9

Mediating Mechanisms

9.1 An Overview

WHY DOES meditation work? Why do the components discussed in Chapter Eight cause the effects discussed in Chapters Five and Seven? Is there any way we can determine whether any one mediating mechanism is significantly salient compared to another?

The list of possible mechanisms mediating meditation's effects is quite lengthy. These explanations as to "why" meditation works include the following: a) a constellation of physiological changes which, taken collectively, constitute a "hypometabolic" state, a relaxation response (Benson, 1975); b) a single physiological change considered to be a primary mediator: oxygen consumption (Watanabe et al., 1972); skeletal muscular relaxation (Davidson, 1976); c) cognitive factors, including the role of self-instruction (Shapiro & Zifferblatt, 1976; Meichenbaum, 1975; Ellis, in press, 1980, Boals, 1978); d) attentional components (Davidson, Goleman & Schwartz, 1976) including global desensitization (Goleman, 1971); the information-processing mechanisms literature (Brown, 1977); sensory deprivation via steady visual fixation and/or repeated auditory stimulation (Piggins & Morgan, 1977); discrimination (Hendricks, 1975);

deautomatization and bimodal consciousness (Deikman, 1971, 1966); sustained nonanalytic attending (Spanos et al., 1978); e) regression in the service of the ego (Maupin, 1965; Lesh, 1970); f) general arousal (Fischer, 1971) and ergotropic/trophotropic shifts (Davidson, 1976); g) sleep (Pagano et al., 1975); h) hemispheric lateralization (Pagano & Frumkin, 1977; Bennett & Trinder, 1977; Galin, 1974); i) interhemispheric synchrony (Haymes, 1977); j) expectation effects (Smith, 1976); k) demand characteristics (Orne, 1962; Malec & Sipprelle, 1977); l) daydreaming (Singer, 1975); m) specific neural activation patterns involving heightened cortical arousal with decreased limbic arousal (Glueck & Stroebel, 1975; Schwartz, 1975; Goleman & Schwartz, 1976); n) habituation, including the ganzfeld experiments (Ornstein, 1971; Anand, Chinna & Singh, 1961a; Banquet, 1973); o) disidentifications from mental content (Walsh, 1977, 1978); p) imagery (Holt, 1964; DiGiusto & Bond, 1979); q) adherence; and r) "non-specific" variables such as structured training format, being part of a group and resultant exposure to other patients practicing the techniques (Galanter & Buckley, 1978), a society's socio-cultural values, the passage of time, and the regulation of lifestyle, including the subject's willingness to adapt to the regimentation of daily sitting.

As noted in Chapter Eight, based on an omni-deterministic model, these variables interact with each other and often occur simultaneously in a multi-level hierarchy. However, because writing and reading require a linear mode, I discuss these mechanisms separately. Further, where an individual has hypothesized a principal or first-cause "underlying" mechanism, this is noted and discussed.

9.2 Physiological Mechanisms

9.2A GENERAL CONSTELLATION OF CHANGES

AS NOTED IN the effects section, Chapter Five, during meditation itself, certain physiological changes have been rather consistently reported. They number *reduced heart rate:* Wallace, 1970; Anand, Chinna & Singh, 1961a; Wegner & Bagchi, 1961; Goyeche, Chihara & Shimizu, 1972; Karambelkar, Vinekar & Bhole, 1968; Das & Gastaut, 1955; Bagchi & Wenger, 1957; *decreased oxygen consumption:* Wallace, Benson & Wilson,

1971; Wallace, 1970; Wenger & Bagchi, 1961; Goyeche, Chihara & Shimizu, 1972; Anand, Chinna & Singh, 1961a; Sugi & Akutsu, 1968; Watanabe, Shapiro & Schwartz, 1972; Allison, 1970; Treichel, Clinch & Cran, 1973; Hirai, 1974; *decreased blood pressure:* Wallace, Benson & Wilson, 1971; Wenger and Bagchi, 1961; Karambelkar, Vinekar & Bhole, 1968; Bagchi and Wenger, 1957; *increased skin resistance:* Wallace, Benson, and Wilson, 1971; Wallace, 1970; Wenger and Bagchi, 1961; Karambelkar, Vinekar and Bhole, 1968; Bagchi and Wenger, 1957; Akishige, 1970; Orme-Johnson, 1973; and *increased regularity and amplitude of alpha activity:* Wallace et al., 1971; Wallace, 1970; Anand, Chinna and Singh, 1961a; Das and Gastaut, 1955; Bagchi and Wenger, 1957; Watanabe, Shapiro and Schwartz, 1972; Hirai, 1974; Akishige, 1970; Kasamatsu and Hirai, 1966; Banquet, 1972; 1973; Williams and West, 1975. It has been hypothesized that these physiological changes during meditation produce a "hypometabolic state" (Wallace et al., 1971) or a state of relaxation (Benson, Beary & Carol, 1974). This relaxed state has been considered the central mediating mechanism accounting for meditation's clinical effects, whether for managing stress (e.g., Girodo, 1974), reducing alcohol consumption (Marlatt et al., in press, 1980), decreasing hypertension (Benson et al., 1974a), or aiding psychotherapy (Glueck & Stroebel, 1975; Vahia et al., 1973).

9.2B SPECIFIC PHYSIOLOGICAL VARIABLES

OXYGEN CONSUMPTION:

WATANABE, SHAPIRO and Schwartz (1972) suggested that the reduction of oxygen consumption which occurred in all forms of meditation was the single most important factor in producing the accompanying psycho-physiological changes. Similarly, Kasamatsu and Hirai (1966) and Rao (1968) noted that when air is breathed at high altitudes under reduced pressure, oxygen is lowered and an increase of alpha activity is observed. Certainly there has been a great deal of literature showing that oxygen consumption is reduced during meditation.*

*Wallace et al. 1971; Wenger and Bagchi, 1961; Sugi et al. 1968; Allison, 1970; Trichel, 1973; Hirai, 1974; Fenwick et al. 1977.

With regard to respiration, Nakamizo (1968) noted that the ratio of exhalation to inhalation increases during meditation so that the body is literally emptied of air. Timmons et al. (1972) noted a correlation of EEG alpha with increased abdominal, decreased thoracic breathing, a pattern which occurs during meditation.

Certainly, breathing is considered an important variable in most meditation traditions. Both the Zen and Yoga traditions place great emphasis on breathing, counting, observing, or concentrating upon breaths, and in some sects, even hyperventilating. However, at this point, it seems premature to look at oxygen consumption as *the* primary variable inducing subsequent muscular, electro-cortical, and electro-dermal changes. For example, why might not lowered oxygen consumption be merely a function of a lowered arousal level and lowered metabolism?

SKELETAL RELAXATION:

A second variable posited as the primary mediating mechanism is skeletal musculature relaxation (Davidson, 1976). Davidson bases this theory on Gelhorn and Kiely (1972), suggesting the central role of proprioceptive input from the muscles in maintaining ergotropic activation. This ergotropic activation involves a coordinated complex of sympathetic visceral, cerebral, behavioral and skeletal muscle reactions. Curare-like drugs which immobolize skeletal muscles inhibit any responsiveness. Davidson suggested that "a positive feedback loop appears to be operating here in that increased muscle tone produces diffuse ergotropic activation, while the latter induced by other means results in increased muscle tone" (Davidson, 1976). Also, the resulting lower level of muscular activity in meditation may be the cause of the reported decrease in oxygen consumption. He cites as evidence the fact that muscular relaxation has been documented in several studies showing very low electro-myographic activity (Datey et. al., 1969; Das & Gastaut, 1955; Akishige, 1968). In the two studies which have compared oxygen consumption in meditation and Progressive Relaxation, both groups' oxygen consumption decreased (Pagano et al., Note Fourteen; Fee & Girdano, 1978) This finding certainly is not sufficient to justify a primary role for muscular relaxation, but it does suggest it might be one of the mechanisms having a mediating effect.

However, some question exists about the exact connection between muscular relaxation, as first clinically studied by Jacobson (1929), and resultant decrease in autonomic level arousal (cf. Connor, 1974). For example, in the Fee and Girdano (1978) study, muscle tension was significantly reduced with both meditation and EMG biofeedback, but there was a significant decrease in respiration rate only with meditators.

Further, the studies of Ikegami (1973) suggest that the skeletal muscles are maximally relaxed consistent only with the maintenance of the specific posture in which the individual holds him/herself. Ikegami's work showed that the most geometrically stable of the postures, the full lotus, yields the most even distribution of muscular activity and the least random muscle noise. In addition, Glueck and Stoebel (1975) noted that meditation does not seem to be effective for migraine headaches, whereas EMG biofeedback is. Brown (1977) hypothesized, in contrast to the relaxation effects of EMG biofeedback and hypnosis where global muscle tension can be significantly reduced (Green, Green, & Walters, 1970), that realigning and holding fast the meditation posture may not be technically relaxing in the sense of reduced muscle activity. For example, in a study that Davidson cited to support his theory (Datey et al., 1969) breathing exercises were done in a supine posture, not in a sitting or lotus posture.

However, Morse et al. (1977) found meditators did evidence less muscle activity than relaxation or self-hypnosis groups, suggesting that meditation is an effective means of muscle relaxation in the fontalis and temporal regions, and Zaichkowsky and Kamen (1978) found TM and Benson meditation to be as effective as biofeedback in decreasing frontalis muscle tension. Therefore, although it appears that muscular relaxation may be a mediating mechanism, it seems premature at this point to label it as *the* primary mechanism.

9.2C ERGOTROPIC/TROPHOTROPIC STATES

Some additional comments seem appropriate here regarding the trophotropic and ergotropic states. Fischer (1971) and Davidson (1976) describe this theory based on Hess (1938) and, later, Gellhorn and Kiely (1972). The trophotropic state is one of

quiescence and relaxation, what Benson (1975) referred to as the relaxation response, and what Wallace et al. (1971) called the hypometabolic state. This state is assumed to involve an integrated hypothalamic response, inhibition of the sympathetic nervous system (Fischer, 1971), and perhaps increased parasympathetic arousal (Benson, 1975) as well as autonomic stability (Orme-Johnson, 1973).

However, some data are at first glance paradoxical or at least unclear. For example, in some studies correlating EEG with subjective experience (Banquet, 1973), generalized fast frequencies of the dominant beta rhythm during states of deep meditation and transcendence were found. A brief report (Das and Gastaut, 1955) reported a similar finding, as did a recent study by Corby et al. (1978). How do we account for this high activation, ergotropic activity in a technique usually intended in Western use* to produce a hypometabolic state of trophotropic activity?

Fischer (1971) tried to explain this by saying that "altered-state experiences" could occur at both ends of an arousal continuum, either at low arousal or at high arousal. Davidson elaborated on this model, suggesting that there was a shift involved from low arousal to high arousal or vice-versa. He based his theory on Gelhorn's model of either an "imbalance resulting from an intense, prolonged trophotropic activation, or the postulated rebound of the ergotropic system, whereby *after cessation* of key excitation, strong ergotropic activation supervenes" (Davidson, 1976, p. 28). This is a finding which may be supported by the work of Schwartz (1973, Note Eight) in which he found higher beta activation after meditation in meditators than in the just-sitting control group.

Davidson (1976) noted that there are certain examples of mystical states of consciousness which occur as a result of intense activity: Sufis' whirling dervish dancing (Naranjo, 1971), and Ishiguro Zen, which includes prolonged shouting and violent abdominal contractions (Akishige, 1968). Davidson suggests that

*In Eastern models, meditation is seen as a technique to produce *balance;* via mindfulness, between energy, investigation, rapture, and tranquility, equanimity, concentration (Buddhaghosa, 1976; Kornfield, 1978.)

in these cases the approach to the mystical experience would be ergotropic (E). However, Davidson then suggested, based on work by Sargent (1974), that when people undergo extreme excitation, induced either by psychologic or intense sensory stimuli, a stage is reached in which the subject collapses and extreme changes of mental and physical state supervene, involving altered states of consciousness and greatly heightened suggestibility. Davidson suggested that experiences of altered states of consciousness may be approached from either the E or the T side. For example, a rapid E to T shift is found in orgasm. The opposite switch from T (relative) to E dominance is seen in the transition from slow wave to REM sleep, accompanied by profound alteration in consciousness; and, in sensory deprivation for example, where hallucinogenic activity is correlated with increased E activity.

This model, though provocative as a theory to explain variables mediating meditation's "altered-state" effects, needs further research and specification. In particular, we need to become more precise about our definition of mystical states and ensure we are not lumping quite different types of experience—hallucinogenic, dreamlike, orgastic, meditative—under the same rubric. Further, it seems that the variable of arousal may not be sufficiently precise. For example, Schwartz, Davidson & Goleman (1978) have suggested that there are both somatic and cognitive components to arousal. These somatic components may be further subdivided into autonomic and skeletal (Borkovec, 1976); the cognitive components may be separated into left and right hemisphere arousal. In addition, based on their recent research on advanced meditators showing a simultaneous increase of urinary catecholamines (representing increased sympathetic arousal) and decrease in heart rate reduction (suggesting increased activation of the parasympathetic nervous system), Land, Dehof, Meurer, and Kaufmann (1979) suggest that meditation may cause an increase in both the sympathetic *and* parasympathetic systems. Finally, as Davidson (1976) himself noted, even if these "global" physiological shifts did occur, the cognitive interpretation that one places on them would be an additional mediating variable. We now turn to the literature on cognitions, in order to assess their role as a mediating mechanism of meditation.

9.3 Cognitions

We are what we think.
All that we are arises with our thoughts.
With our thoughts we make the world.

Buddha (Dhammapada, 1976)

THOSE OF US who have ever spent more than a few moments closing our eyes and just watching our minds, have some knowledge of the ceaseless and largely uncontrollable flux of thoughts, emotions, and images which continuously but usually only semiconsciously fills and controls our awareness (Walsh, 1977; 1978). Sometimes these take a definite pattern such as purposeful daydreams (Singer, 1975). Sometimes they seem random and incoherent. Within the social learning tradition, several clinicians have suggested the importance of teaching clients how to utilize thoughts (Meichenbaum, 1976; Mahoney, 1974; Ellis, 1962) and images (Cautela, 1967, Ellis, in press 1980; Lazarus, 1978) in precise ways to facilitate desired behavior change. What about the meditation traditions? Certainly, as suggested by the above quote, Buddha recognized the importance of thoughts. What, then, are meditators taught to think and how are they taught to "react" to thoughts?

Meditators are taught that uncontrolled thoughts act as an unrecognized filter which distorts their perception of reality. Thus, uncontrolled thoughts, analysis, and intellect are viewed as hindering a person in his/her search for "true" meaning and reality. Meditators are taught, at least indirectly through modeling, to give themselves cognitions and self-instructions such as, "Do not focus your attention on thoughts, but on the source from which they derive," "You are not your thoughts" (they are epiphenomena), "Watch them, accept them, let them go."

At least in the initial stages of meditation, the meditator continues to have thoughts. However, he or she has now learned a "meta-cognition" to say every time one of these thoughts is discriminated. Therefore, when beginning to meditate, a person may say to him or herself, "I'll never be a good meditator, I'm no good at anything." Once they become aware of that thought, they then may think the meta-cognition, "That's just another thought, let it go" or "thinking, thinking; judging, judging." In essence, the individual is practicing instruction him/herself to stay

detached from the thoughts (Shapiro & Zifferblatt, 1976b; Meichenbaum, 1976; Ellis, 1980, in press), either giving "meta-cognitions" as above, or self-instructions relating to returning attention to the task at hand, "keep focused, relax, stay calm," (cf. case study, Chapter Three). The role of these meta-cognitions is insufficiently acknowledged in the Eastern tradition, where it is globally stated that one is to invest less importance in thoughts. Aside from koans, the role of thoughts or self-instructions as a mediating mechanism for reducing thoughts is never explicitly stated.

In addition to thoughts during meditation, there are also thoughts before and after meditation which may mediate outcome. Premeditation thoughts may be thought of in terms of *expectations* and belief systems.

As discussed in Chapter Eight, prior to meditation there are certain preparatory trainings which, whether implicitly or explicitly, set forth a certain vision (i.e. demands) for the student, who is to understand that if these meditation disciplines are correctly practiced, certain positive consequences will follow (Orne, 1962, Franks, 1963). These demands may cause certain expectations for the student. Further, based on self-perception (Bem, 1972) and cognitive dissonance theory (Festinger, 1962), the engaging in preparatory actions such as changing one's eating habits or paying a large initiation fee may cause one to feel that one would never expend so much effort unless the training was significantly valuable.

Further, Shapiro and Giber (1978), discussing research on meditation and the addictions (e.g., Benson and Wallace, 1972), note that there is a strong likelihood that instructions in the initial preparatory training of Transcendental Meditation—stating that drug use adversely affects meditation performance—may have a strong influence on a) the individual's drug taking behavior and/or b) the retrospective self-report of drug usage. Similarly, in the study by Kohr (1977), certain meditators of the Indian tradition noted "vibrations" and warmth at points along their spine, near the "chakras." Might there be a connection between this philosophical system which suggests the importance of the chakras and the actual experiences of the mediator?

In addition, as with biofeedback (Blanchard and Young, 1974) and psychotherapeutic outcomes (Bergin and Garfield, 1971), the individual's belief that a cure is possible may also be an

important aspect of the expectation effect. This effect may be intimately related to promotion, in which organizations outline elaborate testimonials of success: in effect, demand characteristics (cf. Smith, 1976; Malec & Sipprelle, 1977). These belief systems (premeditation cognitions) might include the following kinds of self-statements: a) an altered state of consciousness does exist, b) the practice of meditation will help me in attaining that altered state, and c) this altered state and its effects will help me be more the person I would like to be. Also, motivation, cognitions about how much an individual wants to succeed, may to a certain extent determine intention and arousal level, which may in turn mediate variables such as attention. Further, premeditation cognitions may include certain decisions, such as self-contracting, in terms of how long the person wishes to meditate, where, and how often.

Demand characteristics (expectation effects) may influence meditative outcome in two other ways. The first way is the type of "cognitive set" which the meditation disciplines attempt to give to beginning meditators. Specifically, meditation traditions often note that thoughts and images are a hindrance to successful practice. Statements such as, "Be aware of your beliefs," "Do not take ideas too seriously," "Merely focus on focusing," are standard. If an individual believes this message, he or she will likely have a different reaction to thoughts than individuals who, like most in our culture, are at least implicitly instructed to take thoughts seriously.

Second, literature on hypnosis presents evidence that belief in the "magicalness" or "mysticalness" of a technique may contribute to successful outcome, so disrobing meditation of its mystical garb may reduce its effectiveness for those people to whom the mystery is part of the attraction (Katz, Note Two, 1978; Barber & Calverly, 1964). For some individuals the context of religion itself is as important in treatment outcome as the meditation technique itself (Galanter & Buckley, 1978).

EXPECTATION EFFECTS/ DEMAND CHARACTERISTICS

Demand characteristics comprise a relatively confusing issue to separate out from expectation effects. Demand characteristics may be said to come from the external environment—teacher, training organization; expectation effects are the beliefs the subject brings to the practice. We can assess demand characteristics by looking at promotional written statements and verbal and non-verbal cues during the training session. We can assess the subject's expectations by a simple questionnaire. However, there is an obvious interaction between these two and the exact variance and influence of each may be empirically unresolvable (Wilkins, 1978).

One case study (Ikegami, 1973) and one control-group study (Malec and Sipprelle, 1977) have tried to assess the effects of "demand" characteristics on treatment outcome; several other studies with "uniform" demand characteristics across different treatments have tried to create similar expectation effects in subjects (Smith, 1976; Goldman et al. 1979; Boswell & Murray, 1979).

But all these studies assume that presenting uniform demand characteristics automatically controls for expectation effects. A critical mediating variable assessed in only one study is the subjects' belief in the treatment (Kirsch & Henry, 1979). Though experimenters believe their anti-meditation or control-group rationale is credible, subjects may not in fact find it so. Further, Kirsh and Henry (1979), using a credibility questionnaire adapted from Borkovic & Nau (1972), have shown that the subjective estimates of anxiety reduction were augmented by the degree to which subjects perceived the treatment rationale to be credible, thereby suggesting a clear relationship between expectation effects and treatment outcome.

Let us now look at examples of studies that try to assess and/or control for demand characteristics. In Malec and Sipprelle's study (1977) forty students were assigned to one of four groups: a just-sit control group and three meditation groups. The first meditation group was asked to meditate after viewing a videotape demonstrating the Zen exercise "counting breaths" followed by a relaxation outcome. The second group was asked to meditate after viewing a videotape of Zen breath meditation followed by no specific outcome. The third group was asked to meditate after viewing a videotape of Zen counting breaths followed by an arousal outcome. Significant differences appeared between the meditation groups and the control group in terms of respiration rate and frontalis EMG, but there was no significant difference between meditation groups. The authors note that

neither physiological changes nor self-report were related to varying conditions of demand. The authors conclude that although demand characteristics were varied, no attempt was made to control the subjects' expectation effects and that further investigation should examine the interaction between demand and subject expectation.

Whereas Malec and Sipprelle called their varying of the effects of the outcome after meditation "demand characteristics," Smith (1976) in his study comparing Periodic Somatic Inactivity (PSI) with TM developed elaborate testimonials about PSI's success rate and bogus research to support the claims in order to control for "expectation effects." Here again, I would argue that all that can be said is that uniform demand characteristics, designed to create expectation of positive outcome, were presented to subjects. Whether the demand characteristics created the desired "expectation effect" remains to be assessed. In Smith's study the control group, practicing PSI, was instructed to "sit quietly" two times a day and was not instructed to focus on a mantra, as did the TM group. The PSI control treatment was contrived to match every aspect of TM with the above exception of the focus on the mantra. It began with two introductory lectures that outlined what the experimenter considered to be a believable theory explaining why sitting twice a day would be an effective cure for most psychopathology. In addition to the testimonials and bogus research, subjects were instructed to participate in a fifteen-day fast from illegal drugs, similar to the TM preparation. Results showed that the TM and PSI groups did not differ significantly on trait anxiety scores, symptons of striate muscle tension, or symptoms of autonomic arousal. However, both TM and PSI post-test means were significantly lower than the no-treatment control group's means on all dependent variables. This study, actually comparing the interaction of expectation effects and just-sitting with expectation effects and just-sitting and concentration on a mantra, suggests the potentially crucial importance of expectation effects (demand characteristics) as a contributor to meditation outcome.

Another study supportive of the importance of demand characteristics was done by Ikegami (1973) with one subject. Ikegami had the subject sit on a disc that measured the amount of movement of the meditator as a way of measuring the effect of previous meditation practice on the amount of fluctuation of

the disc, and found great variability across sessions: increased practice did not seem to produce more stable posture. Two months later the same subject was reinstructed, this time told to "gaze steadily at one point," "to strictly observe the instructed posture," and so on; "these instructions had the purpose of strengthening his mental set for the posture," and led to a significant decrease in the amount of fluctuation and a clear gradient decrease over the eight session trial, an effect perhaps due to additional practice, but quite possibly due to the investigator's demand characteristics.

Finally, there are cognitions which may occur *after* the experience of meditation. One possible significant cognition involves self-statements that an individual might make about his or her ability to relax. An individual, having meditated and having had subjective experiences of feeling calm during meditation, may be more able and more willing to attribute anxiety episodes to situational variables, rather than to a specific anxious personality trait (Mischel, 1968; Shapiro & Zifferblatt, 1976b). This self statement should help a person further reduce the amount of anxiety in his or her life.

A second cognition that may be important is what one says to oneself if there is an experience of "void" or "blankness." Ornstein (1971) reviewed studies involving ganzfeld conditions. An example of these experiments was one in which ping-pong balls, cut in half, were attached to an individual's eyes so that nothing was visible except the inside of the ball. Soon the individual reported the balls disappearing, a period of "blanking out." Simultaneous with the individual's report of the disappearance of the image, a burst of alpha waves was recorded (Cohen, 1957). Ornstein noted that the "period of blanking out" that occurred in the ganzfeld experiment may be similar to the feeling of void or emptiness, or absence of cognition that occurs in many types of meditation.

What is important to our discussion here is how the individual interprets the period of blanking out.* As Ornstein noted, a person in a scientific experiment would describe the experience

*Even though the ganzfeld experiments deal only with perceptual habituation (i.e. there still may be thoughts the individual is having), the cognitive system for explaining this perceptual void may be important in determining how the person reacts to it.

of the void very differently from someone who is meditating in a religious or philosophical framework which talks of oneness, of a merging with non-being, or emptiness. In other words, certain of the subjective effects of meditation which occur as a result of prolonged attentional focus, may be due to the subject's cognitions, his/her interpretation of that experience.

For example, Woolfolk (1975) has noted that although samadhi is universally described with terms such as "transcendence" and "bliss" and characterized as a "turning off" of the external world, one Yogin showed cortical excitation in very deep meditation while another clearly evidenced slowing of the EEG. Thus, consistent reports of the phenomenology of meditation may simply reflect similarly shaped verbal sets, rather than regularities along other dimensions (Woolfolk, 1975).*

Davidson has even gone so far as to suggest that an individual's interpretation of the experience of the shift from either ergotropic or trophotropic or vice versa, "depending upon the psychological status of the individual and the circumstances in which he finds himself—may be interpreted as dreaming, hallucinations, psychosis, meditative states, or mystical experiences" (J. Davidson, 1976, p. 43). This assumes, however, that the states in question are quite similar.

A third post-meditation cognitive variable which may account for some of the effects of meditation may be referred to as the William James Box effect (eg., Fadiman & Frager, 1976). William James, during a time of great depression about his inability to resolve the issue of free will versus determinism, made a decision to choose to act as if he lived in a world which allowed freedom of choice. The William James Box actually involves taking matches out of a match box one by one and then putting them back in the box in a continous cycle for five minutes each day. This specific behavior has no particular meaning, but in an existential world where all values are relative, no act has any particular meaning. Meaning comes from the existential decision to choose a certain course of action in one's life. Based on self-perception theory (Bem, 1972), if an individual chooses to perform an action and then carries it through, he or she may subsequently observe their behavior and label it as willful and highly motivated. Therefore, the very act of meditation (whether or not that behavior has any intrinsic meaning or effect) may in itself be sufficient to allow one to perceive oneself as having increased willpower and motivation.

*In this regard, it should be noted that sometimes while S's EEG evidenced alpha production, they reported that their minds were active; other S's reported "blank minds" and yet had high beta EEG activity (Morse et al., 1977). This does call into question the usefulness of the EEG alpha as a measure.

9.4 Nature of Attentional Process: Active Versus Receptive; Role of Discrimination

DEIKMAN'S WORK on deautomatization (1966) and bimodal consciousness (1971) suggested that mystical experiences occurred because meditation is an attempt to reduce automatic reaction and automatic ways of perceiving the world. Deautomatization or letting go of our cognitive constructs allows us to be more open and receptive to what is around us. Automatic reactions normally have specific intentional focus, causing us to tune out aspects of experience that are not necessary for the goal or do not conform to our expectations (Bruner, 1973). This "active" mode, Deikman noted, is a "state organized to manipulate the environment, a state of striving, oriented toward achieving personal goals that range from nutrition to defense to obtaining social reward . . . a mode that involves striated muscle systems and sympathetic nervous systems, an EEG showing beta activity and an increase in baseline muscle tension" (Deikman, 1971, p. 481). The receptive mode, Deikman continued, is a state "organized around intake of the environment rather than manipulation. The sensory perceptive system is the dominant agency rather than the muscle system, and parasympathetic systems tend to be most prominent. The EEG tends toward alpha waves and the baseline muscle tension is decreased." Deikman noted that these are two different, functionally specific modes, each with advantages and disadvantages, for specific purposes, and that during meditation there is a shift away from the active mode toward the receptive mode.

Others, such as Washburn (1978), Brown (1977), and Smith (Note Nine) have noted that this "receptive" model of meditation

may be accurate for mindfulness meditation, but that in concentrative meditation certain kinds of efforts are necessary. Effort, as well as discrimination, is needed initially to keep the attention on the object of meditation and on fine-honed perceptual differentiation (Linden, 1973). As Washburn noted, it may be a mistake to put all meditation systems under the guise of the receptive mode because in its initial stages concentrative meditation involves many of the aspects of the active mode: a) discrimination of the meditation object and the intent actively to grasp or penetrate it; b) discursive, sequential mental activity, and c) subject object separation.*

Other thinkers (e.g., Welwood, 1977; Smith, Note Nine) have also discussed how the process of discriminating the "figure" from the field is important in meditation. They have both suggested that there is an alternating process which occurs between "convergence," or increasingly focused attention, and "divergence," the focus receding and the background field coming into focus. Welwood referred to this background field as the unconscious. As such, the background forms the context for focal perceptions. During part of the meditative experience, the background becomes the foreground, the field becomes the focus, the unconscious becomes the conscious. Smith viewed this process as cyclical between focus and field, a "natural process which occurs in that most convergence is intrinsically self-limiting and eventually uncovers or triggers a set of divergent processes." Smith noted further that two "traits" may be strengthened by this process—concentration during the convergent phase and acceptance of the field during the divergent phase. To support this he observed that the attentional mechanisms which Davidson and Goleman (1977) discuss are based on the Tellegan Absorption Scale. This scale consists primarily of five factors, based on Tellegan and Atkinson's own factor analytic research: a) reality absorption, b) fantasy absorption, c) dissociation, d) openness to experiences, and e) devotion and trust. Smith (Note Nine) noted that the first three do seem to reflect full, undistracted attention. This would deal primarily with the convergent aspect of his model, and the last two seem to "tap what we have been calling

*Washburn (1978) and Brown (1977) note that eventually this kind of active mode is not necessary and "falls aside." However, it may be a mistake not to note it as an important feature in the beginning.

acceptance of experience, as well as concentration: the acceptance aspect of the divergent experience."

Although Smith's model is interesting and supports the importance of the discrimination function, it has certain limitations. Primarily, it deals with beginning meditation steps and makes no distinction between mindfulness and concentrative meditation. Second, it does not seem to state whether this "divergence" will continue indefinitely or if with more practice there will be a greater increase in convergence. Third, it does not discuss the intentional variable, that is, convergence as the result of conscious effort whereas divergence may just happen. As noted in Goleman (1972), Brown (1977), and Washburn (1978) at the most advanced levels of meditation, the discrimination function lessens, subject/object seem to merge, discursive thought diminishes, a feeling of blankness, void, oneness occurs.

We have looked primarily at concentrative meditation in the cognitive analysis above. How does this compare with mindfulness meditation such as the just sitting of Zen (Shikan-taza), the insight meditation (Vipassana) of the Buddha, Krishnamurti's choiceless awareness, and Gurdjieff's self-remembering?

As Washburn noted, mindfulness meditation seems to begin in the receptive mode. However, interestingly, he suggested that the opening-up awareness may end in the same place as concentrative meditation:

> As the intensity threshold of the awareness is lowered, the objects that are received into consciousness become subtler and subtler; and a limit is approached in this way in which they cease being discrete entities, each with a form and nature of its own. In other words, receptivity to experience culminates in the dissolution of differentiated experience and therefore in a transcendence of the receptive function per se. Thus it is said of Buddhist insight meditation that it leads not only to an objectless nirvanic state, but also, beyond this, to a state of cessation (nirodha), which is still a state of awareness, but of no one or no thing (1978, p. 19).

Thus, both concentrative and opening-up meditation seem to end at ultimate states of "non-discrimination." However, particularly in the case of concentrative meditation, discrimination is an important and necessary component in the beginning stages.

The importance of discrimination, especially in the beginning of concentrative meditation, may be one of the reasons why there has not yet been much support for the split-brain theory accounting for meditation's effects (Ornstein, 1972; Davidson, 1976). The basic theory is as follows: The left brain in right-handed people seems to be specialized for verbal, sequential, analytical information processing; the right hemisphere seems to be more specialized for holistic (seeing the entire gestalt), spatial, parallel processing of information (Galin, 1974). Since advanced meditative and mystical experiences are often described as ineffable (Frank, 1977) and since language is "in the left hemisphere" (Sperry, 1969), it was expected that during the "holistic," ineffable experience of meditation, one would see relatively more activation of the right hemisphere (increased beta) and a decrease in activation in the left hemisphere (increased alpha). However, the theory and predictions are not definitively born out (Bennett & Trinder, 1977; Pagano & Franklin, 1977).

This lack of support may be explicable through our discussion on discrimination. If there is a large discrimination function in concentrative meditation, and discrimination of parts is primarily an analytical left-brain function, then in relatively new meditators one would expect ambiguous results (Bennett & Trinder, 1977). Further, this may account for reasons why first-time meditators did not do as well on the Embedded Figure Test (Van Nuys, 1973). Three-week meditators did slightly better (Kubose, 1976) and eighteen-week and three-month meditators did quite well (Linden, 1973; Pelletier, 1974). Discrimination ability may be a function of adherence and practice.

9.5 *Information-Processing*

BASICALLY, the normal perceptual mode of information processing, based on the work of Bruner (1973) involves a) categorizing based on certain minimally defining perceptual features, b) testing these perceptual hypotheses by scanning the environment, c) confirming and modifying the hypotheses. The phenomenology of concentrative meditation, Brown noted, is "much like perceptual categorizing in reverse; the yogi stops categorizing perceptual objects" (1977, p. 250). Further, as the individual goes into deeper and deeper levels of

concentration, as the gaze becomes fixed, there is a reduction in microsaccadic eye movements (Fischer, 1971); as already discussed, the ganzfeld experiments suggest that perceptual images disappear under excessive stimulus constancy. The mechanism for this may be, as Brown noted, analogous to the process of pattern recognition in cognitive psychology, but in reverse. Further, meditation may be reversing the cognitive developmental stages described by Piaget. Piaget assumed certain structural changes—generalization and differentiation, and these are dependent upon constant interaction between the organism and novel stimuli in the environment. As Brown noted, concentrative meditation reverses the fundamental interaction proposition in Piaget's theory:

> The yogi minimizes his interaction with the environment and disrupts this novelty by restricting his concentration to a single object over long periods. An invariant sequence of structural changes and levels of meditation likewise occurs, but in the opposite direction: decreased generalization and de-differentiation of structures (1977, p. 268).

Finally, a similar process may be working on affect construction, that is individuals learn to perceive non-neutral stimuli neutrally. Neurophysiologically, Fischer (1971) described this state as a trophotropic state in which individuals can perceive without high limbic affect (cf. Schwartz, 1975). It may be this quality of finely honed perceptual discrimination without high affective properties that accounts for meditation's effects in reducing fears and phobias.

9.6 *Global Desensitization*

ANOTHER HYPOTHESIS that attempts to explain meditation's effectiveness in reducing fears and phobias was proposed in a seminal article by Goleman (1971). He described meditation as a type of global desensitization: First, an individual learns to achieve a relaxed state; then, as new thoughts arise, the individuals *learns* to witness the random flow of thoughts from this relaxed state, thereby reciprocally inhibiting the anxiety normally elicited by those thoughts.

Although plausible, this hypothesis leaves many questions unanswered. For example, there is some question as to whether reciprocal inhibition offers the most parsimonious explanation for systematic desensitization.In fact, Jacobs & Wolpin, (1971), Yulis et al. (1975) and Wilkins (1971) suggest that perhaps the important variables are attention shifts and cognitive refocusing (see also Lazarus, 1975). Further, there is no research that supports the hypothesis that the "global desensitization hierarchy is inherently self-regulating" and that "optimal salience is guaranteed" (Goleman, 1971, p. 17). In fact, clinical experience suggests that the original assumptions of Goleman (1971), Otis (1974), and Shapiro and Zifferblatt (1976b) regarding meditation as global desensitization may need more refinement. An individual may not attain a state of sufficient relaxation to deal with unpleasant experiences that arise during meditation. For example, French, Schmid and Ingalls (1975), Carrington and Ephron (1975), and Kanellakos (1974) described complaints from Transcendental Meditators who felt themselves overwhelmed by negative and unpleasant thoughts during meditation. In addition, Otis (1974) noted that Transcendental Meditators who dropped out had more negative self-images before beginning the practice than those who did not drop out. It may be that the meditators who dropped out did so because the unpleasant images that arose during meditation were too unpleasant to deal with. Further, anecdotal accounts of meditators suggest that the thoughts during meditation, rather than being the most important in their life, are often trivial and irrelevant. Based on this latter assumption, Yalom et al. (1977) even used meditators as a control group in a clinical study testing the impact of a weekend group-experience on individual therapy. To document this hypothesis more substantially, future research would have to determine whether the meditator's thoughts are: a) self-paced so that they are never more overwhelming than the individual can deal with; and b) are necessarily concerned with the most important variables in the individual's life.

9.7 Summary: The Technique-Specific and Stage-Specific Nature of Mechanisms

TO CONCLUDE, reliance on any one exclusive unimodal mediating mechanism, be it oxygen consumption, skeletal muscular relaxation, general physiological changes, electrocortical activity such as hemispheric laterality or attentional mode does not appear totally satisfactory. What seems necessary is to work toward developing a hierarchic, multi-level, interdependent biopsychological model for mediating mechanisms. This model would require an enormous precision, and would need to be applied to each meditation technique separately, depending both on the effects being measured, as well as the different levels within the technique being experienced. For example, looking only at the variable of attention, there may be differences in attentional style between concentrative and opening-up meditation (Kasamatsu & Hirai; Anand, Chinna & Singh, 1961a); between passive attention and active attention, (Shwartz et al., Note Six); and between different levels within a given technique (Brown, 1977).

Regarding levels of depth of experience, it might be illustrative to look briefly at the five-step model of breath meditation outlined in Chapter One. The initial steps of meditation, described in Chapter One, Figure 1.2, (Step One—reactive effect, Step Two—attention wandering from the task) may be the result of certain mechanisms mediating ordinary awareness. For example, the neurophysiological literature (Pribram, 1971) suggests that the deployment of conscious attention on an automatic activity may interfere with that activity, as we saw in Step One. In Step Two—habituation, attention wandering—the orientation response, or simple distraction, and inability to maintain attentive focus may be operating. Steps Three and Four, as we have noted, involve meditation as a self-regulation strategy. Here the relaxation component of meditation may be important—muscular relaxation, decreased arousal of sympathetic nervous system, etc. (Benson, 1975), as well as counter-conditioning (e.g., Wolpe, 1969; Goleman, 1971). Further, it seems that for Zen breath meditation or concentrative meditation an alternative attentional focus (competing response) may also be responsible for the effects found in stress and tension management, overcoming fears and phobias, reducing blood pressure, and decreasing use of addictive substances. Finally, in Step Five, meditation as an altered state of consciousness, it seems that the relaxation component probably plays a relatively small role. The habituation literature for concentrative meditation, dehabituation literature for mindfulness meditation, and information-processing literature may be more important for understanding some of the phenomenological "enlightenment" experiences of meditation and the findings of

increased perceptual clarity. The above comments are made in order to suggest the importance of greater precision in trying to specify mediating mechanisms of meditation—both across meditation techniques and within different levels of a given technique itself.

Chapter Nine: Further Reading: Mediating Mechanisms

PHYSIOLOGICAL

General

Wallace, R.K., Benson, H. & Wilson, A.F. A wakeful hypometabolic state. *American Journal of Physiology,* 1971, *221,* (3), 795-799. (Reprinted in D.H. Shapiro & R.N. Walsh [Eds.], *The science of meditation.* New York: Aldine, 1980).

HEMISPHERIC LATERALITY

Davidson, J. Physiology of meditation and mystical states of consciousness. *Perspectives in Biology & Medicine,* 1976, *32,* 1323-1326. (Reprinted in D.H. Shapiro & R.N. Walsh [Eds.], *The science of meditation.* New York: Aldine, 1980).

Bennet, J. & Trinder, J. Hemispheric laterality and cognitive styles associated with Transcendental Meditation. *Psychophysiology,* 1977, *14,* (3), 293-296. (Reprinted in D.H. Shapiro & R.N. Walsh [Eds.], *The science of meditation.* New York: Aldine, 1980).

Pagano, R. & Frumkin, L.R. The effects of Transcendental Meditation on right hemispheric function. In D.H. Shapiro & R.N. Walsh (Eds.), *The science of meditation.* New York: Aldine, 1980.

ATTENTIONAL—INFORMATION PROCESSING

Davidson, R. & Goleman, D. The role of attention in meditation and hypnosis: A psychobiological perspective on transformations of consciousness. *International Journal of Clinical & Experimental Hypnosis,* 1977, *25,* (4), 291-308. (Reprinted in D.H. Shapiro & R.N. Walsh [Eds.], *The science of meditation.* New York: Aldine, 1980).

Brown, D. A model of the levels of concentrative meditation. *The International Journal of Clinical & Experimental Hypnosis,* 1977, *25,* (4), 236-273. (Reprinted in D.H. Shapiro & R.N.

Walsh [Eds.], *The science of meditation,* New York: Aldine, 1980).

Deikman, A.J. Deautomatization and the mystic experience. *Psychiatry,* 1966, *29,* 324-38.

Deikman, A.J. Biomodal consciousness. *Archives of General Psychiatry,* 1971, *25,* 481-489.

EXPECTATION EFFECTS/ DEMAND CHARACTERISTICS

Smith, J.D. Psychotherapeutic effects of transcendental meditation with controls for expectation of relief and daily sitting. *Journal of Consulting & Clinical Psychology,* 1976, *44,* 630-637. (Reprinted in D.H. Shapiro & R.N. Walsh [Eds.], *The science of meditation,* New York: Aldine, 1980).

Malec, J. & Sipprelle, C. Physiological and subjective effects of Zen meditation and demand characteristics. *Journal of Consulting & Clinical Psychology,* 1977, *44,* 339-340. (Reprinted in D.H. Shapiro & R.N. Walsh [Eds.], *The science of meditation.* New York: Aldine, 1980).