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From Trance to Transcendence: A Neurocognitive Approach

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Rapaport (1951) made a strong claim regarding the pivotal role of *reflective awareness* in characterizing both cognition and consciousness. It is suggested that the transition between a state of trance to one of transcendence entails a shift in reflective awareness from awareness' apparent absence (trance) to its apparent multiplicity (transcendence). It is further suggested and demonstrated that it is the balance in EEG alpha-theta activity along the anterior-posterior axis that accompanies this transition.

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Trance and transcendence mean a number of things to a number of people. Charles Tart, whose impact in this area is long-standing, made a confession quite some time ago (Tart, 1972, p. 3): "A few years ago . . . I tried to find a clear definition of the word 'trance,' a very common psychological term, used in an explanatory as well as a descriptive sense. To my surprise, for every defining characteristic of a trance mentioned by one authority, another authority would use the opposite characteristic." That was written in the introduction to his collection of essays on altered states of consciousness, both in the first edition in 1969 through to the third edition in 1990 — and, we assume, the situation has not fared any better at the present. An example of this confusion can be seen in the *Oxford English Dictionary* (1989), which defines trance not only as "a state characterized by a more or less prolonged suspension of consciousness and inertness to stimulus," but also as "an intermediate state between sleeping

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and waking; half-conscious or half-awake condition; a stunned or dazed state" or "a state of mental abstraction from external things; absorption, exaltation, rapture, ecstasy."

David Rapaport (1951, 1967) set the stage for the development of a good understanding of trance, and was followed by both Arnold Ludwig and Ronald Shor a few years later (both of these authors appear in Tart's edited volume). In his discussion of the construct of an altered state of consciousness — trance clearly being one form of altered state of consciousness (Inglis, 1989) — Ludwig (1966) emphasized: (1) alterations in thinking, (2) a disturbed time sense, (3) the loss of control, (4) a change in emotional expression, (5) body-image change, (6) perceptual distortions, (7) change in meaning or significance, (8) sense of the ineffable, (9) feelings of rejuvenation, and (10) hypersuggestibility. But, it is Rapaport (1951) who makes a strong claim regarding the pivotal role of reflective awareness in characterizing the altered state of consciousness (not stressed by Ludwig), stating that there are altered states of consciousness "in which reflective awareness is either absent or limited" (p. 706). Reflective awareness plays a pivotal role because "it is involved in keeping thinking within a given 'realm of discourse': this is characteristic of ordered thinking, and its absence is striking in the shifts of conceptual level common, for instance, in schizophrenic thinking. Those states of consciousness in which thought-formations of the primary-process type abound are as a rule characterized by a limitation or absence of reflective awareness" (p. 707). It is when reflective awareness is "either absent or limited" that one experiences trance. Ludwig (1967) fleshes this out:

> Along with this alteration in subjective awareness, a whole new variety of behavioral responses, which normally might have been regarded as logically and realistically "impossible," may come to seem feasible and possible for the entranced person, depending upon his particular subjective experience. Just as with the experience of "insight," the subject may come to regard his trance experiences as subjectively real and true, and is often obliged to act in conformance to these experiences, even though by certain *objective* standards they might be regarded as absurd or illogical . . . . (p. 13)

Trance involves a severe restriction in reflective awareness, one that, in Gestalt terms, lends itself to description using the figure–ground distinction (Glicksohn, 1998). Firstly, there is an intense focus on the figure at the expense of the background. One might say that the individual becomes entranced by the figure, and it is surely the case that, as the figure attracts more attention, it will become more predominate in awareness. But, secondly, given the disruption in the figure–ground distinction, the ground fades from awareness, and the figure becomes decontextualized. This notion is at the heart of Shor's elaboration of the concept of trance, using what he terms "the generalized reality-orientation" to describe this background. As Shor (1972, p. 247) writes: "In normal waking

life, even where special aspects of the generalized reality-orientation are in central focus, the rest of it is in close communication at all times. When close communication is lost, the resultant state of mind may be designated as trance . . . . Any state in which the generalized reality-orientation has faded to relatively nonfunctional unawareness may be termed a trance state."

Two more recent analyses can aid the discussion. Both are concerned with the relationship between trance and hypnosis. For Plotkin and Schwartz (1982, p. 149), trance refers to "a psychological state characterized by a significant reduction in the person's power and/or disposition to generate final-order appraisals." Such final-order appraisals are, of course, dependent on an intact generalized reality-orientation. Trance and hypnosis (or, hypnotic state) are not, however, equivalent, according to Fellows (1986, p. 53), who, following Barber (1981), distinguishes between "Trance A" and "Trance B": Trance A entails "various degrees of relaxation, calmness, passivity and unconcern or detachment from reality," whereas Trance B "refers to the absorption, involvement, etc. in the ideas and words communicated by the hypnotist. Thus Trance B incorporates concepts such as being entranced, fascinated, captivated, enthralled and enraptured." In Rapaport's terms, Trance A and Trance B differ in the degree to which reflective awareness is either limited (Trance A) or absent (Trance B). Using other terminology, this reminds us of the distinction between literal and figurative language, the former depicting how things "are" while the latter "involves disengagement from or suspension of typical modes of experiencing. It [figurative language] has an 'as if' quality" (Honeck, 1980, p. 42). Or, to use Engel's (2005) terms, one might distinguish between a "*what is* and *what if*" mode of thought. This, of course, suggests an intimate relationship between trance, reflective awareness and thought (see Glicksohn, 1998, 2001; Glicksohn and Lipperman–Kreda, 2007).

The *Oxford English Dictionary* definition of transcendence as being "the action or fact of transcending, surmounting, or rising above" is not enlightening vis-à-vis an altered state of consciousness. Following Rapaport, we would argue that in transcendence there is a large degree of reflective awareness, or rather multiple layers of reflective awareness. As Rapaport (1951, p. 707) suggested, "the lower orders of reflective awareness are mirrored in the higher." The figure is seen to appear on a background which itself appears on a multi-layered background of more and more complexity (as an icon of this, consider a mandala). In Shor's terms, the generalized reality-orientation "is not an inflexible entity but is of shifting character with many facets. What emerges into the central background of attention depends on the special cognitive requirements of the immediate situation" (1972, p. 246). This suggests that trance and transcendence are clearly differentiated altered states of consciousness. A good example of such differentiation is that between the normal dream and the lucid dream. The normal dream, as Dietrich (2003, p. 238) reminds us, is "void of prefrontal-

dependent cognition. Self-reflection is absent . . . time is distorted with past, present, and future freely exchanged . . . and volitional control is greatly diminished." In contrast, in a lucid dream an individual becomes aware that she is dreaming and can control some of the events or content of that dream (LaBerge and Gackenbach, 1986) — hence she can transcend the confines of the dream experience.

We would argue that the path from trance to transcendence comprises a series of altered states of consciousness — one that should be viewed as comprising a natural series (Hunt and Ogilvie, 1988). William James (1902/1958, p. 294) has proposed a principle that we have adopted in this paper: "phenomena are best understood when placed within their series, studied in their germ and in their over-ripe decay, and compared with their exaggerated and degenerated kindred." We will examine both trance and transcendence within meditative states, aided by data gathered from ongoing research.

The Meditative States of Consciousness

The meditative practices oriented toward attaining concentration encourage the participant to sustain intense focus on a figure, and to decontextualize the figure from its background. Consider, for example, Arthur Deikman's (1972) presentation of "experimental meditation," wherein his participants were requested to focus on a blue vase: "Common . . . was the reported alteration of their perception of the vase. Sooner or later they experienced a shift to a deeper and more intense blue . . . . For the most part . . . [they] felt that less time had elapsed than was recorded on the clock" (p. 208). In Heinz Werner's (1948) terms, there is a high degree of differentiation of the figure (the vase) from its background, with a concomitant articulation of the figure in consciousness. As such, concentrative meditation, if successful, seems to be a prima facie example of a trance state.

Concentration — and especially intense concentration — results in a series of states of consciousness as discussed by Brown (1977). The participant (or practitioner) progresses from one level to the next with increasing experience: "In concentrative meditation, the yogi is reported to go through distinct levels of practice, each level being some major alteration in cognitive organization and functioning. These levels appear to have a logical order much in the same way that child development has been conceptualized. They appear to demonstrate an invariant sequence" (pp. 243–244). Hence, one can refer to a series of meditative states of consciousness emerging from a trance state. In Werner's (1957/1978, pp. 108–109) terms: "wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration." The "hierarchic integration" referred to in the context of concentrative meditation may well be

more perceptual than conceptual for two reasons. First, concentrative meditation draws attention to the perceptual experience and not to the conceptualization of that experience. Secondly, thought during the experience is inherently impeded by the impairment in reflective awareness. We develop these two ideas below.

Drawing attention to the perceptual experience means that the experience becomes increasingly detached from language and thought — resulting in a concomitant degree of ineffability. Ineffability, however, may be alleviated by supervised introspection, for as Brown (1977) argues,

> contrary to popular opinion, meditative and mystical states are rarely ineffable. Ineffability is largely a function of inadequate data sources, inadequate methods of analyzing the texts, and lack of verbal skills. For example, the meditation system . . . contains several hundred technical terms of varying degrees of importance. When appropriate sources and methods of analysis are used, a sophisticated phenomenology of meditation emerges in which its technical terms are organized around distinct levels of attainment. (p. 238)

The impairment in reflective awareness experienced in trance and concentrative meditation is codependent with a major shift in thought, as Ludwig (1967, p. 13) elaborates: "There is a special form of thinking called 'trance logic,' which seems to occur in trance whereby 'primary process' or more primitive forms of thinking become manifest. The person no longer seems bound to the necessity for syllogistic reasoning, the distinction between cause and effect may vanish, the notion of time may become more relative, opposites can coexist and not seem contradictory . . . ." The appearance of such thinking in various altered states of consciousness has been well documented in the recent literature (e.g., French, 2005; Glicksohn and Lipperman–Kreda, 2007; Greyson, 2006). Nevertheless, we wish to note an insight offered by Lancaster (1991):

> Trance logic means that both versions can coexist simultaneously. This is reminiscent of the paradoxes we examined in relation to mysticism . . . . As discussed there, paradox is inevitable owing to the undifferentiated nature of things in the mystical state . . . . A crucial difference between the two cases concerns the individual's awareness. The hypnotized subject is completely unaware of the undifferentiated source of the hallucinations affecting his perception of reality. The mystic, on the other hand, *is* aware of the undifferentiated state, and reverts to paradox only when attempting to describe it. (p. 166)

Turning once again to Rapaport's discussion of reflective awareness, it would seem that for the hypnotized subject in trance (or, in Trance B), reflective awareness is absent, whereas the mystic, who is subsequently relating the experience, has regained reflective awareness.

It is perhaps artificial to distinguish between the experience of concentrative meditation — and, indeed, that of trance — and that of absorption, both state and trait (Hunt, 2007). As Pagano and Warrenburg (1983, p. 188) conclude, "absorbed attention may be an important prerequisite for successful long-term

practice of meditation." One may place the meditative states on a continuum together with lucid dreaming, out-of-the body experiences, and other such altered states of consciousness (Hunt and Ogilvie, 1988). Meditators, those reporting out-of-the-body experiences, and lucid dreamers are all characterized as scoring high on trait absorption (e.g., Blackmore, 1988; Hunt, 2007). Furthermore, trait absorption is "correlated with increased and more vivid imagery, inward and absorbed attention, positive affect, decreased self-awareness, and increased alterations in state of consciousness and various aspects of subjective experience" (Pekala, Wenger, and Levine, 1985, p. 125). Individual differences in reflective awareness would thus seem to be correlated with trait absorption — the higher the absorption score, the more entranced the individual will be, circumstances permitting. There is a close relationship between absorption and synaesthesia (Hunt, 2005), hence it is perhaps not surprising to note the high degree to which synaesthesia is encountered in meditation (Walsh, 2005). Returning again to Werner (1948, p. 92), who suggests that synaesthesia can be experimentally induced, it seems that synaesthesia can also be induced via concentrative meditation.

Of course, concentrative meditation is only one path of meditation — the other is mindfulness meditation, wherein the participant is encouraged to pay attention to whatever figure emerges into consciousness. In this mode of perception, the figure–ground balance is dynamic: what was previously figure now becomes ground; what was ground now becomes figure; new figures emerge from the background. In Rapaport's terms, there are multiple layers of reflective awareness. As such, mindfulness meditation, if successful, seems to be a prima facie example of a transcendent state, as discussed previously. Indeed, as Horan (2009, p. 200) has suggested, "the transcendent observer, or witness, perspective is either an explicit or implicit aspect of most meditative traditions . . . ." Mindfulness meditation usually requires prior training in concentrative meditation, hence we propose the existence of a path from trance to transcendence.

Mindfulness meditation is different from concentrative meditation. As Brown (1977, pp. 243–244) emphasizes, "mindfulness meditations . . . do not have well-defined levels. After many years of practice, there is a sudden and dramatic reorganization of cognition. Classically, a distinction is made between the quick and gradual meditative paths. Exactly why the practice of restrictive attention correlates with distinct levels of practice and why expansive meditation does not have clear levels needs to be researched." Absorption score does not increase with practice of mindfulness (Easterlin and Cardeña, 1998–1999), and mindfulness itself can be uneven within an experimental session. Advanced practitioners become aware of transcendent experiences during the session and, like lucid dreamers, can indicate by means of a series of agreed-upon signs (e.g., eye movements) that they were reflectively aware of a change in consciousness.

Electrophysiology of Meditation and Trance

It is convenient to consider two orthogonal axes traversing the cortex: one is the anterior-posterior longitude, extending from the frontal cortex through the motor system (central cortex) and ending in the parietal cortex; the second is the right-left axis, contrasting the right hemisphere with the left. Each axis has been considered in both theory and research as providing an electrophysiological signature for altered states of consciousness in general and trance in particular — and hence also for concentrative meditation.

A balance in EEG alpha activity (8–13 Hz synchronous waves) and theta activity (4–8 Hz synchronous waves) along the anterior-posterior axis is implicated in the construct of "transient prefrontal cortex deregulation" (Dietrich, 2003): relative to a "resting wakefulness" baseline, the frontal lobe becomes less active (hence, more alpha activity), and is balanced by a greater degree of parietal activation. If the frontal lobe becomes less active, then such cognitive functions as planning and decision making (the executive functions) become impaired. A similar impairment would occur to reflective awareness, as the individual's capacity to engage in reflective thinking is reduced. Concomitant with this would be both a susceptibility to trance logic in cognition, and a greater degree of impulsivity in behavior. The greater degree of activation of the parietal lobe would indicate a greater degree of attention to ongoing perceptual experience in concentrative meditation.

A balance in alpha and theta activity along the right-left axis is implicated in the idea of there being a shift to right-hemisphere dominance in altered states of consciousness (Davidson, 1976). Relative to a "resting wakefulness" baseline, the left hemisphere becomes less active (hence, more alpha and theta activity), which is balanced by a greater degree of activation of the right hemisphere. If the left hemisphere is less active then the use of literal language and analytical thinking become impaired. Concomitant with this would be both the experience of ineffability and a shift to an imagery-based mode of cognition. The greater degree of activation of the right hemisphere would further indicate a greater degree of attention to ongoing perceptual experience and the embedding of that experience within a multi-layered frame of reference (Corballis, 2003), as one would expect in both concentrative and mindfulness meditation. To what degree are these expectations realized in the empirical literature? Given the diversity of meditation traditions, care is needed in extrapolating from one study to another. For example, as Horan (2009, p. 204) notes, "before theta bursts appear in Zen meditators, alpha has a tendency to move frontally from the posterior cortex . . . yet, in TM [Transcendental Meditation], alpha spreads rapidly from frontal regions posteriorly . . . . The difference is likely due to meditation strategy."

The most current and extensive review on meditation and its electrophysiology (Cahn and Polich, 2006, p. 190) finds that "long-term meditators relative to novices exhibited slower mean frequency and greater theta-alpha power at rest, widespread increases in theta and early alpha power, and enhanced theta coherence at frontal-central locations. Theta coherence was most pronounced in the left frontal pole . . . ." And yet, in another recent review the authors disagree with Cahn and Polich: "Cahn and Polich . . . describe the finding of greater frontal theta activity in mindfulness meditation as unexpected, given the presumed association between frontal theta and focused concentration and suggest this observed theta activity may be indicative of drowsiness resulting from the use of inexperienced meditators and higher global theta during resting relaxation. Future EEG investigations of mindfulness meditation may seek to clarify this matter" (Ivanovski and Malhi, 2007, p. 83). An increase in theta activity frontally in concentrative meditation has been presented as providing "strong support to the existing claims of frontal theta in producing meditative states along with trait effects in attentional processing" (Baijal and Srinivasan, 2010). The same authors note that this was accompanied by "reduced activity (deactivation) in parietal-occipital areas signifying reduction in processing associated with self, space and, time" (p. 31). Another report found that "compared to rest periods the practice of TM [Transcendental Meditation] produced an increase in alpha phase synchrony primarily between anterior and posterior regions. Control subjects tested under the same conditions did not show increases" (Hebert, Lehmann, Tan, Travis, and Arenander, 2005, p. 2222). Thus, a balance in both alpha and theta activity along the anterior-posterior axis is found for meditation and for experienced meditators during restful wakefulness.

In contrast, a balance in alpha and theta activity along the right-left axis does not seem to be robust. An earlier review of the literature (Pagano and Warrenburg, 1983) indicated that the data "fail to support the theory . . . that meditation causes a shift toward right hemisphere dominance that may underlie subjective reports of altered states of consciousness. The average asymmetry index in both parietal and frontal channels suggests a slightly greater relative activation of the left hemisphere that did not change appreciably when the subject engaged in meditation or relaxation" (p. 171). Some recent studies do, however, report such asymmetry: Travis and Arenander (2006, p. 1519) found that both frontal coherence and lateralized asymmetry were higher in Transcendental Meditation participants relative to controls; Aftanas and Golosheykin (2005, p. 893) found that Sahaja Yoga meditators displayed no hemispheric asymmetry during restful wakefulness, and the controls were marked by a "more active left hemisphere parieto-temporal cortex."

In related studies of altered states of consciousness, such asymmetry has also been reported. For example, a pianist playing for a continuous period of 28 hours, during which he "experienced different states of consciousness through-

out the performance ranging from alertness to trance and drowsiness," exhibited an increase in alpha power which "occurred more markedly over the left hemisphere and is often referred to as equivalent to a meditative state of consciousness" (Kohlmetz, Kopiez, and Altenmüller, 2003, p. 173). In a study looking at EEG correlates of hypnotic susceptibility (and trance), it was found that those participants exhibiting high susceptibility "had substantially more mean theta power . . . than did low hypnotizable subjects in occipital, central and frontal regions in all conditions but one . . ." (Sabourin, Cutcomb, Crawford, and Pribram, 1990, p. 131), and "significantly more mean alpha power was found overall in the left hemisphere" (p. 135). And in a more recent study looking at a "recalled mystical experience," greater theta power was found within the left hemisphere along the anterior–posterior axis, coupled with greater anterior-posterior coherence for alpha within the right hemisphere (Beauregard and Paquette, 2008).

This pattern of data suggests that in meditation and trance the major shift in EEG is along the anterior-posterior axis, and that this is sometimes manifested differentially within each hemisphere. The experienced meditator — just like the lucid dreamer — might well be able to signal to the experimenter just when she has experienced a spontaneous change in consciousness, indicative of transcendence — as a result of a perceived change in time perception, space perception, or perception of the self (Baijal and Srinivasan, 2010).

From Trance to Transcendence during Meditation

We have been looking at the incidence of transcendence during meditation among a select group of experienced meditators, the majority of whom had been practicing Vipassana, and have between 2,000 and 38,000 hours of practice. We focus here on the reports of a male participant (#1061), who has 23,000 hours of practice with Vipassana, who scores 34 (out of 34) on Tellegen's (1982) Absorption Scale, and who signaled us six times during the course of his 15-min meditation session. We investigated the change in electrophysiological signature with alteration in subjective report. The EEG was recorded using a 65-channel geodesic net (Electrical Geodesics Inc.) at a 500 Hz sampling rate, with average reference.

Figure 1 displays the manner in which the participant, with eyes closed, signaled during meditation that he had experienced a spontaneous change in consciousness — a signal that we view as an indication of an experience of transcendence, wherein he was reflectively aware of such a prior change in consciousness. This use of eye movements (see far right, in the F3 and F4 frontal channels of the EEG) to signal lucidity or transcendence is familiar from research on lucid dreaming (LaBerge and Gackenbach, 1986). This participant reported that immediately prior to his signal he had had no sense of his body, no verbalization, no feeling, and that a visualization spontaneously appeared just as in a

dream. That is to say, the meditator became aware of a prior peak experience of transcendence, which due to the dissolution of the boundaries of the self (Deikman, 1972; Vollenweider and Geyer, 2001), was itself a trancelike event — and that he was now able to report on this change in consciousness. The figure further presents a selection of frontal, central, and parietal channels from the recording immediately preceding this signal, wherein one can visually attempt to assess the extent to which a shift along the anterior-posterior axis (e.g., F4 vs. P6) or a shift along the right-left axis (e.g., P6 vs. P5) is apparent. Note the appearance of theta bursts, which are preceded and followed by alpha activity (as previously reported by Hebert and Lehmann, 1977).

Figure 2b presents a topographic snapshot of alpha power and of theta power using all channels, averaged over 16 non-overlapping epochs of 2.048 sec, extracted between five and 10 minutes after the start of the meditation session (with eyes closed). There is a clear dominance of alpha activity both parietally (as would be expected) — with left (L) > right (R) asymmetry — but also frontally, and especially mid-frontally. Figure 2a presents a comparable topographic snapshot taken from the prior baseline condition of restful wakefulness (again, with eyes closed). It is relative to this that one notes heightened parietal alpha during meditation. Figure 2c presents a topographic snapshot extracted from a 2.048-sec epoch, immediately prior to the signal, which enables a very clear assessment of the transition from transcendence (Vipassana meditation) to a trancelike peak experience and back to transcendence. Note that with respect to alpha power, the prior topography is preserved. There is, however, a marked shift in parietal alpha asymmetry (R > L) and a greater amount of mid-frontal alpha. It is with respect to theta power that another marked shift is seen: there is an increase in theta power frontally, and this seems to reflect frontal-midline theta which "is most obvious with well-trained participants in cognitive tasks — when task-related arousal is likely to be reduced and atten-

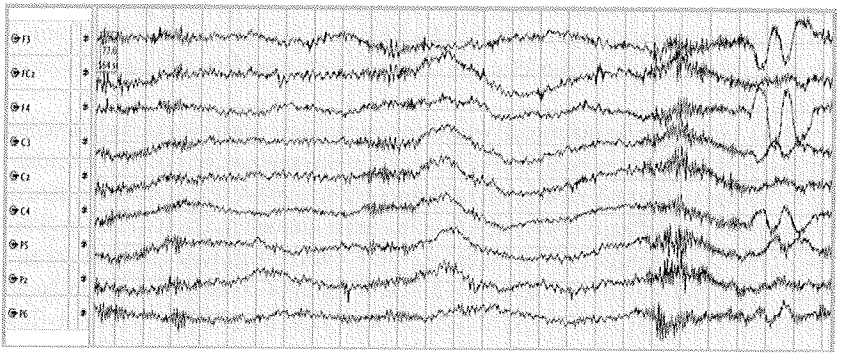

Figure 1: Eye signalling of a spontaneous change in consciousness.

tional resources focused. The meditation data make it possible that FM [frontal-midline]-theta is a sign that attentional resources are more internally than externally focused" (Mitchell, McNaughton, Flanagan, and Kirk, 2008).

As a comparison, we present the data of another male participant, who has 37,500 hours of practice with Transcendental Meditation, who scores 31 on the Absorption Scale, and who did *not* signal during the session because he felt that he was continuously within a transcendent state. This participant reported that for him there was no thought, and that he became aware of each transcendent episode only after it ended — and that this was accompanied by bliss. Figure 3 presents two topographic snapshots for this participant: one for the baseline condition of restful wakefulness, the other with respect to his meditation session. Clearly, this participant exhibited low power for both alpha and theta relative to the other participant. Nevertheless, the topography is similar for the two participants both at baseline and during meditation. That is to say, parietal alpha asymmetry, coupled with midfrontal theta activity.

Conclusions

A change in reflective awareness characterizes the transition from trance to transcendence. There seems to be an accompanying shift in the electrophysiological state centered on the predominance of frontal-midline theta activity, and a change in posterior alpha asymmetry. While the study of mind and behavior can progress without taking into consideration ongoing cortical activity, it is an

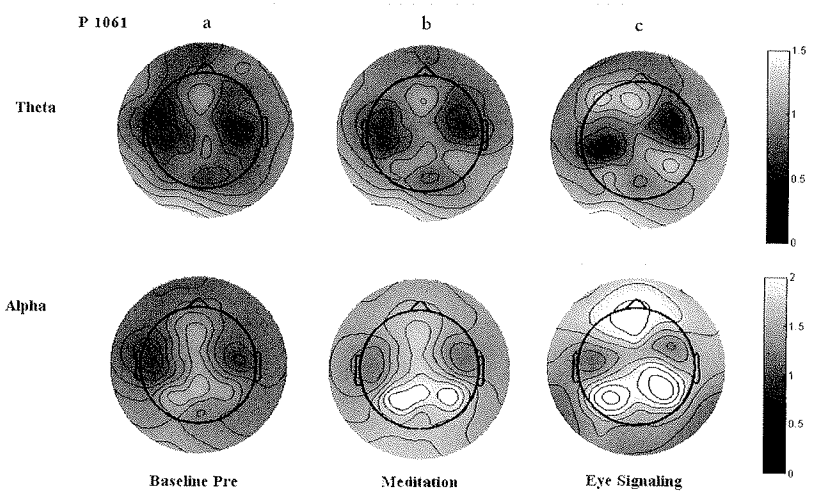

Figure 2: Topographic snapshot of log alpha and theta power prior to signalling a change in consciousness.

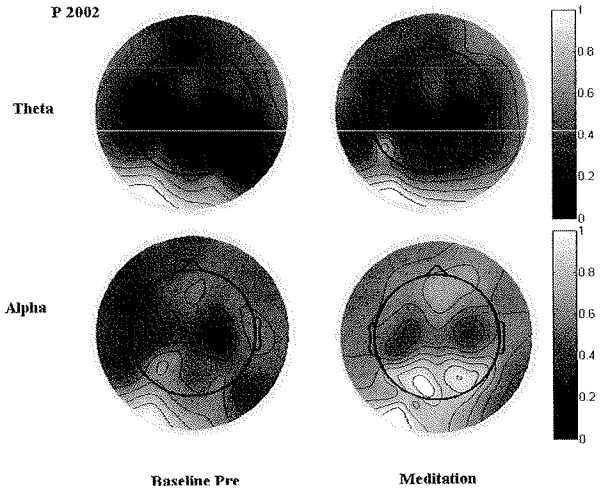

Figure 3: Topographic snapshot of log alpha and theta power during baseline and meditation.

appreciation of the changing dynamics along the anterior-posterior axis, with its electrophysiological signature of alpha-theta power, which can be beneficial for our understanding. Rapaport would have been sympathetic to these neurocognitive explorations. For, as he indicated, ". . . the implied varieties of reflectiveness are presumably forms of appearance which specific distributions of attention-cathexes can take. But about these we know woefully little" (1951, p. 705). A topographic snapshot of alpha and theta power can serve as a useful window on the distribution of attention and awareness.

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