

A RATIONAL AYURVEDIC APPROACH OF SMRITI (MEMORY) IN PURVIEW OF MODERN SCIENCE

Saraswat Bhawna¹, Sabharwal pooja², Gaur M. B.³, Pandey Yogesh⁴

¹M.D. Scholar Final Year, Dept. of Kriya Sharer; ²Assistant professor, Dept. of Rachana Sharir;

³Professor & H.O. D., Dept. of Kriya Sharir; ⁴Associate Professor, Dept. of Kaya Chikitsa; CBPACS, New Delhi, India

Email: saraswatbhawna12@gmail.com

ABSTRACT

Smriti is the faculty of mind that plays an important role in perception of knowledge. It is one of the components of *Pragya* according to Ayurveda. It is the recalling capacity of the knowledge which is perceived by the brain from past experiences. The *Smriti* is determined by various factors like *Prakriti*, age, *Ahar-Vihar*, repetition of events etc. The consideration of all the factors can provide better knowledge to improve *Smriti*. Modern science considers various components of memory which includes recent & past memories, mental balance, attention and concentration, recalling, retention and recognition. All these components are governed by different areas in the brain. An attempt is made to understand the mechanism of attaining knowledge and its recall and the involvement of various anatomical structures and their function to develop an understanding regarding various aspects of memory.

Keywords: *Pragya, Smriti, Memory, Ayurveda, Prakriti*

INTRODUCTION

Dhee (Perception), *Dhriti* (Retention) and *Smriti* (Memory) are the entities which are responsible for attaining, holding and recalling of the knowledge. Each of these has little different working areas, but acts in coherence with each other and produces an act accordingly. According to *Chakrapani*¹ *Prajna* is the knowledge, which is having three faculties as *Dhee, Dhriti and Smriti*. *Prajna* is to know, understand, especially a mode of action, discern, distinguish, know about, be acquainted with, to find out, discover, perceive, learn, wisdom, intelligence, knowledge, discrimination and judgment. All these

functions are the result of proper action of the three components of *Prajna*. *Prajna* is also understood as *buddhi*. *Dalhana* defined *Prajna* as Knowledge about the present, past and future.

FACULTIES OF *PRAGYA*-

Dhee- It is the intellectual and discriminating power of the mind that identifies the right and wrong.

*Amarakosha*² defines "*Dhee*" as to perceive and to reflect i.e. the faculty of *Buddhi*, which performs the duty of perceiving the things. According to *Arundutta* and *Chakrapani* *Dhee* is a type of *Prajna*. It can be considered as the analyzing and logistic

power of brain which understands the good or bad aspects of an object.

Dhriti- Dhriti is the ability of holding knowledge which was perceived in past and to utilize that knowledge against the subjects which have harmful impact in future. It is basically seizing, supporting, firmness, well, resolution, command and satisfaction. *Sushrut* describes it as the ability of firmness within the norms, which is under the influence of *Satvaguna* of *Manas*. According to *Charak*³ Dhriti is a controlling factor, which prevents the mind from

indulging in harmful and non beneficial objects. The *Svasyanigraha* (self control) function of *Manas* is carried out by the factor *Dhriti* only.

Smriti- Remembrance, memory or calling of mind. It is the ability to recall the past experiences. According to *Charak*, the assessment of *smriti* can be done by recall ability- “*Smriti Smarnena*”⁴.

Remembrance of these factors are responsible to attain the “actual or as it is” (*Yatharth*) knowledge of the objects, which prevents the indulgence of *Manas* in harmful activities which is main cause of misery.

Table 1: The following are the eight factors that are responsible for retrieval⁵ of the acquired knowledge.

1	<i>Nimitta</i>	Knowledge of cause (of a thing and event etc.);
2	<i>Rupagrahanat</i>	Knowledge of form, like the perception of one object provokes the memory of some other related objects.
3	<i>Sadrishyat</i>	Knowledge of similarity for remembrance of another similar object.
4	<i>Saviparyayat</i>	Knowledge of contrast (e.g. having seen an ugly form one remembers a beautiful form)
5	<i>Sattvanubandhat</i>	Concentration of mind
6	<i>Abhyasa</i>	Practice
7	<i>Jnana Yoga</i>	Attainment of metaphysical knowledge; and
8	<i>Punah Shrutat</i>	Subsequent partial communication of an event. For instance, when a thing has passed away from the memory, then even a slight hint or previous reference can help in memorizing that thing.

A memory is nothing but the remembrance of things directly perceived, heard (from scriptures) or experienced earlier. *Smriti* is graded according to different *Prakriti* by Acharyas. *Prakriti* is the innate constitution of an individual based on his *Dosha* predominance determined at the time of conception which cannot be changed from birth till death.

Physiology of *Smriti* in Ayurveda-

The five (types of) sensory perceptions are- visual perception etc. This perception of knowledge are produced in conjunction with the senses (*Indriya*), sense objects (*Indriyarth*), mind (*Manas*) and the self (Atman). All these four are the essential components and mere incoherence any of them is responsible for improper or lack of knowledge. That's why the *buddhi* is known as “*Sanyogaja*”. In process of acquiring knowledge, the *manas* is the *Achetana* (unconscious) but active component while the *atma* is the conscious hence known as the *Karta*. *Manas* in coherence with the *Indriyas* perceives the objects. After perception *manas* (mind) has the tendency to

analyze the object critically, to understand its pros and cons. This process derives a conclusive result about the whole incidence, which is termed as “*Gyanottapatti* or the knowledge”. This process suggests the involvement of analytical component of brain in acquiring knowledge which is the function of *Buddhi*. *Smriti* is produced as a result of remembrance of pre acquired facts by any of the above described (*Nimitta* etc.) eight factors.

The whole process of *smriti* (recall and action accordingly) completes in three steps which is a combination of sensory and motor signals. It must be clear that *Smriti* of only those objects are produced which were already received in the past. *Indriya* receives *Arthas* when associated with *Manas*-(*ManahPurah Sarani Indriyanyartha Grahana Samarthani Bhavanti*). This perception needs *Artha, Indriya, Manas* and *Atma* in sequel. This is called as *Uha*. After the perception, *Manas* starts process of actual analysis, i.e., *Chintan, Vichara, Uha, Dhreyeya, Samkalpa* are

performed. It is the understanding or determination of perceived information. Hence, the *manas* through its objects (*vishaya*) draws a conclusion and produce knowledge (*Buddhi*) about the perceived object, Hence, the role of *manas* begins from perception & ends in determination i.e. *Adhyavasaya* or *Nischayatmaka Buddhi* which is the first half (sensory part) of the physiology of *Manas*. The second half of the physiology of *Manas* is related with *Karmendriyas* that forms

the motor response towards an event. *Manas* being *Ubhayatmaka Indriya* coordinate with both *Jnanendriya* and *Karmendriya* in harmony. After determination of the knowledge perceived by *Jnanendriyas* on the basis of previous experiences, desired reflex action is to be carried out, which is coordinated by *Manas* with the help of determined knowledge, i.e. *Nischayatmaka Buddhi*, and the further required action is carried out by *Karmendriyas*.

Following are the factors⁶ which serves as an aid to good memory as well as these are way to attain salvation.

Due devotion to noble person
Shunning of the company of the wicked
Observing sacred vows and fast
Pursuit of the rules of good conduct
Compliance with scriptural prescriptions
Scriptural knowledge
Liking for lonely living
Detachment from the objects of senses
Striving for <i>Moksha</i> (salvation)
Absolute mental control.

Causation of disease-Impairment of intellect (grasping and keeping power), *Dhriti* (controlling power) and memory (recalling power), ageing/advent of maturity, unwholesome contact with objects of senses, and deeds could be counted as factors responsible for causing miseries⁷.

Dhee Vibhramsa- If something eternal is viewed as ephemeral and something harmful as useful, and vice versa, this is indicative of the impairment of intellect. For, the normal intellect views things as they are.

Dhriti Vibhramsha- It is the state of mind in which the person indulges in harmful activities even after knowing the harmful results. In *Dhriti vibhramsha*, one loses the ability to control the mind.

Smruti Vibramsha (memory disturbance) –*Smruti vibhramsha* is the state in which the memory is altered from its normalcy; this means either reduced

memory or selective memory or total loss of memory.

Causes of *Smriti Hras*⁸-

Mental factors not only affect the psyche but also the physical processes⁹. This can be seen as indigestion in individuals having disturbed mental states due passion, anger, greed, confusion, envy, bashfulness, grief, anxiety.

Divaswapana- Sleeping during daytime is contraindicated in the seasons other than summer because it causes vitiation of *kapha* and *pitta*, impairment of memory and intelligence, obstruction of the body channels, incapability of sensory and motor systems along with various disorders.

Gramyahasana- *Gramyahara* includes -*Amla, katu, Lavanarasatmakaaharasevana, Shushkashaka and mamsasevana, Viruddhadhanyasevana – usage of sprouted grain Nava shukashamee dhanya sevana, Paryushita bhojana, Streenithya – Daily indulgence of sex, Madya nitya – Daily intake of alcohol, Vishama and atimatrayayama, Bhaya, Krodha, Shoka, lobha, Mohabahulanam - excessive fear, anger, grief etc. All these harmful ahar vihar are responsible factors for distortion and impairment of memory.*

Rajo and Mohavrita mana- Raja and Moha are the psychological factors that cover the buddhi and alter the intellect.

Jara (Senile)- Increasing age causes impaired memory. According to *Sharangdhar*, in the ninth decade of life, memory and analyzing power diminishes. It is the age associated neuro-degeneration. It is the one among the *Sahaj Vyadhi*, so cannot be prevented, but premature ageing process can be managed by implication of correct life style and behavior to counteract these premature ageing related neuro degeneration. Apart from age, various other factors, which increase the risk of dementia include: genetic factor, socio-medical and life-style factors.

Role of Rasayanas⁹ as the memory enhancer- Multiple actions of *Rasayanas* are immunomodulation, Adaptogenic action, Antioxidant role, nootropic action. Particularly nootropic action Promotes⁹ intelligence and functions of brain e.g., *Medhya Rasayana* drugs (namely- *Mandookparni, Guduchi, Yashtimadhu and Shankhpushpi*).

Table 1: Tabular¹⁰ representation of various *Medhya Rasayanas* with function & mode of action

S.no.	Medhya Rasayana (drug)	Functions
1.	<i>Yashtimadhu (Glycyrrhiza glabra)</i>	Spatial learning and passive avoidance, preliminary free radical scavenging, cerebral ischemia and antioxidant capacity towards LDL oxidation.
2.	<i>Guduchi(Tinosporacordifolia)</i>	Strong free radical scavenging properties against reactive oxygen and nitrogen species diminishing the expression of iNOS gene, reduction in thiobarbituric acid reactive substances and an increase in reduced glutathione catalase and superoxide dismutase (anti-oxidant)
3.	<i>Shankhpushpi (Convolvulus pluricaulis)</i>	Anxiolytic, memory enhancing and mood elevating effect, retard brain aging, help in regeneration of brain cells and in Dendritic arborization which is the neuronal basis for improved learning and memory, increase in AGHe activity in CA1 with AS and CA3
4.	<i>Mandukaparni (Centella asiatica)</i>	Neuronal dendritic growth stimulating property, effective in reducing brain regional lipid peroxidation (LPO) and protein carbonyl (PCO) levels and in increasing antioxidant status, improve the altered levels of neurotransmitters such as 5HT, acetylcholine, epinephrine, norepinephrine, GABA (gamma-aminobutyric acid) and Glutamate, improve the mental ability and fatigability of subjects under stress, inhibit the formation of beta amyloid plaques owing to the oxidative stress and activation of glial cells and thereby delay neuronal apoptosis.
5.	<i>Brahmi (Bacopa monnieri)</i>	Positive implications for improved neurotransmission and repair of damaged neurons via enhanced regeneration of nerve synapses via changes in the hippocampus, cerebral cortex (areas critical to memory function) and hypothalamus regions of the brain

6.	<i>Ashwagandha</i> (<i>WithaniaSomnifera</i>)	GABA-like activity, owing to its anxiolytic effect, increase in the levels of three natural antioxidants superoxide dismutase, catalase and glutathione peroxidase.
7.	<i>Kapikachu</i> (<i>MucunaPruriens</i>)	Contain significant quantity of L-Dopa which could be the basis for its anti- Parkinsonism effect.
8.	<i>Jyotishmati</i> (<i>Celastruspaniculata</i>)and <i>Tagara</i> (<i>Valerianawallichii</i>)	Role in brain and memory disorders in the elderly.

By using the metallic *Rasayana*¹¹ for a year one becomes intelligent, renowned orator, scholar and wealthy. The use of gold or silver *Rasayana* also provides longevity and freedom from all ailments.

Anatomical structures and their physiology in relation to the memory-

The central nervous system deals with the storage of memory. Main parts of the brain involved in memory are the *amygdala*, the hippocampus, the cerebellum, and the prefrontal cortex¹². The *amygdala* is involved in fearful memories. The hippocampus is related with declarative and episodic and recognition memory. Cerebral cortex is divided into several areas like supplemental and premotor area, primary motor, primary somatic and secondary somatic areas. These secondary sensory areas, analyze the meanings of the specific sensory signals, such as interpretation of the shape, texture, color, light intensity, directions of lines and angles, and other aspects of vision; and interpretations of the meanings of sound tones and sequence of tones in the auditory signals. This function of secondary areas is similar to functions performed by the *manas* in ayurveda literature. The major area for language comprehension is the Wernicke's area which lies behind the primary auditory cortex in the posterior part of the superior gyrus of the temporal lobe. It is the most important region for higher intellectual function because most of the intellectual functions are language based. The prefrontal association area carries out "thought" processes in the mind. This area is important for thoughts elaboration, and it is said to store on a short-term basis "working memories" that combine new thoughts while they are entering the brain. This area is highly developed in the dominant side of the brain—the left side in almost

all right-handed people which plays an important role for the higher comprehension levels of brain function that is considered as intelligence. This area has almost global importance and known by various names the general interpretative area, the gnostic area, the knowing area, the tertiary association area etc. The prefrontal area is responsible for elaboration of thought. It increases the depth and abstractness of the different thoughts & put the information together from multiple sources. This ability of the prefrontal areas to keep track of many bits of information and to cause recall of this information instantaneously as it is needed for subsequent thoughts is called the brain's "working memory". Means this prefrontal area of cortex plays important role in the *smriti*. Hippocampus which is a part of limbic system has role in learning new information. This area also responsible for turning short term memory into long term and make the mind rehearse the information again and again until it gets permanently stored in the brain. Basal ganglia also plays important role in cognition process. This cognitive motor control of complex activities occurs subconsciously to achieve complex goals.

Mechanism of memory formation and roles of Synaptic Facilitation and Synaptic Inhibition –

Physiologically, memories are stored in the brain by changing the basic sensitivity of synaptic transmission between neurons as a result of previous neural activity. The newly formed facilitated pathways are called memory traces. The traces ones established can be selectively activated by the thinking mind to reproduce the memories. Fortunately, our brain has the capability to ignore information that is of no consequence. It results from inhibition of the synap-

tic pathways for that information; this effect is called habituation. This is a type of negative memory. Conversely, when incoming information has important consequences such as pain or pleasure, the brain automatically enhances and stores those memory traces. This is positive memory which results from facilitation of the synaptic pathways, and this process is called memory sensitization.

Classification of Memories-Short-term memory- Includes memories that last for seconds or at most minutes unless they are converted into longer-term memories. Short term memory is formed by continual neural activity from nerve signals travelling around and around a temporary memory trace in a circuit of reverberating neurons. Another possible mechanism is presynaptic facilitation or inhibition. This occurs at synapses of terminal nerve fibrils immediately before these fibrils synapse with an adjacent neuron. The neurotransmitter released at terminals frequently causes facilitation or inhibition which lasts from seconds up to several minutes. **Intermediate long-term memories**, that last for days to weeks and after that diminishes; these traces will be lost unless activated enough to become more permanent; then they form the long-term memories. **Long-term memory**, are those which, once stored, can be recalled up to years or even a lifetime later.

According to the type of information stored-
Declarative memory- memories of the various details of an integrated thought, such as memory of an important experience are called Declarative memories. They include memories of the surroundings, time & relationships, causes of the experience, and their meaning and memories of deductions that were left in the person's mind. **Skill memory-** this includes the memory of skillful process, learned by experiences, such as all the skills developed for hitting a tennis ball, includes automatic memories of sighting the ball, calculation of relationship and speed of the ball to the racquet and then hitting it. All of the process is activated instantly based on previous learning of the game of tennis, which is also a part of *smriti*.

CONCLUSION

Smriti is the recall of the knowledge perceived in the past. The perception of knowledge is the result of cumulative effort done by *Indriyaartha Mana & Atma*. *Indriyas* are the receptor organs for the subject, which perceives the facts or knowledge about the subject. This perceived matter is analyzed by various brain areas including Wernicke's area, Hippocampal area, basal ganglia thalamus etc. which are equivalent to the objectives and functions of *Manas* described in Ayurvedic literature. Recalling of past knowledge depends on various factors like rehearsal of the perceived information by repetitive synaptic transmission along the memory traces. Classics already mentioned the idea of stimulating factors for regeneration of already acquired knowledge by *Smarana*. Ayurveda classics also describes how to get away from worries & miseries by utilizing the *Smriti* & to leave the factors responsible for causation of disease, which is the clinically important aspect of concept of *Smriti* for prevention of diseases and ultimately leading to a healthy and cheerful life.

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Source of Support: Nil

Conflict Of Interest: None Declared

How to cite this URL: Saraswat Bhawna et al: A Rational Ayurvedic Approach Of Smriti (Memory) In Purview Of Modern Science. International Ayurvedic Medical Journal {online} 2018 {cited December, 2018} Available from: http://www.iamj.in/posts/images/upload/2372_2378.pdf