A MODEL FOR VIEWING MEDITATION RESEARCH

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increasing number of Western meditators

Transpersonal psychologists have been interested in meditation for both personal and theoretical reasons. As one of the cornerstones of practice in almost all of the consciousness disciplines, it has been widely used for personal and transpersonal growth. The number of Westerners who have learned to meditate now number several million, and surveys of transpersonal psychologists suggest that the large majority are involved in some form of this practice.

On the theoretical side, one of the long-held goals of transpersonal psychology has been an integration of Western science and Eastern practice. As yet, these linkages remain few, although a significant body of meditation research now exists. However, as with most research fields, most of the data is fragmentary and disconnected. The aim of this article is not to perform a detailed analysis and review of individual studies, since this would require book-length treatment and has been done elsewhere (Carrington, 1978; Shapiro, 1980; Shapiro & Walsh, 1982). Rather, it aims at providing an evolutionary model of meditation research which provides a context from which to view and understand it.

the aim of meditation

Despite the fact that meditation has a longer history than almost any other psychotherapeutic endeavor, it is only within the last few years that it has attracted significant scientific attention. Meditation of one type or another can be found in a wide variety of cultures and traced back for at least two-and-a-half thousand years. Its ultimate aim is to enable its practitioners to enhance control of their minds and develop levels of psychological well-being and states of consciousness beyond those recognized in traditional Western psychological models.

Until recently, the typical Western reaction to these claims tended to be one of cynicism. Many of the claimed effects seem to run counter to traditional Western psychological assumptions. Indeed, at first sight, some of the reported experiences appear reminiscent of psychopathology as much as of extreme health, *e.g.*, claims of the loss of ego boundaries and of a sense of merging with the universe.

scientific inquiry and expanding empirical research

However, closer examination, personal experience of these disciplines, and a recognition of the limitations imposed by paradigm clash and communication across different states of consciousness have made these claims appear more coherent and comprehensible (Tart, 1975a, 1975b; Shapiro, 1980; Walsh, 1980; Walsh & Vaughan, 1980). Furthermore, the generally favorable findings of empirical research have now established this as a respectable area for scientific inquiry. Indeed, research in this area appears to be expanding rapidly, a fact which can be traced to several roots. In part, it is a reaction to popular interest and practice of these disciplines. In addition, a number of behavioral scientists have themselves undertaken meditative practice, and several have described positive results including an expanded comprehension of meditative claims once they had some experiential basis for understanding (*e.g.*, Tart, 1972; Walsh, 1977, 1978; Shapiro, 1978, 1980; Wilber, 1982a). The widespread popularity of transcendental meditation has also been helpful since it comprises a simple, rapid, highly standardized training procedure which readily lends itself to experimental investigation.

an evolutionary model of research

The model presented here represents a specific application of a more general stimulus-response model of the evolution of research (Walsh, 1981). In this case, the stimulus (S) represents the meditative practice, and the responses (R) are considered to be mediated by a variety of psychological, physiological, and chemical mechanisms (M) (Figure 1).

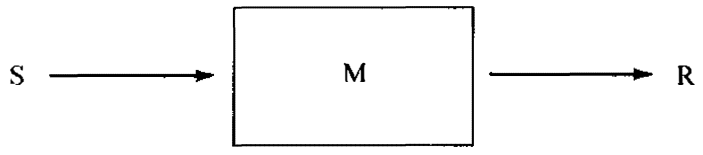

FIGURE 1

This model has five major divisions based on the sequence in which specific aspects of meditation tend to be examined. The first of these is the response side of the paradigm: *i.e.*, just what are the qualitative and quantitative changes which occur as a result of meditation? Historically, this is the first division to be investigated, and, in fact, the first demonstration of a significant response establishes the research area. As is appropriate for a young field, most studies today have been concerned with this division.

responses

After responses have been demonstrated, interest tends to turn towards the temporal aspects. Research at this second level tends to ask questions such as: what is the time course of the development, and sometimes regression, of these changes, how long will they persist under various conditions, and what is the minimum duration in which effects can be detected?

temporal aspects

When a research field begins to demonstrate a respectable range of responses, interest begins to turn toward the stimulus side of the paradigm. The sensory stimulus employed, in this case the meditative practice, actually represents a multi-dimensional array of stimulus components. The question is then posed, what are the precise stimulus attributes which elicit which effects? This stage is essentially one of component analysis.

stimulus attributes

In the fourth stage, the effects of additional independent variables are investigated. Whereas initial studies were concerned only with the effects of meditation *per se*, more complex experimental designs are now employed in which the interaction between the stimulus and other factors such as biological rhythms, genetic and experiential background of the subject, *etc.*, are investigated.

effects of other independent variables

The fifth level is concerned with the mechanisms involved in the production of the observed findings. Ideally, such a consideration should be multi-level and take into account mechanisms at a variety of levels from the psychological through the physiological to the chemical.

mechanisms at various levels

Since research tends to evolve across these five levels, the maturity of a field can to some extent be judged by the relative amounts of published work at each stage. In the case of meditation, the major emphasis in Western research has been on the first level. Each of these divisions will now be considered in more detail.

RESPONSES

responses: psychological, physiological, and chemical

The responses to meditation are most readily subdivided into psychological, physiological, and chemical. As might be expected, the general trend has been one of moving from initial fairly gross parameters to finer, more subtle, and more discrete ones, and from those parameters which are most easy to measure to more difficult ones. For example, the first physiological measures examined parameters such as respiratory rate and rhythm, which have subsequently given way to electrophysiological investigations, including spectral analyses and interhemispheric comparisons.

Psychological Parameters

behavioral and phenomenological subdivisions

Turning first to the psychological arena, studies in this area fall readily into behavioral and phenomenological subdivisions. In accordance with Western research paradigms, most work has focussed on the more easily and objectively measured behavioral parameters, even though the aim of meditation is primarily phenomenological. In normal subjects, such trait variables as intelligence, personality factors, self-actualization, and field dependence have been examined (Shapiro, 1980; Shapiro & Walsh, 1982).

Perceptual studies have looked at both external and internal stimuli. Studies of perception have examined such factors as sensory thresholds, which are lowered, and empathy, which is increased (Lesh, 1970; Leung, 1973).

Phenomenological changes are of special interest since they represent the very *raison d'etre* for meditation. Two different approaches have been used here which essentially represent both sides of the old nomothetic versus ideographic debate. The nomothetic approach has used groups of subjects and checklists or rating scales of predetermined experiences. The other approach has been one of intensive single-case study using a participant-experimenter, usually one who is trained in the Western behavioral sciences (Tart, 1972; Shapiro, 1980; Walsh, 1977, 1978). Such an approach obviously suffers from all the limitations inherent in self-report single-case studies. On the other hand, single-case designs are now recognized as valuable and, at times, irreplaceable clinical research strategies. For studies of meditation, they have the advantage of allowing a deeper examination of the depth and range of subjective experiences, of the evolution of effects, and greater room for serendipity, the fortuitous finding of unexpected phenomena.

single-case studies

Participant-experimenters have provided novel information on a number of processes including perception, identification, and psychodynamics. They have also reported a progressive, experientially-based increase in intellectual understanding of the statements and claims made by more advanced meditators. 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 sufficient experience of the meditative process. In part, this may reflect state-dependent learning, a suggestion made by Western scientists as well as Eastern yogis (*e.g.*, Rajneesh, 1975): "(This) is a learning in which a basic requirement is: First change your consciousness."

an experientially-based understanding

This area of phenomenology is currently the most subtle and difficult for Western science, and hence the one which has been most avoided. In part, this avoidance is based on a general antiphenomenological bias. It should be noted that this bias is based partly on uncertain assumptions concerning scientific "objectivity" and may be without solid philosophical justification (Tart, 1975b).

Another factor is the "means oriented" rather than "problem oriented" nature of most research. These are terms introduced by Maslow (1966) to suggest that what tends to be measured is what is easy to measure, rather than what is especially important. In many cases, the phenomenological responses lie outside Western measurement technologies and in some cases outside the realm of traditional Western psychology itself, since they represent alternate states of consciousness. The very existence of such states has only recently been acknowledged in the West (Tart, 1975a). It is here that the "East-West" split is largest, for the meditative disciplines have provided millenia-old, exquisitely articulated phenomenological maps of altered states, and some of these states are held to be *sine qua nons* of advanced meditation (Goleman, 1977; Goldstein, 1976; Walsh, 1982). These alternate states hold far-reaching implications for Western psychology, and the difficulty of measuring and conceptualizing them should not deter investigation. Indeed it is the responsibility of science to confront all areas of knowledge irrespective of the difficulty involved, and not to shirk investigation because the areas in question do not readily lend themselves to the best-honed experimental tools presently at hand. For as Abraham Maslow (1966) noted:

an approach to alternate states

> Most psychological problems do and should start with phenomenology rather than with experimental, behavioral labo-

> ratory techniques. We must press on from phenomenological beginnings *toward* objective experimental, behavioral laboratory methods. . . . It is easy for the laboratory scientist to criticize all this. But in the end, these criticisms come down to an accusation that the final state of knowledge has not yet been achieved (pp. 47, 130).

types of effects of meditation

Relatively few studies measure the types of effects that meditation was designed to produce, *e.g.*, altered states of consciousness, perceptual enhancement, concentration, increase in certain "mental factors" such as mindfulness, equanimity, tranquility, and reduction in others, such as anger, fear, aversion. Indeed, meditative practitioners sometimes laugh at our current scientific investigations and tell the story of two thieves who went to one of the Buddha's talks. One of them used the rapt attention of the crowd to his advantage by picking pockets while the other listened to the talk and became enlightened. At the end of the lecture, the pickpocket chastised his friend for coming away with nothing concrete to show for his time.

This suggests that we are investigating epiphenomena. The information we are collecting may well be of interest and value from our traditional Western perspective. On the other hand, it may be of less relevance to meditation, and ultimately of less significance than an examination of the effects which yogis describe as the goals for which meditation was introduced.

Physiological Parameters

measures with increased sensitivity and specificity

One dimension of the evolution of physiological research has already been described as a movement from gross to more sensitive parameters. Early studies employed such parameters as respiration and heart rate. More recent ones have used a range of sophisticated electrophysiological, metabolic, and chemical measures. These are not only more sensitive but allow greater specificity. Thus, for example, spectral analyses and precise regional mapping of EEGs are beginning to point to meditation-induced regionally specific spectral patterns (*e.g.*, Banquet, 1973). Regionally specific intra- and inter-hemispheric synchronicities are also becoming apparent (Glueck & Stroebel, 1975), as are responses localized to one hemisphere which presumably reflect hemispheric specialization (*e.g.*, Pagano & Frumkin, 1977; Earle, 1981).

A Systems Approach

Obviously, a research field can go on indefinitely investigating a single or a few parameters at a time. However, treating

variables in isolation sets obvious limits to the information which can be derived from them. Moreover, the inherently holistic nature of systems has become increasingly apparent in a variety of disciplines and levels (Capra, 1975; Walsh, 1981). Therefore, as a research area starts to develop a respectable number and range of variables under investigation, there is an increasing recognition of the need to adopt an organismic (holistic, general systems, integrative) approach. Thus, variables begin to be considered in relationship to other parameters and in the context of the functioning of the whole organism, and it is recognized that a change in one variable affects all others.

approaching the whole organism

The first such attempt to consider variables in relationship to one another usually involves simple correlations. For meditation, such attempts to date have been few in number, *e.g.*, attempts to correlate anxiety with GSR. This type of comparison usually makes overly simplifying assumptions about the nature and complexity of the underlying constructs being correlated, and it is not surprising that successes to date have been few.

simple correlations

A more sophisticated approach employs multivariate studies and statistics. These provide more accurate and valid measures of underlying constructs, *e.g.*, anxiety, as well as of correlations between constructs, *e.g.*, by canonical correlation. Their added complexity is probably a necessary price to pay for the advancement of the field beyond a certain point, but to date, only a few such studies have appeared in the meditation literature (*e.g.*, Osis *et al.*, 1973; Kohr, 1977).

multivariate studies and statistics

The interrelated organismic nature of systems holds further implications. If changes in one variable produce changes in all, a condition known as holocoenoticism, then it follows that any intervention such as meditation will affect the whole organism. This provides a very different research perspective from the one usually employed and suggests that negative findings may be due to a lack of experimental and measurement sensitivity rather than to a lack of meditative effects. The question is not "Does meditation produce an effect?," but rather, "Is the meditative effect of any practical significance and, if so, what proportion of the variance does it account for?" This shift from asking simple "yes or no" questions to more quantitative, correlative, and ecological approaches represents an evolutionary stage which is appropriate for developing research fields once responses have been clearly demonstrated, but is also often unnecessarily delayed.

holocoenoticism

the later effects of earlier limitations

The question of the sensitivity, appropriateness, reliability, and validity of response measures is extremely important for the evolution of any research field, but especially for meditation. What will subsequently become apparent is that limitations at any one stage of research become limiting factors for the evolution of subsequent stages. As the demonstration of responses is the first of the five stages, measurement limitations at this stage will act as limiting factors for all subsequent research.

TEMPORAL FACTORS

effect of time duration

The study of the temporal characteristics of meditation involves several dimensions. The first of these is the effect of varying durations of practice or the time course and evolution of effects. As yet, we have very little information on this. Not surprisingly, the trend seems to be for greater practice to produce more marked effects. However, 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 meditative systems. On the other hand, a study by Goleman & Schwartz (1976) suggested that even first-timers might show detectable GSR effects.

permanence and reversibility of effects

The second dimension concerns the permanence and reversibility of meditation-induced effects, a question of obvious therapeutic importance. This actually involves several subquestions such as, "Will the effects be maintained after practice ceases?," "If so, for what parameters?," "Can the extent of this maintenance be increased or decreased (reversed) by various means including other therapeutic practices?," and "What is the optimum scheduling of practice to maximize gains?" To date, these questions remain untested and unanswered.

The problem may actually be more complex. This is suggested by other fields such as research on effects of psychotherapy or sensory environments which have found interactions among various temporal factors and between these factors and other dimensions (Walsh, 1981). Thus, for example, the effects of meditation in young individuals might differ not only in magnitude, but also in time course from those in older ones. Furthermore, different parameters may exhibit different temporal profiles. It therefore seems prudent to be very cautious in drawing general conclusions from the few facts currently available to us.

THE STIMULUS

Research on the stimulus side of the stimulus-response paradigm tends to be a type of component analysis. Initial studies of any stimulus input tend to consider the stimulus as a whole and are not too concerned with its individual components. However, after the stimulus complex has been demonstrated to be effective, then the question arises as to precisely which components are responsible for which effects. That is, the initial approach is a uni-dimensional one where the total stimulus impact alone is considered, whereas later studies begin to recognize the multi-dimensional nature of this complex and to question the contribution of various stimulus dimensions to it. When sufficient work has been done at this level, then the question arises as to the nature of the interactions between stimulus components. Related questions include, "Are stimuli additive, inhibitory, or synergistic?," and "What is the optimum (most effective) combination of stimuli for which effect?" To date, there have been few attempts to conceptualize these stimulus dimensions for meditation, and so the following partial scheme is suggested.

multi-dimensional nature of stimulus

A basic question which arises during this phase is, "What is meditation?" On close examination, most meditative practices are seen to consist of an array of behaviors ranging from the focusing of awareness to somatic posturing, and to be couched within a philosophical, ethical, and life style context. A precise definition of meditation becomes essential so as to differentiate between those behaviors which are inherent or essential to the practice and those which can be regarded as ancillary.

"Meditation" is defined here as the conscious training of attention aimed at modifying mental processes so as to elicit enhanced states of consciousness and well-being. It should be noted that this definition avoids saying anything about the nature of the object(s) of awareness, which may be single and fixed as in "concentration" meditation, or multiple and varied as in "open" meditation. It also recognizes that meditation may be independent of posture or behavior and is not restricted to sitting meditation, a common confusion. If all meditation is a function of awareness and not necessarily of overt behavior, it may be impossible to tell whether meditation is occurring by behavioral measures alone. Any, and in some practices all, behavior may thus provide an opportunity for meditation. Furthermore, within a single session, there may be wide fluctuations in the degree to which attention is successfully controlled. Thus, for

a definition of "meditation"

research purposes, it is necessary not only to differentiate meditation from non-meditation, but also usually to limit investigation to one specific type of meditation, *e.g.*, sitting meditation. It is also important to be aware of the probable occurrence of considerable within-trials variability, even where the overt behavior remains stable.

Initially, research fields tend to assume a certain degree of equality between different stimuli. However, as component analysis proceeds, it is usually recognized that stimulus complexes vary, and at this stage it becomes possible to begin categorizing different complexes. Thus, initial studies of meditation tended to make implicit assumptions about the uniformity of meditation traditions and rarely furnished precise details of the practices being studied.

three categories of meditation

One ancient division distinguishes between three categories of meditation: concentrative, receptive, and combined. Concentrative practices aim at focusing awareness on a single object only, whereas receptive meditations open awareness in a non-discriminative manner to any and all stimuli. Combined practices follow both approaches, alternating between fixed and open awareness. This division is not absolute, and there is some overlap in effects (Goleman, 1977).

a progressive component analysis

While this categorization represents a considerable advance over assumptions of equivalence, it represents only an initial stage of stimulus analysis. The next stage moves toward the simultaneous examination of greater numbers of stimulus dimensions. In view of the multi-dimensional nature of meditation an adequate description and conceptualization must necessarily entail description and measurement of as many dimensions as possible, effectively necessitating a multi-dimensional descriptive grid. Development of this aspect of research, which is a form of progressive component analysis, tends to consist of moving from a uni-dimensional to an increasingly multi-dimensional conceptualization, towards increasing specificity of description of component stimuli, and to more precise control such that experimental and control subjects differ on fewer stimulus dimensions.

As yet, there has been almost no research on meditation at this level of sophistication. However, an appreciation of this potential level of analysis is essential if adequate controls are to be employed. Thus, in a study (Smith, 1976) designed to determine whether meditation effects were due to expectancy, the experiment employed a control group who sat repeating a specific phrase. The study concluded that since

there were no detectable differences between experimental and control groups, the meditative effects were indeed due to expectation. However, this type of repetition might be viewed as a mantra, so that the control group might also be doing a form of meditation, though a different type than the experimental group.

OTHER INDEPENDENT VARIABLES

recognizing and controlling variables

The fourth stage investigates the interactions between independent variables. When other independent variables go unrecognized or uncontrolled, then they function as confounding variables which reduce the sensitivity, reliability, and validity of experimental findings. On the other hand, when they are recognized and appropriately manipulated and controlled, they then provide information on their interaction with meditation.

subject and non-subject variables

These variables can be divided into two major categories: those associated with the experimental subjects and those independent of the subjects. The major subject variables can be subsumed under the headings of genetic, sex, age, intellectual, experiential, and personality factors. Non-subject variables are limitless in number but common significant ones include such things as demand characteristics of the experimental situation, experimenter expectancy (Rosenthal effect), other forms of training given simultaneously, *etc.*

Subject variables can be examined from two perspectives, employing them as either independent or dependent variables. Where they are used as independents, then the response of pre-selected groups differing on these characteristics, *e.g.*, extroversion-introversion, can be determined. In the other case, individuals manifesting differential responsivity, *e.g.*, people who persist in meditation versus those who drop out, are compared on various subject variables. By experiments such as this, it is possible to determine the characteristics most likely to facilitate or hinder successful outcome.

As might be predicted, there has been little work done at this level. However, Osis *et al.*, (1973) and Smith (1978) found that compared with those who drop out, individuals who persist with the practice of transcendental meditation are likely to be less psychologically disturbed, to have low psychoticism scores, and to be more open to recognizing and acknowledging unfavorable personal characteristics.

Future research in this area is likely to focus especially on defining those subjects who will respond optimally, those at risk for negative effects (Walsh & Roche, 1979; Epstein & Lieff, 1981), and possible means of enhancing favorable responses, *e.g.*, matching subjects to type of practice, manipulating expectancy, provision of previous training and information (Shapiro, 1982).

MEDIATING MECHANISMS

This stage comprises the study of mechanisms involved in the production of the observed effects. In most research areas, mechanisms tend to be viewed overly simplistically and to be advanced singly and in competition with one another. Unfortunately, meditation has been no exception to this principle. However, a moment's thought suggests that there will be many mechanisms involved at all levels from the psychological to the molecular biological. A more useful approach may employ a multi-dimensional hierarchical model which acknowledges mechanisms at all levels: psychological, physiological, and chemical. From this perspective, what is viewed as a response at one level may be seen as a mechanism at another. Indeed, it may be that forms of reciprocal feedback exist such that, for example, chemical responses may mediate phenomenological changes which in turn may themselves affect physiology and chemistry. In any event, the search for *the* single mechanism is clearly an anachronistic approach reflecting an atomistic non-holistic, non-organismic, nonholocoenotic model of the universe in general and of biological systems in particular (Capra, 1975; Walsh, 1981). The recognition of an organismic model serves as a useful antidote to the common tendency towards reductionism which attempts to explain (away) meditation in terms of lower order processes only, *e.g.*, relaxation or reduced blood lactate, and to sometimes suggest that it is *nothing but* these lower order processes.

a multi-dimensional hierarchical model

Suggested psychological mechanisms include relaxation and global desensitization (Goleman, 1971), deconditioning, behavioral reactivity, heightened awareness (Walsh, 1977), dehypnosis (Walsh, 1982), behavioral self-control skills (Shapiro, 1980), and facilitation of psychological development and maturation (Wilber, 1980, 1982b). At the physiological level, suggested mechanisms include reduced arousal, hemispheric-lateralization (Pagano & Frumkin, 1977; Earle, 1981), and electroencephalographic resonance and coherence (Glueck & Stroebel, 1975). To date, no chemical mechanisms seem to have been advanced, although a number of relevant responses have been identified, *e.g.*, altera-

tions in blood hormone levels (Jevning & O'Halloran, 1982). As data accumulates, the multiple overdetermined nature of any response becomes apparent, and ultimately one is forced to a holoceenotic viewpoint of "omni-determinism" in which it is recognized that every component influences every other and the very concept of mediating mechanisms becomes meaningless (Walsh, 1981; Walsh & Vaughan, 1980).

"omni-determinism"

OVERVIEW

This model provides a context in which the evolution of meditation research can be viewed. In addition, current and future problems and limiting factors can be identified, and an overview of this field as a whole can be obtained.

It can be seen that meditation has met the criteria for acceptance as a serious area of investigation in that a broad range of significant responses have now been identified. On the other hand, a major limitation is set by the phenomenological nature of many of the most significant variables since traditional Western science has been hesitant to tackle these areas. Not surprisingly, research at subsequent levels has as yet been limited. However, an examination of the second level, *i.e.*, temporal factors, suggests a further major limitation, namely that most experimental subjects have practiced amounts of meditation which would be considered miniscule by most meditative disciplines. The complex multidimensional nature of the stimuli which comprise meditation has as yet been little recognized, a situation which must be remedied to allow for more sophisticated controls and the identification of the effective components. Studies of other independent variables may improve meditation results by such procedures as selecting and matching subjects, providing pre-trainings, expectation setting, social support, *etc.*

the phenomenological nature of variables

Finally, I would like to add two personal pleas based on my own experience as a meditator, researcher, and journal editor. The first is for researchers to begin to acquaint themselves with the Asian literature on meditation. Some of these practices span thousands of years and some of humankind's best minds have devoted themselves to this study. The result has been a voluminous literature, as yet largely untapped by Western researchers, produced by people with far greater experience and knowledge of meditation than most of us now beginning research.

importance of studying Asian meditation literature

My second plea is for researchers to have some personal experience of meditation practice. The meditative traditions

personal experience necessary for researchers

almost invariably state that intellectual understanding of the nature of the meditative process is dependent on an adequate base of personal experience. This seems to be borne out by the personal experience of researchers who have themselves undertaken the practice and also in some cases by the quality of research. In my role as a journal editor, it is sometimes painfully apparent that researchers lack direct experience when statements are made and conclusions drawn that are markedly at variance with even a basic experiential understanding.

To give an example of a problem which could have been avoided by either personal experience or familiarity with the traditional literature, I will cite the case of the controversy around the role of sleep in meditation. When EEG patterns consistent with certain stages of sleep were found in some meditators (Pagano & Frumkin, 1977; Younger *et al.*, 1975), some researchers concluded that this was the major mechanism mediating any beneficial effects and they dismissed meditation entirely. Certainly, sleepiness can occur in the initial stages of meditation as even a small amount of personal experience will show. But greater experience and the Asian literature both suggest that this is a largely transient phenomenon and a major trap for the beginning meditator. Indeed, many traditions contain detailed discussions and instructions on the need and means for overcoming what the Buddhists picturesquely call "sloth and torpor" (Goldstein, 1976). Thus, some Western researchers dismissed meditation on the basis of an epiphenomenon which meditation traditions explicitly warn against. Personal acquaintance with both the practice and its traditional literature may deepen and even be essential for our understanding of this millenia-old discipline which we are now beginning to explore.

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