

# MEDITATION RESEARCH: AN INTRODUCTION AND REVIEW

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Although the field of meditation research began only some twenty years ago, the current research literature is voluminous, generally technical, and rapidly expanding. A full technical review now requires book length treatment and two such volumes are in press (Shapiro, 1980; Shapiro & Walsh, 1980).

However as yet there is nothing available for the nonspecialist reader which provides a general overview of the evolution and state of the art of empirical research on meditation. The present paper thus aims at filling this gap by providing a brief introductory and relatively nontechnical review. This review therefore emphasizes the extraction of general principles of the evolution and state of the research art rather than exhaustive, critical analysis of individual studies. Readers wanting such an analysis are referred to the critical reviews of Shapiro & Giber (1978), Shapiro (1980), or Shapiro & Walsh (1980).

*introductory  
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Empirical research began in the early sixties with sporadic investigations of claims by some yogis that they could demonstrate abnormal degrees of physiological control such as the slowing of heart rate (*e.g.*, Anand & Chhina, 1961; Anand *et al.*, 1961).

Initial skepticism was high, and Charles Tart (1969) claimed that the two articles in his book on altered states comprised two-thirds of the English-language literature on meditation. However, the development of fields such as biofeedback and altered states research plus the popular interest in non-West-

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ern cultures and disciplines led in turn to greater scientific interest, and by the early seventies widespread systematic research had begun.

Transpersonal psychologists have been interested in meditation research because of their hope that they could forge a link between the practices of the Eastern consciousness disciplines and Western empirical research. However, the current research tools of science are primarily aimed at measuring objective physiological, chemical, and behavioral variables, and especially initially, the meditation variables examined have tended to be relatively gross, *e.g.*, heart and respiration rate, by comparison with the subtle experiential shifts which are the goal of meditation. There is thus some question of the relevance of much research, but recent trends are towards more sensitive and refined measures.

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Research in areas such as meditation tends to evolve through several stages, beginning with examining the responses which occur and their time course, then looking at the interaction of meditation with other factors such as the age, background, and personality of the practitioner, and finally looking for the mechanisms which might be involved in producing the observed effects. As might be expected of a young field, most research on meditation has focused on the earlier stages, such as its effects. Each of these stages will now be examined in detail.

#### RESPONSES

Psychological, physiological, and chemical responses to meditation have all been observed, and these provide useful divisions for discussion.

#### *Psychological Variables*

*Objective Measures.* The general picture which is emerging suggests that meditation may enhance psychological well-being and perceptual sensitivity (for extensive reviews, *see* Shapiro & Giber, 1978; Shapiro, 1980; Shapiro & Walsh, 1980). Many studies have reported that meditation reduces anxiety, either for non-specific anxiety and anxiety neurosis (Girodo, 1974; Shapiro, 1976), or for specific phobias such as of enclosed spaces, examinations, being alone (Boudreau, 1972), or of heart attack (French & Tupin, 1974). Clinical research has indicated that drug and alcohol use may be reduced (Benson, 1969; Shafii *et al.*, 1975; Shapiro & Zifferblatt, 1976). Hospitalized psychiatric patients with a variety of disorders

may benefit from daily Transcendental Meditation (Glueck & Stroebel, 1978).

There have also been reports of psychosomatic benefits. Meditation has been employed successfully for rehabilitation after myocardial infarct (Tulpule, 1971), to treat bronchial asthma (Honsberger, 1973) and insomnia (Woolfolk, 1975), and to reduce high blood pressure (Datey *et al.*, 1969; Benson & Wallace, 1972; Patel, 1975; Stone & DeLeo, 1976).

Positive effects have also been noted in healthy nonclinical populations. A number of studies have suggested that meditators change more than controls in the direction of enhanced confidence, self-esteem, sense of self-control, empathy and self-actualization (Lesh, 1970; Nidich *et al.*, 1973; Hjelle, 1974).

In summary then, experimental evidence clearly indicates that meditation may have considerable therapeutic potential. However few definitive claims can be made and many points remain unclear. For example, many studies have been flawed by methodological problems such as the lack of adequate control groups, uncertain expectation and placebo effects, and dubious measurement procedures.

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Furthermore, several recent studies have suggested that meditation may not necessarily be more effective for clinical disorders than are other self-regulation strategies such as relaxation training and self-hypnosis, at least over short time periods such as two weeks and using objective measures (Kirsch & Henry, 1979; Boswell & Murray, 1979; Goldman *et al.*, 1979; Zuroff & Schwartz, 1978; Marlatt *et al.*, 1980). On the other hand, in several comparative studies meditators reported that their subjective experiences were deeper, more meaningful, and/or more enjoyable than those of subjects using other self-regulation strategies, even though objective tests did not reveal significant differences (Curtis & Wessberg, 1975; Cauthen & Prymak, 1977; Morse *et al.*, 1977).

### *Phenomenological Studies*

Relatively few phenomenological studies have been performed and most have been confined to beginning meditators. Some of the more commonly reported experiences include intense and labile emotions, episodes of high arousal and deep relaxation, enhanced perceptual clarity and sensitivity to psychological processes and a range of psychological insights, increased change and fluidity in perception of objects includ-

ing the body (reduced object constancy), awareness of the difficulty of controlling the mind and especially in not losing concentration or becoming lost in fantasy, altered time sense, altered states of consciousness, experience of self-transcendence and unity with others, reduced defensiveness, and greater openness to experience (Maupin, 1965; Deikman, 1966; Lesh, 1970; VanNuys, 1973; Banquet, 1973; Kubose, 1976; Osis *et al.*, 1973; Kohr, 1977; Walsh, 1977, 1978; Kornfield, 1979; Shapiro, 1980; Walsh & Shapiro, 1980; Walsh & Vaughan, 1980).

The range is large and suggests that almost any experience may occur in meditation as a result of greater openness and sensitivity. Indeed more experienced meditators note that, what tends to emerge as one continues to have more and deeper experiences is an underlying calm and nonreactive equanimity so that this greater range of experiences can be observed and allowed without disturbance, defensiveness, or interference. More and more the individual identifies him or herself with the calm observer or witness of these experiences rather than with the experiences *per se* (Goldstein, 1976; Goleman, 1977; Ram Dass, 1978).

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Many meditators, including behavioral scientists, have reported that as they continued to meditate, they noticed a deepening of their intellectual understanding of the statements of more advanced practitioners (Walsh, 1977, 1978; Ram Dass, 1978). It thus appears that intellectual understanding in this area demands an experiential basis and that what was incomprehensible at one stage may subsequently become understandable once an individual has experienced some of the meditative process.

Occasionally some of the experiences which occur may be disturbing, *e.g.*, anxiety, tension, anger, perceptual changes in sense of self and reality (French *et al.*, 1975; Lazarus, 1976; Kennedy, 1976; Walsh & Roche, 1979; Otis, 1980). These may sometimes be quite intense but generally are short-lived and remit spontaneously. In many cases they seem to represent a greater sensitivity to, and the emergence and release of, previously repressed psychological memories and conflicts. Thus the initial discomfort of experiencing them may be a necessary price for processing and discharging them.

Experimental measures also indicate greater perceptual sensitivity. Sensory thresholds, the lowest levels at which a stimulus can be detected, are lowered (Davidson *et al.*, 1976), while the capacity for empathy (Lesh, 1970; Leung, 1973) and field independence (Linden, 1973; Pelletier, 1974) are increased. Thus

both phenomenological and objective studies agree with the classical literature that meditation enhances perceptual sensitivity. A recent exception is a study which failed to detect effects of Zen practice on either field independence or the Holtzman Inkblot test, but the practice period was extremely short, only 5 days (Goldman *et al.*, 1979). In contrast a study of experienced subjects who had undertaken at least three months of intensive practice of Buddhist meditation showed highly significant shifts in Rorschach effects (Brown and Engler, 1980). These effects showed some consistency with those described in classical meditation texts and recently reinterpreted in the light of modern cognitive and perceptual theory (Brown, 1977).

### *Physiological Variables*

The evolution of research on the physiology of meditation began with sporadic investigations of some of the more spectacular feats allegedly performed by certain yogis, such as the ability to alter heart rate. When some of these claims proved valid, more systematic investigation was begun. The introduction of better controls led to the appearance of the next phase in which it was found that many of the physiological effects initially assumed to be unique to meditation could actually be induced by a number of other self-control strategies such as relaxation or self-hypnosis. This has led some researchers to assume prematurely that there is little that is unique to meditation or its effects.

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### *Metabolism*

For example, in the field of metabolism, the initial reports of Wallace (1970; Wallace *et al.*, 1971) were met with a combination of enthusiasm and skepticism. Wallace reported marked reductions in metabolic rate as shown by reduced oxygen consumption, carbon dioxide production, and blood lactate levels and suggested that transcendental meditation led to a unique hypometabolic state. Subsequent studies did in fact confirm a reduced metabolic rate, but better controls suggested that the effects were not unique to meditation (Fenwick *et al.*, 1977).

### *Autonomic Nervous System*

Similarly, initial studies revealed a reduction in the galvanic skin response (GSR) following Transcendental Meditation

(Orme-Johnson, 1973). The GSR provides a measure of autonomic nervous system reactivity and hence also of stress reactivity. Goleman and Schwartz (1976) noticed an interesting GSR pattern in which meditators displayed a greater anticipatory response to an expected stressor but then recovered more rapidly than controls. Goleman and Schwartz suggested that this might represent a more adaptive pattern of stress response.

However, recent studies have not demonstrated greater effects of short-term (weeks) meditation than of equivalent amounts of other self-regulation strategies such as self-hypnosis and relaxation (Curtis & Wessberg, 1975; Cauthen & Prymak, 1977; Morse *et al.*, 1977; Parker *et al.*, 1978).

At this stage some researchers felt that the uniqueness of meditation as a metabolic state had been disproved. However meditation aims at very subtle shifts in awareness and perception and the most commonly used physiological measures are probably insufficiently sensitive to detect them. With rare exceptions most studies have examined novice meditators who may well show less marked effects. In addition, recent studies of Transcendental Meditation have found unique patterns of blood hormone levels and blood flow to a number of organs including the brain (Jevning & O'Halloran, 1980). Thus in summary, it is apparent that meditation elicits significant metabolic effects, but to what extent these are unique to meditation remains unclear.

#### *Brain Physiology*

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Studies of brain physiology during meditation have most frequently employed the EEG (electroencephalograph) for the measurement of brain wave electrical activity and have tentatively identified a number of patterns. With most meditative practices the EEG patterns have slowed and displayed greater synchronization, with alpha waves (8–13 cycles per second) predominating. With more advanced practitioners even greater slowing may be evident, and theta (4–7 cycles) patterns may occur (Wallace, 1970; Wallace *et al.*, 1971; Corby *et al.*, 1978). These patterns are consistent with deep relaxation and some meditators may show episodes of drowsiness or sleep, though these appear to be less common than in untrained controls. Some degree of slowing may also be evident between meditation periods.

More discrete analyses are beginning to suggest the existence of specific patterns of synchronization both between corresponding areas of the two cerebral hemispheres and within

individual hemispheres (Glueck & Stroebel, 1978). These patterns appear to be different from those which occur with relaxation or biofeedback, but their significance is not yet clear. Preliminary tests indicate that meditators may exhibit enhanced ability in skills localized in the right hemisphere, e.g., ability to remember and discriminate musical tones (Paganano & Frumkin, 1977), and that EEG activation may display greater flexibility in shifting from one side to the other in response to the demands of specific tasks (Bennet & Trinder, 1977).

Most studies have employed Transcendental Meditation because of its popularity and simplicity. However it should not be assumed that all practices have the same effects. Zen monks, whose practice involves a continuous open receptivity to all stimuli, displayed a continued EEG responsiveness to a repeated sound, instead of habituating to it as non-meditators would (Kasamatsu & Hirai, 1966). However, Raj yogis, whose practice involved an internal focusing which reduced responsiveness to environmental stimuli, failed to show any EEG responses to repeated noises (Anand *et al.*, 1961).

In summary then, both metabolic and neural responses have been clearly demonstrated to occur in meditation. Certain features of the EEG patterns appear to be unique to meditation, but whether the metabolic responses are also unique remains unclear.

#### TIME COURSE

Meditators vary widely in their subjective reports of how rapidly they experience effects of the practice, though almost all report that the experiences deepen with continued practice (Kornfield, 1979). However, as yet we have very little experimental data. Greater practice seems to produce more marked effects (Shapiro, 1980), but the nature of the learning curve is quite unclear, and with few exceptions subjects have had amounts of experience which would be considered only beginning level by most meditation systems. On the other hand, a study by Goleman and Schwartz (1976) suggested that even first-timers might show detectable effects.

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#### THE INTERACTION OF MEDITATION WITH OTHER VARIABLES

This level of research looks at the ways in which the effects of meditation are modified by other variables. Important variables here include the personality and background of the

meditator, the combination of meditation and psychotherapy, and the identification of factors which enhance meditation effectiveness.

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As might be predicted there has as yet been little work done at this level. However, individuals who persist with the practice of transcendental meditation and appear to have a successful outcome, as compared to those who give it up, have been found to display certain features in common. These include being less likely to be seriously psychologically disturbed, to have little indication of psychotic tendencies, and to be more open to recognizing and acknowledging unfavorable personal characteristics. They appear to be more interested in internal subjective experiences and more open to unusual and "unrealistic" experiences. They may be less emotionally labile, perceive themselves as having a high degree of control over their own lives, and possess high baseline levels of concentration and alpha wave activity (Anand *et al.*, 1961; Maupin, 1965; Lesh, 1970; Smith, 1978). On the other hand, some people with a past history of schizophrenia may suffer psychotic breaks if they engage in very intensive meditation practice (Walsh & Roche, 1979). Future research in this area may identify those subjects who will respond optimally, those who risk negative effects, and the means of enhancing favorable responses. Although there is little firm experimental data, subjective reports from both therapists and clients suggest that meditation by either the therapist or client or both may facilitate psychotherapy.

MECHANISMS BY WHICH THE EFFECTS  
OF MEDITATION ARE PRODUCED

Most effects of meditation represent the end product of a chain of reactions or mechanisms which extend from the first brain response through chemical, physiological, and behavioral links. Knowledge of these mechanisms would be extremely helpful in understanding how effects of meditation are produced and how they may be influenced.

At the present time the mechanisms most frequently suggested to mediate or produce meditative effects are psychological, *e.g.*, relaxation, desensitization to formerly stressful stimuli, heightened awareness, habituation, attention, expectation, deautomatization, cognitive factors, counterconditioning, insight, disidentification from mental content, regression in the service of the ego, and behavioral self-control skills (Maupin, 1965; Deikman, 1966; Goleman, 1971; Shapiro & Zifferblatt, 1976; Walsh, 1977, 1978). At the physiological level, suggested

mechanisms include reduced metabolism and arousal, hemispheric-lateralization (a shift in the relative activity of the two cerebral hemispheres), brain wave resonance and coherence, a shift in the balance between the activating and quieting components of the autonomic nervous system, and altered brain blood flow (Davidson, 1976; Bennett & Trinder, 1977; Glueck & Stroebel, 1978). To date, few chemical mechanisms seem to have been advanced, although a number of relevant responses have been identified, *e.g.*, reduced blood levels of lactate and of the hormones cortisol and epinephrine which are involved in the response to stress.

One possible mechanism which has received surprisingly little consideration is dehypnosis (Walsh, 1978). Anyone who has undertaken intensive meditation practice soon realizes that the untrained mind is filled with a continuous flux of largely unrecognized thoughts, images, and fantasies which constrict and distort awareness to a significant degree (Tart, 1975; Goldstein, 1976; Walsh, 1977, 1978; Walsh and Vaughan, 1980b). This recognition is available to anyone willing to undertake sufficient practice and has been a widely held tenet of meditation disciplines across cultures and centuries. In the words of the Buddha (Byrom, 1976),

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

Such a process in which the state of consciousness is altered and perception is distorted by thoughts without the individual's recognition of these effects is essentially one of hypnosis. From this perspective our usual state of consciousness can be seen as a hypnotized state and advanced meditation can be seen as a process of dehypnosis. This is most apparent in practices such as Buddhist insight meditation where refinement of perception results in a progressive disidentification from increasingly subtle layers of thought (Goldstein, 1976; Walsh and Vaughan, 1980b).

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Precisely how any or all of these mechanisms might be involved in producing the final pattern of responses is as yet unclear (Shapiro, 1980; Shapiro & Walsh, 1980). Most commonly a single factor or process has been suggested to be *the* mediating mechanism. However the complexity of biological systems is so great that it is probably more accurate to think in terms of multilevel, multidimensional interactive patterns. Indeed ultimately it may even be inappropriate to think of cause and effect relationships in light of the emerging evidence—at levels from quantum physics to neurosciences and the con-

sciousness disciplines—of the inseparability and interdependence of all components of any system in particular and of the universe in general (Capra, 1975; Walsh, 1979; Walsh & Vaughan, 1980).

#### SUMMARY

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While much has been learned experimentally about meditation and its effects, this research field is still in an early stage of development. Many conclusions are tentative, and as yet relatively little can be said about the relationships between the shifts in consciousness and perception which are the goals of meditation and the variables which readily lend themselves to Western empirical measures. The dream of a bridge between Eastern practice and Western research thus remains largely unattained, but also remains worth seeking.

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