A Review on Smriti (Memory) and its Affiliates in Physiology

Dr. Pritam Moharana¹, Dr. Rakesh Roushan²*

¹MD Scholar – Kriya Sharir, Ch. Brahm Prakash Ayurved Charak Sanathan, New Delhi
²Assistant professor, Dept of Kriya Sharir, Ch. Brahm Prakash Ayurved Charak Sanathan, New Delhi
¹pritamm.543@gmail.com, ²rakesh3151@gmail.com

Abstract

Mana (mind) is the integral part of life which influences the overall health of life. In modern era due to stress, disturbed emotion there is increase incidence of psychosomatic disease where dhi, dhriti and smriti of person are affected. Smriti (memory) is nothing but the remembrance of things directly perceived, heard or experienced earlier. It is described as one among the eight aishwaryas (desire of power) which is possible only through the concentration of pure mind. Smriti is one of the most complex processes of the brain. The first step in understanding memory is to understand how the brain receives and transfers information in ancient literature as well as modern medical science. Very few works have been accomplished on conceptual features of smriti. In this article an attempt has been made to correlate the physiological activity of smriti as described in Ayurved with modern medical science. For this study, the basic materials have been collected from the Ayurvedic classics with available commentaries, as well as text books of contemporary modern medical science for better understanding of the concept and its comparison with contemporary science.

Key Words: Smriti, memory, mana, buddhi, limbic system

Introduction:

Smriti is the remembrance of things directly perceived, heard or experienced earlier¹. Memory is the higher mental process in which information is encoded, stored and retrieved. It has a prominent role in the perception of buddhi (intelligence). Smriti is more related with Buddhī and Manovyapaar. It is the recreation of past experiences by the synchronous firing of neurons that were involved in the original experience. Mana plays an important role in the process of retention of knowledge and it also coordinates the external environment with the atma through the different Gyanendriyas (sense organs). Ayurveda is the science based on the concept of functional understanding. There is no specific correlation of smriti mentioned in any ancient literature. It seems to be a problem found in student life to understand about the concept of smriti. Increased demand of Ayurveda science in the present society is required to understand the depth of Ayurvedic principles on criterion of modern medical science in an easy mode. In this review we are trying to explain psychological and physical aspects of Smriti with modern perspective.

Manovyapaar and Buddhi- A Cause Effect Relationship:

Indriya, indryartha, mana and atma are the four entities which act in coherence to produce gyaana (knowledge). The process of knowledge is as follows. Mana conjugates with atma (the supreme power soul) for acquiring knowledge. The knowledge received can be reproduced only if one has the ability to recollect the information required. Things requiring chintya, vicharya, uhya, dheya, sankalpa or whatever can be perceived by the mind, are regarded as its subjects. Generally these five processes help in
generation of buddhi. The indriyartha are perceived through the indriyas and then the information is processed through manas. The information whether it is indriyasapekshya or indriyanirapekshya undergoes chintya, vicharya, uhya, dhaya. At this level sankalpa sorts out the data into Gunayukta, doshayukta or anyata. This categorization data develops buddhi².

Physiological Aspect of Smriti:

Doshas are the functional representatives of our body. Vata is the main dosha that controls mind for its normal functioning and its activities ‘niyanta praneta cha manasa’. The main dosha involved for the process of attaining smriti is udana vayu⁵. The other type of dosha contributing to processing of memory is Prana vata which maintains the proper activity of buddhi, mana and indriya⁶. Sadhaka pitta residing in hridaya is responsible for the proper functioning of buddhi and mana⁷. Tarpaka kapha residing in head provides nourishment and protection to centers of sense organs in the brain⁶. Prana vayu, Udana vayu, Sadhaka pitta, Tarpaka kapha operate in support of one another in processing of memory. Nimitta (Knowledge of cause), Rupa grahaṇa (Knowledge of form), Sādṛṣya (Knowledge of similarity), Saviparyaya (Knowledge of contrast), Satwanuvandha (Concentration of mind), Abhyasa (Practice), Gyanayoga (Attainment of metaphysical knowledge), Punahsrutat (Subsequent partial communication of an event) are the eight factors that bring about a good memory⁷. Among eight sara twak sara purusha have a high intellect and sattva sara purusha is having good memory. Vata prakriti are endowed with śruta grahi, alpa smriti⁸ and chala smriti⁹. Pitta prakriti individuals are considered to be medhavi¹⁰. In kapha prakriti individuals, they are chiragrahi and smrutiman¹¹. With respect to manasa prakriti, Satwika prakriti has good memory.

Modern Aspects:

Neurons are the basic cell for the transformation of information within the nervous system. A stimulus is detected by a specific type of neuron which is called sensory neuron. The sensory information then travels through the nervous system by communicating with other neurons through an electro-chemical process. This sensory stimulus is detained for a fraction of a second in the sensory memory. If an individual does not pay attention to encode the stimulus into short-term memory, it will be lost. The information can be "rehearsed" silently or aloud. This will keep the information into intermediate long term memory or long term memory. Short term memories are stored in prefrontal lobe of cerebral cortex. Long-term memories are accumulated in multiple regions throughout the nervous system.

The cerebral cortex becomes activated by either thought processes of mana or excitatory signals, signals are sent from the cortex to the brain stem excitatory area, which in turn sends still more excitatory signals to the cortex. This helps to sustain the level of excitation of the cerebral cortex or even to enhance it. This is a general mechanism of positive feedback that allows any beginning activity in the cerebral cortex to enhance still more activity. The thinking process helps in establishment of long-term memories by activating such back-and-forth reverberation of signals. Another area called reticular inhibitory area is important in controlling brain activity¹².

Limbic system has an important role in processing and storage of memory. It is the neuronal circuitry that controls emotional behavior and motivational drives. Hippocampus a part of limbic system became a critical decision-making neuronal mechanism, determining the importance of the incoming sensory signals. The hippocampus provides the translation of short-term memory in to long term memory—that is, the hippocampus transmits some signal to make the mind rehearse over and over the new information until permanent storage takes place¹³.
A thought results from a “pattern” of stimulation of the cerebral cortex, thalamus, limbic system, and upper reticular formation of the brain stem. The stimulated areas of the limbic system, thalamus, and reticular formation help in determination of general nature of the thought, giving it such qualities like pleasure, displeasure, pain, comfort, basic modalities of sensation, localization to gross areas of the body, and other general characteristics.

Memory is the method of storing knowledge. Physiologically, memories are stored in the brain by changing the basic sensitivity of synaptic transmission between neurons as an outcome of previous neural activity. The new or facilitated pathways are named as memory traces. They are important because once the traces are established; they can be selectively activated by the thinking mind to reproduce the memories. Memory traces can take place at all levels of the nervous system. Special areas in the basal limbic regions of the brain decide whether information is important or unimportant and make the subconscious decision whether to store the thought as a sensitized memory trace or to suppress it. Memories are classified into short term memory, intermediate long term memory and long term memory. The ability of the prefrontal areas to keep track of many bits of information simultaneously and recall this information instantaneously as it is needed for subsequent thoughts is called the brain’s “working memory.” Brain’s working memory is a type of short term memory that is used during intellectual reasoning. It is used while the individual plans action based on it14.

Memory is again divided into two types. Those are explicit or declarative memory and implicit or non-declarative memory. Explicit or declarative memory is associated with consciousness or at least awareness. Implicit memory is otherwise called as non-declarative memory or reflexive memory which does not involve awareness. Explicit memory can become implicit once the task is thoroughly learned15.

Processing of explicit memory occurs in four stages: encoding, consolidation, storage and retrieval of memory. Encoding is the process by which newly learned information is attended to and processed when first encountered. Consolidation is the process that alters the newly stored and still labile information so as to make it more stable for long term storage. Storage refers to the retention of memory at specific sites in the brain. It involves the expression of genes and synthesis of new proteins. Retrieval refers to the recall and use of storage information.

Consolidation of memory into long term memory occurs when sensory experiences are associated with profound emotions. Hence we reminisce about our childhood days the events recalled are only those that are associated with deep emotions. For the same reason we remember even the trivial things we were doing moments before we received shocking news. This is the brains way of deciding what is to be remembered and what is to be forgotten is called positive or negative memory. Experiences with no emotional adjunct are better forgotten so that they do not take up memory space in the brain. The amygdale stores components of memory concerned with emotions16.

Discussion:

Smriti helps the mind in recollecting the entire percept or experienced objects on the basis of concept formed by past experiences. Acharya chakrapani states that chetana, dhrti, smruti and ahankara are the types of buddhi. Smriti is a component to bring about the attachment. It is obvious that without Smriti, the function of Buddhi is impossible. Buddhi cannot develop without uhapoha and vichara, which comes through smruti or past experiences. Buddhi is of two types. Kshanika and nischyatmika. Kshanika buddhi may be correlated with working memory. Prefrontal area of cerebral cortex keeps track of many bits of information simultaneously and to cause recall of this information instantaneously as it is needed for subsequent thoughts which is required to develop kshanika buddhi. Kshanika buddhi (short term memory) may be converted into nischayatmika buddhi (long term memory) if hippocampus enhances the
rehearsal of information (kshanika buddhi) repeatedly will transfer into long term memory by initiating chemical, physical and anatomical changes in the synapse that are responsible for the long term type of memory. Structural changes occurs during development of nischayatmika buddhi is as follows.

1. An increase in vesicle release site for secretion of transmission substance
2. An increase in the number of transmitter vesicles released.
3. An increase in number of presynaptic terminal
4. Changes in structures of dendrites spine that permit transmission of stronger signals.

Drista (visual traces), sruta (auditory traces) and anubhuta (experience memory traces has already been formed), these three traces help in recollection of memory. Drista, sruta, anubhuta through visual and auditory sensory information reaches to wernicke’s area, the area for intellectual function as well as comprehension of words. After that memory traces are formed at all level of nervous system.

Nimitta (Knowledge of cause), Rupa grahana (Knowledge of form), Sadrusya (Knowledge of similarity), Saviparyaya (Knowledge of contrast), Satwanuvandha (Concentration of mind), Abhyasa (Practice), Gyanayoga (Attainment of metaphysical knowledge), Puahsrutat (Subsequent partial communication of an event) are the eight causes of smriti. These eight causes of smriti help in recollection and transformation of knowledge from short term memory to long term memory. It is stored in cerebral cortex. When a person is exposed to any cause of memory, thalamus plays a role in helping the person to “search” memory store house and thus read out the memory. So these eight causes of memory process not only require the storing of memory but also an ability to search and find the memory at a later date.

Chintya, Vicharya, uhya, dheya, sankalpya are the five processes that help in generation of buddhi. In modern science a thought results from a “pattern” of stimulation of the cerebral cortex, thalamus, limbic system, and upper reticular formation of the brain stem. It may be concluded that all these five process of mana are progressed by the simultaneous stimulation of cerebral cortex, thalamus, limbic system, and upper reticular formation of the brain stem.

Acharya charak has described lack of concentration of mind is the cause due to which direct perception of knowledge is not possible. It means there is habituation of stimulation of sensory terminal. During this case at first the signal transmission is great but become less due to lack of concentration of mind which is a type of negative memory. If any noxious stimuli excite the facilitator terminal the ease of transmission becomes stronger and there will be perception of direct knowledge.

Learning is the process of acquisition of sensory information while memory is the storage and retrieval of the same information. A change in behavior is called the learning which develops after thought process based on storage of memory. After the formation of buddhi (gyana) it is stored in the cerebral cortex as memory.

Conclusion:

Mana is called as ubhayendriya (both gyanendriya and karmendriya). It supports in the function of both sensory and motor part of nervous system. The part of nervous system which synchronizes both sensory and motor part of nervous system is called as mana. According to its function it is generally responsible for generation of thoughts which comes from smriti, smriti comes from the gyana (buddhi) which is processed by the help of atma, mana, indriya, and indriyartha. So the structures like cerebral cortex, limbic system (hypothalamus, hippocampus, basal ganglia, amygdala), upper reticular formation of brain stem may be represented as mana. The structures like reticular activating system, limbic system, cerebral cortex, wernicke’s area, angular gyrus area is responsible for storage and recollection of memory.
References:


15. Barrett Kim E. etal(2016) Central peripheral neurophysiology, Ganong’s review of medical physiology, New Delhi (India), Lange; 2016:290