

CHAPTER – 8

DISCUSSION

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CHAPTER – 8 - DISCUSSION

8.0 DISCUSSION

The major results to be discussed in this chapter are that Cyclic Meditation training improved performance on the ATTA Creativity test and those of the second experiment indicating how activity of various brain regions was responsible for those improvements, showing the neural correlates. The various sections will also consider the questions of how these observations relate to the states of consciousness presented in Chapter 2, various pieces of modern neurophysiological research from Chapter 3, and how our results begin to define the relationship between the Vedic insights and modern scientific findings.

8.1 EXPERIMENTAL RESULTS REPORTED ABOVE

The results reported in Chapter 7 suggest that Creativity improved on ATTA subscales, Fluency, Originality and Elaboration by practicing Cyclic Meditation technique for one month in the first experiment, and one week in the second experiment, as compared to the shavasana groups, relatively short durations of time practiced for 45 minutes. When effect sizes are compared to experiments on deep meditation, we find relaxation alone performed in accordance with Gaudapada's principle of alternating excitation and relaxation has comparable effect sizes (Control & Exp 0.28,0.56, 0.28,0.77).^{338,305} Cyclic meditation practice improved performance on Torrance tests of Creativity, presumably because CM can help participants enter deeper states of awareness, where arousal is in equilibrium, alertness increased, and attention functions from deeper levels.¹¹

Theory suggests that relaxation involved in Cyclic Meditation should help the participant enter deeper states of awareness, where attention is at deeper levels of the mind in terms of ocean diagram (refer back Figure 1.1), meaning that arousal is in equilibrium. Also, dependence of increase on time period of practice should be investigated to assess the extent to which performance on ATTA tests of creativity increase with duration of meditation practice.

The results provide evidence that, while Cyclic Meditation training increases performance on tests of Creative Cognition, shavasana training generally does not. Creative processes are held to occur in three stages i.e. preparation, incubation and illumination; so which of these are affected? As has previously been shown, the frontal and parietal lobes of the brain play special roles in above mentioned stages of creativity.

Brain regions of the interest F3, F4 (frontal) and P3, P4 (parietal) electrodes, which represent core regions of executive attention networks and where specialized, domain specific knowledge important for Creativity is stored, and where it is retrieved from,^{34,46,316} becomes predominantly involved and activated. Cyclic Meditation training seems to promote awareness and attention strengthening connections in the frontal lobe and associations between these regions, presumably facilitating retrieval of required information from the parietal regions.³

Before the intervention, baseline data showed dominant delta wave activity during eyes closed periods in both groups. During and after the intervention (post), a shift from delta to gamma activity was observed in the CM group, whereas, in the control group, delta activity remained dominant. This seems to suggest a mechanism behind Cyclic Meditation's effect of increasing ATTA scores and creating a cognitive state suitable for the Creativity. Delta wave activity is associated with mental activity in dullness while gamma wave activity is associated with refined levels of awareness, presence, alertness and positive feeling. (Refer back table 3.4 & 3.5). Results suggest that the experimental group's levels of attention, alertness, awareness and subtle positive feeling (gamma) increased, while controls failed to release stress and remained in dullness (delta). As discussed in this chapter. Increased levels of awareness, alertness and subtle positive feeling may be reasonably expected to be connected to Creative intuition, and to increase Creative Cognition.

This result should be compared with the observations of periods of peak Creativity and Buddhist compassion meditation, both of which are characterized by gamma waves. More speculatively we may also suggest that by better connecting mind and body, CM practice may shift consciousness from gamma towards alpha during practice and performance on tasks assessing Creative Cognition. This can be investigated in depth further. Another dimension to the regions of brain activation concerns the various brain networks active during different tasks or activities: the executive network,¹⁹⁰ the self referential network,⁵ and the default mode network.^{7,39} Observed connections between frontal and parietal lobes in the CM group suggests that Cyclic Meditation facilitates associations between the first two networks, which are both important for Creative Cognition and focusing attention.⁵⁰

From a holistic perspective, the deep relaxation and meditation given to body and mind over the time period of the intervention enables awareness to become refined to a deeper level of functioning, thereby improving focus, while the corresponding processes at a cortical level indicate that, from the more reductive perspective that Cyclic Meditation increases association and connectivity between frontal and parietal lobes.

In terms of the four stage model of creativity, improvements must be due to enhancing the capacity of the incubation and illumination stages, since no changes can be considered for the preparation and verification stages, which would have been less tested.

8.2 CREATIVITY AND MODERN NEUROSCIENCE

Analysis of the EEG recordings in experiment 2 detected a shift to predominant gamma activity during the creativity task compared to controls that showed delta activity. Such a shift had also been observed during Cyclic Meditation, suggesting that increase in gamma frequency is associated with increased capacity for Creative Cognition and thinking. The other main finding, that activation of frontal and parietal regions (EEG leads F3, F4 and P3, P4) scores increased more in the experimental group than controls, suggests greater capacity for the executive network to draw on mental function, since these correspond to regions of the executive control network, and are regions for storage of domain specific and specialized knowledge.

Experimental evidence suggests that two large-scale neural networks²⁵³ representing the self and others are involved in Creativity. Fronto-parietal mirror-neuron areas provide the basis for bridging the gap between the physical self and others through motor-simulation mechanisms.⁴² Cortical midline structures engage in processing information about the self and others in more abstract, evaluative terms.²³⁴ The neural systems of midline structures and mirror neurons show that self and others are two sides of the same coin, whether physical interactions or their most internal mental processes are examined.⁵

8.3 CREATIVE COGNITION FROM THE VEDIC PERSPECTIVE

This close neurophysiological relationship between cognition of self, others and Creativity is also found in Vedic wisdom, where it discusses the universal self, rather than the individual personality.⁷⁹ In the Vedas, the most fundamental realization comes in deep meditation when a person transcends all relative changing experience. Students who wish to understand the nature of this deep, content-free level of experience are traditionally given the answer, “*Tat Tvam Asi*”,¹⁶ That is your real inner nature. The teacher may also preface that statement with another traditional saying, “*Ahami Tat*”; “I (myself) am That”, so that the student realizes that the teacher’s own realization of his identity and his own wisdom, with ‘That’ is the source of the knowledge he teaches.²⁸

8.4 CREATIVE COGNITION AND BRAIN NETWORKS

The earlier research referenced above identified several strong candidates for Creative Cognition, innovation, supporting and maintaining the sense of self, as discussed in Chapter 3. In parallel, researchers in the domain of social-cognitive neuroscience have described several brain regions that support aspects of social interaction and representation of others.³⁷

A network composed of cortical midline structures (CMS),²³⁴ including the medial prefrontal cortex, the anterior cingulate cortex and the precuneus, has been associated with self-processing²⁴³ and social cognition.²⁴³ Uddin et al. proposed a model accounting for self and social cognition supported by the mirror neuron system (MNS) and cortical midline system (CMS).²⁴³ The right-lateralized MNS is involved in understanding the multimodal embodied self (i.e. its face and voice), whereas the CMS seem to represent a less bodily grounded self as shaped by its social relationships. Here, we find a clue to the ability to identify with one's own form, the Vedic concept of *Nāma-Rūpa*.¹²³ It is probably connected to the mirror neuron system, and is in turn made possible by the Vedic concept of *Alochāna*, which as we have seen is closely parallel to the concept of Gestalt.³¹⁰ Since Gestalt cognition is supported by self-organized criticality, the whole structure of self-awareness at the cortical level begins to find a deeper and richer field of expression than has hitherto been available despite the quantity of literature reviewed in Chapter 3, and those portions not reviewed there for want of space. This means that modern cognitive neuroscience is beginning to be able to follow the leads of ancient Vedic science such as the specific regions in frontal and parietal areas. Self-awareness can now be grounded in criticality, and immediately possesses cognition of visual form, *Rūpaḥ*, of the correct conceptual kind, *Alochāna*, in the form of Gestalts.³¹⁰

8.5 INPUTS FROM THE SIX SYSTEMS OF INDIAN PHILOSOPHY

As we have seen in Chapters 1 and 2, the Vedic sciences start from their understanding of consciousness and those subjective elements of mind making possible embodied awareness. *Sāṅkhya* and *Yoga*, nos 3 and 4 of the Six Systems of Indian Philosophy, name specific levels of mind (*Sāṅkhya*), and means to clearly experience and identify them (*Yoga*).¹⁶⁰ The *Sāṅkhya* system⁹³ names three easily identified levels of mind involved in processing information coming from the five senses:

Manah, the level at which sense information is stored in the mind; *Buddhi* the level at which discrimination and choice is made; also the level where cognition occurs. All choice is made with respect to personal experience, the sum total of which, *Citta*, forms the basis for the autobiographical self, *Ahaṅkāra*. *Yoga* states that its first goal is to eliminate the fluctuations in the mind arising from past experiences,¹⁰⁶ the *Citta-Vṛttaya*, due to unresolved rumination in those experiences leading to DMN activity. One is naturally led to suspect that *Citta-Vṛttaya* are responsible for the fluctuations in attention etc. seen when the mind is trying to rest with only partial success; because the DMN is active and mind's energy is distorted, non-directed goal.⁷

Any disharmony in *Prāṇa* is a disease, whether physical or mental. Any mental activity is a cause of disharmony in *Prāṇa*. Lack of attention, lack of goal is a cause of mental fluctuations, reinforcing activation of the DMN. That is why meditation and Aṣṭāṅgayoga practice is of prime importance to physical and mental health and to higher functioning, enabling the cognitive states necessary for Creative Cognition.⁷

With regard to the sense of autobiographical self, *Ahaṅkāra*., identifying it with the sense of self in the midbrain or limbic system would be reasonable, because those regions carry our sense of danger, anxiety and fear, the *rājsik* fight or flight response, based on what *Yoga* and *Vedanta* call *avidyā*, ignorance of the deep nature of life. When we identify with the *Ahaṅkāra*, or little ego, the personality self, the local attention is activated, followed by background DMN activity. The other side of the coin arises when attention shifts from local to global, from personality self to fully expanded unbounded infinite awareness (Refer back Fig 1.1). Then individual awareness shifts from focused local attention to expanded global consciousness; awareness of the universal or cosmic presence.^{63, 65} This corresponds to the shift from information in the *Cittākāśa* to the far greater possibilities in the *Cidākāśa*.¹¹⁹

What stabilizes and strengthens the attention is focus on the frontal lobes, possibly identifying the medial prefrontal areas with the *Ajñā Cakra*.¹⁴⁵ Transfer of attention from the prefrontal to the parietal region is only possible when the midline structures in between fall silent, allowing the fronto-parietal regions to connect; as is clearly seen in transcendence, induced by self-transcending meditation techniques or even in Tibetan Zen practices.^{63, 64} This seems to be the key process that allows the full Creative power of the mind to shine forth. As *Maharṣi Patañjali* states in verse I.3 of his *Yoga Sūtra*, *Tadā draṣṭuḥ svarūpe'vasthānam* .¹¹³

Then the seer dwells fully in his own nature – Svarūpaḥ i.e. self-form. The finding that DMN activity generally decreases during meditation practice is a sign that such practices aim to help the person make the transition to this higher level of functioning, and to clear the *Citta-Vṛttayah* while doing so, ‘*Yogaś citta vṛtti nirodhaḥ*’,¹⁰⁸ so that the higher state becomes permanent.

8.6 ROLE OF CRITICALITY, PAÑCAKOṢĀḤ AND THREE BODIES IN CREATIVE COGNITION

A major concept in brain function that has been deeply researched in recent years is criticality. For reasons still being clarified, biological control systems at all levels of biology site their loci of control at conditions known as Edge of Chaos, or critical instability.⁴¹ The consequence is that responses to sequence of identical stimuli are not all the same, but vary, due to the instability. This is particularly true of nervous systems and brain cortices; recent reviews conclude that we need to be in no doubt that this is the case. At instability, physical excitations take the form of critical point fluctuations, which are locally holistic in their nature, and confer unanticipated new properties on nervous system function. Loci of control are in command of other regions of the system, suggesting that the subtle aspects of system function can be equated with, and explained by, properties of critical fluctuations. This provides a launching pad to discuss the Vedic concept of koṣāḥ, or subtle body, known generally as the Sūkṣma and Kāraṇa Śarīra, which are said to provide a multi-level hierarchy of control of the physiology and psychology, body and mind.

The theory of the *Pañcakoṣāḥ*, five coverings of pure consciousness, is also used to explain the health benefits of Yoga practice. Here, the important point is that the phenomenon of criticality in the cortex provides a basis for understanding the *Koṣa*. On the one hand, critical fluctuations present a form of ‘subtle energy’; on the other, the different cortices, and layers of the neocortex provide a structure which can support different levels of subtlety, one behind the other. Being at criticality, all function on experience information; taken together, they provide a way to understand the different modes and levels of experience proposed in the Vedic sciences, and how these may give rise to Creativity in a person’s actions. One way that these have been successfully applied is to understand the production of speech, the verbal aspect of creativity with its various possible words, phrases and sentences. According to the Vedic science of Śikṣā, there are four levels of verbal expression i.e. *Parā, Paśyanti, Madhyamā, and Vaikhari*: physical through sound, mental, ideational and transcendental, moving from gross to increasingly subtle.⁶⁰

These employ different kinds of information, corresponding to (1) outwardly expressed digital information (i.e, physical, digital / entropy information, used in information technology); (2) experience information used to represent words and phrases as ideas in the mind; (3) a higher level of information where ideas representing sentences and sequences of clauses and sentences are contained as wholes, and (4) Totality Information, the ground state of the mind, from which all ideas spring, as represented in the mind in terms of ocean diagram, (refer back Figure 1.1). Providing a physical ground for these metaphysical ideas means that we gain insights into the nature of such things as the ground state of consciousness.

In the past, this has been compared with the vacuum state of quantum field theory, to which IISc physicist Professor K.P.Sinha has added the possibility of a degenerate, or ‘superfluid’, ground state, something closely paralleled by ground states of systems at instability.*² The criticality, or instability, model of how the brain supports experience, is thus able to offer fundamental insights into what makes creativity possible. It offers an embodied physical picture of Creative Intelligence in action. As explained above, it also agrees with the picture from *Maharṣi Patañjali Aṣṭāṅgayoga*. The Nātha Sampradāyaḥ So'ham tradition goes further than the discussion of the Pañcakoṣāḥ, and names further dehaḥ, starting with *Sthūla, Sūkṣma and Kāraṇa Śarīra* that we have previously discussed, and then adds the highest level body *Mahākāraṇa dehaḥ*, the Cosmic / Universal Body, on the cosmic level, where the whole Universal Creative Intelligence pervades. That is accessed through complete absorption of Awareness into, ‘*Being Aware of Awareness itself alone*’. Accessing this supremely high level of Creative Intelligence pervading at higher levels of consciousness can only be achieved by refining all the bodies, *Sthūla, Sūkṣma and Kāraṇa Śarīra*, through procedures prescribed in *Aṣṭāṅgayoga*.

Maharṣi Patañjali divides his *Aṣṭāṅgayoga*, eight limbs, into two halves, the five outer, *Bahiraṅga*, limbs and three inner, *Antaraṅga*; limbs comprising the three divisions of meditation: focus of attention, *Dhāraṇā*, on the prescribed technique, such as the mantra *So'ham*; allowing the mental process to carry the mind inwards, *Dhyāna*, to the level of inner stillness of mind, *Samādhi*, where it can merge in the ‘source of thought’, and achieve the state of pure Creative Intelligence, in unbounded cosmic awareness.

Note *2: special discussion and dialogues with the 2nd author Dr. Alex Hankey, (my PhD mentor), Theoretical Physicist, MIT, Cambridge., Distinguished Professor, SVYASA University, Bangalore.

8.7 REFINED UNDERSTANDING FROM THE EXPERIMENTS

Here we can return to the experiments described in chapter 5 and their results reported in Chapter 7. In the second experiment, analysis of EEG taken in experimental group Cyclic Meditation (Chapter 6) indicated that, during CM, attentional processes focused, i.e. the mind became more inwardly directed, as if *Pātañjali's Pratyāhāraḥ āṅga*,¹⁰⁷ inward direction of the mind, was occurring. The executive network in the frontal area had activated the sensorimotor areas in the parietal lobe. This basic mechanism is a starting point to explain the increased level of activity, refined awareness and synchrony seen between the frontal and parietal lobes in both cerebral hemispheres, F3, F4, and P3, P4.

A subsidiary hypothesis requiring detailed testing at a later date is that this association is a sign that activation of the *Ajñā Cakra* region, medial-prefrontal, is followed by activation of the *Sahasrāra Cakra*, parietal region. In both eastern and western systems these are the candidates considered responsible for generation of conscious experience.¹⁶² For the first time a direct connection has been made between brain regions and centers of higher consciousness, by combining the eastern and western sciences both together in human cognitive domain.

The first constitute the perspective and language of neuroscience, and the latter those of Vedic science. The strength of evidence may increase with further studies in the fields of cognition, education, creativity, intelligence and to hopefully establish it. In the east, successive enlivenment of the *Ajñāḥ* and *Sahasrāra Cakra* regions brings about the state of super-consciousness, deep understanding about various levels of awareness and its analysis, described above;²⁴ while in the western approach, this represents a connection between the two main hubs of consciousness – the medial prefrontal and medial parietal regions containing the executive and self-referential networks and the CMS.¹¹⁹ Presumably these changes were observed because CM can help participants enter deeper states of awareness, where arousal is in equilibrium, alertness increased, and attention functions from deeper levels.²⁹¹ These three A's are enhanced, as mentioned in the Introduction, Chapter 1, meaning that pathways in the brain for Creativity stages i and ii, Preparation and Incubation, are strengthened.

These results were a supreme contrast to what was observed before the intervention, where baseline data showed dominant delta wave activity during eyes closed periods in both groups. During the intervention, however, the CM group showed a shift to gamma activity as for focused attention,³ whereas delta frequencies remained dominant in the control group.

This suggests a mechanism behind CM's affect on ATTA scores. Gamma is associated with maintaining abstract visual forms, i.e. gestalts.³¹⁰ The CM group's levels of alertness (gamma) and conscious attention, followed by deeper levels of awareness, the sense perception and integration (gamma) increase, while controls remained in drowsiness or sleepiness (delta).³ The former states lead to the possibility of removal of stress, seen in previous CM studies, while delta wave states do not. Removal of stress would reduce mental fluctuations from default mode network activity, and promote clearer inner cognitions for creative activity. The association with gestalts provides a good clue to how fluid attention offers useful answers.⁴⁴

8.8 BRAIN MECHANISMS DURING CM AND CREATIVE COGNITION

The results compared with observations of periods of peak creativity and Buddhist compassion meditation, both are characterized by gamma waves.²⁵⁰ We may also hypothesize better connecting mind and body shifts brain activity from beta to gamma during CM practice, promoting gamma during performance on tasks assessing Creative Cognition. This will require elaborate, long-term protocols and committed long term research in the future. Another aspect of the observed connection between frontal and parietal lobes in the CM group is facilitation of connections between the executive network²⁹⁹ and the self-referential network³⁷ the nodes of fronto-parietal regions, both of which are important for Creative Cognition and associated with DMN. The last stage of CM practice is *nadanusandhana*, chanting the mantra, Aum, first as three separate sounds, *Aaaa...*, *Uuu...*, and *Mmm...*, and finally 'Omikara', as a single phoneme. EEG waves may be modified by sound, and mediated by the mid-brain; influencing the parasympathetic nervous system, which in turn influences the heart via the vagus nerve. At least one published fMRI study conducted on the 'Omikara' sound' observed significant deactivation within the nodes of DMN, mainly in limbic system and anterior cingulate.³⁵¹ 'Om' chanting indicated limbic deactivation particularly the parietal-temporal node of DMN.

In contrast, regions active in depression include the orbito-frontal, anterior cingulate, parahippocampal gyri, thalami and hippocampi. If OM is deactivating these regions and activating others, that may explain its efficacy against depression and aspects of self.^{55, 68}

8.9 CONNECTIONS TO VEDIC SPACES OF AWARENESS, ĀKĀŚĀḤ AND CREATIVE COGNITION

Practice of CM at a depth with complete involvement seems to produce a kind of combination of *Dhāraṇā*, *Dhyāna*, and *brief Samādhi* state wherein the mind travels into the spaces of the *Cittākāśaḥ*, the *Cidākāśaḥ* and the *Mahākāśaḥ* discussed in Chapter 2. Because the DMN causes mental activity and visual imagery in states of undirected physical rest, the self-referential network may be taken as the space for the *Cittākāśaḥ*; when the whole area of the cortical midline structures (CMS) is silenced, experience of the *Cidākāśaḥ* may arise. Finally, when its silence and tranquility persist for longer durations of time, leading to a higher *Samādhi* state, the meditator enters the space of *Mahākāśa* i.e. infinite expansion and freedom (Ref Fig. 1.1).

This sequence expresses in terms of successively expanded states and spaces of ‘experience’, where an individual experiences self, what the *Bhagavadgītā*¹⁵⁰ and *Yoga Sūtra* mentions about Creativity.¹⁰⁶ Parallel works on growth of enlightenment express in terms of successive levels of *Samādhi* and their neural correlates, using neuro-imaging methods.^{179,181}

With regard to the concept of experience information based on self-organized criticality⁴¹ observed in cortical states in the brain, the space of *Cittākāśaḥ*⁹⁰ can be directly equated with the space of experience information, since it only involves ordinary mental thoughts and imagery. In this case, the information structure representing pure consciousness simply assumes the form of the object of cognition. When there is no object of cognition, because, e.g. the mantra has gone away the state of pure consciousness is regained.

From the perspective of growing Creativity, the three spaces of *Cittākāśaḥ*, *Cidākāśaḥ* and *Mahākāśaḥ* represent qualitatively different levels of Creative Cognition. In the *Cittākāśaḥ*, arise from unresolved memories and stress; with origins in such emotions as anxiety and fear within the limbic system and, if unattended. On the other hand, when all that is sufficiently purified and one begins to have greater clarity of mind, one can begin to function on the level of *Cidākāśaḥ*, where Creative Cognitions arise solving various kinds of problems. When a person rises to the *Mahākāśaḥ*, then the kinds of Cognition become possible recounted in Vedic stories where Lord *Shiva* is questioned by his wife *Parvati* about the most refined problems of understanding in spiritual life.⁵⁴

The experimental findings indicate that a sublime process occurring along as higher levels of cognition. The technique of *Dhāraṇā* produces shifts within the field of possible states of brain and mind; resulting in calm states that increase depth of awareness through specific EEG activity in the brain regions mentioned above. First, this leads to stability of mind within the space of *Cittākāśaḥ*, i.e., 'Yogaś citta vṛtti nirodhaḥ'. The observed gamma activity, known to be associated with perceptual binding and integration, can now be equated with the second, incubation, stage of Creativity.³⁵² This is how the DMN is trained to no longer play the role of the default, but to create a new baseline for its various nodes to play their ideal roles to integrate and bind information into creative processes arising in the *Cidākāśaḥ*; through the task of goal-directed meditative (CM) activity. Built on these outcomes arises the automatic shift of the mind to the *Dhyāna* stage of meditation, where the mind naturally enters the space of *Cidākāśaḥ*

Cidākāśaḥ, deepening the incubation stage of creativity, until it results in a flash of intuitive insight, the actual Creative Cognition begins. In terms of *Jñāna*, growth takes place in a series of 'Aha' moments and such experiences (*Siddhis*), in themselves Creative Cognitions, since they resolve problems in spiritual understanding faced by the practitioner. That is why the 'Goal towards the Self', involving integration of left and right hemispheres, is very important. This has been emphasized by *Svāmī Vivekānanda* when he says, "Take up one idea, go to the depths by the technique of focus; follow your dream and make it your life's path and purpose".¹³⁰

Further developments of brain activity may result in even deeper and more tranquil states of mind, bringing into play the most subtle source of Creative Intelligence, *Prājñā*, from the Cosmic Space, *Mahākāśa*, of which it is said, *Prajñānani Brāhman*, equating *Prājñā* with cosmic intelligence. One can foresee that observations of brain activity like a step-by-step shifts into delta activity, from delta to gamma, and then stability into gamma activity, might be able to prove the above conceptual series of subtle shifts named in the Vedic Sciences in terms of modern neuro-physiology. It is like the *Jīva* meeting *Śiva*. When we return, we experience a fullness of Creativity and blossoming of happiness. This is why *Adi Saṅkarācārya* described the whole process in terms of fullness, in accordance with *Mahāvākya* in *Chāndogyopaniṣat*;

In contrast to *Nāgārjuna*, who in his effort to negate the Vedic wisdom focused on the empty, content-free, Śūnya,¹²¹ aspect of the state, which is the perspective of the lower *Manomaya* and *Vignanamaya Koshas*,⁹² rather than that of the *Ānandamaya Kośa* where unrestricted flow of *Prana* is enabled.

Thoughts about scientific models of states of awareness presented in this Chapter are in accordance with the information state applicable to criticality' and the theory developed by the second author that supports the model of the first and the third author, of a pure self-referential mode of awareness.^{122,}

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A detailed brain model of this entire process by which this is achieved still needs investigation and testing in the formal set up to prove its efficacy in the forthcoming experiments. The patterns of EEG and their roles are known. How observed shifts results in the higher states of consciousness leading to the refined levels of cognition, leading to high synchrony and coherence, is yet to be understood. This presents an important potential focus of research in the future.