Cerebral Mechanisms Underlying Facial, Prosodic, and Lexical Emotional Expressions: a Review of Neuropsychological Studies and Methodological Issues", *Neuropsychology*, 7: 445-63.
- Boulding, K. (1956), "General Systems Theory: the Skeleton of Science", *Management Science*, 2: 197-208.
- Cannon, W. B. (1927), "The James-Lange Theory of Emotions: A Critical Examination and an Alternative Theory", *American Journal of Psychology*, 39: 106-24.
- Carmichael, M. (2002), "New Cells in the Thinking Cap? Think Again", *Newsweek*, 00289604, 139: 7.
- Castelluci, V. F. & Kandel, E. R. (1974), "A Quantal Analysis of the Synaptic Depression Underlying Habituation of the Gill Withdrawal Reflex in Aplysia", *Proceedings of the National Academy of Sciences, USA*, 71: 5004-08.
- Chugani, H.T. (1998), "Biological Basis of Emotions: Brain Systems and Brain Development", *New Perspectives in Early Emotional Development*, Johnson & Johnson Pediatric Institute Ltd: 5.
- Chugani, H.T (1996), "Neuroimaging of Developmental Non-linearity and Developmental Pathologies". In: Thatcher, R.W., Lyon, G.R., Rumsey, J., Krasnegor, N., *Developmental Neuroimaging: Mapping the Development of Brain and Behavior*, San Diego, CA: Academic Press, Inc: 187-95.

- Dalgleish Tim. (2004), "The Emotional Brain", *Nature Reviews Neuroscience*, Emotion Research Group, Medical Research Council Cognition and Brain Sciences Unit, Cambridge, 5: 582-85.
- Damasio, A.R., Grabowski, J.T., Bechara, A., Damasio, H., Ponto, L.B Laura., Parvizi, J., & Hichwa, D. Richard (2000), "Subcortical and Cortical Brain Activity during the Feeling of Self-generated Emotions", *Nature Neuroscience*, 3: 1049-56.
- Darwin, C. (1872), *The Expression of the Emotions in Man and Animals*, Chicago University Press, Chicago.
- Davidson, J. R. & Lutz, A. (2007), "Buddha's Brain: Neuroplasticity and Meditation", *IEEE signal processing magazine*: 176.
- Devinsky, O., Morrell, M. J & Vogt B, A. (1995), "Contributions of Anterior Cingulate Cortex to Behaviour", *Brain*, 118: 279-306.
- Dutton, D. G. & Aron, A. P. (1974), "Some Evidence for Heightened Sexual Attraction under Conditions of High Anxiety", *Journal of Personality and Social Psychology*, 30: 510-17.
- Ekman P. (1992), 'Facial Expressions of Emotion: New Findings, New Questions', *Psychological Science*, 3: 34-38.
- Ekman, P. (1992), "An Argument for the Basic Emotions", *Cognition and Emotion*, 6:189.
- Ekman, P., Levenson, R. W. & Friesen, W. (1983), "Autonomic Nervous System Activity Distinguishes among Emotions", *Science*, 221: 1208-10.
- Elbert, T., Pantev, C., Wienbruch, C., Rockstroh, B. & Taub, E. (1995), "Increased Cortical Representation of the Fingers of the Left hand in String Players", *Science* 270: 305-07.
- Eriksson, P. S., et al. (1998), "Neurogenesis in the Adult Human Hippocampus", *Nature Medicine*, 4 (11): 1313-17.
- Fanselow, M.S. (2000), "Contextual Fear, Gestalt Memories, and the Hippocampus", *Behavioural Brain Research*, 110: 73-81.
- Flack, W.F., Laird, J.D. & Cavallero, R. (1999), "Additive Effects of Facial Expressions and Postures on Emotional Feelings", *European Journal of Social Psychology*, 29: 203-17.
- Forgas, J.P. & Fiedler, K. (1996), "Us and Them: Mood Effects on Inter-group Discrimination", *Journal of Personality and Social Psychology*, 70: 28-40.
- Gage Fred, H. (2003), "Brain, Repair Yourself", *Scientific American*, 289 (3):47-53.
- George, M. S. & Ketter, T. A. (1994), "Post R. M. Prefrontal Cortex Dysfunction in Clinical Depression", *Depression*, 2: 59-72.
- Goleman Daniel (1995), *Emotional Intelligence*, Bantam Books, New York :15-36 & Appendix B
- Goleman Daniel, (2003), *Destructive Emotions*, Bantam Dell Publishing Group, New York
- Greenough, W.T.& Volkmar, F.R. (1973), "Pattern of Dendritic Branching in Occipital Cortex of Rats Reared in Complex Environments", *Experimental Neurology*, 40: 491- 504.
- Hariri, A. R., Mattay, V.S., Tessitore, A., Kolachana B., Fera, F., Goldman, D., Egan, F.M., & Weinberger, R.D (2002), "Serotonin Transporter Genetic Variation and the Response of the Human Amygdala", *Science*, 297: 400-03.
- Harlow, J. M. (1868), "Recovery of the Passage of an Iron Bar through the Head", *Publ. Mass. Med. Soc.*, pp. 271-281.
- Hastings, N. B., Tanapat, P. & Gould, E. (2000), "Comparative Views of Adult Neurogenesis", *The Neuroscientist*, 6: 313-25.
- Hebb, D.O. (1949), *Organisation of Behavior*, Wiley Publication, New York: 14.
- Heller, W., Nitschke, J.B. & Miller, G.A. (1998), "Lateralisation in Emotion and Emotional

- Disorders”, *Current Directions in Psychological Science*, 7: 26-32.
- James, W. (1884), “What is an Emotion?”, *Mind*, 9: 188-205.
- James, W. (1890), *Principles of Psychology*, New York: Holt: 1066.
- Kaas, J. H. (1991), ‘Plasticity of Sensory and Motor Maps in Adult Mammals’, *Annual Review of Neuroscience*, 14: 137-67.
- Keivlpermann Gerd & Fred H Gage (2002), “New Nerve Cells for the Adult Brain”, *Scientific American Special Edition*, 12 (1): 38-44.
- Klitssova, A. Y. & Greenough, W. T. (1999), “Synaptic Plasticity in Cortical Systems”, *Current Opinion in Neurobiology*, 9: 203-208.
- Kluver, H. & Bucy, P. C. (1937), “Psychic Blindness and Other Symptoms Following Bilateral Temporal Lobectomy”, *American Journal of Physiology*, 119: 254-84.
- Knudsen, E. I. (1998), “Capacity for Plasticity in the Owl Auditory System Expanded by Juvenile Experience”, *Science*, 279: 1531-33.
- Kolb Bryan & Whishaw, Q. I. (1998) “Brain Plasticity and Behaviour”, *Annual Review of Psychology*, 49: 43-64.
- Konorski, J. (1948), *Conditioned Reflexes and Neuron Organisation*, Cambridge University Press.
- Lange, C (1885), “The Emotions” (ed. Dunlap, E.), Williams & Wilkins, Baltimore, Maryland, 33-90.
- LeDoux J. E. (1992), “Emotion and the Limbic System Concept”, *Concepts in Neuro Science*, 2.
- LeDoux, J. E. (1986), “Sensory Systems and Emotion: A Model of Affective Processing”, *Integrative Psychiatry*, 4: 237-48.
- LeDoux, J. E. (2002), “Emotion, Memory and the Brain”, *Scientific American Special Edition*, 12(1): 62-71.
- Levenson, R.W. (1992), “Autonomous Nervous System Differences among Emotions”, *Psychological Science*, 3: 23-27.
- Luthans Fred, (2005), *Organisational Behaviour*, 10th Edition, McGraw Hill International: 282, 513.
- MacLean, P. D. (1949), “Psychosomatic Disease and the ‘Visceral Brain’, Recent Developments Bearing on the Papez Theory of Emotion”, *Psychosomatic Medicine*, 11: 338-53.
- Merzenich, M. M. & Sameshima, K. (1993), “Cortical Plasticity and Memory”, *Current Opinion in Neurobiology*, 3: 187-96.
- Miller, N. E., & Dollard, J. C. (1950), *Personality and Psychotherapy*, McGraw Hill.
- Mills, C. K. (1912), “The Cortical Representation of Emotion, with a Discussion of Some Points in the General Nervous System Mechanism of Expression in Its Relation to Organic Nervous Disease and Insanity”, *Proceedings of the American Medico-Psychological Association*, 19: 297-300.
- Papez, J. W. (1937), “A Proposed Mechanism of Emotion”, *Archives of Neurology and Psychiatry*, 38: 725-43.
- Pavlov & I. P. (1927), *Conditional Reflexes*, New York: Dover Publications.
- Rakic, P. (1985), “DNA Synthesis and Cell Division in the Adult Primate Brain”, *Annals of the New York Academy of Sciences*, 457: 93-211.
- Siegmán, A.W. & Boyle, S. (1993), “Voices of Fear and Anxiety and Sadness and Depression: The Effects of Speech Rate and Loudness on Fear and Anxiety and Sadness and Depression”, *Journal of Abnormal Psychology*, 102: 430-37.
- Simic & Goran, (2009), “Biological Basis of Emotions”, 3rd European Summer School of Social Pediatrics “Early Emotional Child Development” *UNICEF / WHO*: 1-3.

- Sinclair R. C., Hoffman C., Mar, M.M., Martin, L.L. & Pickering, T.L. (1994), "Construct Accessibility and the Misattribution of Arousal", *Psychological Science*, 5: 15-19.
- Skinner, B.F. (1953), *Science and Human Behavior*, Macmillan.
- Solomon, R.L (1982). "The Opponent-Process on Acquired Motivation" in Pfaff, D.W. (Ed)., *The Physiological Mechanisms of Motivation*, New York: Springer-Verlag.
- Squire, L.R & Knowlton, B.J (2000), "The Medial Temporal Lobe, the Hippocampus, and the Memory Systems of the Brain", In Gazzaniga MS, *The New Cognitive Neurosciences* ed, Cambridge, MA: MIT Press,: 765-79.
- Stewart Ian & Joines Vann, (1987), *TA Today: A New Introduction to Transactional Analysis*, Life Space Publishing, England: 173-214.
- Tangney, J.P., Miller, R. S., Flicker, L. & Barlow, D.H. (1996), "Are Shame, Guilt and Embarrassment Distinct Emotions?", *Journal of Personality and Social Psychology*, 70:1256-69.
- Watson, J.B. (1924), *Behaviourism*, JB Lippincott.
- Weinberger, N. M. (1995), "Dynamic Regulation of Receptive Fields and Maps in the Adult Sensory Cortex", *Annual Review of Neuroscience*, 18: 129-58.
- Weiskrantz, L. (1956), "Behavioural Changes Associated with Ablation of the Amygdaloid Complex in Monkeys", *Journal of Comparative and Physiological Psychology*, 49 : 381-91.
- William, R.W. & Herrup, K. (1988), "The Control of Neuron Number", *Annual Review of Neuro Science*, 11: 423-53.
- Woollams, S. & Brown, M. (1978), *Transactional Analysis*, Dexter: Huron Valley Institute: 131, 173.
- Zajonc, R.B. & McIntosh, D.N. (2002), "Emotions Research: Some Promising Questions and Some Questionable Promises", *Psychological Science*, 3: 70-74.