



**Review Article**

**ROLE OF *INDRIYA* IN COGNITION AS EXPLAINED IN AYURVEDA WITH REFERENCE TO RECEPTORS**

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**ABSTRACT**

Cognitive impairments is a silent issue which is imparting a lot of burden over society now-a-days. Intellectual and emotional dysfunctions are another story which are displayed by the virtue of poor dietary regimen where the concept of – *Tan mana bhunjita* is neglected. The *Sharir* and *Indriya* are feed with adulterated things with an extensive variety of distractions today. This altogether is misleading the cell signaling mechanics of body affecting the perception through by – *Asatmyendriyarthasamyoga*.

Ayurveda has deep roots in the process of learning or cognition which mainly depends on the *Indriyarthasannikarsha*. *Indriya*, for the sense of objective understanding, here are justified with variety of receptors in terms of their functional capacities. The concept of *Indriya* and knowledge learning process is much more beyond the present concept of receptors and neural biochemistry. Specificity of receptors within the body with various morphological and functional responsibilities can be graded to understand the intellectual concepts of *Indriya* from gross to subtle level, such as- *Sukshma*, *Sukshmatara* and *Sukshmatama*. *Indriyapanchapanchak* is one such concept in Ayurveda where the specificity of receptors, its respective pathways and neural centers for perception of knowledge are easily understood and efforts for the same are highlighted through this topic.

**KEYWORDS:** *Indriya*, *Indriyapanchapanchak*, *Indriyarthasannikarsha*, Cognition, Receptors.

**INTRODUCTION**

The element of curiosity is closely associated with human behaviour which is manifested through human development with a characteristic feature of desire for learning, acquiring knowledge and skill from the external environment. This is later translated into an organized experience within the human intellect. Modern science is conclusive of involvement of hypothalamus and limbic system and are together indulged in reward mechanism to inquest and gather more and more information, knowledge and skill from the external environment. At the same time, ancient science of Ayurveda is having a unique look for the above complex process where *Indriya* being the center point of the overall philosophy.

Modern science believes that receptors do play an important role in perception, receiving and sensing the change in the environment to let the body know the change internally. As per the theory of Ayurved disciple, the same role of an instrument or an equipment is considered to be played by *Indriya*.

Ayurveda has deep roots in philosophy and mythology as well. The materialistic object responsible for knowledge perception viz. Receptor, can it be somewhere correlated or understood with the help of *Indriya* as per *Ayurveda*? This article gives an insight of understanding *Indriya* and Receptor mechanics.

**AIMS AND OBJECTIVES**

1. To study receptors in terms of its physiology and biochemistry.
2. To highlight *Indriya* in detail as mentioned in Ayurved classics.
3. To understand the role and significance of establishment of relationship (if any) between *Indriya* and Receptors.
4. To study about the cognition perspectives only in relation to *Indriya* and disciples of Neural-biochemistry.

**MATERIALS AND METHODS**

It is a literary study about concepts of ancient Ayurveda science also that of proposed and

established concepts of modern neurosciences. Thus a detail surfing of ancient Ayurved literature of available treatises, modern sciences, material available on internet was done to put forth some conclusive statements regarding the same.

## REVIEW OF LITERATURE

The literary review is mainly categorized into two sections comprising Ayurveda (*Indriya*) and Modern Neurology (Receptors). However, authors have tried to justify the correlation and mutual understanding between two sections in both the sections from authors own intellectual point of view.

### *Indriya*

Indian philosophy and Ayurved both acknowledge *Indriya* as instrument responsible for *pratyaksha* - direct perception of knowledge from the external environment. Authenticity of the perception of knowledge is governed by the consciousness – *Atma*.<sup>[1]</sup> For perception of knowledge the translated form of stimulus from external environment within the body has to undergo through a complex and very subtle process involving conjugation of this *Atma* with *Mana*, where the chain later connects with respective *Indriya* and later with its *Indriya artha*.<sup>[2]</sup> Any impairment or abnormality in *Indriya* leads to lack of perception of knowledge. Thus the *Indriya* are playing a role of means of cognition hereby which is feel or experienced by the *Atma*.<sup>[3]</sup>

*Indriya* is also said to be the factor denoting the existence of consciousness in oneself.<sup>[4]</sup>

Eminent scholar Panini has elaborated the nature of *Indriya*. *Indriya* means *Linga*, *Drshta*, *Shrsta*, *Jrshta* and *Artha*. It states that which is created by *Indra*, lives with *Indra*, expresses the character of *Indra*, which always sees through *Indra* and in which the activities are always carried out by *Indra* is called as *Indriya*.<sup>[5]</sup>

Living creature is unique due to the presence of soul (*Atma*) which is manifested by *Indriya*. This is again purposefully classified into two as such – *Dnyanendriya* and *Karmendriya*, while one which behaves like both and functionally expresses dual in nature is *Ubhayendriya* (*Mana*).<sup>[6]</sup> Attaining sensory perception using sensory faculty and obeying or following motor activity as per the knowledge received is the main role of *Dnyanendriya* and *Karmendriya*. *Ubhayendriya* keenly regulates and governs whole process and tries to experience the state of feeling when knowledge is perceived with the help of *Atma*.

*Indriya* also stand as a differentiating factors between the *Sendriya* or *Chetana* (Sentient) and *Nirindriya* or *Achetana* (Non-Sentient) matters.<sup>[7]</sup> This is conclusive that *Indriya* are responsible for

differentiation of biotic and abiotic components of this ecosystem.

### Significance of *Indriya*

Ayurveda have clearly highlighted the importance the *Indriya* in its various Ayurvedic treatises from time to time. The actual wealth or richness of an individual is decided who have overcome and controlled own *Indriya* (senses).<sup>[8]</sup>

Unwholesome nature, duration or point of contact of *Indriya* with its respective *Indriya artha* leads to disorders related to *Indriya*. *Indriya* disorders even though are at spiritual and psychological level but by the adulteration of *Sharir dosha* later it manifest as the form of physical pathological ailments.<sup>[9]</sup>

*Indriya*, are the component which can be studied and gained knowledge about the same and thus they are *Prameya*. *Indriya* being situated in their respective locations continuously go on working with their all normal functions unless prone to abnormality by aggravation or pacification of etiological factors responsible for the same.<sup>[10]</sup>

*Indriya* are responsible for perception of knowledge by *Pratyaksha pramaan* (direct observation) but however, the same are unable to be perceived by *Pratyaksha pramaan*. The only things we notice under the name of *Indriya* are not *Indriya* but *Indriya Adhishtana*.

Ayurveda believe *Indriya* as made up of specific physical constitutional make up – *Panchabhautik*. Thus they are involved in receiving and perception of respective *Artha* (object) only which is having same constitutional make up. This is due to the *Samantulya Yonitva* of *Indriya* and its respective *Indriya-Artha*. For ex. *Chakshurendriya* (Eyeball and visionary elements) can have perception of knowledge of *Rupa* (vision) only and not either of smell or taste or hearing or touch.

### Formation of *Indriya*

#### As per Ayurveda

*Indriya* are formed by the *Sara* part of *Strotasa* of *Kapha* and *Rakta*. The *Mahabhutagni* of the *Strotasa* of *Kapha* and *Rakta* is responsible for origin of *Indriya*.<sup>[11]</sup>

It takes nearly three months in a newly formed zygote after fertilization for the development of *Indriya* with its related organs.<sup>[12]</sup>

#### As per Indian Philosophy<sup>13</sup>

India is having a strong backbone of ancient philosophical hierarchy. Ayurveda is also influenced by the *Samkhya Shastra*. Ancient treatises like *Sushruta Samhita* follows *Samkhya Shastra* believing formation of *Indriya* as a part of evolution theory made up of twenty four elements. The *Indriya*

according to *Samkhya* have originated from *Trividha Ahamkara* which is emerged from *Avyakta* – *Mahat* and *Buddhi* in a sequential manner, viz. *Sattvik* (*Vaikarik*), *Rajasik* (*Tejas*) and *Tamasik Ahamkara* (*Bhutadi*). Where all the *Indriya* means- *Panchadnyanendriya* (sense organs), *Panchakarmendriya* (motor organs) and *Ubhayednriya* (psyche) in all eleven *Indriya* are formed from conjugation of *Sattvik* and *Rajasik Ahamkara*.

### Cognition process in Ayurveda

The criteria for perception of knowledge are *Sannikarsha* (sense-object affirmation or conjunction) between *Atma-Indriya-Mana-Artha*. All types of perception of knowledge involve a point of contact between the *Indriya* (sense) and its respective *Artha* (object). However, Indian ancient philosophical roots mentions six kinds of sense-object contacts, these are – *Samyoga* (conjunction), *Samyukta Samavaya* (inherence with what has come into contact), *Samyukta Samaveta Samavaya* (inherence with that is inherent with a thing which has come in contact), *Samavaya* (inherence), *Samaveta Samavaya* (inherence with what is inherent) and *Visheshana Visheshyabhaava* (the connection of the attribute with the substantive).<sup>[14]</sup>

*Sannikarsha* here is suggestive of the point of contact between receptors and their respective stimulus, this is related with five sense organs obviously but the same also needs the approval and *sannikarsha* of transduced stimulus in the form of impulse with its respective area of integration situated in brain thereby giving satisfaction of perception of knowledge.

The complex process of cognition followed by perception involves all the following stages.<sup>[15]</sup>

- Point of contact between *Indriya* and its *Artha*
- Parallel conjoining of every involved *Indriya* with *Mana* to further connect with *Atma*.
- Assumption, inferences are drawn on the basis of integration and analysis of the perceived stimulus in the form of impulses with the considerations of its pros and cons by *Mana* at psychological level.
- Simultaneously the above subtle and complex process is run through in parallel with involvement of other firm component to bring all the thinking, contemplating process at conclusion using *Buddhi*, at higher intellectual level. Further leading to cognitive perception of the same. Hence, *Buddhi* is affirmed with phrase like – *Nischayatmaka*.
- Later this cognitive component of *Buddhi* comes to a conclusion to act upon accordingly using the message supplied by the above mentioned

process. It is responsible for initiation of a complex and sequential acts by complete motor control over it.

- All the above process mentioned is a vicious cycle which runs persistently until the point of contact of stimulus and respective *Indriya* is intact.

### Capacity of Indriya for perception of respective objects<sup>[16]</sup>

Ayurveda have clearly stated that *Indriya* are just beyond direct observation and can be felt by application of proper inference. Although beyond perception, these are inevitably made up of five primitive elements and the only way to feel the presence of *Indriya* is the perception of its respective objects as – *Shabda, Sparsha, Rupa, Rasa* and *Gandha*. *Indriya* have gained importance due to their specificity as every *Indriya* is capable to receive and get in touch with its respective object only as like – *Chakshurendriya* with *Rupa*, *Sparshanendriya* with *Sparsha* only and so on. This specificity comes with the similarity in the elemental composition of cause (*Indriya*) and effect (*Artha* and *Indriya Buddhi*).

Along with this there is influence of two other factors as per the Ayurvedic compendia and these are:

*Svabhavat* means its own *Prakruti*, *Prakruti* of *Indriya* having affinity towards respective *Indriya-artha*.

*Vibhutvat* means these are omnipresent throughout the body, and always in contact with *Mana* further in connection with *Atma* for feeling or experiencing the knowledge by the perception of objects from external environment.

Along with *Indriya*, *Mana* is the main key player for gaining or acquiring knowledge.<sup>[17]</sup> There are certain criteria wherein even the existence or presence of object or stimulus is unable for direct perception of knowledge. These includes<sup>[18]</sup>–

**Ati Sannikarshat** – Object very close to *Indriya* which is just beyond direct observable limits.

**Ati Viprakarshat** – Very far distance between object and *Indriya*.

**Avaranaat** – Object is coated or overlapped or enclosed within and just seems to be invisible for direct perception.

**Karan Daurbalyat** – This criterion is concerned with defects in a particular *Indriya* leading to impairment in perception process.

**Manoavasthanaat**– The major criteria being highlighted here is *Mana*. *Mana* should always be in contact with the respective *Indriya* thereby completing the chain of process of perception. But in this criterion, if the *Mana* is distracted or unstable even after proper contact of *Indriya* and *Indriyaartha*, there is lack of perception of knowledge.

**Samanaabhiharat** – Objects intermixed with very closely identical other objects may lead us into a state of dilemma and actual perception may misguide then.

**Abhibhavat** – Any object is ever is dominated by the other object, then the object becomes most little perceivable.

**Atisoukshmyat** – Very tiny, minute objects beyond direct perceivable limits becomes a criterion for lack of perception of knowledge.

### Receptors

There are specialized materialistic structural interface constitutionally made up of proteins, having ability to receive and transduce the signals received. Thus they have ability to transform and convert any form of energy into an electrical energy. This transformation of one form of energy to other at receptor level is termed as– Transduction. So the receptors behave as biological transducers.<sup>[19]</sup>

Receptors must possess structural and steric specificity. These are saturable and finite which means having countable number of binding sites. They must have high affinity towards its respective ligands within physiological limits and concentrations.<sup>[20]</sup>

The impulses generated by receptors are further carried to higher centers situated in brain and spinal cord to analyze and interpret the stimulus. This conduction of impulse on reaching brain may either have or do not have conscious perception of knowledge.

Receptors are basically sensitized structures or cells which carry specialized set of functions such as- can induce cell growth, division and death; regulate cell permeability; regulates cell binding; cell signaling, immune responses and many more activities.

### Properties of receptors

1. Excitability
2. Specificity
3. Discrimination
4. Conductivity

### Excitability

The ability of receptor to respond to a stimulus by generating an electrical impulse is said as – Excitability. As receptors are specialized structures with nerve endings, which are polarized at resting state. Soon after application of stimulus, there is change in the polarized state of a receptor thereby developing receptor potential further leading to generation of action potential.

This is accountable only for those materialistic entities in body manifesting presence of consciousness – *Chetana*. Thus rightly mentioned as

one of the component defining *Sharir* as– *Chetanaadhishtana bhutam*.<sup>[21]</sup> At the same time the conjunction or reception of stimulus by receptor manifest ultimately the component of– *Indriyabhigraha*.<sup>[22]</sup>

### Specificity

Every specific receptor is specially designed for giving response towards a specific stimulus. However, there are certain group of receptors which gets stimulated by implication of a stimulus for any other type of receptor also. This depends on the strength of stimulus applied.

The specificity of receptors towards a particular stimulus is only due to similarity in their basic constitutional makeup, this is suggestive of *Samantulya yonitva*.<sup>[23]</sup>

### Discrimination

Increased strength of stimulus will increase the number of waves of action potential generated from the receptor. There is necessity to discriminate the signals received to brain to command over a specific group of muscles or related structure, to act accordingly. This is also dependent on the different threshold of receptor towards excitation. Discrimination of sensory signals is controlled and governed completely by Thalamus in brain.<sup>[24]</sup>

The discrimination of senses perceived is only due to the charging and exciting of specific receptors, structures having a particular elemental composition homogenous with the same of senses. This is again manifesting the fact of– *Samantulyayonitva*.

### Conductivity

The stimulus perceived by the receptors after transduction process by development of receptor potential is converted into action potential which is thereby able to travel along the body towards brain and spinalcord for further analysis and interpretation. Receptors are not directly involved in conducting the impulses but they are necessary to develop receptor potential which later provokes generation of action potential of adequate and appropriate strength.

Proper conduction and transport of electrical impulses viz. conscious components is only designed for connecting multiple structures and organs thereby co-operating each other. The coordination between structures using this conscious component will definitely highlight the significance of *Samayogavahi*<sup>[25]</sup> phenomenon.

### Indriyapancha panchak<sup>[26]</sup>

Cognition and perception of knowledge are very tightly related terms but differ by the actual process occurring to achieve the same. Cognition is

the process of acquiring knowledge through thought process, experiences, mostly by adaptation towards sensory and motor events, whereas the perception of knowledge comes through the interpretation and analysis of impulses feed to brain in the form of sensory input and may also uproot from the experiences stored in the form of memory at subconscious level of mind. This is acceptable and true in sense of understanding related to many modern streams like - biology, physics, chemistry at initial state; later may also be understood in terms like- Neurochemistry, Neurobiology, Neuroendocrinology and many more.

With a remarkable note, Ayurveda have a very giant view in a group of five components with each one having an independent significance. This is explored under the concept of- *Indriyapanchapanchak*. As name suggests it is pentads of faculty of senses, including- *Indriya* (five senses), *Indriyadravya* (five sense material), *Indriyaadhishtana*, (five sense organs), *Indriyaartha* (five sense objects) and *Indriya Buddhi* (five sense perception).

In this topic, the detailed elaboration of the concept of *Indriyapanchapanchak* is mentioned which is discussed in detail in discussion part.

**Table 1: Understanding of Gyanendriya Panchapanchak**

<b>Sr No</b>	<b>Indriya</b> Five Senses	<b>Indriyadravya</b> Five Sense Material	<b>Indriyaadhishtana</b> Five Sense Organs	<b>Indriyaartha</b> Five Sense Objects
1	<i>Shrotrendriya</i>	<i>Kha (Akash)</i>	<i>Karna</i> (Ears)	<i>Shabda</i> (Sound)
2	<i>Sparshanendriya</i>	<i>Vayu (Vayu)</i>	<i>Tvak</i> (Skin)	<i>Sparsha</i> (Touch)
3	<i>Chakshurendriya</i>	<i>Jyoti (Teja)</i>	<i>Netra</i> (Eyes)	<i>Rupa</i> (Physical appearance)
4	<i>Rasandriya</i>	<i>Aapa (Jala)</i>	<i>Jivha</i> (Tongue)	<i>Rasa</i> (Taste)
5	<i>Ghranendriya</i>	<i>Bhu (Prithvi)</i>	<i>Nasika</i> (Nose)	<i>Gandha</i> (Smell)

**Table 2: Understanding of Gyanendriya Panchapanchak from Modern Perspective**

<b>Sr. No</b>	<b>Indriya</b>	<b>Indriya as Sadhan - Equipment</b>	<b>Indriya as Sadhan - Equipment (Sukshma)</b>	<b>Indriya as Sadhan - Equipment (Sukshmatara)</b>	<b>Indriyajanya Pratyaksha Dnyan-Perceivable knowledge (Sukshma tama)</b>
1	<i>Shrotrendriya</i>	Auditory receptors	Auditory Area (Area No. 21, 22)	Organ of Cortii	Hearing
2	<i>Sparshanendriya</i>	Tactile receptors	Somesthetic&Somesthetic Association area (Area No. 1,2,3,5&7)	Merkel's disc, Meissner's corpuscle, Free nerve endings	Tactile Sensation, Localization, Discrimination
3	<i>Chakshurendriya</i>	Photosensitive receptors	Primary Visual & Visual Association area (Area No. 17,18,19)	Rods & Cones	Vision
4	<i>Rasandriya</i>	Gustatory receptors	Gustatory Area (Area No. 43)	Type III Gustatory cells with Papillae of Taste buds	Taste perception
5	<i>Ghranendriya</i>	Olfactory receptors	Olfactory Area (Area No. 28)	Type I Olfactory cells	Olfaction

**Table 3: Understanding of Karmendriya Panchapanchak**

Sr. No	Indriya Five Senses	Indriyadravya Five Sense Material	Indriyaadhishtana Five Sense Organs	Indriyaartha Five Sense Objects	Indriya Buddhi Five Motor Activity
1	Vaagendriya	Kha (Akash)	Jivha Tongue	Vani	Vakabuddhi Phonation
2	Paani	Vayu (Vayu)	Hasta Hands	Adana	Panibuddhi Receive, Grasp, Hold, Collect
3	Paada	Jyoti (Teja)	Pada Legs	Viharan	Padabuddhi Locomotion
4	Paayu	Aapa (Jala)	Guda Rectum & Anal canal	Visarga	Payubuddhi Excretion
5	Upastha	Bhu (Prithvi)	Jananedriya Genitals	Anand	Upasthabuddhi Reproduction

**Table 4: Understanding of KarmendriyaPanchapanchak from Modern perspective -**

Sr. No	Indriya	Indriya as Sadhan - Equipment (Sukshma)	Indriya as Sadhan - Equipment (Sukshmatara)	Indriyajanya Pratyaksha Dnyan - Perceivable knowledge (Sukshma tama)
1	Vaagendriya	Peripheral Speech apparatus (Larynx with Vocal cords)	Central speech apparatus (Sensory & Motor areas for Speech)	Phonation
2	Paani	Upper extremity	Areas of Spino cerebellum & Motor cerebral cortex	Neuromuscular coordination
3	Paada	Lower extremity	Areas of Spino cerebellum & Motor cerebral cortex	Neuromuscular coordination Locomotion
4	Paayu	Rectum and Anal Canal	Sacral nerves Parasympathetic system	Excretion
5	Upastha	External genital organs	Center of arousal in Hypothalamus Limbic system	Satisfaction / Joy after Reproduction

**DISCUSSION**

It is of no doubt that *Indriya* are beyond the consideration of instruments or materialistic object designed just to perceive the knowledge. It is also known to us that *Indriya* are means to feel and experience about the real time events irrespective of time period. This is equally felt at the psychological and spiritual level (*Atma*). Thus this becomes the base criteria to discriminate the species on the basis of presence of consciousness.

Even though multiple (total eleven) *Indriya*, the criteria for cognition from Ayurveda science depends on the nature of sense object conjunction i.e. *Sannikasha*, which also have an extended view (six types) in Ayurveda. The wholesome and uninterrupted *Sannikarsha* between - *Atma- Indriya-*

*Mana- Artha* is necessary for fruitful cognition and thereafter perception of knowledge.

Receptors from other disciplines however can be closely related to the functions and role attributed to *Indriya*; but this correlation too has limitations at its very primary stage. Because the *Indriya panchapanchak* itself states the five stages of whole process of cognition, an attempt was made in this topic to correlate the properties of receptors with the attributes of *Indriya*. The existence, structural modification and functional responsibilities of receptors can be justified by the intellectual concepts of *Indriya* grading it into - *Sukshma, Sukshmatara* and *Sukshma tama* in broad perspectives. However, it should be noted that it is just for better understanding of the concept and not the postulation

of any principle behind it. Scholars have tried to categorize the sensory and motor senses as per the pentads of *Indriya* pre-established in ancient Ayurvedic treatises.

The reason behind the excitability of receptors is justified by the presence of state of consciousness—*Chetanaadhishtanabhutam*; specificity of receptors and discrimination ability as stated by Ayurvedic studies is *Samantulyayonitva*; conductivity of impulses through receptors is acceptable by the concept of *Samayogvahi*.

### CONCLUSION

- ❖ *Indriya* are beyond the direct perception limits of oneself.
- ❖ *Indriya* are components of cognitive faculties responsible for perception of knowledge after coming in contact with the *Indriyarthas* as working stimulus from external environment.
- ❖ *Indriya* are key point for discrimination between biotic and abiotic species.
- ❖ Receptors can be compared and correlated with *Indriya* at their very primitive level. As *Indriya* are more beyond just primary perception considerations.
- ❖ Properties of receptors can be justified by the basic fundamental concepts of Ayurveda.
- ❖ Cognition is the whole process starting from point of contact of receptors with stimulus till analysis or interpretation of the impulses feed to the respective centers.
- ❖ While perception of knowledge occurs after conjunctive involvement of multiple faculties such as *Atma-Mana-Indriya* and *Indriyarthas*. With *Buddhi* component of intellect interfering in the process and achieving final firm conclusion of the experience dealt with.
- ❖ There are six different types of conjunction between *Indriya* and its respective *Indriya-arthas*, extensively discussed in Ayurveda which signifies the vitality of cognition and its impairment.
- ❖ However, there is more scope for metaphysical, molecular and nano-technological intervention for actual process of cognition and perception.

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