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Arousal and Drive - Cognitively Molded Emotional Arousal

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Abstract

Arousal or drive has been always considered a psychophysiological state of body-mind required for all performances. Wakefulness of the system is controlled by the Ascending Reticular Activating System, whereas arousal may be controlled by several psychological and physiological states and needs, which contribute to the efficiency of performance that would contribute to the optimum efficiency in performance. The cognitive judgments of the various factors affecting performance, made during states of performance, contribute to positive or negative emotional molding of the drive. The emotional molding may take place in positive or negative manner, or one may refrain from such molding, when emotional effects are not experienced or expressed. Cognitive judgments may affect the drive within, leading to experiences and expressions of achievement, happiness, sorrow, pain, anger, and disgust and so on, which could in turn affect efficiency and outcome of performance. One may practice and learn not to make such cognitive judgments, which may in turn mold own drive in negative manner causing dissatisfaction, distress and several other negative emotional effects. Positive drive is an important requirement for making good efforts and achievements, and hence one may learn to make cognitive judgments which would positively aid efforts and tasks with which one may be associated.

Keywords: *Arousal; Drive; Cognitive Molding; Positive and Negative Emotional Effects; Learning Strengthening Cognitive Molding of*

The Drive: Introduction

A major concept that was commonly used in the earlier days for referring to the capability for performance and actions has been that of arousal or drive. Arousal or drive was considered a basic necessity for carrying out actions. Need to act and the potentiality to act were more often religiously considered. Actions were initiated and controlled by facets of emotional and cognitive functions possessed and as understood by them. Arousal or drive was not identified as a specific function, except for referring to utilization of energy and resources from the system for application or execution of actions. On the other hand, emotions and feelings played significant role in execution of actions. Arousal was first formulated as the driving force required for actions and performance in the Yerkes-Dodson Law [1], wherein it explained the motivational role of the drive for carrying out action and performance. A physical evidence of the presence of drive has been reported in several Bereitschafts potential studies, where the individual shows the presence and rise of a negative potential before the motor potentials are initiated, demonstrated in several studies [2,3]. Several earlier theoretical scientific postulations [4-16] have clearly indicated the strong influence of cognitive judgments on creation of positive or negative molding of emotional effects on the drive and the specific genesis of quality of performance. The drive state determined the nature of performance or action causing positive and/or negative effects. Optimum performance is not possible if the drive level is high and similarly higher levels of drive is needed for optimum performance of simple tasks. The inverted U relationship between arousal and performance was known since then, when successful optimum performance has been related to the drive level that one has for applications. The value and the valence of the drive in a given situation or performance is usually determined by the positive or negative cognitive judgments one may make Mukundan., *et al*. [17-32] during the period regarding the various factors that may influence the performance and achievement, which may enhance or reduce the efficiency of the drive for obtaining optimum performance. Good performance of complex and difficult tasks was possible only it the drive level is proportionately low, whereas good performance of simple tasks requires higher levels of drive, whereas tasks with complex and difficult cognitive judgments and performance may require matching drive levels, which would allow the individual deal with com-

plex performance requirements with lesser drive levels. Simple performance tasks would require higher drive levels whereas complex tasks could be performed at the optimum levels only when the drive is not very high, but matching and low, which would allow one to go through complex and difficult task demands in successful manner with matching drive levels. On the other hand, high drive will make complex and difficult tasks, which require careful examination and performance may get debilitated and impaired by the high drive levels. Simultaneous positive and/or negative effects produced by the complex cognitive judgments and actions and/or responses have been attributed to the positive or negative emotional effects of arousal or drive. Such positively or negatively molded drive has been identified as emotion. Drive could be present and applied without such molded effects also, when it is merely identified merely as drive. The specific roles of cognitive judgments with their positive or negative valences, or their mixture from intended and executed actions and responses were not earlier understood as the factor that determined the experiential quality of arousal or as emotional arousal. Application of cognitive judgments which could produce positive and/or negative interpretations of the drive state, which came to be called positive or negative emotional arousal and their extensive applications in terms of behavioral manifestations. Large number of studies by Beck and Beck., *et al*. [24-37] using cognitive therapies have revealed some of the earlier important findings of demonstrating the role of cognitive judgmental corrections for managing emotional responses and their roles in positive and negative behavioral manifestations, emerging from the molded effects of use of cognitive judgments.

Traditional cognitive judgments

Cognitive judgments affecting arousal or drive are carried out almost as a routine, especially when actions and responses may produce natural outcome effects, which may be positively or negatively valued by the individual. Emotional experiences and expressions are therefore regular features of every action and response. A spiritual or religious processing of the drive or arousal in the most ancient Himalayan yogic philosophy designed four yogic methods for defining and describing life effects, which produced unique experiential and expressive features of the drive. Cognitive processing applying spiritual and devotional methods of the drive states have been used in most of the religious practices, though gains and punishments are also the themes of several of the cognitive processing methods within the religious domain also. The Himalayan Yogic philosophy emphasized four yogic paths for independent cognitive processing such as Jnana, Bhakti, Karma, Raja yoga. Yoga was supposed to mean the union between individual and universal consciousness or spiritual force. If the cognitive components are removed from the drive or arousal, what remains as drive is indeed a life force, which could be evaluated only based on the effects of actions and responses initiated and executed by the drive. The life force makes the unique use of the energy available in the body system and therefore it is indeed different from the mere physical energy available in the system. Presence of drive is necessary for making use of the physical energy available in the system for carrying out responses and actions. No action or response may be performed, even if a system has plenty of such energy, but not the drive to act. There are those who display high drive and achievements in life, despite average cognitive - intellectual capabilities, while there are also those intellectually capable individuals, who make poor achievements in life because of presence of poor drive in them. Therefore, arousal or drive is indeed different from the mere physical energy available in the system, as the former is a unique combination of psychological and physiological energies of the system, which we used to always refer to a spiritual force, and merely as drive or arousal now. Cognitive processing carried out within the system, is a combination of making sensory and motor contacts, interpreting those contacts with and without awareness, that may be in semantic or symbolic manner. The awareness of the sensory-motor contacts and all combinations of relationships are semantically and symbolically assembled into conceptual system of information, which has become the knowledge foundation of the system. Cognitive processing methods have helped to understand the multiple sensory-motor interactions at all physical and virtual levels, as well as shape the drive into emotional experiences and expressions. Human brain has been to store within and outside, all the information of its interactions and also use them for creating new relationships and physical realities in the universe. Presence of drive enables a system to work even if it has physical defects in the systems, or poor physical energy at the disposal. As per yogic methods, cognitive analyses could be carried out in an objective manner without using any personal references and eliciting any personal advantages, or attributing any value system to the self or others. Cognitive processing could be carried out independent of any emotional experiences and effects, when cognitive processing is totally objectively carried out, which has been labelled a state of "Sthita Prajna" [21-23]. On the other hand, if one turns cognitively into a devotional state, emotion may become blissful, with faith and loving experience. A person may become devotionally dependent on the force, which one learns to accept as a universal force shared by the self and all other living beings. The devotion to the force becomes strong and one may totally depend on its presence in every phase and moment of life. Expressed as devotion and blissful love, it may also reflect and experience as strong positive emotion, but without any selfish or personal benefits. When one carries out his responsibilities

and actions without ever considering personal benefits or even when they need to be carried out despite losses and discomfort to the self, as the actions and responses performed may yield pain, discomfort or losses to self, performance of the actions become superior state of duty in life. One may learn to practice all the above methods as per needs arising in life, and such capability may become a unique combination of utilization of the drive of life.

Neurogenesis of actions

It is scientifically complex and virtually not possible for considering arousal or drive as a force of life, different from cognitively molded emotion. The life force component of the drive is beyond scientific understanding and investigations; though there is no doubt about its presence and functioning as we experience its presence almost continuously. Hence, we try to understand it from a spiritual or religious point of view. The physical movements one makes with limbs and muscles allow the utilization of the psychic energy or the drive. One does not carry out even simple movements or responses, unless one has the drive to carry out the same, though the concerned physical system is capable of the proposed movements. The psychic energy may be considered different from the physical energy utilized for movements and the displacements that we make by making physical movements with minimum drive or through mere commands and instructions. We only know that the drive is generated from within; though we have no idea where it has come from. It may also be part of a larger energy source of the universe, or a spiritual energy source, inducing life in body, thereby sharing life. If it were only physical energy, man has already assembled such force and they have been using such physical forces. Every vehicle on road, water, and in air uses such energy for its movements. But they cannot take up any journey on their own initiative or wish. This drive is indeed different from the physical energy that may be deployed for movements one may make, simultaneously utilizing sensory contacts with the motor contacts. What is important is to understand and accept the fact that arousal or drive is different from mere emotion, though emotion is indeed a cognitively molded state of the drive. Drive is the force that initiates the sensory-motor movements and contacts for carrying on with the physical adjustments and movements required for the body, and other physical movements. Bereitschaftspotential is a clear example of the presence of neural beginning of drive for voluntary movements, before the specific motor potentials are initiated in the brain. Once the drive reaches a Critical Level of Potential (CLP), Mukundan., et al. [3], the concerned specific motor activity is automatically initiated from the motor cortex. In our Bereitschaftspotential experiment, when the subject has to voluntarily make a simple button press, many refused to do it for long durations, as they voluntarily have to make the simple movements, which they were not prepared to carry out. It is true that cognitive molding starts from the early stages of life and one may never have the opportunity to identify the drive unless it is cognitively molded by the self and others. Practicing moments of life, when one employs the drive, with sensory-motor contacts for performing planned actions and responses could become simple to difficult task, depending on the practices one may regularly and irregularly carry out in daily life. Cognitive molding would take place through semantic processing and creation of meanings and effects [17], which help shape the drive as emotional experience. The drive may get molded positively or negatively even without any prior cognitive judgments, provided there is a threat to the biological survival state of the system. There is indeed no scope for perception and cognitive processing, and we are used to call such responses 'pre-attentive emotional responses'. Biological survival - based flight and fight responses explain the presence of such survival responses. Large subcortical areas of the brain including the Ascending Reticular activating system in the brain stem area, are associated with such arousal and drive. It is indeed correct to state that the presence of drive is a wakeful condition, and one could not be sleeping during the state. However, dreaming and performing actions and responses as in dreams could occur, though they do not represent physical reality. Contacting physical reality is indeed the most important aspect and result of contacting physical reality. Keeping awake is indeed an important need to make sensory-motor contacts with physical realities. The other areas subcortical areas have been identified long back as Anterior Cingulate Cortex, which formed the medial parts of the cerebral cortex lying right above the corpus callosum interconnecting the two cerebral hemispheres, as well as projecting into the limbic striatum, which includes Nucleus Accumbens and Ventromedial aspects of the Caudate and Putamen. The Anterior Cingulate Cortex directly interacts with the thalamus and the entorhinal cortex located in the medial temporal lobe. Other structures such as Hippocampus and Amygdala also interact with the above limbic structures, and they together form the Limbic System considered responsible for emotional arousal effects and emotional experiences molded on the drive. Emotional arousal provides the cognitively justified propelling force, which could make use of the fuels or energy in the body for multiple sensory-motor activities. The propelling force has been always considered different from the energy supplied by the body systems. Presence of physical energy was indeed necessary for the initiation and performance of actions by the body.

Cognitive molding of emotion

The James-Lange (1984) theory as explained by Ledoux [38-40] of emotion helped to explain the effects of movements and behavior on the genesis of specificity and depth of emotional arousal. On the other hand, the Cannon - Bard theory [41,42], as explained by LeDoux [38-40] when emotion becomes the foundation for understanding the role of cognitive processing for the generation of specific emotional arousal. Schachter, Singer and Tulving [34,43] and Schacter [35,36] later supported this in their explanations of the complex process of cognitive labelling of emotional experiences, that occurs during cognitive judgments of own emotional arousal. These findings based on the pre-attentive emotion (LeDoux [38-40], Morris., *et al.* [44], Whalen., *et al.* [45], Ohman Soars [46], Windmann, Kruger [47]) supported that emotional responses and associated behavior could be elicited by an external stimulus without its perception and awareness. Sigmund Freud had suggested such emotional effects as unconscious repressed effects. Emotional molding of the drive was considered an important and crucial propelling force for the generation of the sensory-motor contacts for performing actions and responses [48,49]. The Anterior Cingulate Cortex forming the medial aspect of the Cerebral Cortex, and lying over the Corpus Callosum interconnecting the right and left- brain hemispheres, directly interacts with the Thalamus, the Neocortex, and the Entorhinal Cortex located in the medial Temporal Lobe and other limbic structures such as Hippocampus, Amygdala, and Entorhinal Cortex, also project into ventral striatum. The Striatum is connected through the rostrolateral Globus Pallidus, to the mediodorsal Thalamus, establishing a direct link between the Thalamus and the Anterior Cingulate as in the case of the other two circuits discussed above by Cummings [48,49]. These areas and the Ascending Reticular Activating System serve important roles in the cognitive judgments which help process the associated phenomenon as emotional experiences and expressions [50].

The anatomical connectivity of the Orbitofrontal, Medial and Dorsal Frontal structures, with basotemporal areas and the Striatum help initiate volitional regulation leading to associated psychomotor behavior with the drive producing the related emotional experiences and expressions. Cognitive controls may be employed either automatically or with awareness through monitoring when the controls employed are already familiar to the person as he has experience of previous practice. Prefrontal cortex is the chief area for executive controls. Activate the Anterior Cingulate Cortex for the release of the necessary drive to act, which would also facilitate monitoring the sensory - motor contacts and link them with the drive state. The link with the drive would activate the dorsolateral Prefrontal cortex for goal directed and planned execution of actions, a pattern of functional interaction, which is impaired in patients with frontal lesions as demonstrated and explained by Luria [51-56]. Banich [57] called it a 'cascade of controls' in the frontal cortex. Continuous monitoring of sensory-motor effects are required for updating the processing as per the anticipated and planned requirements generated from own judgments, and also preferentially inhibit those select components from action [58].

Neural basis of movements

Several disinhibitive processes giving rise to Impulsiveness, loss of tact, uncontrolled speech, impersistence, inappropriate perseveration, restlessness, and hyperactivity, pressure of speech, decreased need for sleep and difficulty to focus attention intentionally (distractibility) are parts of disinhibition symptoms, generated from the Orbitofrontal lesions of patients. Schmidt and Lee [59,60] proposed in their Generalized Motor Program (GMP), a motor programming model for explaining the needs of frontal controls required for setting the nature and type of wholesome movements, their sequences, timing, and the forces to be used. On the other hand, the model suggested by Goldberg [61] explained the neural strategy for navigation across space and time, and the role of supplementary motor area and other brain centers engaged in carrying out propositional and navigational movements across space and time. As against these, conditioned responses, which are already determined as per prior plan, are controlled from the Arcuate Premotor Areas (APA), as they are elicited and determined by a specific stimulus. The same differences are applied in speech production, when one kind of speech occurs spontaneously and repeatedly controlled by APA, another type is controlled from the Supplementary Motor Area and assembled as per the needs and the meaning. The 'schema' theoretical model proposed by Schmidt [59] explained set of general rules need to be used for motor programming in different environmental and situational contexts. The motor programming model later proposed by Schmidt and Lee [60] explained the frontal control required for movement in their Generalized Motor Program (GMP), which takes into account the nature and type of movements, their sequences, timing and the forces to be used. The model suggested by Goldberg [61] explained the neural strategy for navigation across space and time, and the role of Supplementary Motor Cortex and other brain centers in carrying out propositional and navigational movements across space and time. As against this, the conditioned responses, which are controlled from the Arcuate Premotor Areas (APA), are elicited by a stimulus (discussed elsewhere). The same differences in speech controls are seen in the production of speech, in which one kind of speech is spontaneous and controlled from the Supplementary Motor Cortex, whereas the other kind is repetitive and controlled from the APA. Another important functional domain is that of verbal awareness, especially self-awareness. Self-awareness is a self-reflection of the sensory-motor contacts which one makes the physical world. Awareness could be also

the knowledge of the virtual sensory-motor contacts one makes. The most important aspect of self-awareness occurs while monitoring own transcoded and encoded thoughts, and the meaning one understands of own thoughts create awareness of the same encoded and transcoded thoughts. The most crucial aspect of awareness is one's ability to know the meanings and the relationships of multiples of components representing the physical or virtual realities [30] with which one makes contacts. One may be aware of the drive one has, the changes - increase in the drive levels, and the actions and responses one may initiate. However, when actions and responses make sensory-motor contacts, one is inclined to become aware of the contacts one make, though one may not still be aware of the presence of the arousal or drive within which has made one initiate the actions or responses. However, one could definitely make efforts to become aware of the presence of the drive, provided one learns to monitor own sensory-motor contacts and changes in them.

Nascent drive and achievements of cognitive molding of drive

One could learn to experience arousal or drive in its nascent or original form, without any cognitive molding by practicing. The strong supporting method for eliciting the arousal or drive in such form is the practice of meditation. Meditation is often referred as an art of living yoga, when one learns to maintain the state of consciousness or mindfulness, which does not induce or be influenced by any stress or cognitive molding effects on the drive within. Meditation allows one to become monitor important bodily functions like breathing in and out, aware of the encoded thoughts, transcoded bodily movements, and thereby enhance the awareness and monitoring of mental and bodily functions that could be monitored. Practice of meditation trains one to maintain the drive not being negatively affected by the input signals and their personal interpretations. The only emotion encouraged and entertained is expected to be that of devotion, love and affection to the force which maintains the arousal or drive. The mental exercises, especially associated with breathing could be shaped without any overt thinking, which may mold the drive in positive manner. Negative cognitive judgments could easily mold the same drive into negative state or negative emotion. One could learn to identify the drive as the spiritual force within. One accepts that such spiritual force must be universally present and allows oneself to be showered by its almighty strength. Yoga is often referred as an ancient Himalayan mental training method, which came to be identified and used as a meditation or religious method, all over the world. Major religions of the world have identified meditation as a religious method for exercising worship of the higher spiritual force, whereas there are the Himalayan and Buddhists methods, where one of the major applications of meditation is to maintain mindfulness without allowing the drive or arousal being emotionally affected. What is referred as consciousness or mindfulness may be considered the same as drive or arousal. Being aroused is to remain alert, attentive and watchful, anticipative but not with any personal interest in observing any specific effects from outside. Various cognitive processing strategies are indeed important, but one would not allow the judgments to affect own arousal, and allow it to become emotionally shaped or molded causing distress or excitements.

The mindfulness one has to learn and maintain is indeed an extremely complex state, where one is pushed into excitement or distress. Interestingly meditation has been practiced within and outside religion, from time immemorial. Focusing on breathing and maintaining focus on awareness through breathing, helped to enrich mindfulness and drive. However, many may not use the availability of the high drive obtained in this manner for investing in positive and enriching actions, but may depend on them as a mere divine strength. When positive or negative cognitive processing without any personal effects take place, they may not lead to any cognitive molding of the drive within, transforming it into positive or negative emotional experiences or expressions. Or one may focus on love of the spiritual force as the theme of focusing, which fills the mind with affection and love, taking away from any disturbing thoughts or their emotional effects. Practice of music and dance may also contribute to the immense utilization of the drive, may facilitate only positive emotional effects without giving rise to any negative emotional effects.

However, forming positive or negative meanings could be considered a highly creative mental and physical effort for each person, provided one does not allow the outcome cause personalized distress and pain, leading to self-destruction. However, if the efforts and their positive or negative results could help create superior functional systems, it could be an asset to individuals who constitute the system. A working system or organization, which could correct and change itself could be created only by human beings, even though the nature shows several systems which control the flow of events in the time and space. The "circular causation" (Human civilization is created by the members of the human society through their system approach (Ludwig Von Bertalanffy [62-64]; Karl Gunnar Myrdal - Nobel Prize winner in 1974; O'Hara [65] and the systems they have created work on the principles of "learning organization" [66] which help them to learn and grow by creating newer physical realities in the world they live. Cognitive processing could be conducted even with virtual realities, creating and molding emotional experiences and expressions as if the they are created through cognitive molding of physical realities. There are also people who would monitor the thoughts and prayers to the super power that they think controls the universe. The devotional state is reinforced through praying, and practicing it every day may benefit the mental processing in every individual. Keeping brain-mind unused in cognitive processing challenges, and maintaining continuous self-awareness may help for limited periods in life. However, cognitive processing endeavors are needed for the creation of new systems, and the related physical and virtual realities

are important exercises for mind-brain. Meeting intellectual challenges and their emotional effects, which man could create with new solutions are enormous achievements of life. They render living for limited number of years as the most advanced and enriching experience of the individual, and the miracle of the universe. Rise of a potential before the motor potential is initiated, is a clear example of the presence of drive, which alone could initiate the motor potentials and the related actions. Drive is therefore not a mere psychological or spiritual state in the system. Presence of the negative potential reaching a certain critical level [3], when the motor response is automatically initiated happen with every action and response. No action would start without the presence of the negative potential reaching the CLP level, as measured in several studies, Allowing the drive to set in so that the related action could be initiated, is a complex functional state of body and the mind, which one has to inculcate and learn. Many fails to carry out the actions, which enable them to achieve specific goals in life, because of the absence of the drive in them, because of which they do not carry out the efforts for such achievements. Looking at the presence of initiation of an action well before one is aware of the presence of the action, Libet [67,68] had proposed that man has no will power, as motor activity in the brain gets initiated several seconds before the respective motor actions are carried out. The presence of the negative DC potential, seen well before the initiation of the specific motor potentials in the brain, were clearly evident in several studies [69-80] are is clearly an indication of the presence of rise of a condition, which we call drive or arousal in the individual, which alone could initiate any action or response. The negative DC potential seen before the initiation of the motor potentials in the brain may indeed be taken to indicate the presence of drive and its effects on the brain system. However, what we have noticed in experiments are the rise of DC potentials over a few seconds, whereas we consider drive as a force for longer duration. It is indeed necessary to know more about the process of drive in the brain. The process of molding the drive positively is indeed a great art of life, though its failure leads to negative molding with the concurrence of pain, distress, and disappointments.

Conclusion

It has been conceptualized or a specific meaning has been proposed that drive or arousal needed for carrying out responses and actions, which has been always detected and experienced by the living being is a true psychobiological state of a living being. It is almost always or very often is molded in most of the individuals, by the cognitive judgments devised by them for processing it into an emotional state of experience and expression. Drive with emotional alignment made by each individual has an extraordinary effect and meaning to each self, though the drive is indeed has an independent origin and could remain without being molded, when it may instill or initiate actions and responses with totally different meaning and value to the individual and others. This is indeed an aspect very little understood even now. We do have to make sustained efforts to not to realize and experience the drive in its original form and learn to utilize it in a scientific as well as personal context for achieving the highest and best its outcome effects in every moment of life. It is indeed true that we may have to spend the efforts of several lives for arriving at and achieving meaningful outcome. Knowing the science of drive in this context will indeed take us to unknown heights of existence of life in the universe.

Bibliography

1. Yerkes RM and Dodson JD. "The relation of strength of stimulus to rapidity of habit-formation". *Journal of Comparative Neurology and Psychology* 18 (1908): 459-482.
2. Mukundan CR., *et al*. "Bereitschaftspotential in Alcoholics". *Biological Psychiatry* 21.11 (1986): 1090-1092.
3. Mukundan CR., *et al*. "Violent Behavior: Absence of Social Conditioning of Drives during Neurodevelopmental Stages". *International Journal of Indian Psychology* 2.1 (2014): 1-33.
4. Schlosberg H. "Three dimensions of emotion". *Psychological Review* 61.2 (1954): 81-88.
5. Arnold MB. "Emotion and personality. Volume I: Psychological aspects". New York: Columbia University Press (1960a).
6. Arnold MB. "Emotion and personality. Volume II: Neurological and Physiological aspects". New York: Columbia University Press (1960b).
7. Freud S. "Repression". In S. Freud, Collected papers (Volume 4). London: Hogarth Press, (Originally published 1915) (1949).
8. Darwin C. "The expression of the emotions in man and animals. Chicago: University of Chicago Press. (Originally published 1872) (1965).
9. Schachter S. "The assumption of identity and peripheralist centralist controversies in motivation and emotion". In M. B. Arnold (Ed.), Feelings and emotions: The Loyola Symposium. New York: Academic Press (1970).
10. Young PT. "Understanding your feelings and emotions". Englewood Cliffs, New Jersey: Prentice-Hall (1975).
11. Gazzaniga MS., *et al*. "Functional neuroscience". New York: Harper and Row (1979).

12. Schneider AM and Tarshis B. "An introduction to physiological psychology". New York: Random House (1980).

13. Plutchik R. "A general psycho revolutionary theory of emotion". In (Eds.) Plutchik, R., Kellerman, H., Theories of Emotion-Volume 1, Emotion, Theory, Research and Experience, Academic Press, New York (1980).

14. Lazarus RS. "Emotions and adaptation: Conceptual and empirical relations". In WJ Arnold (Ed.), Nebraska symposium on motivation. Lincoln, NE: University of Nebraska Press Volume 16 (1968): 175- 266.

15. Lazarus RS. "Emotion and adaptation". New York: Oxford University Press (1991).

16. Kleinginna PR and Kleinginna AM. "A categorized list of emotion definitions, with suggestions for a consensual definition". *Motivation and Emotion* 5.4 (1981): 345-379.

17. Mukundan CR and Ajayan P. "Awareness and Self-Image". *Indian Journal of Clinical Psychology* 38.1 (2011): 37-48.

18. Mukundan CR. "Assigning Meaning to Emotional Arousal". *International Journal of Indian Psychology* 3.4 (2016): 11-33.

19. Mukundan CR. "Emotional Experience and Expressions". *International Journal of Indian Psychology* 3.3 (2016): 1-28.

20. Mukundan CR. "Emotion-Arousal and Control". *International Journal of Indian Psychology* 3.2 (2016): 1-20.

21. Mukundan CR., *et al*. "Sthita Prajna: A State to Control Cognitive Molding of Emotional Arousal". In (Ed.) Jitendra Mohan, Emerging Contours of Excellence, Publication Bureau, Punjab University, Chandigarh (2017): 24-40.

22. Mukundan CR and Kacker P. "Molding emotion while cognitively processing physical and virtual realities". *EC Neurology* 10.5 (2018): 354-366.

23. Mukundan CR and Kacker P. "Emotional Arousal-the Driving Force of Life". *Journal of Psychology and Clinical Psychiatry* 9.1 (2018): 00505.

24. Beck AT. "Cognitive Therapy and the Emotional Disorders". International Universities Press, New York (1975).

25. Beck AT., *et al*. "Cognitive therapy of depression". New York: Guilford Press (1979).

26. Beck DM., *et al*. "Neural correlates of change detection and change blindness". *Nature Neuroscience* 4.6 (2001): 645-650.

27. Beck AT., *et al*. "Cognitive Therapy of Personality Disorders". The Guilford Press (2003).

28. Brewin C. "Theoretical foundations of cognitive behavioral therapy for anxiety and depression". *Annual Review of Psychology* 47 (1996): 33-57.

29. Segal ZV., *et al*. "Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse". New York: The Guilford Press (2002).

30. Ma SH and Teasdale JD. "Mindfulness-based cognitive therapy for depression: replication and exploration of differential relapse prevention effects". *Journal of Consulting and Clinical Psychology* 72.1 (2004): 31-40.

31. Heidenreich T., *et al*. "Mindfulness-based cognitive therapy for persistent insomnia: A pilot study". *Psychotherapy and Psychosomatics* 75.3 (2006): 188-189.

32. Foley K., *et al*. "Effect of job skills training on employment and job seeking behaviors in an American Indian substance abuse treatment sample". *Journal of Vocational Rehabilitation* 33.3 (2010): 181-192.

33. Schacter DL., *et al*. "Psychology". (2nd edition). New York: Worth Pub (2010): 600.

34. Schacter DL. "Memory Systems". Tulving, E. (Ed), MIT Press, Cambridge, MA (1994).

35. Schacter DL. "Illusory memories: A cognitive neuroscience analysis". *Proceedings of the National Academy of Sciences of the United States of America* 93.24 (1996): 13527-13533.

36. Schacter DL. "Memory distortion: How minds, brains, and societies reconstruct the past". Harvard University Press, Cambridge, MA (1995).

37. Hayes SC., *et al*. "Open, aware, and active: contextual approaches as an emerging trend in the behavioral and cognitive therapies". *Annual Review of Clinical Psychology* 7 (2011): 141-168.

38. LeDoux J. "Emotional networks and motor control: A fearful view". *Progress in Brain Research* 107 (1996): 437-446.

39. LeDoux J. "Fear and the brain: Where have we been, and where are we going?" *Biological Psychiatry* 44.12 (1998): 1229-1238.

40. LeDoux J. "The emotional brain, fear, and the amygdala". *Cellular and Molecular Neurobiology* 23.4-5 (2003): 727-738.

41. Cannon W. "The James-Lange Theory of Emotions: A Critical Examination and an Alternative Theory". *The American Journal of Psychology* 39.1-4 (1927): 106-124.

42. Cannon W. "Organization for Physiological Homeostasis". *Physiological Review* 9.3 (1929): 399-421.

43. Schacter S and Singer JE. "Cognitive, social and physiological determinants of emotional states". *Psychological Review* 69 (1962): 379-399.

44. Morris JS., *et al*. "Conscious and unconscious emotional learning in the human amygdala". *Nature* 393.6684 (1998): 467-470.

45. Whalen PJ., *et al*. "Masked presentations of emotional facial expressions modulate amygdala activity without explicit knowledge". *Journal of Neuroscience* 18.1 (1998): 411-418.

46. Ohman A and Soares JJ. "Emotional conditioning to masked stimuli: expectancies for aversive outcomes following nonrecognized fear-relevant stimuli". *Journal of Experimental Psychology: General* 127.1 (1998): 69-82.

47. Windmann S and Kruger T. "Subconscious detection of threat as reflected by an enhanced response bias". *Conscious Cognition* 7.4 (1998): 603-633.

48. Cummings JL. "Frontal-Subcortical circuits and human behavior". *Archives of Neurology* 50.8 (1993): 873-880.

49. Cummings JL. "Anatomic and behavioral aspects of frontal-subcortical circuits". *Annals of New York Academy of Sciences* 769 (1995): 1-13.

50. Hayden BY and Platt ML. "Neurons in Anterior Cingulate Cortex Multiplex Information about Reward and Action". *Journal of Neuroscience* 30.9 (2010): 3339-3346.

51. Luria AR. "Higher Cortical Functions in Man". Basic books, New York (1966a).

52. Luria AR. "Human Brain and Psychological Processes". Harper and Row (1966b).

53. Luria AR. "Frontal lobe syndromes". In PJ Vinken and GW Bruyn (Eds.), Handbook of Clinical Neurology, II. New York: Elsevier (1969).

54. Luria AR. "The functional organization of the brain". *Scientific American* 222.3 (1970): 66-78.

55. Luria AR. "The Working Brain". Basic Books (1973).

56. Luria AR. "Outline for the neuropsychological examination of patients with local brain lesions". *Neuropsychology Review* 9.1 (1999): 9-22.

57. Banich MT. "Executive function: The search for an integrated account". *Current Directions in Psychological Science* 18.2 (2009): 89-94.

58. Miyaki A., *et al*. "The unity and diversity of executive functions and their contributions to complex 'frontal lobe' tasks: A latent variable analysis". *Cognitive Psychology* 41.1 (2000): 49-100.

59. Schmidt RA. "A schema theory of discrete motor skill learning". *Psychological Review* 82.4 (1975): 225-260.

60. Schmidt RA and Lee TD. "Motor control and learning: A behavioral emphasis". Champaign, IL: Human Kinetics (2005).

61. Goldberg G. "Supplementary motor area structure and function: Review and hypotheses". *The Behavior and Brain Sciences* 8.4 (1985): 567-615.

62. Ludwig Von Bertalanffy. "An outline of general systems theory". *British Journal for the Philosophy of Science* 1.2 (1950): 139-164.

63. Ludwig Von Bertalanffy. "General System Theory-A critical review". *General Systems* 7 (1962): 1-20.

64. Ludwig Von Bertalanffy. "General System Theory: Foundations, Development, Applications". Ludwig von Bertalanffy, George Braziller, New York (1968).

65. O'Hara PA. "Principle of circular and cumulative causation: fusing Myrdalian and Kaldorian growth and development dynamics". *Journal of Economic Issues* 42.2 (2008): 375-387.

66. Peter M Senge. "The Fifth Discipline: The Art and Practice of the Learning Organization". Currency Doubleday, New York (1990).

67. Libel B. "Unconscious cerebral initiative and the role of conscious will in voluntary action". *The Behavioral and Brain Sciences* 8.4 (1985): 529-566.

68. Libel B. "Do we have free will?" *Journal of Consciousness Studies* 6.8 (1999): 47-57.

69. Deecke L. "Cerebral potentials related to voluntary actions: Parkinsonian and normal subjects". In PJ Delwaide and A Agnoli (Eds.), Clinical Neurophysiology in Parkinsonism. Amsterdam and Oxford, Elsevier (1985): 91-105.

70. Deecke L. "Bereitschaftspotential as an indicator of movement preparation in supplementary motor area and motor cortex". *Ciba Foundation Symposium* 132 (1987): 231-250.

71. Deecke L. "Electrophysiological correlates of movement initiation". *Revue Neurologique* 146.10 (1990): 612-619.

72. Deecke L., *et al*. "Comparison of Bereitschaftspotential, promotion positivity and motor potential preceding voluntary flexion and extension movements in man". *Progress in Brain Research* 54 (1980): 171-176.

73. Deecke L and Kornhuber HH. "An electrical sign of participation of the mesial supplementary motor cortex in human voluntary finger movement". *Brain Research* 159.2 (1978): 473-476.

74. Shibasaki H., *et al*. "Components of the movement related cortical potentials and their scalp topography". *Electroencephalography Clinical Neurophysiology* 49.3-4 (1980a): 213-226.

75. Shibasaki H., *et al*. "Cortical potentials following voluntary and passive finger movements". *Electroencephalography Clinical Neurophysiology* 50.3-4 (1980b): 201-213.

76. Shibasaki H., *et al*. "Cortical potentials associated with voluntary foot movements in man". *Electroencephalography Clinical Neurophysiology* 52.6 (1981): 507-516.

77. Shibasaki H., *et al*. "Both primary motor cortex and supplementary motor area play an important role in complex finger movement". *Brain* 116.6 (1993): 1387-1398.

78. Khanna S., *et al*. "Bereitschafts potential in melancholic depression". *Biological Psychiatry* 26.5 (1989): 526-529.

79. Soon CS., *et al*. "Unconscious determinants of free decisions in the human brain". *Nature Neuroscience* 11.5 (2008): 543-545.

80. Matsuhashi M and Hallett M. "The timing of the conscious intention to move". *European Journal of Neuroscience* 28.11 (2008): 2344-2351.

Volume 11 Issue 1 January 2019