



Psychological and physiological characteristics of a proposed object-referral/self-referral continuum of self-awareness

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Abstract

This research extends and confirms recent brainwave findings that distinguished an individual's sense-of-self along an Object-referral/Self-referral Continuum of self-awareness. Subjects were interviewed and were given tests measuring inner/outer orientation, moral reasoning, anxiety, and personality. Scores on the psychological tests were factor analyzed. The first unrotated PCA component of the test scores yielded a "Consciousness Factor," analogous to the intelligence "g" factor, which accounted for over half of the variance among groups. Analysis of unstructured interviews of these subjects revealed fundamentally different descriptions of self-awareness. Individuals who described themselves in terms of concrete cognitive and behavioral processes (predominantly *Object-referral mode*) exhibited lower Consciousness Factor scores, lower frontal EEG coherence, lower alpha and higher gamma power during tasks, and less efficient cortical preparatory responses (contingent negative variation). In contrast, individuals who described themselves in terms of an abstract, independent sense-of-self underlying thought, feeling and action (predominantly *Self-referral mode*) exhibited higher Consciousness Factor scores, higher frontal coherence, higher alpha and lower gamma power during tasks, and more efficient cortical responses. These data suggest that definable states of brain activity and subjective experiences exist, in addition to waking, sleeping and dreaming, that may be operationally defined by psychological and physiological measures along a continuum of Object-referral/Self-referral Continuum of self-awareness.

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1. Introduction

Consciousness research employs a variety of techniques and approaches to explore the nature of human experience. Neural imaging techniques, including EEG, MEG, PET, and fMRI, have been used to characterize different mental processes and internal states including attention (Posner, Petersen, Fox, & Raichle, 1988; Posner & Raichle, 1998), word generation (Petersen, Fox, Posner, Mintun, & Raichle, 1988; Snyder, Abdullaev, Posner, & Raichle, 1995), emotional states (Davidson, 2002; Davidson, Pizzagalli, Nitschke, & Putnam, 2002; Gur et al., 2002), and moral reasoning (Chayer & Freedman, 2001; Moll et al., 2002; Moll, Eslinger, & Oliveira-Souza, 2001). Patterns of brain functioning have also provided insight into the development of psychological processes. For instance, Piagetian cognitive stages in children are correlated with a sequence of bursts in brain volume (Epstein, 1974; Epstein, 1980; Thatcher, 1992) and increased density in frontal, hippocampal, cerebellum and basal ganglia cortices (Herschkowitz, Kagan, & Zilles, 1997).

Patterns of brain functioning have even helped delineate different descriptions of self-awareness, such as: *ownership* (in respect to perceptions and judgments), *agency* (in respect to actions and thoughts), *cognitive unity* (in respect to beliefs and attitudes) and *reflective self-awareness* awareness of one's physical characteristics, behavior, personality, emotional states, or imagery (Marshall & Fink, 2001; Vogeley, Kurthen, Falkai, & Maier, 1999). Different levels of reflective self-awareness have been associated with activation across predominately midline frontal-parietal structures. For instance, stories containing either 1st or 3rd person pronouns were found to activate the precuneus in a PET study (Ruby & Decety, 2001), and anterior cingulate in a fMRI study (Vogeley et al., 2001). The level of abstractness/concreteness of 1st person reflection (personality traits versus physical traits) activated precuneus and angular gyrus, respectively (Kjaer et al., 2001). 'Perspectivity,' bodily processes contributing to ones point of view, is also reported to activate medial parietal cortices including the precuneus and angular gyrus (Taylor, 2001). Action planning also activates these structures (Ruby, Sirigu, & Decety, 2002). Other studies have reported medial frontal activation during self-referential judgments of pictures (Gusnard, Akbudak, Shulman, & Raichle, 2001) and in self-referential judgments of trait adjectives (Kelley, Macrae, Wyland, Caglar, & Inati, 2002). A meta-analysis of fMRI and PET studies also reported elevated medial parietal and prefrontal activation during "baseline" resting conditions, including simple visual fixation or eyes-closed rest, compared to active task conditions (Raichle et al., 2001). The striking similarity between neural networks associated with states of reflective self-awareness and resting baseline suggests that there are distinct brain states associated with more outward, object- and task-oriented modes of processing versus more inward, self-oriented modes of processing.

This distinction between external versus internal modes of awareness is a predominant theme in cognitive development. At each stage of development, a more stable and unified internal frame of reference or dominant focus of awareness is established, providing an increasingly comprehensive context within which information of external objects and events is processed and given meaning (Alexander et al., 1990; Kegan, 1983; Wilber, 2000).

The progressive primacy of more inner abstract levels of self-awareness with development has been characterized by Alexander et al. (1990) and Kegan (1983) as a process of "de-embedding" from a more expressed level to a more abstract level of self-awareness. (See Alexander et al., 1990 for a detailed discussion of this process). For instance, Piaget's stages of cognitive development

can be understood as the progressive de-embedding of an individual's sense-of-self from sensory, motor, and cognitive processes (Alexander et al., 1990). Thus, one could have a *behavioral-centered* self in which the person identifies with sensorimotor behavior: "I like to forge my own way;" or "I like to go out and experiment with new ideas." As one de-embeds from behavior, one could have a more *cognitive-centered* self in which the person identifies with mental objects and ongoing mentation: "I'm open to new experiences." In turn, one could become more *affect-centered*, in which one identifies more with feelings and interrelations with others and the environment: "I care deeply for other people;" or "I'm happy, caring, helpful. I like to help other people. This progressive de-embedding of self-awareness from mental contents and processes is a natural process that is shaped by ongoing experience (Alexander et al., 1990; Travis, Tecce, & Durchholz, 2001).

This developmental process of de-embedding raises a question: Can one's experience of sense-of-self be de-embedded from *all* mental processing? If so, then awareness would experience awareness, without the usual mental content and processing associated with daily experience.

The prevailing Western view is that an individual cannot be aware without being aware of something (James, 1962). In contrast, the subjective traditions of the East—the Vedic tradition of India (Maharishi, 1969), and the Buddhist traditions of China (Chung-Yuan, 1969) and Japan (Reps, 1955)—include formalized meditation techniques predicted to lead to the direct experience of a foundational state of self-awareness devoid of mental content. For instance, the *Maitri Upanishad* (Maitri Upanishad 6:19, in Upanishads, 1953) states:

When a wise man has withdrawn his mind from all things without, and when his spirit of life has peacefully left inner sensations, let him rest in peace, free from the movements of will and desire. . . . Let the spirit of life surrender itself into what is called *turya*, the fourth condition of consciousness. For it has been said: There is something beyond our mind, which abides in silence within our mind. It is the supreme mystery beyond thought. Let one's mind. . . rest upon that and not rest on anything else.

Over the past 40 years, a growing body of research suggests a putative fourth state of consciousness, distinct from waking, dreaming, and sleeping, can be systematically experienced and documented with western scientific experimentation. Physiological patterns distinguish individuals who report a state of awareness, during Transcendental Meditation (TM) practice, where the self is only aware of itself, devoid of all thoughts, feelings and perceptions (Badawi, Wallace, Orme-Johnson, & Rouzere, 1984; Farrow & Hebert, 1982; Travis & Wallace, 1997). This state, has been called "pure, self-referral consciousness" (Maharishi, 1969) to distinguish it from "object-referral consciousness" in which we experience self-awareness along with inner thoughts and feelings and/or outer objects. First-person reports of pure, self-referral consciousness define a state of awareness in which self-awareness is intact, yet there is no 'sense' of time, space, or one's body (Travis & Pearson, 2000).

Repeated experience of the fourth state of pure, self-referral consciousness alternated with customary waking activity gives rise to a new integrated brain state in which pure, self-referral consciousness or awareness co-exists across the 24 h of waking, dreaming and sleeping consciousness (Maharishi, 1969). In this new integrated state, pure self-referral consciousness is experienced as a foundational state that gives rise to ongoing experience during waking, sleeping and dreaming (Maharishi, 1969). It is analogous to the vastness of the ocean not be lost with each rising wave of daily life.

In the past decade, research has investigated individuals reporting this experience of the integration of pure, self-referral consciousness with sleeping and waking. Mason et al. (1997) reported

that 11 individuals reporting this integrated experience exhibited similar levels of delta activity during slow wave sleep compared to 11 non-meditating controls, but elevated levels of theta and alpha EEG (Mason et al., 1997). It is noteworthy that the co-existence of the EEG patterns of deep sleep (delta) and meditation (theta and alpha) was associated with the subjective experience of co-existence of deep sleep along with the continued inner awareness. In a second study, EEG and ERP patterns during eyes-open computer tasks also distinguished individuals who report this integrated state (Travis, Tecce, Arenander, & Wallace, 2002). The EEG and ERP patterns distinguishing these subjects are summarized in detail below because these same subjects participated in the research reported in this paper. An understanding of their brainwave patterns may facilitate the interpretation of the 1st and 3rd person data reported in this paper.

1.1. Brainwave patterns discriminating subjects who report the integration of pure, self-referral consciousness with waking and sleeping states

EEG and ERP patterns were compared across three groups of individuals distinguished by their self-reported experience of the integration of pure self-referral awareness with waking and sleeping. These three groups also differed on scores of two tests of transcendental experiences—Hood's M-Scale (Hood & Ralph, 1975) and Baruss's test of Material/Transcendental Worldview (Baruss & Moore, 1992), and in years practice of TM: a Non-TM group, a Short-term group (7.2 years TM practice), and a Long-term group (24.3 years TM practice).

EEG patterns were recorded during two contingent negative variation (CNV) tasks in these three groups. Both tasks contained a pair of stimuli 1.5 s apart. CNV is the rise in the EEG baseline between the two stimuli (Walter, Cooper, Aldridge, McCallum, & Winter, 1964). CNV amplitude 200 ms before the expected stimulus, called the *late CNV*, reflects proactive preparatory processes, including mobilization of motor (Brunia, 1993; van Boxtel & Brunia, 1994) perceptual, cognitive, and attention resources (Tecce & Cattanach, 1993).

The first task was a simple CNV task—asterisk/ tone/ button-press to stop the tone. The second task was a choice CNV task—two numbers were sequentially presented, 1.5 s apart. Subjects responded with a left/right button press to indicate which number was larger. Three brainwave measures calculated during the choice CNV trials distinguished individuals who reported the integration of pure self-referral awareness with waking and sleeping. These measures were: (1) higher broadband frontal EEG coherence, (2) higher alpha and lower gamma power, and (3) a better match of the timing and magnitude of CNV with task demands.

1.1.1. Broadband (8–45 Hz) frontal coherence during tasks

Broadband frontal task EEG coherence was highest in the Long-term group (Travis et al., 2002). The Non-TM group had lowest task coherence, and the Short-Term group exhibited intermediate values of coherence. The frontal cortices, which are reciprocally connected with nearly all other cortical, subcortical, and brainstem structures (Fuster, 1993), are important circuits for emotion regulation (Davidson, 2002), moral reasoning (Moll et al., 2002; Moll et al., 2001), decision making and planning (Fuster, 1993, 2000) and self-concept (Ben Shalom, 2000; Vogeley et al., 1999). Broadband coherence, in contrast to narrow band coherence such as theta or alpha, may reflect large-scale cortical integration thought necessary for the unity of subjective experience (Varela, Lachaux, Rodriguez, & Martinerie, 2001). Broadband frontal coherence observed in

subjects reporting this integrate state may characterize the large-scale neural integration necessary to support the coexistence of pure, self-referral consciousness with waking and sleeping experience.

1.1.2. *Increased alpha and decreased gamma power*

The pattern of peak power estimates during tasks also discriminated these subjects (Travis et al., 2002). Alpha (8–10 Hz) EEG can be associated with long-range, top-down processes, while gamma (25–55 Hz) EEG is associated with local, bottom-up, sensory processing (von Stein & Sarnthein, 2000). During tasks, the Long-term group had higher alpha power and lower gamma power than the other two groups. This high alpha/gamma ratio in Long-term TM subjects suggests that they may process information differently: Inner, self-awareness may play a greater role in cognitive processing.

1.1.3. *Different CNV patterns*

The CNV patterns in the three groups support the proposition that the Long-term subjects processed tasks differently. CNV in the Long-term group better suited the task demands.

In the Long-term group, late CNV was higher during simple trials, when subjects knew the correct response before the second stimulus. In the simple trials, it would be appropriate to initiate preparatory responses before the second stimulus. In contrast, the Long-term group's CNV was lower during choice trials, when they had not yet seen the second number and so did not have enough information to decide whether a left or right response were appropriate. The reverse pattern was observed in the Non-TM group. In the choice trials, the Non-TM subjects activated brain response processes before they had sufficient information to determine the correct response, i.e., before they saw the second number.

Frontal and central cortical areas participate in generating the CNV waveform (Tecce & Cattanach, 1993). Appropriate timing of CNV activation suggests more appropriate timing of frontal executive processes in the Long-term TM subjects. This CNV finding complements the finding of higher levels of frontal EEG coherence during tasks in these subjects. Thus, frontal areas, whose functioning are critical for generating levels of self-awareness (Hobson & Pace-Schott, 2002; Vogeley et al., 1999) appear to function differently in these three groups. As a consequence, one might expect significant differences in the inner experience of sense-of-self in the Long-term TM subjects.

1.2. *Purpose of the current study*

The current study extends these earlier brainwave findings by exploring the details of the inner subjective experience of these subjects through two approaches—an unstructured interview and a battery of standard psychological tests. The 1st person phenomenological reports and psychological tests used in this research explore possible dimensions of inner experience to complement the previously reported brain measures. Taken together, the qualitative and quantitative measures are used to delineate a *Object referral/Self-referral Continuum* of self-awareness that links ordinary descriptions of identity in which the outer, objective worldview predominates in one's sense-of-self, with so-called experience of higher states of consciousness, in which pure, self-referral consciousness is the predominant aspect of experience (Alexander et al., 1990).

2. Experiment 1: Exploring inner experience through unstructured interviews

This experiment explores 1st person, phenomenological reports of self-awareness as revealed in unstructured interviews and analyzed using Atlas-ti content analysis software. We hypothesize that the analysis will yield dimensions of experience that distinguish the three groups.

2.1. Method

2.1.1. Subjects

The 51 subjects in this research comprised three groups based on degree of self-reported experiences of pure, self-referral consciousness during activity. The *Non-TM* group ($N = 17$, age = 39.7 ± 11.5 years)¹ did not practice a meditation technique and rarely if ever reported the experience of pure self-referral consciousness. The *Short-Term TM* group ($N = 17$; age = 42.5 ± 11.5 years) had practiced TM for about eight years (7.8 ± 3.0 years), and reported pure self-referral consciousness experiences during TM but only occasionally during daily life. The *Long-term TM* group ($N = 17$; age = 46.5 ± 7.0 years) had practiced TM for about 25 years (24.5 ± 1.2 years) and reported the continuous experience of pure self-referral consciousness throughout daily life. (The age differences between groups were not statistically significant, $F(2, 48) = 1.90$, $p = .160$) Each group comprised eight females and nine males.

The subjects were part of the larger Fairfield, Iowa community. Subjects in the two TM groups responded to signs on campus inviting people to participate in a study on the benefits of TM practice. Individuals in the Non-TM group comprised students at Maharishi University of Management who intended, but had not yet learned TM. All subjects were right-handed by self-report. Table 1 represents these subjects' demographics. As seen in this table, subjects in each group spanned levels of education (high school to Graduate training) and vocation. The "Professions" category included architects, engineers, lawyers, researchers, computer professionals, pharmacists, and university administrators and faculty. These were combined into the "Professionals" category to simplify this table.

Subjects were in good health with no history of serious accidents, hospitalization, or psychiatric diseases that would affect their EEG. They were free of prescription or non-prescription drugs. Informed consent was obtained before the testing, and the University Institutional Review Board approved the experimental protocol.

We used individuals who practiced the TM technique for three reasons. First, the TM technique explicitly leads to self-awareness de-embedded from perception, thoughts and feelings, through an effortless process called transcending, which culminates in the experience of pure, self-referral consciousness—awareness without mental content, referred to as pure, self-referral consciousness (Maharishi, 1969). In contrast, many other meditations have different goals and involve more object-referral, mind/body techniques, without reports of pure, self-referral consciousness. For instance, Qigong involves moving "Qi" to different parts of the body by attending to an area of the physiology while controlling inhalation and exhalation (Lim, Boone, Flarity, & Thompson, 1993); Vipassana meditation involves attention on the breath during eyes-closed meditation, and

¹ Data are reported as mean \pm SD.

Table 1
Education levels and vocation of the subjects

Group	Education	Vocation
Non-TM	2 High school	2 Artisans
	9 Some college	2 Military
	6 Graduate/professional	4 Business and management
		7 Professionals
	2 Student	
Short-term TM	9 Some college	7 Business and management
	8 Graduate/professional	9 Professionals
		1 Student
Long-term TM	4 Some college	2 Artisans
	13 Graduate/professional	4 Business and management
		11 Professionals

on the dispassionate, non-manipulative observation of ongoing perceptual, bodily and/or mental states during eyes open tasks (Buchheld, Grossman, & Walach, 2001); and Yoga Nidra meditation involves visualization of various mental and bodily states (Lazar et al., 2000; Lou et al., 1999). Second, TM subjects in the community around the university report the experience of the integration of pure consciousness with waking, dreaming and sleeping, providing adequate number of subjects for this study. Third, using subjects practicing the same meditation technique provides a relatively homogenous ‘meditating’ population along with a common vocabulary to describe experiences. Although TM subjects were used in this study, the research paradigm can be used to explore meditation and spiritual experiences across meditation and religious traditions.

2.1.2. Procedure

Following EEG recording during computer tasks, reported in (Travis et al., 2002), subjects were asked three questions in a tape-recorded unstructured interview. (1) “Please describe experiences during the CNV tasks.” (2) “Please describe experiences during sleep.” And (3) “Please describe yourself.” Questions were always in this order. The first two questions allowed the interview to gain rapport with the subjects. The third question was used for this analysis. During the interview, the interviewer asked the person to explain any comment that did not seem obvious. For instance, when one person said: “I think I’m not as happy as I used to be.” The interviewer asked: “You used to be... does that mean two years ago or 10 years ago?” Or the interviewer asked: “You talk about connectedness, could you expand on that concept?” The interview ended when the person had no further comments to make. These taped interviews were transcribed for later analysis.

2.1.3. Data analysis

2.1.3.1. Content analysis of interviews. The audiotaped interviews were transcribed, and were content analyzed using Atlas-ti software (Scientific Solution Development, 2002). Atlas-ti is an interactive software program. A section of transcribed text is opened in an Atlas-ti window. The experimenter reads the text and manually highlights phrases or sentences that contain a single

idea. For instance, “I believe anything is possible.” With a mouse click, the highlighted section is added to Atlas-ti’s lists of “quotations” for that group. After going through the entire text, the experimenter begins with the first quotation and generates a single word or phrase that encapsulates the unit of meaning in that quotation. In Atlas-ti these are called “codes.” The codes are connected to the quotations in Atlas-ti so that double-clicking any code brings up all quotations connected with it. These codes were not generated before hand, but were generated from the data itself. This “grounded theory” approach (Sommer, 1991) was used to discover dimensions of the experience of the integration of pure consciousness with waking, sleeping and dreaming. Next the experimenter structured codes into hierarchical networks within subjects to create a picture of their inner world of meaning. For instance, in the *Non-TM* group the networks centered on the descriptions (codes) of the self as a: (1) belief system, (2) cognitive style, (3) feelings, and (4) social roles. These networks were then assigned a supercode. In the example of the *Non-TM* group, the supercode was: “Self is identified with thoughts, feelings and actions.”

2.2. Results

The responses to the question: “Describe yourself.” were analyzed and are reported here. Table 2 presents the summary of the content analysis. This table reports average total words in each interview, average number of quotations selected from each interview, total codes for each group and the resulting supercode. The total codes are reported because the same code often summarized quotations from different subjects in each group.

The interviews varied in number of words. However, this difference was not statistically significant ($F(2, 48) = 2.07, p = .108$) due to high variability within groups. The average number of quotations and total codes were very similar between groups.

The super codes for the three groups are presented in Table 3, along with sample quotations. This gives the reader a sense of the responses of subjects in each group that generated the final super-codes.

The supercodes derived from the Atlas-ti content analysis delineated three quite different descriptions of self-awareness in healthy adults. As seen in Table 3, the *Non-TM* group, who rarely, if ever, reported the experience of pure, self-referral consciousness, described themselves predominantly in terms of their thoughts, feelings and behavior: “*I guess I’m open to new experiences...*” or “*I tend to appreciate those things that are different...*” or “*I kind of like to forge my*

Table 2
Means and *SD* of average number of words, quotations, total codes and the supercode for each group from the content analysis

Group	Average word count	Average quotations	Total codes	Supercodes
Non-TM	554 ± 459	9.5 ± 5.0	57	Self is <i>identified</i> with thoughts, feelings, and actions
Short-term	850 ± 760	9.3 ± 3.2	56	Self is the <i>director</i> of thoughts, feelings and actions
Long-term	1156 ± 1180	10.1 ± 6.2	59	Self is underlying and <i>independent</i> of thoughts, feelings and actions

Table 3

Results of content analysis: Super codes and sample responses from the three groups

Group and super code	Sample responses/quotations
<i>Non-TM Group: Self is identified with thoughts, feelings, and actions</i>	<p>N1: I guess I'm open to new experiences, and I tend to appreciate those things that are different</p> <p>N2: I kind of like to forge my own way</p> <p>N3: I am open to change and new ideas... I'm an adventuress. I like to go out...and experiment with new ideas</p> <p>N4: I tend to appreciate those things that are different, even in my style of dress. I like something usually because its odd or strange or something that other people absolutely wouldn't wear</p> <p>N5: I'm happy, caring, helpful, I like people who like to help other people; I hate seeing anyone in trouble</p>
<i>Short-Term group: Self is the director of thoughts, feelings, and actions</i>	<p>S1: I'm my own awareness. My ability to perceive and be aware. I'm my own potential, my own power,</p> <p>S2: I'm my own capabilities; my ability to learn; my ability to do things... in it's essential nature—my ability to act</p> <p>S3: There are many different levels to who I am. I'm a sister, a daughter, a friend, an athlete, a nature lover, a seeker of the truth. I'm a very spiritual person. I believe that I can do and accomplish anything that I set my mind to</p> <p>S4: I am a little bit more silent, more reserved, and thoughtful than most, with a deep desire to just succeed in all activities and at the same time to develop spiritually very quickly</p> <p>S5: Who I am is who I am inside. How I think. What I believe. How I feel. How I react</p>
<i>Long-term Group: Self is independent of and underlying thoughts, feelings, and actions</i>	<p>L1: We ordinarily think my self as this age; this color of hair; these hobbies... my experience is that my Self is a lot larger than that. It's immeasurably vast... on a physical level. It is not just restricted to this physical environment</p> <p>L2: It's the "I am-ness." It's my Being. There's just a channel underneath that's just underlying everything. It's my essence there and it just doesn't stop where I stop... by "I," I mean this 5 ft. 2 person that moves around here and there</p> <p>L3: I look out and see this beautiful divine Intelligence... you could say in the sky, in the tree, but really being expressed through these things... and these are my Self</p> <p>L3: I experience myself as being without edges or content... beyond the universe... all-pervading, and being absolutely thrilled, absolutely delighted with every motion that my body makes. With everything that my eyes see, my ears hear, my nose smells. There's a delight in the sense that I am able to penetrate that. My consciousness, my intelligence pervades everything I see, feel and think</p> <p>L5: When I say "I" that's the Self. There's a quality that is so pervasive about the Self that I'm quite sure that the "I" is the same "I" as everyone else's "I." Not in terms of what follows right after. I am tall, I am short, I am fat, I am this, I am that. But the "I" part. The "I am" part is the same "I am" for you and me</p>

own way." This group described their sense-of-self as predominately *identified* with their thoughts, feelings, and actions.

Individuals in the Short-term group, with infrequent experiences of pure, self-referral consciousness during daily life, described themselves predominately as that which *directed* thoughts,

feelings and actions. While their sense-of-self was less object-referral, it was still in terms of active processing. “*I’m my awareness. My ability to perceive and be aware.*” or “*I’m my own capabilities; my ability to learn.*”

Individuals in the Long-term group, who reported the continuous experience of pure, self-referral consciousness co-existing with waking and sleeping activity, described themselves as *underlying and independent* of thoughts, feelings and actions. This group recognized space-time boundaries. For instance, “*And in certain contexts that has some value, like when I tell my wife, I’m going to bed now.*” However, they predominately described themselves as existing outside of space-time causation—“*my self is immeasurably vast... on a physical level*”; “*all-pervading*”; “*beyond speech*”; or “*My self doesn’t stop where I stop.*”

Table 4 presents the number of subjects in each group (columns) who fell in the three super-code categories (rows). As seen in this figure, all subjects in the first group (Non-TM Group) described themselves in terms of feelings, thoughts and actions. Subjects in the second group (Short-Term Group) described themselves in terms of the first two categories. Subjects in the last group (Long-term Group) described themselves in terms of an independent, underlying reality.

2.3. Discussion

Qualitative research is valuable for: (1) elucidating the inner world of meaning for subject groups, and (2) generating hypothesis rather than testing hypothesis (Shadich, Cook, & Campbell, 2002). The interview of these subjects revealed fundamentally different descriptions of self-awareness. Subjects in the Non-TM group described themselves predominantly in terms of how they interacted with the world. That is, the self was “embedded” in or identified with the processes by which they experienced the world. This could be characterized as an *object-referral* style. One is what one *does*. Subjects in the Short-Term group described themselves as *directing* thinking and behavior—the first stages of the self “de-embedding” or separating from the processes of thinking and behavior. “*I’m my own capabilities; my ability to learn.*” And another: “*I am my ability to perceive and be aware.*” Yet, these subjects still described themselves primarily in terms of what they did. In contrast, subjects in the Long-term group described themselves as separate from what they were thinking or doing—their identities, their selves were completely “de-embedded” from the processes of thinking and behavior. “*My self is immeasurably vast... on a physical level. Not just restricted to this physical environment.*” And another: “*It’s my Being. There’s just a channel underneath that’s just underlying everything. It’s my essence there and it just doesn’t stop*

Table 4

Table of number of subjects in each group in each of the three super-code categories that emerged from the content analysis

Sense-of-self	Non-TM group	Short-Term group	Long-term group
... <i>Identified</i> with Thoughts, Feelings, and Actions	17	3	0
... <i>Director</i> of Thoughts, Feelings, and Actions	0	14	0
... <i>Independent and Underlying</i> Thoughts, Feelings, and Actions	0	0	17

where I stop.” This sense of expanded self-awareness is sometimes written with a capital “S”—“Self”—to differentiate it from the objective-referral experience of being identified with mental or perceptual objects. This style of functioning could thus be termed *Self-referral*. In this state, the Self has its own status. It is defined in terms of its own structure, independent of objects and processes of knowing.

2.3.1. *Limitations of Interview data*

There are admittedly many threats to internal validity in an open-ended interview design. Foremost, the findings from the interviews could reflect, in part, experimenter bias. The Long-term subjects’ descriptions of self-awareness were so different from the other two groups, it was not possible for the interviewer to remain blind to group membership during the interview. However, the interviewer did not use probe questions that could have been selectively used to lead the subject to bring out a specific point. Rather, the interview unfolded as a conversation, with the interviewer only asking for clarification of any statements. In addition, the distinction between groups from the content analysis is supported by significant group differences in blind scored standardized psychological tests—results in the next experiment. Also, these groups were distinguished by EEG patterns during tasks as presented in our previous work (Travis et al., 2002). Therefore, experimenter bias did not appear to greatly influence results.

Another possible confound is subject reactivity. Did the content analysis simply reveal “well-learned convictions” in these subjects? Again, a close inspection of the data suggests that there was minimal effect of subject reactivity. Both TM groups had been meditating for some time. The so-called Short-Term group in this study had been meditating for an average of 7 years. That is time enough to learn all the “right” answers. However, not having the experience of the integration of pure consciousness with waking and sleeping, the Short-Term subjects were not able to actually *describe* that integrated experience. They were not able to discuss fine details of the integration of pure consciousness with waking. Rather, subjects simply expressed what predominated in their daily experience. This conclusion is supported by the lack of significant group differences between the lengths of the interviews, and the number of quotations and codes resulting from the content analysis. This suggests that individuals in each group described their experience to similar degrees. What differed was the actual nature of their personal experience.

2.4. *Conclusion to Experiment 1*

One strength of qualitative interview data is the ability to generate hypotheses. The content analysis of these interview data revealed a continuum of self-awareness that ranged from *Object-referral* awareness (being embedded in or identified with feelings, thinking and action) to *Self-referral* awareness (a greatly expanded sense-of-self de-embedded from or independent of all thinking, feeling and action). A proposed Object referral/Self referral Continuum of self-awareness is presented in the Section 4, which summarizes the qualitative findings from this experiment, the results from the psychological tests in the next experiment, and the brainwave findings from our previous work, which were summarized in the introduction. In addition, the statements from this content analysis could be used to create a pencil-and-paper Likert Scale that may assess inner experiences along the proposed Object referral/Self referral Continuum.

3. Experiment 2: Exploring inner experience through psychological tests

This second experiment used standardized tests of psychological health to further investigate the nature of self-awareness in these subjects.

3.1. Method

3.1.1. Subjects and procedure

The 51 subjects in the original study were re-contacted. EEG recordings and interview data were already collected on these subjects as part of the earlier study. Subjects were mailed four pencil-and-paper instruments measuring personality, inner/outer orientation, moral reasoning, and anxiety, as described below. The mailing was followed up by phone calls to confirm receipt and participation. Individuals returned their tests by mail in an enclosed self-addressed stamped envelope.

Twenty-nine subjects in the original sample were successfully re-contacted and returned forms. There were 15 males and 14 females in this sample, with a mean age of 38.5 years, ranging from 17 to 58 years of age. This sample included 9 from the Non-TM group, 9 from the Short-term group, and 11 from the Long-term group. This subset of the original population should provide sufficient range and variability in subjective experience and in brain-patterns to yield reliable correlation coefficients (Hair, Anderson, Tatham, & Black, 1992).

3.1.2. Test Instruments

3.1.2.1. Inner/outer orientation. Baruss developed this scale to quantify a subject's worldview along an outer/inner, material/transcendental dimension (Baruss & Moore, 1992). Subjects are given 38 statements like: "My spiritual beliefs determine my approach to life." Subjects respond on a 7-point Likert Scale. This instrument has high item-total correlations ($r = .56 - .62$) and high Cronbach α coefficients ($r = .82 - .95$) (Baruss & Moore, 1992). Scores on this scale correlate highly with positive inner growth and meaningfulness of life (Baruss & Moore, 1992). This scale yields a single number, which ranges from -114 (materialistic: "conceptualizing consciousness in terms of information processing") to +114 (transcendental: "emphasize subjective features of consciousness and declare it's ontological primacy").

3.1.2.2. Moral reasoning. Gibbs Socio-Moral Reflection Measure-Short Form (SMR-SF) presents moral statements and asks subjects to describe *why* a moral act may be important to them. For instance: "Keeping promises is important because..."; or "Helping one's friend is important because..." Gibbs has written an extensive reference manual to aid in categorizing responses into moral maturity levels (Gibbs, Basinger, & Fuller, 1992).

The SMR-SF can be group administered as a pencil-and-paper test, takes 15–20 min to complete, and can be scored in 25 min. In addition, a scorer can gain competency in 25–30 h of self-study. Gibbs's SMR-SF has high test-retest reliability ($r = .88$), and high Cronbach α coefficients ($r = .92$). Scores on the SMR-SF are highly correlated with scores on Kohlberg's Moral Judgment Interview ($r = .70$) (Gibbs et al., 1992), which is much more intensive to administer and to score.

Levels of moral reasoning range from surface considerations to an inner autonomous basis for decision-making. More abstract levels of moral reasoning emerge developmentally and parallel growth in cognitive development, and in ego development (Gibbs et al., 1992).

3.1.2.3. Anxiety levels. Spielberger's State/Trait Anxiety (STAI) assesses both transitory feelings of anxiety (state anxiety) and chronic feelings of anxiety (trait anxiety). High trait anxiety levels are considered a general risk for psychological and physiological disease, perhaps due to the impact of distress on immune response (Friedman & Booth-Kewley, 1987; Watson & Clark, 1984) and brain function (Graef, 2003).

3.1.2.4. Personality. The International Personality Item Pool (IPIP) was used to measure personality. The IPIP is the result of an international effort to develop and continually refine a set of personality inventories, whose items are in the public domain, and whose scales can be used for both scientific and commercial purposes. The IPIP items are freely available on the Internet (<http://ipip.ori.org/ipip/>). This website also provides sub-scales and their correlations with proprietary instruments such as the Minnesota Multiphasic Personality Inventory or the California Personality Inventory.

We used 100 items in the IPIP that index the five personality constructs in the "Big Five" model of personality: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience (Goldberg, 1992). *Extraversion* represents the tendency to be social, assertive and active, including the two dimensions of dominance and sociability; *Agreeableness* is the tendency to be trusting, caring and gentle; *Conscientiousness* includes achievement and dependability; *Emotional Stability* includes good emotional adjustment, high self-esteem, low anxiety, and high security and easiness with others; and *Openness to experience* is the disposition to be imaginative, nonconforming and unconventional (Judge, Bono, Ilies, & Gerhardt, 2002; Judge & Ilies, 2002). Consensus is emerging that this five-factor model of personality may describe the most salient aspects of personality (Goldberg, 1990).

3.1.3. Data analysis: scoring of psychological tests

The tests of inner/outer orientation, state/trait anxiety, and personality were scored using standard templates. Gibbs's moral reasoning protocols were sent to trained scorers. The scorers met the requirements for reliability in scoring, set forth in Appendices B and C in Gibbs's manual, (Gibbs et al., 1992).

3.2. Results

Following the recommendations in *Psychophysiology* (Jennings, Cohen, Ruchkin, & Fridlund, 1987; Keselman, 1998), a between MANOVA was used to test for group differences. In this analysis, group was the between factor and scores on the psychological tests were the variates. For this analysis, anxiety was reversed scored so that a high value was associated with lower anxiety levels. In this MANOVA, significant omnibus group differences were found (Wilk's Lambda $F(18, 36) = 36.0, p = .044$). Based on the significant F-test, individual ANOVAs were calculated to test for significant group differences on each test. Table 5 presents the means(*SD*) for the psychological tests for the three groups as well as the *F* and *p* values from the ANOVAs. Highly

Table 5
Means (*SD*), *F* statistics and *p*-values for the psychological tests

Test	Non-TM	Short-term	Long-term	<i>F</i> stat (2,26)	<i>p</i> value
Inner/outer orientation	60.2(23.8)	70.0(12.4)	84.4(13.9)	9.03	.001
Moral reasoning	3.1(0.4)	3.4(0.4)	3.7(0.2)	5.69	.009
State anxiety	35.9(15.2)	27.1(9.1)	22.3(2.4)	7.66	.002
Trait anxiety	40.2(15.5)	30.6(7.6)	24.6(4.0)	7.90	.002
IPIP: Extraversion	3.1(0.6)	3.4(0.5)	4.1(0.8)	4.48	.021
IPIP: Agreeableness	4.0(0.5)	4.2(0.4)	4.6(0.4)	3.98	.031
IPIP: Conscientiousness	3.6(0.7)	3.9(0.8)	4.2(0.4)	2.28	ns
IPIP: Emotional stability	3.3(1.0)	3.8(0.8)	4.4(0.4)	10.64	.0004
IPIP: Openness to experience	4.0(0.4)	4.5(0.4)	4.7(0.4)	3.64	.040

significant *P*-values are in bold. As seen in this table, the most significant group differences were seen in inner orientation, moral reasoning, state and trait anxiety, and one component of the IPIP, emotional stability.

A Pearson Correlation analysis showed that the psychological measures were highly intercorrelated (all $r > .5$). To model the variance in the test scores, a principle component analysis (PCA) was conducted. Conscientiousness was not entered in this analysis because there were no significant group differences on this variable, and so this variable may not be sensitive to differences in inner experiences. The first unrotated component of the PCA has a long tradition in intelligence research as a measure of general intelligence or “*g*”—a construct theorized to underlie performance across a range of reasoning and problem solving tests (Jensen, 1980; Spearman, 1904). In the current study, the first principal component of the unrotated PCA of psychological tests may represent a general measure of sense-of-self, a basic quality of self-consciousness or life-orientation. Table 6 contains the factor loadings for the first and second unrotated components, which accounted for 69% of the variance in test scores. The other components had eigenvalues less than 1.

All variables from the psychological tests were converted to *z*-scores, weighted by their factor loadings on the 1st unrotated component, and summed. This sum was called a *Consciousness Factor*, because it was theorized to reflect a basic quality of consciousness or life-orientation common to measures of psychological health and personality. An ANOVA was used to test for

Table 6
Variable loadings of the 1st and 2nd unrotated components of the PCA

Variable	1st Unrotated component	2nd Unrotated component
Inner/outer orientation	.71	-.48
Moral reasoning	.64	-.30
State anxiety	-.86	.19
Trait anxiety	-.87	.12
Extraversion	.77	.50
Agreeable	.77	.46
Emotional stability	.88	-.11
Openness to experience	.77	.34
Variance accounted for	58%	12%

main effects for group on the Consciousness Factor scores. This analysis yielded significant main effects for group, $F(2, 26) = 13.2$, $p < .0001$: *Non-TM*: 4.78 ± 1.2 ; *Short-Term*: 0.40 ± 1.2 ; *Long-term*: 3.59 ± 1.1 . Individual comparisons revealed that Consciousness Factor scores for the *Short-Term* subjects were significantly higher (two-tailed) than those of the *Non-TM* subjects ($t(28) = 3.03$, $p = .006$), and there was a trend for Long-term subjects to be higher than those for the Short-Term subjects ($t(28) = 1.96$, $p = .062$).

3.3. Discussion

The Consciousness Factor, which represents a common dimension across several tests of psychological health and personality, accounted for over half the variance among groups. As “g” represents a common dimension among all intelligence tests (Spearman, 1904), so the Consciousness Factor may represent a common dimension among measures of psychological health and personality. This infers that one’s sense-of-self, as operationalized as scores on the Consciousness Factor, may be an important determinant of health as well as personal identity. In light of the phenomenological data in Experiment 1, higher scores on the Consciousness Factor may represent increasing ‘de-embedding’ of sense-of-self from mental processes and behavior.

4. General discussion

These three groups of subjects showed significant differences on: 1st person descriptions of self-awareness, Consciousness-Factor scores, and brain waves patterns during tasks (from our previous work). These three measures may define a range of sense-of-self along an Object-referral/Self-referral Continuum (see Fig. 1). The two boxes on the right of Fig. 1 present the supercode from the phenomenological first person reports, and the psychological (Consciousness Factor) and physiological (brain-based Integration Scale) correlates of the ends of the proposed continuum.

In general, the development of self-awareness can be understood along this continuum as the progressive de-embedding of the knower or Self from the objects and processes of knowing—thoughts, feelings, and actions. As one de-embeds from cognitive and behavioral process or moves towards the Self-referral end of this continuum an integrated set of mind/body measures appear: scores on the Consciousness factor increased, as reported in this study, frontal EEG 6–40 Hz coherence increased during tasks, alpha power increased and gamma power decreased during tasks, and there was a better match between task demands and brain preparatory responses as measured by contingent negative variation (CNV), as reported in previous work (Travis et al., 2002).

These subjective and objective findings may characterize the process of self “de-embedding” from thinking, feeling and behavior. We suggest these expressions of brain and sense-of-self represent a normal extension of human development.

This extension of human development can be understood in terms of a movie-metaphor. Watching a movie, most individuals are “lost” in the movie. The movie is real. Emotions and thoughts are dictated by the ever-changing sequence of the film. This is a predominantly object-referral state. The meditative experience of transcending—the repeated experience of pure,

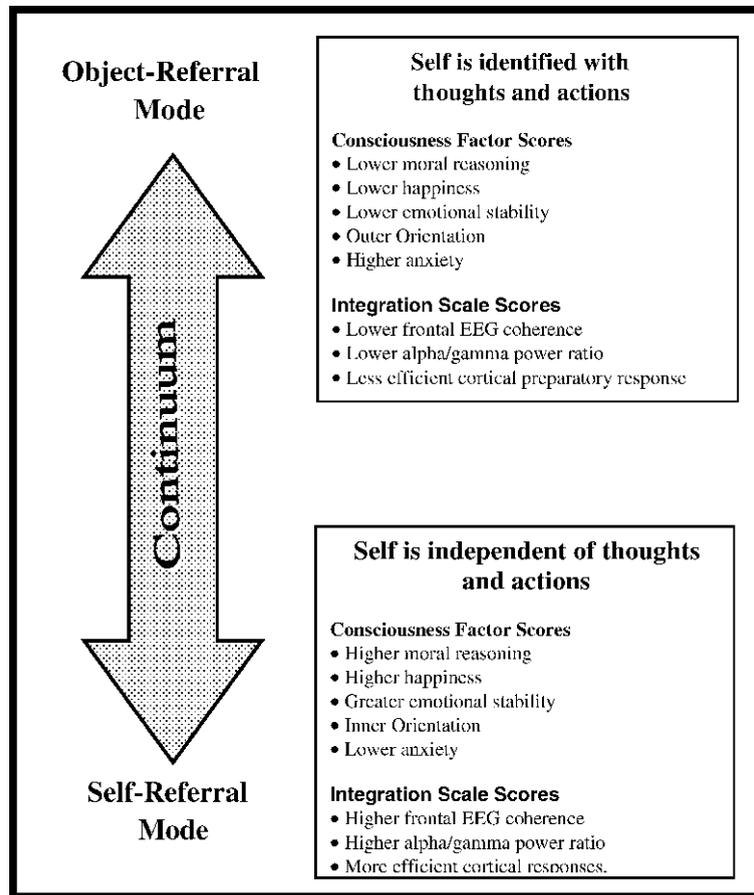


Fig. 1. Schematic representation of sense-of-self along an object referral/self referral continuum. The range of descriptions of sense-of-self extended from *Object-referral* to *Self-referral* predominant modes. The two boxes on the right present the supercode from the phenomenological first person reports, and the psychological (Consciousness Factor scores) and physiological (brain-based Integration Scale scores) correlates of the ends of the proposed continuum.

self-referral consciousness—alters this common movie-going experience. Subjectively, the individual begins to “wake up” to his/her own inner status. Although continuing to enjoy the movie, he/she gradually becomes aware that they exist independent from the movie. They experience a value of ‘witnessing’ the activity around them. To these individuals, the ever-changing movie frames are a secondary part of experience because these frames are always changing. The most salient part of their every experience is pure, self-awareness. What is ‘real’ shifts with time from the movie to self-awareness, from the thoughts, feelings and actions to the Self, from object-referral to self-referral awareness.

The reported experience of stable states of self-awareness de-embedded from, but co-existing with, the processes of waking, sleeping or dreaming is traditionally termed “Cosmic Consciousness” or “enlightenment” (Maharishi, 1969; Shear & Jevning, 1999). This state has been described in many traditions (Bucke, 1991). Though many scientifically minded people may consider enlightenment either imaginary, impractical, or simply outside the boundaries of scientific

investigation, the implications of these data are that enlightenment may be operationalized. Laboratory experimentation can help us make progress in this arena as seen by responses during unstructured interviews, supported by factor analysis of scores on psychological tests and brainwave patterns during tasks.

In conclusion, these qualitative data along with previously reported brainwave patterns suggest a range of fundamentally different values of one's identity or sense-of-self. Meditative traditions predict the possibility of experiencing various ends of a object-referral/self-referral continuum of self-awareness. Modern neuroscience research, especially increasingly more sophisticated whole brain scanning techniques, are now beginning to map out the brain states associated with unique states of self-awareness, both in meditation and in activity (Newberg & Iversen, 2003). Future longitudinal research can investigate the outcomes of different meditation and spiritual traditions using these and other qualitative and quantitative mind/body measures. This line of research could dramatically impact our understanding of the possible range of human development, and could help promote a more unified understanding of diverse spiritual traditions as different roads to the same goal—a more extensive development of human brain integration and unfoldment of our full human potential.

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