

## Through The Indian Filter: An Examination Of Attention Theories

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### **Abstract**

Attention is the basis for experience, both in modern psychology and Indian traditional knowledge systems like Yoga and Sāṃkhya. However, there are several differences in the way attention is discussed by these schools. The following paper presents a comparative analysis of the two theories on attention. We discuss the components of the mind according to Yoga and Sāṃkhya, the role of the attention in connecting the Seer to the world, Yoga as sustained attention, the importance of directing the senses, and the concept of Dhāranā. Following this the modern western views are presented, beginning from Broadbent's filter theory, the attenuation theory of Treisman to the Attention Schema model and Theory of Biased Competition put forth in recent years. The paper concludes with a comparison of the two models. The west is oriented from the world to the consciousness, while Yoga and Sāṃkhya are oriented inside-out, from the consciousness to the world. Additionally, Indian theories promote the development of sustained attention and see it as the ultimate goal of the mind. However, what is common between the two is that attention is directed towards objects that are of personal relevance, and attention is the basis for higher processing and ultimately create experience.

**Key words:** Attention Filter, Attenuation, Citta, Dhāranā, Sāṃkhya, Yoga

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### **Introduction:**

Attention is seen by psychology as the basis of experience. Though several stimuli are sensed, only those that are attended to are perceived and enter the systems involved in higher cognition. While discussing the concept of attention in *Yoga*, we realise that there is an inside-out pathway – that is, attention starts with the Self/Consciousness – rather than going outside-in from the environment through the attentional filter of Broadbent (1963).

This fundamental difference creates a need to examine both models.

In this paper, I present a detailed analysis of the *Yoga* and *Sāṃkhya* theory of Attention, as well as an analysis of the Filter Theory of Attention proposed by Broadbent (1957) and revised by Treisman (1964). This conceptual paper aims to present two vastly different models of attention that both have their support as well as critique.

## INDIAN CONCEPTS OF ATTENTION

### The components of the mind

*Sāṃkhya* and *Yoga* believe that there exists a *Cit* or *Puruṣa*, a being that exists only to observe, which because of *Karma* must undergo life after life or *Janma* after *Janma*, in a world filled with both *Sukha*

(joy) and *Duḥkha* (sorrow). The *Puruṣa* can experience but is incapable of interacting with the world and thus requires the *Citta* or mind. Then comes the tripartite separation of the Mind into *Manas*, *Asmita*, and *Buddhi*, which the *Sāṃkhya* theory speaks of.

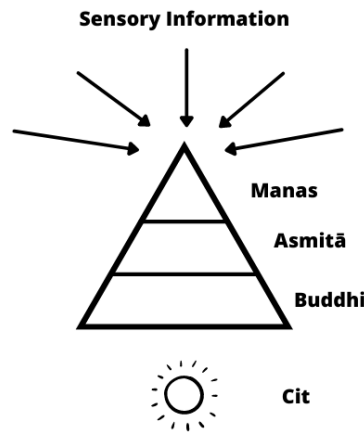


Fig.2 A diagrammatic representation of the tripartite separation

*Sāṃkhya* and *Yoga* believe that the *Manas* assimilates information from the senses. This is the outward-directed part of the mind, the same part that experiences pleasure and pain and remembers these experiences. The *Yoga Sūtra*-s tell us how to rid the mind of these patterns and learn how to achieve one-pointed attention. It is this mind, the *Manas*, that may be subject to Broadbent's filter, which we will discuss in the sections to come.

Then there is the *Asmita*, or Ego, which identifies and subjectifies the sensations attended to and also influences the *Manas*, indicating that some sensations are more personally meaningful, as proposed by western psychologists of the modern era (Graziano & Webb, 2015).

Finally, the *Buddhi* is the contemplating and decision-making part of the *Manas*. Once the *Manas* and *Asmita*, together, say a sensation is worth identifying with, the *Buddhi* considers what to do next. The *Buddhi* is also known as "*Niscayātmika*," or the determinant of what is to be done.

This concept conforms with the modern psychological idea that cognition follows attention (de Santana Correia & Colombini, 2022).

### A Link between the World and the Puruṣa

In *Sāṃkhya* and *Yoga*, as well as most other *Vaidika* Philosophies, there is a single model about attention. This is that the link between the world and the Seer (whether *Puruṣa* or *Brahman*) is through the mind.

*Puruṣa* → *Citta* → *Indriya*-s → *Vastu*

(Soul) → (Mind) → (Senses) → (World)

The mind is constantly on the lookout for an object to attend to. It is the very nature of the mind, as emphasized by the *Sūtra*-s of *Patañjali*:

*Prakāśakariyāsthitiśīlam*

*Bhūtendriyātmakam Bhogāpavargārtham*

*Dṛśyam* | Y.S 2.18

*Translation:* All that is perceived includes the external mind and the senses. They have three qualities – *Sattva* (clarity), *Rajas* (activity), and *Tamas* (heaviness).

The worldly objects have two effects – to expose the perceiver to the influence of the objects of perception and to provide the means to find the distinction between them and the perceiver.

So the mind exists as a tool that can be pointed at various objects, through attention, and enlightens the Seer about the objects as well as shows that the world is distinct from the Seer. The mind is not a perfect tool, since it is easily distracted by the *Kleśa*-s. Distractions in *Yoga* are *Avidyā-asmitā-rāga-dveṣa-abhiniveśaḥ* (Y.S 2.3). These may be translated as ignorance, false identity, attachment, aversion, and fear. All of these tend to colour the perception of the mind and create false knowledge.

That the mind is the only tool for the *Puruṣa* is also clearly states:

*Draṣṭā Drśimātraḥ Suddhōpi  
Pratyayānupaśayaḥ* | Y.S 2.20

Translation: That which perceiver is not subject to any variation, but it always perceives through the mind.

The perceiver has the power to animate the senses – it is the consciousness – however, it lacks the means to interact with the world, which is supplied by the mind and senses.

Hence whatever the *Puruṣa* is motivated to learn about, the senses are directed towards and the mind, with its three parts, mediates the process. Thus, attention starts at the level of consciousness.

When we consider attention as awareness, we can consider what *Vedānta* has to say about sleep. In sleep, we are at peace– we are one with the Brahman. However, since we are not aware of this fact, that is, there is no attention whatsoever, we remain ignorant.

### **Yoga as Sustained Attention**

*Yoga*, in its most simple definition, is attention to the present moment. *Yoga*, frequently used interchangeably with the term *Samādhi* is defined as “*Sārvabhaumāścittasya Dharmah*” – the duty of the mind at all levels – by *Vyāsa*.

The *Yoga Sūtra*-s even begin with the word “*Atha*,” which means now.

All of these combined tell us that *Yoga*, which is experiencing every moment to the fullest, which is the duty of the mind, is simply sustained attention. The goal of all the eight limbs of *Rāja Yoga* is nothing by creating “*Ekāgratha Citta*” or a one-pointed mind.

While modern psychology tells us sustained attention is difficult, and evolutionarily attention is built to look for novel stimuli, *Yoga* and *Patañjali* give us a way to learn to direct attention and sustain it for long periods of time.

### **Directing the senses**

While the 8 limbs begin from *Yama* – social restraints, when talking of attention, the fifth limb *Pratyāhāra* – is of interest to us. It refers to the process of restraining the mind and is defined by *Patañjali* as follows:

*Svaviśayāsaṁprayoge Cittasya  
Svarūpānukāra Ivendriyāṇām Pratyāhāraḥ*  
| Y.S 2.54

Translation: Restraint of the senses occurs when the mind is able to remain in its chosen direction, and the senses disregard the other objects and faithfully follow the direction of the mind.

*Tataḥ Paramā Vaśyateindriyāṇām* | Y.S 2.55

Translation: Thus, the senses can be mastered.

The senses may be drawn away from the target object due to a number of *Kleśas*. However, the direction of attention may be influenced by *Vāsanā*-s and *Samskāra*-s. As we will see, Broadbent and later Treisman believe that stimuli of relevance pass through the filter first, to ensure they are relevant. *Yoga* believes that *Samskāra*-s or patterns established in this *Janma* or the previous one, as well as *Vāsanā*-s or impressions created in this life, direct attention. Since modern psychology does not delve into the realm beyond empirical observation, only that latter concept will be accepted. *Vāsanā*-s may be compared to the implicit associations of memory as

well as priming due to life experiences. Evidence for this comes from research done on aggression primed by violent TV programs (Bushman, 1998). Individuals who watch more aggressive shows tend to associate “punch” more with a hit than a drink.

Before attempting to hold attention for sustained periods (as in *Dhāraṇā*) a *Yogī* is advised to learn how to control their attention. The senses are compared to horses in the *Kaṭhapaniṣad* –

*ātmānagvaṁ rathinaṁ viddhi śharīraṁ  
rathameva tu  
buddhiṁ tu sārathiṁ viddhi manaḥ  
pragrahameva cha  
indriyāṇi hayānāhurviṣhayānsteṣhu  
gocharān  
ātmendriyamanoyuktaṁ  
bhoktetyāhurmanīṣhiṇaḥ (Kaṭhapaniṣad  
1.3.3-4)*

Translation: The Chariot is the body, the horses are the senses, the reins are the *Manas*, the Charioteer the *Buddhi*, and the passenger is the Soul. Ideally, the passenger directs the hands of the charioteer and thus controls the horses, however, when the passenger has gone to sleep, the horses take control.

Once again, the inside-out direction of attention is emphasised to us, and further, the importance of directing attention is also highlighted. The Seer, can only go where the horses take him, and the horses are drawn to pleasurable things (due to *Rāga*) and run away from things that are unpleasant (due to *Dveṣa*). However, though the Seer vicariously enjoys the pleasure of the material world, it still experiences ups and downs and thus must seek the higher goal of liberation.

Though psychology is not interested in *Mokṣa*, where the metaphor can stop is the need the sustain attention though the restraint of the senses. Thus *Pratyāhāra*, the last of the *Bahiraṅga*-s or external branches, lays the foundation for the processes like *Dhāraṇā*, *Dhyāna*, and *Samādhi*.

***Dhāraṇā and Attention***

The *Antaraṅga*-s are those that direct attention inward and bring the mind away from the external world. The first of them is *Dhāraṇā* which is defined by *Patañjali as Deśa Bandha*:

*Deśabandhaścittasya Dhāraṇā* | Y.S 3.1

Translation: *Dhāraṇā* is the process of directing the mind to a chosen object in spite of the availability of other potential objects of attention within reach of the individual.

Once a *Yogī* learns to hold attention on a single object, they can meditate on it, i.e., *Dhyāna* becomes possible. *Dhyāna* is followed by *Samadhi*, which is to become one with the object of inquiry. The final goal is yoga is Liberation, which is attained when the object of inquiry is the *Puruṣa* itself, i.e., the *Puruṣa* alone is attended to.

Thus, the foundation of *Yoga*, its method and goal, revolves around attention.

## WESTERN CONCEPTS OF ATTENTION

While the idea of attention is romanticised by the likes of Simone Weil, in phrases like "Attention is the rarest and purest form of generosity," psychologists have consider the concept with a little more, pardon the pun, attention, and developed several theories. In this section, we will be examining the Attentional Filter Theory in detail.

### Defining Attention

Attention has been clearly expressed by many, but the most compelling and widely used description defines it as the process of concentrating on awareness of phenomena in exclusion of other stimuli (McCallum, 2015). Older definitions agree with this idea, stretching far into William James' *Principles of Psychology* (1890). He says attention is the process of taking possession by the mind, and focalisation and concentration of consciousness are its essences when it is withdrawn from some things in order to deal with others effectively.

Attention is both a behavioural and a cognitive process (Colombini, da Silva Simoes, & Ribeiro, 2014) and is essential for survival. From an evolutionary perspective, the environment presents more perceptual information that can be processed, thus making it necessary to attend to specific stimuli (Chun, Golomb, & Turk-Browne, 2011). This is useful considering the limited capacity of the brain; hence the prioritisation of stimuli offers a clear survival advantage. At the most basic level, attention is needed to modulate and select data yielded from each sensorial process and impacts processing at the cortical level (Colombini, da Silva Simoes, & Ribeiro, 2014)). Further, the cognitive controls in human beings are intrinsically attentional. There is evidence showing increased firing in attentional, reward, and cognitive control networks in tasks that require sustained attention – (Engelmann, Damaraju, Padmala, & Pessoa, 2009) and (Locke & Braver, 2008).

The studies mentioned above are simply stating the obvious. Expecting cognitive processes to occur without paying attention to the matter is like expecting a computer to process data that has not been encoded. The wealth of information available in the world makes no difference to a computer unless the relevant values are inputted in a digestible form. In this analogy, the transduction of a stimulus from the environment into neural signals that can undergo processing in the brain is not possible without attending to the stimulus.

### **Classifying Attention**

Attention is classified fairly consistently throughout psychological and neurological corpora into selective attention, attentional vigilance, and executive attention (Ocasio, 2011).

Selective attention refers to the process of focusing information processing on particular sensory stimuli at a specific moment in time. Originally, psychologists focused on bottom-up attentional processing, as seen with the Gestalts, where the perception of "Wholes" was emphasised. The advancements in imaging and thought led to the cognitive revolution, which gives importance to both top-down or goal-directed and bottom-up or a data-driven attentional process (Corbetta & Shulman, 2002).

Attentional vigilance refers to sustained attention or concentration on a stimulus. This process is energetically taxing and thus also has a time limit. The duration can vary based on individual differences, but many studies have confirmed the trend that an individual's probability of detecting the stimuli decreases over time (Swets & Kristofferson, 1970).

Executive attention is central to planning, problem-solving, and decision-making. It involves allocating cognitive resources in working memory. Executive attention links incoming sensory data and integrates it with existing long-term memory schemas. Further, this kind of attention is activated in novel non-routine situations and guides cognition when there is no pre-existing schema (Fernandez-Duque, Baird, & Posner, 2000).

### **Broadbent's Filter Theory**

In 1957, Broadbent reviewed existing literature on experiments in which sensory organs were simultaneously stimulated and formulated his hypothesis to explain the results. He proposed that stimulations reaching the senses are filtered, and only part of the overwhelming number of sensations proceed into the nervous system and still lesser elicit a response (1957).

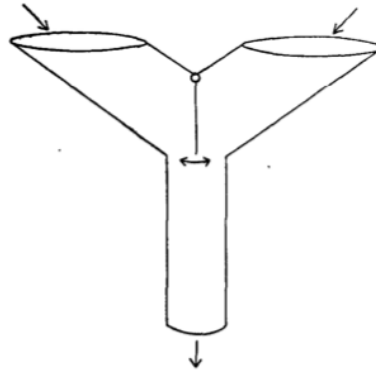


FIG. 1. The simple model for attention.

**Source:** Broadbent, D. E. (1957). A mechanical model for human attention and immediate memory. *Psychological review*, 64(3), 205. Pg 206

This mechanical theory proposed that attention was like a Y-shaped tube. In Broadbent's metaphor, the numerous inputs, balls, could not flood and overwhelm the individual, but rather the channels took turns sending stimuli to the nervous system. He also clarifies that the other channels, ones not selected, are not closed entirely but rather tuned out, and the threshold is lowered (Broadbent & Gregory, 1963). This model works wonders to explain distraction as two balls jamming the flap and neither moving forward. Broadbent succeeded in showing that timing influences what we attend to first; clearly, the ball rolled earlier will move through the tube first. In his metaphor, the angle of inclination in the Y showed that some senses have an advantage in sending stimuli into the CNS. He also explains the effect of stimulus intensity as the force with which the ball is rolled. He posited that the pause between attention to one object and the other resulted from the metaphorical flap swinging both ways before being restored to its central position. While seeming to have all the answers, the mechanical theory fails to explain the role of the semantic meaning of sensory inputs. Further, the attention filter theory does not explain attention as a whole but only offers a model for selective attention.

Still, the impact of Broadbent's work is far-reaching, resulting in the development of other theories of filtration, which are more inclusive of the personal meaning and semantic content of the stimuli.

#### **Other Theories of Attention**

Treisman (1964) brings forth another Bottleneck Theory of Attention, where he proposed that stimuli not attended to are "attenuated" and not eliminated, as Broadbent proposed. This theory helped explain the Cocktail Party Effect, which did not make sense when seen through the Selective Attention model of Broadbent. Here, the person's name had lower signal strength (i.e., it was attenuated) but was attended to because of its meaningfulness to the individual. Though the dichotic hearing test that Treisman used to develop his theory is not without drawbacks, the attenuation approach helps fill the gaps of Broadbent's theory. Further, stimulus quality is considered by Treisman, as opposed to merely stimulus strength. Some studies show that analysis of meaning precedes attention and show that familiar and meaningful stimuli capture attention in a variety of conditions (Mack, Pappas, Silverman, & Gay, 2002). Henderson and Hayes (2017) demonstrate through the development of "meaning maps" that meaning guides attention. Research in the context of social media also shows similar results with respect to attention patterns

and their relationship to meaning (Bennett, Segerberg, & Yang, 2018)

The model of Treisman can also explain divided Attention paradigms. There are two primary generalisations: performance in dual tasks is poorer due to limited cognitive resources, and over time, individuals tend to prefer one task over another. The latter is because people cannot simultaneously attend to two tasks, and hence they generally switch from one task to another. Hence, the signals attenuated can selectively be chosen and alternated with the task initially attended to.

The Attention Schema model (Graziano & Webb, 2015) is another theory focussing on the neuroscientific phenomenon of attention and places it in the context of subjective experience. Visual attention (V) is captured by the eyes and results from the ability to process stimulus features accurately. And for the brain to conclude anything about the image, it requires information about the self (S), and attention (A) is needed to bring it together. So S+A+V is necessary for any real perception. While there is no physical basis for attention, the model concludes that only relevant information gets to the brain. Also, the problem of subjective experience is only in explaining why and how the brain infers that it contains an apparently non-physical property (Dennett, 1993). This simplified model of attention is useful in explaining subjective experiences and states that the brain computes a model of the body, i.e., the body schema, and uses it to understand stimuli.

Another theory proposed by Desimone and Duncan (1995, pp. 193-222) is called the Biased Competition Theory. It characterises attention as a signal competition within the brain in order to be processed more and thus guide behaviour. This competition is said to exist in all levels of the nervous system, even within the circuitry of the eye (Kuffler, 1953) &

(Hartline & Ratliff, 1957) as well as the primary visual cortex (Moran & Desimone, 1985), (Reynolds, Chelazzi, & Desimone, 1999) & (Ungerleider, 2000). A variety of factors, such as the salience of stimuli, can influence this competition, found at every sense organ, and mirrored in the associated neural systems (Graziano & Webb, 2015)

## CONCLUSION

As stated earlier, one of the primary differences between Indian and Western views on attention is that modern psychology takes an outside in perspective. The environment offers a variety of stimuli that are attended to based on personal meaning and urgency in order to enhance survival. *Yoga* and *Sāṃkhya* however believe that stimuli are attended to, though sometimes at the will of the senses, the mind must be trained to pay attention to what the consciousness directs it toward. Hence it starts from within. The consciousness gives the senses the ability to sense and, through them enjoys the physical world.

Secondly, attention towards changing stimuli is seen by modern psychologists as an evolutionary advantage, and thus the purpose of attention is to notice environmental changes that can enable survival. However, *Yoga* believes that the purpose of attention is to help the Seer gain self-realisation, i.e., achieve the state of *Samādhi*.

Finally, modern psychology may offer certain interventions to sustain attention and reduce distractions, including but not limited to, controlling the environment, removing distractions, increasing motivation, and even mindfulness (which is remarkably similar to *Yoga*). But it does not promote sustained attention as a goal to be pursued. Sustaining attention for long or vigilance is an area of interest (Fortenbaugh, DeGutis, & Esterman, 2017) however, it is not seen as something the brain is built for (we know this through studies of habituation and sensory adaptation). *Yoga*, on the other hand,

actively advocates the development of sustained attention through the practice of the 8 limbs – *Yama, Niyama, Āsanā, Prāṇāyāmā, Pratyāhāra, Dhāranā, Dhyāna, and Samādhi*.

However, where both points of view converge is that (1) attention forms the basis for experiences and (2) attention is directed toward stimuli of personal meaning.

Regarding the first point is needless to reiterate that unless attended to, no stimulus/object of inquiry can be processed – whether it is processed by the

Prefrontal Cortex or the Buddhi depends on which school you favour. And while psychology has the cocktail party effect (Cherry, 1953), Yoga has *Vāsanās* and *Samskāra-s*.

Though driven by different research methods and based on different premises, it is interesting to see where new knowledge overlaps with centuries-old traditional knowledge systems. This paper presented a comparative analysis of Broadbent's filter theory through an Indian lens.

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