
Brain Functions: A Comparative Overview of the Modern and the Ancient Indian Thoughts

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Abstract

The modern and the ancient Indian views on the brain functions (higher cortical functions) are presented. The aim is to highlight the difference between these two streams of thought. The major landmarks which eventually shaped the modern knowledge along with a comparative overview of the brain functions as enumerated in the Hindu Philosophy and Yogic texts are discussed. Finally, the implications of these two different approaches are highlighted.

Key words -

**Brain functions,
Chakra,
Nadi,
Tantra**

The human brain is the most complex computer system known to man, both in its organisation and operation. Although considerable research has been generated in brain science, there is still a vast terrain that remains to be explored. Hypotheses have been put forward with respect to the structural aspect on the one hand, and the instinctive and the unconscious aspects of the brain on the other.

Indian thought supplementing both the aspects however, conceptualized midway between structural and psychological functions of brain and advocated the theory of self for understanding each and every mental phenomenon. Brain functions, thus, according to ancient Indian thought can be judged by the fact that conscious and unconscious elements in human nature are required to be controlled and monitored by the activities of the rational self [1].

In this paper, some of the ancient Indian as well as modern concepts related to brain functions are presented in order to provide a comparative overview. It is not intended however to document the chronological growth of brain science, but to highlight succinctly the major turning points which have eventually shaped the contemporary knowledge about brain functions (higher cortical functions).

In the historical context, the genesis of brain science in the West seems to have begun with Edward Smith's Original description of the brain in terms of anatomy, physiology, and pathology [2]. Hippocrates (500 B.C.) described the brain as the 'organ of intellect' or 'the guiding spirit' [3]. The philosopher-scientists, like Herophilus and Galen accepted the mystic nature of the brain and labelled it as the 'seat of the soul' [4]. The 16th century saw the revolutionary trend in the brain science; the neuroscientists discarded the mystic views held by their predecessors. Vesalius for example, regarding the brain as a 'highly developed sense organ', whereas Gall provided the psychological explanation in terms of phrenology and attempted to localize each psychological function within different segments of the brain [5]. The discovery of expressive and receptive speech areas further strengthened the argument for the localization of brain functions [6].

Lashley [7], on the contrary, rejected the concepts of localization and advocated the 'theory of equipotentiality' [3]. Luria [8] from an entirely different front, upheld the theory of intercortical integration. He pointed out that every single brain function is based on the 'complex dynamics or constellation of connections that are at different levels of the central nervous system'. This knowledge has led to neuro-scientists to look into the functioning of different lobes of the brain which are by and large function specific.

The current knowledge in this direction emphasised the phenomenal role of frontal lobes in the psychological functions like, attention, anticipation, mental set and volition [9]; and the pivotal role of the temporal lobes in the storage of newly acquired information [10]. Sperry [11] has further unravelled the mysteries behind the functional asymmetry of the left and right brains where the left and the right brains are specialized in processing analytical and global information respectively. These contemporary findings have revolutionized this area of research. Attempts are being made to study the distinct functional systems of each lobe in order to obtain a comprehensive knowledge with respect to the organisation of brain functions.

On the Indian front, an entirely different frame of reference has been used to describe higher cortical function of human brain. The major distinction is present in the usage of term, 'manas' or mind rather than brain. In the earliest philosophical literature [12], all the mental functions namely, cognition, emotion and volition have been examined and described through the concept of mind. The 'manas' is considered as the figment of consciousness. Further, consciousness is said to reveal itself in waking (Jagriti), dream (Swapna) and dreamless sleep (Sushupti) stages [13].

The Aitareya Upanishad [14] gives a list of 16 functions of mind which represent the single generic term 'Prajnana' or cognition. These are

- 1) 'Samjnana' or awareness
- 2) 'Ajnana' or comprehension
- 3) 'Vignina' or understanding
- 4) 'Prajnana' or knowledge
- 5) 'Medha' or retentiveness
- 6) 'Drishti' or insight
- 7) 'Dhriti' or resolution
- 8) 'Mati' or opinion
- 9) 'Smriti' or memory
- 10) 'Manisha' or reflection
- 11) 'Juti' or impulse
- 12) 'Samkalpa' or conception
- 13) 'Kratu' or purpose
- 14) 'Asu' or vigor
- 15) 'Kamah' or desire and
- 16) 'Vasha' or will.

The other Upanishads including 'Prashna' [15] term mental phenomenon as 'Antahkarana' or internal sense which is constituted by four psychological faculties. These are: 'Manas', 'Buddhi', 'Ahamkara' and 'Chitta'. The 'Manas' refers to that faculty which receives the external stimuli. The message is then passed to 'Buddhi' or intellect which proceeds to analyse these stimuli with the power of discrimination. Further, the message is passed to the 'Ahamkara' or ego which renders unique properties to the incoming message through the 'Chitta' or consciousness. These are all psychological experiences and cannot be empirically proved.

In marked contrast, Tantrik manuals of yoga describe the anatomy and physiology of the nervous system in their understanding of the mind and its various functions 'Shatchakra Nirupana' [16], 'Shiva Samhita' [17] and 'Hatha Yoga Pradipika' [18] have illustrated the physiological process of various 'nadis' and 'chakras' which govern the subtle functions of the body and mind (? brain) [19]. The fourteen major 'nadis' are mentioned in these texts, out of which the three 'Ida' ,

'Pingala' and 'Sushumna' are important. 'Ida' and 'Pingala' are said to be situated on either side of Merudanda (spinal column). The spinal column contains the 'Sushumna' (spinal cord). At the 'Sheershanta' (cephalic end) each passes into the 'Kapala' (cranium) with the other opposite and forms the 'Bhrukitchakra' (Naso-ciliary plexus). From there, the 'Ida' and 'Pingala' proceed further to join the 'Sushumna' (spinal cord) at the 'Mastishka stambha' (brain stem).

'Brahamachakra' (cerebrum) receives the 'sushumna' through the 'Talu' (foramen magnum) forming a 'Sahasrara' or thousand branch plexus. The 'Kapalaguhika' (cranial cavity) is present at the 'Sushumna' and is divided into two parts: the anterior and posterior. The anterior fibres travel upwards and join the 'Ajnachakra' (lobe of intelligence). This lobe is concerned with the control of the voluntary muscles, ligaments and joints. The posterior bundle, on the other hand, travels towards the 'Brahma Randhra' (ventricles of the brain), where soul is supposed to reside. It is this portion of the brain that a student of yogic sciences tries to develop by a process of co-ordinating, the 'Prana' (air which is breathed in) and 'Aprana' (air which is breathed out) 24.

The Shatchakra Nirupana mentions how the different psychological experiences are generated. According to text, the entire central nervous system is divided into six circles (technically called 'chakra'). These are: 'Muladhar', 'Swadhisthana', 'Manipura', 'Anahata', 'Visuddha' and 'Ajna'. Rele [20] prefers to call these 'chakras' plexuses, which stand for the pelvic, hypogastric, solar, cardiac, pharyngeal and naso-ciliary respectively, located in the region of rectum, pelvic, naval, heart, throat and at the base of the skull. Different psychological functions are attributed to these chakras (Table 1).

Table I

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Comments

There is a vast ocean of differences between ancient and modern approaches with respect to the knowledge about brain functions. There are two main reasons for this: Firstly, modern knowledge has been gained through scientific technology and clinical case studies, while the ancient thinkers relied on their brilliant insights and profound thoughts. The ancient yogis through meditation arrived at their conclusions. Secondly, the modern know-how used a specific target approach whereas the ancient yogis used a holistic approach to all fields of knowledge including the study of the Mind.

It is quite evident that in early stages of knowledge about the brain functions, the philosophical notions in the east and west centered around mysticism. But now, with a certain amount of success in scientific brain research, introspection is rather lesser accepted mode of investigation. The ancient Indian viewpoints remained undeveloped after a remarkable growth which was achieved primarily by Yogis and Rishis. This knowledge stagnated in its development when these ideas were never subjected to scientific enquiry. They lacked in scientific rigour and temper. Again, in the modern context, the theory of localization of psychological functions and the holistic approach still remain a matter of controversy. The yogic concept of central nervous system seems to be a fascinating piece of information; this is evident in the usage of different terms such as 'Ajna chakra' or intelligence lobe, 'Brahma Randhra' or the ventricles of the brain and 'Brahma chakra' or cerebrum. It does not require any stretch of imagination to infer that these terms could be easily equated with various parts of the brain known today. It is worth speculating at this point that had Indian thinkers known about the anatomy of the brain, perhaps, they would have, in those ancient days widened the horizon of knowledge of its mysterious functions. Finally, it is also true that to a large extent modern technology and scientific rigour have not till today been able to comprehend the human brain functions specifically those as enumerated in the Tantrik texts [21].

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