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MEDITATION: RATIONALES, EXPERIMENTAL EFFECTS,
AND METHODOLOGICAL ISSUES

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides a critical evaluation of the published work on meditation. It consists of four major sections: Mystical Aspects of Meditation, Psychological Effects, Physiological Effects and Methodological Issues. It is found that Western versions of meditation diverge significantly in their rationales and purposes from the Eastern practices on which they are based. In the East, meditation is a religious practice that has spiritual goals. Although it has retained a mystical flavour in the West, it is employed primarily as a means of counteracting the stresses of modern life. This			

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application of meditation is thought to operate by inducing a state of bodily and mental relaxation mainly through the control of attention and the regulation of breathing. There is some evidence that meditative techniques have therapeutic value in protecting against the pathogenic effects of stress. However, it is not proven that they are significantly more effective than other behavioural methods for inducing relaxation. Neither are the physiological or psychological effects of meditation different from those associated with relaxation. Furthermore the effectiveness of both meditation and these other relaxation techniques appears to be strongly influenced by factors which have not been systematically investigated such as the beliefs of subjects and their confidence in the techniques.

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PREFACE

This report describes the results of a one-year investigation of Meditation. Many beneficial effects ranging from effective treatment of serious diseases, through improvements in social, business and academic progress, to personal bliss and even ecstasy, are claimed for the practice of meditation. Its more ardent proponents go so far as to suggest that the universal practice of meditation provides a key to world peace. Extravagant claims of this sort are not unusual in the domains of religion and politics. What differentiates the claims of meditation from those emanating from these more traditional sources, is that they purport to be based upon publically-verifiable evidence. Certain Western brands of meditation have encouraged and supported research and this has led to the accumulation of a substantial database. What follows represents an attempt to distill the major features contained in this database. Neither of the authors of this report have meditated or conducted experimental research on meditation. Therefore, before embarking on this enterprise it was necessary to generate an understanding of the nature and scope of the subject.

This difficult matter is broached in the first section. The roots of current Western meditational practices are found in cultures that are quite remote from our own. Certain features of meditation have been extracted from Eastern cultures where they are indigenous and imported into the West. However with cultural transplantation, the Eastern practices have been redefined and only the most primitive vestiges of their initial purposes remain in the Western versions. The complexity of this issue is illustrated by an attempt to represent the rationale and goals of Eastern meditative practices. Although the mystical tradition of the East is more profound than that of the West, mysticism does have a place in Western thought. This may have provided a foothold for the rapid expansion of meditative practices in the West over the past 20 years.

The second section deals with psychological processes that are allied to Meditation. Psychology has a natural and historical interest in the subject. After all, meditation claims to be a method for influencing consciousness through the regulation of attention. Furthermore, in its Western incarnation, Meditation has been promoted as a powerful psychotherapeutic method. In the case of Transcendental Meditation at least, a state of deep bodily and mental relaxation has been claimed. The reliable induction of such a state to counteract the pathogenic effects of stress would have great therapeutic potential. An appreciable scientific literature devoted to examining the efficacy of meditation as psychotherapy has grown up. Meditation is also of interest to psychologists because it provides detailed accounts of the behavioural procedures necessary for its induction. This opens a potential route for exploring the links between behaviour and consciousness.

Pathways that may support such links have been most explicitly described in physiological terms. It is therefore unsurprising that physiological researchers have taken an active interest in Meditation. One of the most cogent forces in directing their attention to this subject were claims of improbable, but empirically-testable, feats performed by practitioners of meditation. Many of these feats defy the Western scientific view of what is biologically feasible and yet they appear to have been verified by scientists employing currently-accepted standard methods of observation and measurement. The third section examines the evidence for these and other physiological changes that have been associated with meditation.

The final major section of the report examines methodological issues that arise in attempts to generate scientific evidence of the effects of meditation. Many of the problems encountered are similar to those associated with research in clinical psychology and psychophysiology. Some of them may be resolved by the adoption of recommended procedures of investigation. Others, which relate to the intrusion of belief and commitment in determining therapeutic outcome are more intractable.

Although our studies have taken in only a fraction of the available publications on the subject, it will be seen from the bibliography that more than 300 articles and books have been examined. Meditation is a complex subject that touches on a numerous interesting and potentially important questions. It is hoped that this report will provide the reader with an unbiased view of the current state of the art.



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I. MYSTICAL ASPECTS OF MEDITATION

Introduction

Meditation as a practice, technique, process, state of mind, or means of salvation has always been a fundamental part of Buddhism, the most psychologically developed of the world's religious faiths. Although precise knowledge of its origins have been lost, the practice of meditation has long been associated with the Indian subcontinent and its environs. From there, the practice spread into Tibet, China, Southeast Asia, Japan and what is today Indonesia. A feature reflected by this expansion into other cultures and geographic areas is a remarkable ability to adapt to diverse civilizations and to coexist with other religions. However, there has been less assimilation with Islam and Christianity where meditative techniques competed more directly with other methods of salvation. Western religions, nonetheless, contain certain analogous practices which have similar goals. The process of assimilation has led to shifts of interest, in doctrine and modification of techniques. This has contributed to the many confusions surrounding the nature of meditation.

Currently, such confusions extend even to the amount of information available for study. For example, on one hand, when contrasting Eastern and Western approaches to meditation, some authors describe "a voluminous literature devoted to meditation, mostly in English" (Nalimov, 1982, p.127), while on the other hand, Buddhist scholars have noted that the "... European literature on Buddhist meditation is not very considerable. What there is deals either with practices of the Southern Theravadin school ..." (Conze, 1972, p.26) and of at least 17 anthologies in English alone, each "is woefully inadequate and inevitably omits far more than it includes" (Conze, 1959, p.11). Furthermore, it has been pointed out that different systems of meditation promote approaches and practices which are not only varied but also in conflict, and this has led to no definition of meditation being universally accepted (Goleman, 1977).

The Shorter Oxford English Dictionary (SOED) defines Meditation as sustained reflection or mental contemplation, especially concerning some religious truth. The verb 'to meditate' means 'to exercise the mind in thought/contemplation', especially devotional contemplation (1560); 'to reflect upon, study, or ponder' (1580); 'to design mentally, plan by revolving in the mind' (1591). By 1609 it meant 'to think' and this connotation is reflected in the publication of the 'Meditations' of Rene Descartes addressing the philosophy and methods of science. Later in 1700, 'to observe with intentness' was added (SOED, II p.1300).

Other major dictionaries do not deviate significantly from this authority; each employing definitions consistent with Eastern traditions in the sense that meditation is perceived to be principally a mental process. However, Occidental interpretations of such events differ from those of the Orient, where it is denied that meditation involves thought, reflection or contemplation. Indeed, Buddhists propose that 'stoppage of thought' is a necessary precondition for serious advancement in the practice of meditation. Moreover, the compilers of the SOED do not give 'religious truth' the emphasis implicit in Buddhism, although it is acknowledged that this may be a goal of meditation.

Speciality dictionaries further embellish definitions of meditation. English & English (1958) introduced additional criteria to the definition in their dictionary of psychological and psychoanalytical terms. In this, not only is meditation 'serious and sustained reflection or contemplation', in accordance with the SOED, but it is also 'a quiet and relaxed state'; an aspect of meditation that is typically emphasized by the psychological and psychotherapeutic communities.

Such an expansion of the term highlights the growing Western view of meditation as a physiological, as well as a psychological phenomenon. Nevertheless, this definition does not involve the mystical goal of orthodox Buddhist and Yogic meditators - spiritual enlightenment: a goal achieved through mystical union with the Divine, which in turn, led ultimately to final 'release' or 'liberation' from the perceived limitations of human existence. The term 'mystical' has been commonly used to describe states of consciousness involving feelings of 'bliss', 'love', 'unity' a sense of sacredness, altered perception of space and time and an enhanced sense of reality, authenticity and meaning (Stace, 1960).

Conze (1959) noted the vagueness of the term 'meditation', and stressed that serious meditation could only progress if strict procedures are followed in its practice. If these are put aside, then the aspirant is engaging not in meditation but in something else, perhaps a relaxation technique. However, predominantly Eastern practices have appeared in the West in a much simpler and modified form known as Transcendental Meditation (TM). This type of meditation claims to offer many of the rewards of the more traditional versions without demanding adherence to strict and austere lifestyles. In this, emphasis is placed on the relaxation value of TM at the expense of spiritual enlightenment.

As beliefs and expectations have a direct bearing on psychological and psychiatric research, the mystical features of the Buddhist world view are fundamental to of the practice of meditation. As a salvation methodology, it was instituted for normal adults within the parent society, and not as a therapeutic technique for the physically or mentally ill. In the West, however, the therapeutic promise of meditation has provided the impetus for scientific research, whereas the mystical goals representing the belief system of its original practitioners have been ignored. Thus the concept has been wholly transmogrified. Given these considerations, meditation may be more clearly understood within the world view that it involves.

A. Eastern Mysticism

Although meditation is practiced by a number of Eastern religions, it is an essential of Buddhism and more is written about it in the context of this religion. Buddhism does not concern itself with many issues central to the Christian experience. Questions surrounding the existence of God, the limits of his power and the creation of the universe have no direct bearing on the practice of Buddhism. In Buddhism the universe was not created but has always existed, with neither beginning nor end. However it experiences repeating cycles of change which sequentially pass through periods of origination, duration, destruction, and annihilation. Events occurring within these cycles are caused. The universe is not ruled by the caprice of any god or group of gods, but functions according to the dictates of impersonal laws, the nature of which are only knowable through the practice of meditation.

Conze (1972) has dealt with Buddhist meditation in detail, and his efforts will be drawn upon here, unless otherwise stated. This position is justified on the grounds of his pre-eminence as a Buddhist scholar, being a "Peerless analyst of all sects of Buddhism, being well-versed in Pali, Sanskrit, Chinese, Tibetan, Mongolian, and Japanese" (Peiris, 1973, p.70). Also, Conze saw himself as a translator rather than an interpreter of Buddhist Texts. Other major commentaries - Vajiranana, 1975; Nyanaponika, 1962 - do not diverge significantly from his presentations.

Buddhist meditations, as expounded in the Pali Canon, are based largely upon the experience of Siddhartha Gautama (Gotama) who was the Master Meditator and Founder of Buddhism. In addition to the Canons, there are three major works in post-canonical (Theravadin) literature which specifically address meditation at length and are frequently cited in the literature:

- i) Path of Purity is the unchallenged authority on meditation from the position of the Mahavihara sect and contains over 550 pages devoted to the topic.
- ii) Path to Liberation describes meditation from the position of the Abhayagiravadin sect. It predated, but was possibly eclipsed by, Path of Purity.
- iii) Manual of a Mystic is a much later Ceylonese handbook.

In this context the Yoga Sutra of Patanjali, also heavily cited by meditational researchers, should be mentioned. This is a meditational manual in the yoga tradition, the authority of which is equivalent to the Path of Purity in Buddhism.

The practice of Yoga has been closely associated with both meditation and the use of physical exercises to induce altered states of consciousness. The word 'yoga' is often translated from Sanskrit as 'union', meaning a union of the Individual 'Self' with the Absolute Cosmic 'Self' or Being - the ultimate substrate of reality. This union is achieved in such a way as to allow unenlightened human nature to be 'joined to', and transformed by the Divine nature. In addition to yoga meaning 'yoke' in the sense of linking human nature to the Divine, Sanskrit also defines yoga as 'meditation' or 'going into a trance' (Evans-Wentz, 1958; Conze, 1972). In the Yoga Sutras of Patanjali, Yoga represents an attempt to promote 'pure consciousness', that is, consciousness without object or content. Yoga is not only a set of mystical beliefs, however, but also a method for achieving psychological and bodily health.

Even a superficial examination of these sources reveals meditation to be a complex matter involving every dimension of life. For example, in India reincarnation or rebirth is widely accepted and expressed through KARMA, the doctrine of 'acts' or 'deeds'. According to this doctrine, good behaviour brings pleasant results, while bad behaviour is associated with evil consequences. The acts performed in one's present life shape the existence of the individual in subsequent reincarnations. The belief in karma and rebirth reinforces the idea that people could be born in good and bad places, that is, in one of the three assumed levels of existence - the immaterial plane, the material plane, or the plane of desire. The latter plane corresponds to our natural world, the world of samsara, which is inhabited by six types of beings; men, departed spirits, animals, gods, demons and infernal creatures. In principle, excepting departed spirits, an individual could be reborn as any one of these types. However, it is considered most favourable to be reborn as a human since human birth provides the individual with a privileged chance to attain spiritual knowledge.

(1) Basic Beliefs

The doctrine of the Four Noble Truths is fundamental to the practice of Buddhism and is held in common by all its various sects and schools. Firstly, Gautama argued that one must recognise that universal suffering is the central feature of the everyday world - the world of samsara. Secondly, like all other aspects of the phenomenal world, such suffering is caused, principally by the innate predisposition to desire, 'cling' or 'grasp' for pleasure, rebirth (becoming), etc. which are expressed in bodily actions, speech and mind. Third is the realization that escape from this situation is possible and fourth that meditation is the only means of implementing 'release' from the conditions of suffering and rebirth.

In the Buddhist view only the ignorant and deluded tolerate self-inflicted pain and are born again to suffering. These realizations are, therefore, necessary steps in the practice of meditation and for salvation from the world. In turn, aspirants must set about purifying their minds, speech and behaviour - the Noble Eightfold Path. The details of the purification procedure, and other aspects of Buddhism, need not be explored here. Suffice it to say that moral purification (sila or sati) - mindfulness - allegedly permits control of speech and behaviour, but meditation calms, controls and enlightens the mind. Hence, it has been noted that:

" 'Meditation' is a European term which covers three different things, always clearly distinguished by the Buddhists themselves, i.e., mindfulness, concentration and wisdom. Their mutual relation is not at once obvious to Westerners unfamiliar with the tradition and terminology."

(Conze, 1972, p.16.)

Mindfulness (sati), which Nyanaponika Thera (1962) has called the 'heart of Buddhist meditation', concerns the initial stages of meditation, and functions to induce calm and aid 'insight' or wisdom (panna) which is developed on the basis of concentration (samadhi).

Buddhists assert that individual existence in space-time is possible only through the presence of some degree of greed-hatred delusion. If this delusion is totally transcended, then Cosmic existence is obtained and individual existence ceases. The characterology essays of both Pali and Chinese sources distinguish six types of human behaviour associated respectively with greed, hate, delusions, and fidelity, intelligence, discursion. The connotations carried by these terms are not identical to those of the West however, as they refer to behaviour totally on a spiritual plane.

Not only are the abundance or dearth of the six behavioural characteristics assessed in the aspirant meditator, but posture, attitude to work and food, 'the way they look at things', and mental states are evaluated from a spiritual perspective. Thus, great efforts are made to ensure that the meditations assigned to novices are appropriate to the characteristics and temperaments of those who undertake them. These are often discussed as three pairs of characteristics, in which each dyad share many common attributes; greedy and faithful characteristics go together as do hateful-intelligent, and deluded-discursive.

Hence, before spiritual concentration can commence, the turmoil caused by: 1) the senses, 2) the passions, and 3) discursive thinking, must be suppressed. This may be accomplished by using the '40 subjects' of meditation, which include colours, earth, water, corpses in various stages of decay, recollections of death and morality, friendliness, compassion and 'stations' of unlimited consciousness, among others. Amongst these subjects, individuals of different temperaments will usually find a topic suitable for meditation.

(ii) The Goals of Buddhist Meditation

In traditional Buddhist Scriptures the sage Nagasena spoke of 28 'advantages of meditation'. Thus, meditation induces longevity, strength, good repute, confidence, contentment, gladness and joy among other things. Moreover, the practice was also said to eliminate fear, pride, sloth, faults, ill-fame, and to abolish 'rebirth in the world of becoming' (Conze, 1959). Although breaking the cycle of death and rebirth is the ultimate aspiration of meditators, incidental phenomena denoting psychological and physiological health have provided the greatest attraction to contemporary scientific researchers. The psychophysiological stability purportedly induced by the practice of meditation was seen to generalize to all occasions. This state of internal balance produced a subjective freedom from fear traditionally known as the 'Lion's Roar' of the monks. When denuded of their religious connotations, the demonstration and study of these effects falls within the domain of psychology and physiology.

However, the scientific investigation of meditation has proven more difficult than it first appeared. People of the West have often viewed the practice of meditation as 'unrealistic', probably because serious efforts in this direction require withdrawal from the world and human affairs.

This perception of meditation is quite legitimate: Buddhist canonical scriptures consistently maintain that participation in the everyday world virtually precludes the proper practice of meditation. On this point Conze (1972) noted that:

"The upper ranges of the virtues of mindfulness, concentration and wisdom demand a reformation of the conduct of life which is greater than any layman is willing to undertake. The higher mindfulness, and nearly the whole range of concentration and wisdom, presuppose a degree of withdrawal from the world which is incompatible with the life of an ordinary citizen. Those who are unwilling to make the sacrifices necessary to achieve a radical seclusion from the world can practise these virtues only in very rudimentary form. It is quite idle to pretend that they do not involve a complete break with the established habits of life and thought"

(Conze, 1972, p.38-39)

In this context, wisdom means 'insight' (vipassana) which is the knowledge of things as they really are. In essence, wisdom is the complete lack of spiritual ignorance, and becomes an attribute of mind. Obtaining wisdom permits true reality to be ascertained - a reality fundamentally different from the everyday, common-sensical world.

The Canons are quite clear in stating that the ultimate goal of meditation, a state of liberation called Nirvana, can only be attained during moments of deep 'insight' (vipassana), although this does not necessarily happen. If full insight is achieved however, it may be a direct step to complete liberation. It is not a mere intellectual appreciation or conceptual knowledge of these characteristics, but a direct experience of them which is obtained and mastered through repeated meditations. These reputed attributes of vipassana and other meditations are currently holding the attention of the Western psychiatric community. Together with Yogic techniques, Buddhist meditations are increasingly contributing to Western psychological doctrine and therapeutic practice. This reception by the clinical community in particular is partly based on the observation that 'life style' is a significant predictor of premature mortality, and is implicated in the top ten causes of death in the West. As both techniques involve a degree of self-discipline concerning all aspects of behaviour rarely seen in the lay population, Western researchers are turning to the study of techniques requiring a rigorous control of life style.

Such constraints have usually only been met by monks who believe that spiritual improvement of mankind is slowly achieved through the gradual accumulation of 'merit', a produce of worthy behaviour (the Law of Karma). The prescribed meritorious acts usually concern morality, and in this respect they are similar, in content and tone, to the ten commandments of Christianity. Engagement in a wide variety of behaviours may accumulate 'merit' for present and future lives. However, meditation is advocated as being the most efficient means of making rapid progress towards ultimate reality with some forms of meditation being recognized as more expeditious than others.

Six years of intense meditation were required by Gotama to become 'Enlightened', the necessary step to Buddhahood. Gotama achieved complete spiritual knowledge while practicing 'mindfulness of breathing'. It was through this meditation that he achieved final control over mind and body. Thus prepared, he met and transcended Mara, the King of Passions as well as his sons: Gaiety, Caprice and Wantonness, and his daughters: Discontent, Pleasure and Thirst. Just as Christ refused the Devil in the desert, so Gotama ignored both Mara and his family. Buddhist scriptures have noted that this occasion was accompanied by the complete extinction of selfishness and evil desire. He is said to have subsequently experienced ultimate reality, after which he spoke:

"Neither sorrow nor the conflict of this world
Nor Mara nor his daughters nor his army
Could shake my will. They are destroyed forever.
Let ever man try with will unflinching
To seek out Wisdom, he will surely obtain it.
When once he has it then farewell to sorrow,
For sin and guilt will forever vanish."

(Rawding, 1975, p.30)

The 'wisdom' spoken of here, refers to the full spiritual knowledge arrived at through meditation and mindfulness of breathing. This knowledge necessarily led to peace and tranquillity, among other things. All acts of Gotama were directed toward the goal of spiritual enlightenment, those not so focused were considered a waste of time. Henceforth, the practice of meditation was considered primary to all human behaviour by those who followed him.

In the opinion of Nyanaponika (1962) concentration on mindfulness of respiration, cultivated and practiced, led to peace and happiness; immediately causing every 'evil thought' to disappear. The Scriptures elaborate sixteen methods by which mindfulness of breathing may be practiced. These progressively involve the detachment and rotation of consciousness through different bodily parts, while remaining 'mindful' of breathing.

All but the most simple of these are not recommended for the average meditator, and need not be elaborated here. Progress in concentration however, acquired by this meditation, is believed to be an important aspect of physical and mental health, although from the Buddhist viewpoint such effects are only incidental to the practice.

(iii) Respiratory Manoeuvres and Postures

'Mindfulness of breathing' requires the adoption of its complimentary posture; the Lotus position. This posture was used by the Buddha when he engaged in this meditation and in turn, it has become the posture of choice for all meditative subjects. In this position the meditator sits cross-legged with the soles of the feet facing upward. The outsides of the feet rest on each contralateral thigh, preferably near the crotch. The spine is maintained as near vertical as possible, and the arms are extended so that the hands rest on the knees. The thumbs of each hand may be in contact with one of the fingers of the same hand. As with the spine, the head is held vertical. The gaze is lowered through either half-closed or fully-closed eyes, with 'mindfulness' pointed ahead (attention focused on the end of the nose or on an imaginary point between the eyebrows).

The lotus posture is reputedly difficult for Westerners to master, and more often the 'half-lotus' is used in these cases. The 'half-lotus' is identical to the lotus except that only one foot is placed on the contralateral thigh; the other foot is tucked underneath its opposite thigh. In other versions of the posture, the buttocks rest on a cushion instead of the floor, and the hands may be folded in the lap instead of resting on the knees. The half-lotus posture is deemed particularly beneficial to novice meditators and, thus, to Westerners. The exact combination of meditative subject and posture prescribed for a given meditator depends upon individual characteristics which are assessed by a meditational instructor (guru).

In mindfulness of breathing, attention is initially restricted to the sensation of breathing. All other mental activity is considered intrusive and distracting: if the mind 'wanders', it is brought back to the breathing. With practice, a host of psychophysiological changes occur, including altered states of consciousness and deep relaxation. When 'mindfulness' has been mastered however, attention may detach itself from the sensation of breathing to observe the development of patterns of thought and other mental 'habits'.

The meditational techniques practiced most often in the West however, for example TM which is 'effortless' and requires only brief periods of practice, may bear little similarity to those

discussed in the Buddhist literature. Nevertheless, it is often asserted that meditations, in both the Buddhist and Hindu mode, may be tailored to the needs of Western man. This has led to the assimilation of many technical terms from Buddhist meditation into various Western 'styles'. Such an endeavour should proceed with caution, for although Buddhism is equipped with numerous terms, many defy accurate translation. Rhys Davids, an eminent Pali scholar, during the initial translations of Canonical literature, confessed that it was difficult, if indeed possible, to find any single English word for a Pali which would convey its full force without distorting its connotations (Rhys Davids, 1965).

B. Transcendental Meditation

In contrast to the views of Buddhist meditators, Maharishi Mahesh Yogi has presented Transcendental Meditation (TM) as a natural, automatic process by which attention may be brought to the level of 'Transcendental Being'. This state lies 'beyond' the ordinary senses of vision, audition, olfaction, taste, and proprioception - indeed, 'beyond' all thinking and feeling. In common with mainstream Hinduism, both subjective and objective existence are considered to be relative, and are subsumed under the permanent domain of Being. This is assumed to be a state of pure consciousness - termed 'God' or 'Bliss' consciousness by Maharishi, and asserted to be the source of all those events that, when experienced at the conscious level, are known as thoughts. This state cannot be experienced at the level of thinking or sensory perception, but may easily be experienced through the system of TM. Indeed, the direct experience of TM is claimed to supercede all other types of knowledge of the meditative state - including scientific knowledge.

It is claimed that TM progressively enables thought to be experienced in its 'initial stages' of development. With practice, the source of thought is experienced - the transcendental 'field of being'. The mind is seen to be automatically drawn towards the 'bliss-consciousness' of Absolute Being by increasingly experiencing the 'charm' of the journey. This charm is derived from the natural tendency towards 'greater happiness', an experience which is asserted to be pleasant to all minds. Hence, "The mind is charmed and so is led to experience Transcendental Being" (Maharishi, 1966, p.55).

In 1958, Maharishi Mahesh Yogi founded the Spiritual Regeneration Movement (SRM) with its world headquarters and an Academy of Meditation at Rishikesh in northern India. Dedicated to the spiritual improvement of mankind, the SRM attempted to explain the universe in terms of the Science of Creative Intelligence (SCI) or its equivalent, the science of Being: a 'science' claimed to be "much more valuable for human life than

all the sciences known so far" (Mararishi, 1966, p. 21). It embodies the principles of TM for the purposes of expanding consciousness and contacting absolute, unmanifested Being. Reasoning very much in the Hindu mode, Mararishi offered TM ultimately as an instrument to unite individual being with Universal Being, in which breathing was seen as a direct link between the individual and the Divine.

It should be pointed out, however, that TM is viewed as the 'practical side' of the mystical concept of SCI. Creative Intelligence allegedly pervades all nature - atoms, animals, men, stars, etc. The practice of TM enables aspirants to experience directly the source of creative intelligence within themselves. The proper application of SCI is claimed to possess unlimited potential for good within the human species. We do not possess sufficient knowledge of SCI to make worthy comment but it seems that Mararishi Mahesh Yogi presents it as a solution to the 'chaos of experimentation and speculation' which he asserts abounds in Western science.

In a well-managed campaign Maharishi brought TM to the West and called for its concerted scientific study, thus fulfilling Jung's criterion (discussed in Chapter II) for the acceptance of meditation in the West:

"The field of Being, or absolute existence, was for many centuries considered in terms of mysticism. The present scientific age hesitates to assign value to anything shrouded in the garb of mysticism, and that is why the study of Being, the absolute field of creation, has not been a part of any branch of science until now.

The growth of scientific thinking in the present generation has brought Being to the level of scientific study and scrutiny. The present work [The Science of Being and the Art of Living] is the first of its kind in the long history of human thought."

(Maharishi, 1966, p.20-21)

In Appendix I of that work it is claimed that TM, as a technique for enlarging the conscious mind, is a 'purely scientific method' because it is: (i) systematic, (ii) not opposed to any methods of scientific investigation, (iii) universal in its application, (iv) open to verification by personal experience, and (v) the end result is found to be the same by everyone.

Although there are many parallels between Buddhist mystical perspectives and those of TM, the practical implementation of the respective techniques could hardly be more different. For example Buddhist meditational practices require marked changes in life style and personal habits; great dedication is expected of

monks and, with experience, periods of meditation may increase significantly. Given the rigours of Buddhist meditations great caution is exercised in the selection of monks and in the topics which are chosen for their meditations.

In contrast, TM is 'effortless' and may be practiced for short periods by all and sundry, to the benefit of all. Moreover, mystical and metaphysical features, so important in Buddhism, have been de-emphasized in TM. Indeed, practitioners of TM assert that religious preference and beliefs do not impact on the practice of TM. Typically, TM appears to the scientific and lay communities as an automatic relaxation technique capable of 'de-stressing' the nervous system, an effect claimed by most types of meditation but considered trivial by Buddhists.

Maharishi launched a 'World Plan' in 1972 to save a spiritually impoverished mankind and this program has been extremely successful in drawing prospective meditators, at least in the Western world. There has been enthusiastic and largely uncritical acceptance of TM doctrine, and the subsequent enunciation of untempered views may have been aided and abetted by the fact that meditative traditions also appear in some forms of Christianity. These traditions have not gained an ascendancy equal to those of meditation in the East, although Christian mysticism does possess a long history and is supported by a rich literature.

C. Western Mysticism

(1) Christianity

Meditative practices have been most prominent in Eastern Christianity, where union with God was accepted as the goal of Christian life. Indeed, in mystical traditions the goal of such techniques has been to merge the meditator and the object of meditation, thereby transcending the subject/object distinction. Traditions within the Greek Orthodox Church, especially in Russia, have also incorporated the practice of techniques which were similar to those of mainstream Hinduism, except for the identity of a deity to which prayers or chants were continuously directed. For example, the 'hesychasm' tradition practiced a variously worded prayer involving the name of Jesus Christ (Jesus's Prayer) whose repetition was linked to respiratory movements. Traditionally the practice could become so automatized that the tongue itself could seem to repeat the prayer - leading to a possible state of 'permanent prayer' (Nalimov, 1982).

Another tradition, the Prayer of the Heart, also involved breathing exercises during the constant recitation of a word or prayer. Attention was focused on rhythmical breathing, vocalizations and movements which purportedly induced a state of unassailability to 'suggestions' leading to Divine love (Ornstein, 1977). Similarly, Ornstein (1977) has drawn attention to parallels between the meditative techniques of Zen and Yoga and the repetitive chants of Hasidian and Cabalistic traditions of Judaism. Traditionally, meditation and prayer were largely devoted to inducing religious experiences in practitioners.

In Western Christianity mystical experiences have been viewed with greater caution. Although some mystics, St Teresa, St John of the Cross, and St Paul, have been elevated to sainthood in the Roman Catholic Church, others, Meister Eckhart for example, have been prohibited by papal bull. Nonetheless, meditation, especially as contemplation, was accepted by Christians provided it was guided by the teachings of the Church. Indeed, possibly the best known of Christian spiritual methods, the 'Spiritual Exercises' of St Ignatius Loyola, were based on a discursive or reflective form of mental prayer.

Meditation, however, has also been said to differ from prayer "in that prayer is predominantly a verbal (silent or vocal) turning to an external deity. Meditation is not necessarily directed to a deity, but is more concerned with inducing changes within the meditator himself" (Osis, *et al.* 1973, p.109). Other accounts of the practice of meditation within Christianity have noted the many variants of 'prayer' and other devotionals were designed to produce psychological and behavioural changes within the practitioner (Nalimov, 1982). Regardless of varying points of view, the general climate of opinion is that the world-view held by those experiencing meditation is largely responsible for the varying descriptions of meditative states. These themes are developed in the more informative accounts of the practice of meditation within Christianity which may be found in Goleman (1972), Ornstein (1977), Nalimov (1982), and Benson (1975, 1978).

(11) Spiritualism

In addition to Christian perceptions, various Spiritualistic movements have done much to establish the popular image of meditation in the West. Foremost among these have been such organizations as the Theosophy Society, founded in New York in 1875. This society laid the foundations for late nineteenth and early twentieth century American Spiritualism and was a major force in presenting the religious and philosophical wisdom of the East to Western societies. Early on it was comprised of a diverse group of well-travelled members including such prominent

Americans as Thomas Edison and Albert Doubleday. Later, it attracted first rate intellectuals such as the renowned linguist Benjamin Lee Whorff. However, its guiding light was Helena Petrovna Blavatsky or HPB as she preferred to be known.

HPB believed that it was her 'mission' to impart to the Western world the 'Ancient Wisdom' of the East. In doing so, she argued that the world's religions were but surface phenomena of underlying universal principles. These included a Universal Mind or Soul as the source of all reality and its derivatives, matter and spirit from whose union consciousness was born. These Theosophical views were often an indiscriminate mixture of philosophy, religion and spiritualistic speculation, and tended to legitimise their teachings by looking to ancient and distant examples.

Hanson (1976) summarized the Theosophical interpretation of meditation as articulated by H.P.B. to the London 'inner group' in 1887:

The aspirant was asked to meditate 'logically and consistently' on various states of consciousness in relation to the Universal Mind or UNITY. This would reveal that the normal state of consciousness was shaped by acquisitions and deprivations, which in turn were meditated upon.

Deprivations included sensations, personality, possessions and 'distinctions' such as those between friend and foe, separations and meetings, etc. These were products of self-delusion: meditation involved the continuous denial of their reality and ended with the realization that individuals were without attributes.

Meditation on Acquisitions promoted the development of altered perceptions, attitudes and memory. Acquiring 'universal' memory banished all dread, acquiring new perceptions concerned the recognition of the 'limitation' of all embodied beings and acquiring different attitudes involved the adoption of a 'constant calm' or mentality of 'equilibrium' toward all existing things which was 'neither love, hate or indifference'. This mediation was completed when the meditator was 'all Space and Time'.

Similarly, more recent Theosophical formulations of meditation characterize it as "...the disciplined exercise of awareness, utilizing such processes as recollecting, imagining, and logically and creatively thinking, or intuitively perceiving, which leads to comprehension of a subject within an inclusive conceptual framework" (Roof, 1976, p.78). The goal of such meditations was self-knowledge, personal growth, freedom and creativity among other things.

Other Western spiritualistic views of meditation have show a greater concern for bringing the meditator and God into closer union. For example, Sechrist (1974) drew a distinction between prayer and meditation, in that prayer is direct supplication to God whereas meditation is the 'key' to establishing receptive communication with Him. This is accomplished because meditation attunes:

"...ourselves mentally, physically and spiritually to the spirit within and without so that God may speak to us! It is simply a process of stilling ourselves mentally and physically in order to listen, to become aware, to feel His presence and to receive His guidance and His strength."

(Sechrist, 1974, p.11)

Dunlop (1948) has also acknowledged close links between God and meditation in Western spiritualism. Her 'contemplative' type of meditation involved concentration in the sense that a mantra-like technique was used to prevent the intrusion of 'other thoughts' into the field of consciousness; successful practice "will help bring about the rebirth of the whole consciousness" (Dunlop, 1948, p.50). Here it was not thinking, but a process whose goal was the expansion of consciousness of God. Hence, excepting Theosophical opinions, many spiritual interpretations of meditation thought it to be made up of physical, psychological and metaphysical processes which are a special form of concentration which focused exclusively on thoughts of God.

D. Discussion

Historically the practice of meditation has its roots in India, but today advocates and practitioners are found worldwide. The act of meditating has been primarily perceived as a mental process, although it includes physical activities such as breath control and the maintenance of certain postures. Traditional literature has repeatedly asserted that the psychological and physiological effects of meditation were intimately bound up with respiration. Hence meditation concerned not only the 'mind', but functions and behaviours of the body as well.

In the East, claims regarding the effects of meditation have followed from the metaphysical assumptions made by practitioners concerning the nature of reality, human and otherwise. Govinda (1976) noted that from the Buddhist's perspective:

"The precondition of ... meditation is the recognition of divine or eternal qualities in man, qualities whose awakening or realization constitutes the aim of religious

life. If we do not believe in a supreme, all-transcending value, inherent in man and attainable by him, then the very reason and starting point for any kind of spiritual aspiration is missing."

(Govinda, 1976, p.14)

Within this mystical context, the rapid spiritual improvement of mankind is believed to be assisted only by a demanding engagement in meditation. Hence, profound alterations in states of consciousness, held to be induced by these techniques, have been closely linked with increased spiritual knowledge by practitioners. As greater spirituality was seen as the most treasured aspect of human existence, meditation became a most useful human activity. Moreover, many other claims have emerged for its practice including the achievement of psychological well-being, emotional stability, and elimination of negative affect.

Eastern Christianity, Islam, Judaism and to a lesser extent Western Christianity have promoted meditation as a means of experiencing the presence of 'God' within the meditator. These and other resemblances to Eastern meditations may be found in the practice of contemplation, prayer and chanting. Universally, changes in states of consciousness which were induced by these techniques were highly valued and greatly enhanced the spirituality of those experiencing them, regardless of their preferences.

More recently practices have emerged in the West in simpler, modified forms. For example, the highly popular type of meditation known as TM has offered many of the rewards of the more traditional versions without requiring adherence to strict and austere lifestyles. By virtue of its foundations in Yoga and mainstream Hinduism, TM carried a heavy mystical component. However, emphasis was placed on the relaxation value of TM at the expense of spiritual enlightenment. This aspect of TM was promoted to counter some Western perceptions that the practice of meditation was incompatible with everyday life.

Such perceptions usually revolve around 'withdrawal from the world' either psychologically and or physically. Jung pointed out that the active pursuit of introverted practices may diminish individual capacity to interact realistically within society. Sociologically, this notion has been incorporated into major works concerning mysticism, meditation and other types of behaviour. Weber (1963), for example, thought that the salvation-seeking mystic used techniques which required the exclusion of most if not all 'everyday mundane interest'. Furthermore, he suggested that values of universal love, searches for ultimate meaning, and the deeply private nature of mystical practices virtually precluded participation in the important

political and economic activities of Western society.

However in some segments of the population, the practice of meditation may coexist with political activism. Wuthnow (1978) examined the relationship between mystical and political behaviours in the San Francisco Bay area and noted that these are not necessarily incompatible. Drawing on historical and tentative empirical evidence, he concluded that mysticism and political activism may flourish together if secular corridors of power are accessible and social roles are relatively undifferentiated. Thus given a nourishing environment, which is apparently provided by some segments of American society, political involvement may become a legitimate pursuit of the meditator.

The Western perception that meditation involves a full-time commitment, is not consistent with all variants of the practice. For example, in Sri Lanka, the 'home' of Buddhist meditation, practitioners seem to hold paradoxical views. Sinhalese take Buddhist religious practices very seriously and support over 7000 temples and 21000 monks. Nevertheless, Maquet (1975) reported that while meditation was held to be essential to the Buddhist way of life, it was largely unpracticed. Similarly, the ultimate goal of life, complete 'liberation' - Nirvana, was considered by most (85%) of the respondents to be beyond acquisition in this life and the next few rebirths. Thus whereas meditation may be the vehicle to salvation, rigorous practice may be indefinitely postponed. Improved probability of a rewarding present life and higher rebirth by karmic merit, was considered a good compromise route to ultimate release. Therefore as the rewards of the practice of meditation have attracted an increasing number of eager aspirants in the West, in societies where such are indigenous, the attitude seems to be more practical.

Important contributions have emerged from the hard sciences concerning meditative states and other altered states of consciousness. Gellhorn and Kiely (1974) in particular, attempted to account for meditative states and other altered states of consciousness within the framework of orthodox neurophysiology. Drawing on both physiological and clinical evidence these authors conjectured that such states were derived from changes of cortical and subcortical activity of the central nervous system. Peripherally, muscular relaxation also contributed to their manifestation. Exchanges in the literature (Miles & Campbell, 1974; Kiely, 1974) subsequently brought into sharp focus the possible impact of philosophical, psychological and physiological assumptions on scientific research and explanation of the different types of meditative procedures.

Moreover, in a review of 'mystical states of consciousness', Davidson (1976) restated the proposals of Gellhorn & Kiely (1974), and summarized many of the problems encountered in their scientific study. Prominent among these are the variety of 'full blown' mystical experiences and the vague nature of their verbal description. For example, experimental studies directed at characterizing meditation have frequently reported subjective feelings of 'disembodiment', 'floating' and distortions of space and time (West, 1980, Tart, 1972). Such terms however, were considered "outside the framework of current scientific discourse" (Davidson, 1976, p.308).

Movements as diverse as Buddhist and transcendental meditation, Theosophy, and Jungian and Transpersonal psychologies have emphasized intrapsychic aspects of reality and the alienation of the individual psyche from its cosmic environment. Furthermore, meditation is seen by these to be the method of choice in overcoming this isolation, offering freedom from cares and woes, suffering and pain in exchange for happiness and delight, compassion and ecstasy.

Presently, popular interest in the various aspects of meditation has led to a proliferation of instruction manuals, guides and other 'textbooks' on the subject. The quality of these vary considerably, ranging from simple presentations which may promise almost instant effects to complex restatements of ancient disciplines. Meditation and mystical states of consciousness however, involve ill-defined concepts which are used on several levels of discourse and open to many interpretations. Conflicting world views and life-styles also greatly influence the degree of exposure, acceptance and practice of meditation. Therefore, the types of meditation which are practiced in the West have been simplified. By Eastern standards, these tend to be elementary exercises with limited goals, to the point that it has been suggested, perhaps hyperbolically, that "most of the techniques are specially made for America" (Chiatanya Yeti, 1974, p.37).

II. PSYCHOLOGICAL EFFECTS

Introduction

A wide range of psychological phenomena experienced by meditators has been described and interpreted in traditional Buddhist and Yogic literature. Comments abound concerning the nature of cognition, sensation, perception and various states of consciousness as well as the changes induced in these by the practice of meditation. Although derived from the pursuit of spiritual knowledge, some of the views held on these subjects are broadly consistent with those of contemporary psychology, and recently several translated Buddhist texts have drawn much praise for their possible contributions to Western psychological doctrine (Goleman, 1971; de Silva, 1984).

However, it has also been suggested that there may be limitations to such contributions, especially if Buddhist meditations and their theoretical rationales are seriously considered. For example, it has been noted that:

"Mental health is the goal both of the practitioner of meditation and of the modern psychologist. Apart from that there is little contact or similarity between them. They differ profoundly in their definitions of mental health, in their theoretical assumptions about the structure of the mind and the purpose of human existence, and in the methods which they prescribe for the attainment of mental health."

(Conze, 1972, p. 37-38)

Despite these potential problems however, Western psychologists and psychiatrists have proposed reinterpretations of traditional meditations, often recasting previous opinions to serve their own needs. Transpersonal and Humanistic psychologists have been especially active in merging concepts from Eastern systems of meditation with current Western notions about the structure and function of consciousness as well as personality development and behavioural change. Practitioners of various behavioural therapies have also drawn on meditative procedures as a source of inspiration in the development of relaxation techniques for the treatment of anxiety- and stress-related disorders. Furthermore, psychotherapists, generally suspicious of meditative techniques in the past, have begun to explore their use in clinical settings (Kutz *et al.*, 1985).

Current psychological formulations of meditation frequently adopt Buddhist and Yogic perceptions with an overlay of Western psychological opinion. Most often, psychological effects of meditative practices have been interpreted in terms of conscious

and unconscious states, manipulations of attention and attitudinal change. Although widely used, there has been little agreement regarding definitions of these terms or the appropriateness of their useage. In large part, during the recent process of exploration and adaptation of meditative techniques, there has been uncritical conflation of analogous concepts from Eastern and Western psychological thought.

This, together with the widely differing opinions regarding the nature of the psychological and therapeutic effects of meditation within the scientific community has created a situation which does not invite straight-forward systematic discussion. The following presentation examines the basic psychological processes associated with meditation as asserted by proponents of TM, and then moves to an evaluation the its proposed therapeutic effects.

A. Basic Processes

(1) Transcendental Meditation

Goleman (1977) traced the origins of the techniques used in TM to traditional yogic formulations of 'mantra' meditation, in which a word is continuously repeated by the meditator to drive out other thoughts and induce a state of calm. Maharishi (1966) has claimed however, that it was a type of lost ancient wisdom rediscovered by his mentor Swami Brahmananda Saraswati or 'Guru Dev'. Drawing on this knowledge, Maharishi's concept of psychology may seem unusual to the uninitiated reader, particularly those brought up in the behaviourist tradition. It nevertheless highlights the importance of certain conceptual underpinnings which guide interpretations of meditation, especially Transcendental Meditation:

"The ultimate fulfilment of psychology lies in enabling the individual mind to attune itself to the cosmic mind and to remain so attuned; that is, in establishing a lasting co-ordination of the individual mind with the cosmic mind, so that all activity in the individual mind conforms with cosmic evolution and the purpose of cosmic life."

(Maharishi, 1966, p.263)

Mainstream Western psychology has yet to formulate a coherent view of Cosmic mind or its relation to the individual mind. Most psychological doctrines of individual mind assume the existence of insubstantiable mental processes such as thinking; processes which most doctrines of meditation perceive as obstructive to the meditational process. Interestingly, Maharishi's view of 'thought' is similar to that

of the behaviourist John Watson in that thinking is seen as a subtle form of speech. There the similarities end however, for his description of how thinking occurs digresses radically from anything Watson had to say on the subject. For Maharishi, thoughts arise as subtle events in the field of Being and become increasingly more gross until they enter the level of ordinary thinking. His 'clarification' of this point is quoted at length as Maharishi's analogy of thought is frequently cited, almost verbatim, in discussions of the 'mechanisms' of meditation (Russell, 1976; Campbell, 1973, 1975; Forem, 1974):

"A thought starts from the deepest levels of consciousness, from the deepest level of the ocean of the mind, as a bubble starts at the bottom of the sea. As the bubble rises, it gradually becomes bigger. When it comes to the surface of the water it is perceived as a bubble.

Mind is like an ocean. The surface layers of the mind function actively while the deeper levels remain silent. The functioning surface level of the ocean of mind is called the conscious mind. Any thought at the surface level is consciously cognized, and it is at this level that thought is appreciated as thought.

A thought starts from the deepest level of consciousness and rises through the whole depth of the ocean of mind until it finally appears as a conscious thought at the surface. Thus we find that every thought stirs the whole range of the depth of consciousness but is consciously appreciated only when it reaches the conscious level; all its earlier stages of development are not appreciated. That is why we say that, for practical purposes, the deeper levels of the ocean of consciousness are as though silent".

(Maharishi, 1966, p.53-54)

The notion that 'mind' is made up of an unconscious, undisturbed deep core with a tempestuous, conscious surface is consistent with not only mainstream Hinduism, but also has conceptual parallels in Buddhism and Western psychiatric doctrine, especially psychoanalysis. The psychoanalytic view however, reverses the the analogy in that the deep core is tempestuous and the surface calm. The very essence of TM involves bringing individual attention to the level of this normally unknown 'reality', the state of transcendental Being.

Not surprisingly, the adaptation of such concepts has been associated with a number of equally abstract ideas. For example, some authors have suggested that meditation induces a

unique fourth state of consciousness (Wallace, 1970), whereas others have interpreted the meditative state as a fifth state of consciousness as well as an adjunct to established psychotherapies (Carrington, 1977). Maharishi (1966) has gone a step further in proposing that TM is the ultimate state of consciousness which may, as an instrument of mental health, replace other psychotherapeutic techniques altogether.

Consistent with its history, meditation is frequently associated with numerous altered states of consciousness (ASC). The recent expansion of interest, shown by psychologists and physiologists alike, in consciousness and its various states has led to serious consideration of meditational techniques as experimental and therapeutic procedures. The establishment of professional associations devoted to Transpersonal and Humanistic psychology, and the founding of new publications, such as the Journal of Altered States of Consciousness, highlight the increasing interest in these topics within the circles of clinical psychology and psychiatry. Generally, the potential therapeutic value of meditation has been seen to lie in its capacity to protect the individual from the pathogenic effects of stressful environment conditions.

(ii) The Unconscious

Jung (1954) systematically examined meditation and the psychological notions surrounding its practice as part of his comparative studies of Eastern and Western religions. He thought that Yogic and Buddhist meditations had much to teach the West about the 'inner man', and some attributes of meditative states such as 'oneness', 'timelessness' and the dissolution of 'ego boundaries' were seen as characteristic of a universal, innate psychic experience - his concept of the collective unconscious (Jung, 1954). In his view, the goals of Eastern religious practices were equivalent to those of Western mysticism, especially when involving the expansion of the conscious ego's 'field of personality' into the unconscious 'self'.

However, Jung asserted that analogous concepts of mental function, although related, required careful explaining, as they were derived from alien cultures incorporating unfamiliar metaphysical assumptions concerning the structure of the psyche. Nonetheless, the concept of the unconscious was seen to give an underlying unity to 'yogic' and analytical psychologies and has been fundamental to the development of Western psychological explanations of the effects of meditation. Within the Jungian psychiatric framework, unconscious 'compensations' could create conflict as they broke into consciousness, but if such conflicts were resolved by psychoanalysis, then a transformation occurred in the psyche similar to some of those claimed by Buddhist meditators (Jung, 1936). Moreover, he thought that

normally unknown mental contents could only be made known through technical aids, that is, through learned, deliberately-practiced techniques such as meditation and psychoanalysis.

Although burdened with its own terminology, Jung's interpretation of meditation is compatible with Buddhist theology in that both perceive it to be an inward-looking practice which must be used with caution, for it is not considered to be appropriate for everyone. With its fixation upon one's inner world, it encourages an introversion, that conflicts with the typically extroverted Western way of dealing with the environment. Characterizing meditative techniques as the 'introverted prejudice' of the East, Jung concluded that the inward-looking approach of meditation represented a 'surrender' of consciousness to the unconscious - a dangerous indulgence that could work against realistic interaction with the world. In addition, Conze (1959) noted that the term 'meditation' implied the elimination from the aspirant's life of activities incompatible with its practice. As an 'extreme introversion', it could open up a new reality beyond that commonly experienced by ordinary men.

However, those aspects of meditation that Jung interpreted as an inability to adequately relate to the real world, were proposed by Buddhists to help "...sharpen perceptions, to see things as they are" (Guenther & Trungpa, 1975, p.22). Ultimately, practitioners of meditation aspired to penetrate beyond states of consciousness and perception altogether; mysterious and mystical aspects of meditation which Westerners find very appealing. Noting this appeal, Jung asserted that if a meditative system also claimed to be scientific in the induction of its effects, Western practitioners may find it irresistible. However the uncritical adoption of meditative practices, as well as the blending of science and magic may be misleading and possibly psychologically dangerous (Jung, 1936).

Hinduism also gives prominence to unconscious processes during the practice of meditation. In this view the goal of meditation is to create a state of spiritual knowledge - vidya, which is contrasted with that of normal waking consciousness - avidya. Avidya (spiritual ignorance) is a state brought about by the influence of 'subsurface motivating factors', the vasanas. These are analogous to unconscious urges and purportedly direct the 'thought-flow' within individuals (Chinmayananda, 1974). Consistent with Buddhism, a crucial step in the enterprise is seen to be the control of the sense organs, whose function depends on the mind. As attributes of the mind, they must be dominated for spiritual development to proceed.

Generally, the control of sensation is achieved by the restriction or concentration of attention. As concentration was an essential element of consciousness for Jung, meditations described as not involving concentration intrigued him. Therefore when commenting on some 'most excellent' meditations, purportedly claimed to be devoid of mental concentration, he conjectured that they achieved their effects, not by 'being centered' upon anything, but by 'dissolving' consciousness, thereby helping to reveal the contents of the unconscious. Hence, meditation became for Jung what dreams were for Freud, i.e. "... a sort of Royal Road to the unconscious" (Jung, 1954, p.508).

Freud, although he wrote much less about the subject, was more critical of the practice of meditation than Jung. He identified the effects of meditation with the psychological functions of ego regression and primary process thinking. These were usually considered symptoms of psychopathology, whose untutored manipulation was psychologically dangerous. However, if properly controlled, as in psychoanalysis, such functions could contribute to psychological well being. Therefore, Freud and Jung, key figures in Western psychiatry, held negative or cautionary views regarding the practice of meditation within the context of Western societies.

TM is the meditative system whose claims most closely fulfil Jung's criteria for wide-spread acceptance in the West. Paradoxically it is deeply steeped in typically Eastern mysticism and at the same time is presented as a 'scientific' discipline capable of being studied objectively. Together with claims of the ability to produce immediate beneficial results in all practitioners, it also has been asserted to be an 'effortless' practice which requires no changes in individual life styles. Collectively, these proposals have greatly helped to create a more positive climate of opinion in the general population and among the psychological community regarding meditation.

Several models of meditation, although consistent with that of Jung and open to his caution, do not assume that the practice of such techniques are in any way dangerous. Thus, it has been conjectured that: "Dreams are similar to meditation, except meditation gains the reaction of the unconscious by a systemic technique which is faster than depending on dreams" (Kretschmer, 1969, p.224). From this perspective, the unconscious mind is seen more as a source of 'creative possibilities' than a dangerous uncharted territory. Meditation in this sense was considered to be a superior therapeutic tool in that it could 'provoke' the unconscious into using its proposed creative possibilities as a healing device.

(iii) Attention

In addition to the unconscious, attention is another psychological concept which is central to most discussions of meditation. The ability to voluntarily expand and contract the field of concentration is a primary consequence of its practice. In an attempt to harness the therapeutic effects of meditation in a practical psychiatric setting, Deikman (1966) developed a type of 'experimental' meditation which he called Contemplative Meditation. This procedure was similar to that of Dunlop (1948) in that it involved restricting the field of attention to suppress 'other thoughts', thereby cultivating a receptive attitude in the subject. Unlike Dunlop's contemplative meditation, however, Deikman's procedure, did not lead to an expanded consciousness of God, nor did it involve a deity at all. Based on classical literature, it was described as 'perceptual concentration' which restricted the focus of attention to a single object. The subjects relinquished their customary mode of thinking and perceiving in favour of "a procedure of concentration without thinking" in which sensory input was ignored (Deikman, 1963, p.329). When thoughts were stopped and awareness of sensation diminished, a non-intellectual, non-analytical contemplation of the meditative object (usually a vase in Deikman's experiments) could be conducted.

To explain the effects of meditation, Deikman (1966) drew on the views of Hartmann (1958) and Gill & Brenman (1959) concerning the 'automatization' of perceptual and motor behaviours, a process occurring through the gradual withdrawal of attention. He proposed that the new and unusual perceptual experiences, induced by meditation, were derived from the disintegration of automatic perceptual processes by "reinvesting actions and percepts with attention" (Deikman, 1966, p.111). Focusing attention enhanced the 'de-automatization' of established perceptual processes. Regression of automatization, together with the subsequent subjective experiences, were claimed to contain the essence of the 'actual characteristics' of reality. Hence, although formulated in psychiatric terms, this view adopts the goal of traditional meditation concerning the achievement of ultimate knowledge.

Deikman (1971) also developed the concept of 'bimodal' consciousness in which each mode possessed distinctive physiological features. The receptive mode was characterized by the intake of information from the environment, increased parasympathetic nervous system activity and enhanced alpha EEG. In contrast, the active mode which operates in concert with the movement of the striate musculature, was manifested by a dominance of sympathetic nervous system activity in response to environmental stimulation. In Deikman's scheme, the receptive mode gained ascendancy in consciousness through meditation. Similarly, Washburn (1978) proposed that meditation interfered

with the normal operations of the unconscious, and regular practice brought 'insight' into mental functioning. This occurred either by the suppression of or resistance to unconscious processes by concentrative or receptive meditation respectively.

In more comprehensive discussions of meditation and attention it has been stated that "all meditation systems are variations on a single process for transforming consciousness. The core elements of this process are found in every system, and its specifics undercut ostensible differences between the various schools of meditation" (Goleman, 1977, p.106). Appealing to the Visuddhimagga (Path of Purity), Goleman (1977) categorized twelve meditational systems according to their 'attentional typology', ie. in terms of their strategies for retraining attention: Concentration, Mindfulness, or Integrated. Techniques of concentration focus the mind on a fixed mental object. They include such meditative systems as Kabbalah of Judaism, Christian Hesychasm prayer, Sufism, Transcendental Meditation, and several types of yoga. Techniques of Mindfulness promote the mind watching itself, and may be found in Buddhism as well as contemporary systems such as that of Krishnamurti, intellectual child of the Theosophists. Systems which use both are classed as Integrated. These are the traditional Buddhist systems of Theravada, Tibetan and Zen.

Goleman (1971) has also interpreted meditational systems as metatherapy, which is defined as "a procedure that accomplishes the major goals of conventional therapy and yet has as its end-state a change far beyond the scope of most therapies...- an altered state of consciousness" (Goleman, 1971, p.4). He suggested that meditation may become the major methodology of the emerging Transpersonal Psychology. This 'fourth school' of psychology is concerned with experiences - especially those which take the subject beyond individuality, into mystical realms, self-actualization, cosmic awareness, self-transcendence, ecstasy, bliss, etc.; all highly ambiguous terms subject to many different interpretations. Nonetheless, such suggestions are consistent with the claims of Maharishi (1966) concerning the possible role of the practice of meditation in the future development of clinical psychology.

Shapiro (1980) discussed many of the problems implicit in defining 'meditation', but rather than viewing meditation as a 'metatherapy' saw it as a 'self-regulatory' strategy. He has co-authored several critical reviews of the meditational literature, and, taken as a whole, these form a substantial survey of research into the psychological and physiological effects of meditation (Shapiro & Giber, 1978; Shapiro & Walsh, 1984).

For Shapiro, most meditational techniques involve 'specific, attention-focusing strategies'. He believes that other definitions are inadequate because they obscure what is 'really' going on during the meditative process, that is "discrimination training, covert self-instruction, etc." (Shapiro, 1980, p.13). In an effort to rectify this situation he has provided the following definition:

"Meditation refers to a family of techniques which have in common a conscious attempt to focus attention in a non-analytical way, and an attempt not to dwell on discursive, ruminating thought."

(Shapiro, 1980, p.14)

In the final analysis, Shapiro perceived meditational techniques to be self-regulatory strategies as well as methods to achieve altered states of consciousness (ASC). The emphasis on the avoidance of discursive thought and the suspension of analysis when consciously 'focusing' attention, made Shapiro's definition of meditation consistent with traditional Buddhist and Yogic views, as well as those entering contemporary psychiatry.

(iv) Attitude

The concept of 'attitude' occurs often in both Eastern and Western discussions of meditation. According to Buddhist tradition, both active and passive attitudes may be desirable, depending on the context of the meditation and the proficiency of the meditator. In Zen and TM however, a passive or receptive attitude is most often encouraged. Many Western psychiatrists (Deikman, 1963; Maupin, 1969; Carrington, 1977), also consider meditation to be a classical way of developing the receptive attitude, and view it as first and foremost, 'a deep passivity', combined with awareness. Hence, for them, meditation is partly practice in the skill of being quiet and paying attention. Furthermore, psychologists such as Naranjo & Ornstein (1972) have maintained that the assumption of an appropriate attitude gave an underlying unity to the diverse types of meditation. Indeed:

"It might be said that the attitude, or "inner posture," of the meditator is both his path and his goal. For the subtle and invisible 'how' is not merely a how to meditate but a how to be, which in meditation is exercised in a simplified situation ... meditation is concerned with the development of a presence, a modality of being, which is expressed or developed in whatever situation the individual may be involved."

(Naranjo & Ornstein, 1972, p.8-9)

Moreover, "a trait that all types of meditation have in common, even at the procedural level, gives us a clue to the attitude we are trying to describe: all meditation is a 'dwelling upon' something" (Naranjo & Ornstein, 1972, p.20). This view of meditation is in conflict with that of Jung who thought that dwelling upon something was not a characteristic of meditation, especially the more advanced practices. However, they were in agreement concerning the religious aspects of meditation. Naranjo conjectured that some of the altered states of consciousness, induced by meditation - the so-called 'peak states' - constituted the experiential core of all world religions; an opinion, developed by Abraham Maslow and his followers, which has wide currency in Western psychiatric communities. Naranjo's tripartite classification of meditation (the negative way, the way of forms, and the expressive way) has been described in such psychiatric terms as internalization, introjection, and projection, respectively. However this system has not been widely adopted, and has been eclipsed by that of Goleman (1977).

B. Therapeutic Processes

(1) Views of Stress and Anxiety

Recently, the Alcohol, Drug Abuse and Mental health Administration (ADAMHA) requested that the Board on Mental Health and Behavioral Medicine, Institute of Medicine, National Academy of Sciences report to the administration concerning:

- 1) current knowledge and opportunities for research within ADAMHA mandate.
- 2) needs for future research.
- 3) benefits which have already accrued to public health from relevant clinical and basic research.

As a result of this report the immense expenditure relating to health disorders and health-related behaviours, falling within the ADAMHA domain, was revealed. Briefly, the findings suggested that mental disorders and substance addiction directly affect 30-45 million Americans and cost \$20 billion/year in direct health care. The 'indirect' cost to society, however, includes loss of productivity, higher crime rates, greater use of long-term care facilities and more expenditure by the social services (APA Special Suppl., 1985). Added together, the total expenditure was estimated to be a staggering \$185 billion/year or approximately 15% of the Gross National Product of the US. Indeed mental disorders are currently competing with cardiovascular diseases and cancer in terms of 'cost to society' (APA Special Suppl., 1985).

These data support the view that anxiety states are one of the main causes of psychological problems and chronic disorders of mental health. Such states have been estimated to occur in 2-4% of the general population and in 16-24% of psychiatric patients (Lader, 1975; Wilkinson & Latif, 1974). It has also been estimated that 30-70% of all patients currently being treated by general practitioners, are suffering from conditions which originate in unrelieved stress (Pitts, 1969). Furthermore, the impact of even minor, subclinical symptoms of anxiety has been associated with decreased work effectiveness and contribute to absenteeism (Ganster *et al.*, 1982). Therefore, it is not surprising that clinicians have attempted to develop new techniques to alleviate these disorders.

Anxiety is thought to be caused by individual reactions to real or imagined threats and is characterized by high levels of sympathetic nervous system activity. Hence, a variety of psychosomatic complaints usually accompany its expression. These symptoms vary in severity and can, in some cases (eg. hypertension) be fatal. Activation arising from tense muscles has long been acknowledged as a source of heightened arousal. Anxiety, in turn, may also increase tension in the striate musculature, thereby creating a vicious cycle.

Jacobson (1938) proposed that progressive relaxation (PR) of skeletal muscles may help break this cycle and therefore alleviate the effects of anxiety. Progressive Relaxation involved learning to tense and relax groups of muscles in an orderly fashion with the goal of achieving a more profound state of relaxation. Although PR was based upon a sound theoretical rationale and involved a quantifiable target variable, EMG, it was many years before it received the wide audience that it perhaps deserved. Currently, however, PR is usually included in most 'treatment packages' for anxiety, and the treatment rationale of associating reduced anxiety with diminished arousal is widely accepted.

Two contrasting conceptualizations of arousal/relaxation are currently prominent in the research literature. On one hand, there is a prevalent, more traditional model based on activation theory (Duffy, 1972), which regards states of arousal and relaxation as occupying extreme points on a linear continuum (Benson, 1975). On the other hand a multi-process theory of arousal accepts the existence of different forms of arousal. Lacey (1967), in a review of the literature germane to activation theory, concluded that it supported the idea of different forms of somatic arousal, ie. electrocortical, autonomic and behavioural. He argued that the mechanisms underlying the expression of the different forms of arousal were usually intimately related and act in concert. However, it has been conjectured that under certain stimulus conditions they may exhibit dissociation or desynchrony (Schwartz *et al.*, 1978).

Regarding this point, factor analysis has been applied to anxiety questionnaire scores obtained from psychiatric patients. Two factors were identified, 'psychic' and 'somatic' anxiety, which were claimed to account for most of the test variance (Hamilton, 1959; Buss, 1962). Similarly, Schalling *et al* (1975) and Schwartz *et al* (1978) have more recently postulated that anxiety is comprised of both cognitive and somatic components, conjecturing that "a somatic (physical exercise) and a cognitive (meditation) relaxation procedure" may have differential effects on these different types of anxiety (Schwartz *et al*, 1978, p.321).

Other prominent theories of anxiety have categorized forms of anxiety in terms of their temporal properties. Spielberger (1972), for example, distinguished between transitory anxiety states (A-State) and relatively stable predispositions or anxiety traits (A-Trait). The latter is viewed as measure of anxiety-proneness from which predictions of state reactions may be made. In general, 'ego-threatening' stressful situations have been found to evoke greater increases in state anxiety for high-A-Trait compared with low-A-trait subjects. However, situations involving physical danger, such as threat of electric shock, imminent surgery, or films depicting physically painful accidents, apparently precipitate state anxiety responses which are unrelated to levels of trait anxiety.

(ii) Control of Stress and Anxiety

In addition to greatly enhancing the spirituality of the meditator, the practice of meditation has long been recognized for its ability to develop a stable emotional and social life. This aspect of the many effects of meditation has invited therapeutic interest. Nevertheless:

"In recent years a few psychologists have shown some interest in the therapeutical value of these [Buddhist] meditations. Little has come of it, and this is not surprising in view of the resistance which these meditations are bound to encounter. It is agreed that anxiety is an undesirable state that ought to be removed, - but what would modern psychologists think of Sangharaksha's ... specifics for the removal of fear? Sangharasha claims that anxiety will be dispelled if we think of the excellence of the merits of the Tathagata, or his image, of the Dharma, of the Samgha, or if we meditate on morality and its prohibitions, if we comprehend emptiness, study the six elements and the twelve links, or practise compassion. A modern psychologist will not be able to claim that these measures are incapable of removing anxiety, but he will rightly maintain that they are not likely to have much effect on his patients as he finds them."

(Conze, 1972, p. 38)

The observations of Conze notwithstanding, meditation has been one of several therapies employed as a means of reducing anxiety. Others have included progressive relaxation, biofeedback, psychotherapy and the administration of medication among others. Traditional therapies however, have not demonstrated a great deal of effectiveness in the treatment of chronic anxiety (Miles *et al.* 1951; Raskin, *et al.* 1973; Lazarus, 1963; Gelder, 1969). Extensive recourse to medication has been made in an effort to counteract chronic anxiety, but more recently alternative forms of treatment have been considered. Behavioural strategies or 'self-regulatory' therapies have received greater attention as alternative approaches to treatment which eliminate the risk of negative side-effects associated with drug therapies. In this context, it is interesting to note that both acute physical activity (Byrd, 1965; de Vries, 1968, de Vries *et al.* 1977; Morgan, 1972) and meditation/relaxation techniques (Wallace, 1970; Wallace & Benson, 1972; Benson & Wallace, 1972b; Benson *et al.* 1975; Fergerson & Gowan, 1976) are apparently capable of reducing tension and anxiety, and improving psychological states. Hence two procedures, representing opposite ends of the relaxation / arousal continuum, are associated with a similar outcome - the reduction of anxiety.

Thirteen studies concerned with the role of meditation in the reduction of fears, phobias, stress and tension have been reviewed by Shapiro & Giber (1978). Many of these used within-subject designs, and gathered subjective data in the form of verbal self-reports. Other data were assimilated by the administration of pre-test and post-test anxiety scales and questionnaires (Taylor Manifest Anxiety Scale, Spielberger Trait/State Anxiety Scale, IPAT anxiety questionnaire, among others) as well as through records kept by patients and their relatives and friends. Some experimenters used the methodologically stronger between-subjects design with control groups. Regardless of experimental design however, all the reviewed studies reported successful outcomes on several dependent variables. The reviewers suggested that meditation may form a promising clinical intervention technique for a host stress-related dependent variables including specific fears such as those relating to examinations, elevators, being alone and being in enclosed places, as well as global fears such as generalized anxiety and anxiety neurosis.

Regarding this point, it has been reported that among other techniques, transcendental meditation, relaxation training, and frontalis EMG feedback may produce reductions in clinically-assessed anxiety. Raskin *et al.* (1980) randomly assigned subjects to these groups after gathering psychological, social, and physiological data for a six week 'baseline period'. This was followed by treatment and post-treatment periods of six weeks each, during which comparable data was obtained. In addition, excepting three, subjects were followed-up for three to eighteen

months. It was noted that 40% of the subjects who completed treatment exhibited 'marked clinical improvement' regardless of treatment group assignment. There was no significant differences between groups with respect to degree of adherence to practice regimens and in maintaining level of clinical improvement, although many claimed increased anxiety with lack of practice. Furthermore, "subjects reported that attempts to relax in the face of anxiety, or even prior to expected anxiety, were usually unsuccessful" (Raskin et al. 1980).

Although reductions in self-reported anxiety following the practice of meditation have been frequently noted, these are not always accompanied by decrements in behavioural or physiological measures of anxiety (Delmonte, 1984a,f). For example, support for a lack of a relation between verbal reports and physiological expressions of anxiety can be found in a study by Kirsch & Henry (1979) in a partial replication of Greenwood & Benson (1977). In this, subjects with speech anxiety were randomly assigned to one of four conditions:

- (i) systemic desensitization.
- (ii) meditation.
- (iii) desensitization with meditation.
- (iv) no treatment.

All three treatments were equally effective in reducing self-reported anxiety compared with untreated subjects. However, reliable changes in physiological manifestations of anxiety such as heart rate were reported only in those subjects who perceived the treatment rationale as highly credible. Hence, doubts have also been raised concerning the efficacy of 'behavioural strategies' such as meditation, especially when they are the sole treatment for chronic anxiety, although as adjunct therapies they may be helpful (Raskin et al. 1980).

(iii) Control of Drug and Alcohol Use/Abuse

There has been much speculation concerning the possible role of relaxation techniques in the treatment of alcohol and drug abuse. Much of the experimental research in this area has been directed toward investigating the hypothesis that alcoholic behaviour may be developed and maintained by the tension-reducing properties of alcohol. Therefore therapeutically, relaxation techniques might be used to lower the general state of arousal of the alcoholic, thereby depriving alcohol of some of its proposed tension-reducing capacities. In principle, an induced state of relaxation could function as an alternative for the reduced arousal that follows alcohol consumption, and hence serve as a coping technique in stressful situations. However, some critical examinations of the literature regarding this hypothesis, have concluded that experimental results have yet to be convincing (Cappell & Herman, 1972).

More recently, in a paper partly devoted to a discussion of methodological problems, Steffen *et al* (1974) reported that as blood alcohol levels increased, EMG responses decreased in alcoholics. This negative correlation was statistically significant, suggesting a tension-reducing effect of alcohol. Higgins & Marlett (1975) studied the effects that the anticipation of interpersonal evaluation had on alcohol consumption of non-alcoholic males, and suggested that interpersonal social stress may be a feature in excessive drinking. Social stress has also been suggested as instrumental in increasing drinking in alcoholics (Miller *et al*, 1974).

Alcoholism is a complex clinical entity and alcoholics may also suffer from anxiety or other stress related disorders. Hence, individuals who abuse alcohol and other drugs may benefit from the relaxed state induced by the practice of meditation. Support for this possibility has largely been provided by studies assessing the effects of meditation on self-reports of substance usage (Benson & Wallace, 1972a; Shaffii *et al*, 1974; Winquist, 1977). These studies uniformly investigated the effects of TM, and all employed retrospective questionnaires. This technique is one of the most criticized of all procedures used to evaluate treatment outcome, as it is particularly prone to bias in the subject sample. The early reports reflect this and other methodological flaws in a most glaring manner. However such efforts, like the anecdotal reports, have served to encourage and direct further research.

Benson & Wallace (1972a) mailed questionnaires to over 1800 practitioners of TM in order to obtain information concerning drug use and attitudes to TM, before and after it's practice. The response rate was an amazing 90%; all respondees reporting a dramatic decrease or total abstinence in drug use. Despite the criticisms directed towards 'retrospective' questionnaires, the results of this study have been widely cited and were eventually printed in the Congressional Record. Other investigations, again using questionnaires, have noted that meditation may help to control or even eliminate alcohol and marijuana consumption (Shafii *et al*, 1974).

(iv) Cognitive Alterations

Many testimonials and verbal reports claim that the practice of meditation induces feelings of peace, tranquility, and well-being. A number of studies appear to give 'scientific' support to these testimonials. Investigations of the cognitive effects of meditation have usually employed self-report and questionnaire techniques as well as various personality inventories and anxiety scales. However, the quality of the techniques varies considerably and salient behavioural measures are usually absent in the discussions of experimental results.

Delmonte (1980, 1981, 1984a,c, 1985a) has conducted a series of studies on the 'predisposition to meditation' using various self-reports, scales and questionnaires. These experiments were designed to investigate psychophysiological and psychometric predictors of responses to meditation. In general, he found that subjects who gave favourable self-reports to meditation and those who frequently practiced meditation reported less psychological 'ill-health'. Furthermore, these subjects (compared with those giving unfavourable self-reports) exhibited lower (state) physiological arousal in terms of skin conductance, EMG (frontalis) levels, digital blood volume and temperature, and heart rate both during meditation and during rest. Blood pressure levels were also lower in this group but the difference was much less marked.

Generally, positive experiences have been associated with meditation (Curtis & Wessberg, 1976; Osis *et al* 1973; Tart, 1969; West, 1980), although there have also been reports of negative experiences (Tart, 1972; Kohr, 1977, 1978). The general outcome of these studies was that aspirant meditators tended to be more anxious, report larger drug use and exhibit greater neuroticism than published population norms or comparison groups. However, regular practice of meditation was associated with decrements in anxiety and neuroticism to levels comparable with population norms. Delmonte (1984a) concluded that the clinical value of meditation appeared to be confined to those subjects who experience psychosomatic disorders or mild neuroticism but appear psychologically 'well-integrated'. More severely psychologically-disturbed individuals tended to respond unfavourably to meditation in behavioural (practice), experiential (self-report), and physiological terms.

West (1980) conducted a retrospective survey on the experiences of meditators, and while only about half of the 315 meditators who were approached actually participated, the most frequently registered subjective experience was 'mental relaxation'. Less frequently, 'disembodiment', 'reduction or diffusion of sense of body boundaries' as well as 'distortions of time perception' have been noted (Osis *et al*, 1973; Tart, 1972). Sensations of 'heaviness', 'sinking' and 'floating' also apparently characterize the meditative experience (Barmark & Gaunitz, 1979; West, 1980).

Positive attitudes to both meditation and its perceived benefits are most apparent in individuals who continue to practice meditation compared with short-term meditators or controls. Some experimental evidence suggests that this finding may be accounted for in terms of both expectancy and self-selection (Delmonte, 1981).

(v) The Control of Hypertension

Excessive and sustained elevations in blood pressure are a major cause of premature death in the West. The aetiology of this disease, however, is not known in 80-90% of the cases, although the remaining 10-20% may be traced to organic pathologies, usually involving renal function. Hence, the majority of cases of chronically elevated blood pressure are classified as essential hypertension to distinguish them from those of organic aetiology. Essential hypertension is conjectured to have a large psychosocial component to which renal pathology may be secondary and has been treated by several pharmacological interventions and behavioural therapies. The contributions which psychological processes such as anxiety may make to this pathology are receiving increased attention.

Epidemiological studies of hypertension have repeatedly demonstrated that elevated blood pressure is associated with western, industrialized urban lifestyles (Henry & Cassell, 1969). Such factors as inheritance, age, sex, weight, salt intake and cholesterol levels are known to contribute to the development of hypertension, which is one of the major risk factors for coronary heart disease. However, in 90% of the individuals with high blood pressure the cause is idiopathic and the condition is referred to as essential hypertension. Several well-defined stages in the progression of this disease have been identified. Initially there is often a labile hypertension manifested by transient phases of pressure increases. These are thought to be due to increases in cardiac output associated with autonomic over-reactivity to emotional excitement.

Work by Obrist and his colleagues has demonstrated that when individuals attempt to control challenging situations there is an upsurge of sympathetic activity which produces excessive cardiac responding relative to somatomotor demands. This gives rise to tissue overperfusion which may, at first, be functional. However with repeated elicitation these bouts of excessive cardiac output may cause hypertrophy of the vasculature resulting in increased total peripheral resistance and establish chronic hypertension (Obrist, 1981).

However, the use of traditional psychotherapeutic methods for the reduction of BP are derived from the psychodynamic model of the aetiology of essential hypertension (Alexander, 1950). This model proposes that hypertensives repress their aggressive and hostile feelings thereby attenuating their expression. In turn, this leads to 'conflict' between the individual and their feelings which contributes through unspecified pathways, to an increase in BP. The central assumption of this model is that the resolution of conflict permits the release of 'pent-up', hostile emotions which causes a subsequent reduction in BP.

Psychoanalytic therapy aims at the identification and dissolution of such conflicts. In addition, hypertensives are usually taught and encouraged to express their unsanctioned emotions in a socially acceptable manner, thus establishing effective 'defence' mechanisms. Although widely adopted, the number of published empirical studies testing this hypothesis in hypertensives is small, making conclusions difficult (Reiser *et al.* 1951; Moses *et al.* 1956).

In the West, the treatment of hypertension using techniques inspired by Eastern religious practices has been systematically investigated by Patel (1973) and Benson *et al.* (1974 a,b) among others. In two single-group studies Benson and his colleagues evaluated the effect of TM on moderately hypertensive subjects. Those with systolic pressures greater than 140 mm Hg or diastolic pressures above 90 mm Hg were recruited at introductory lectures given by the Student International Meditation Society. The instruction fee was waived and BP was measured for a baseline period of six weeks. After initiation, Ss were followed up for an average of 20-25 weeks with BP determinations being made when the subject was not meditating. Benson *et al.* (1974a) studied 22 untreated, borderline hypertensives with an average blood pressure of 146.5 mmHg systolic and 94.6 mmHg diastolic. Subjects practiced the relaxation response for 25 weeks after which the groups' BP fell to an average of 139.5 mmHg systolic and 90.5 mmHg diastolic. Benson *et al.* (1974b) extended the investigation on medicated hypertensives whose antihypertension medication and diet were controlled during the experiment. Again, significant decreases in both systolic and diastolic blood pressure were reported, from a group mean of 145.6/91.9 mmHg to an average of 135/87 mmHg.

Blackwell *et al.* (1976) replicated the studies of Benson *et al.* (1974b), examining seven individuals on established regimens of antihypertensive medication. BP was determined four times daily at home by the patient, with a weekly measurement at the clinic by a nurse. TM practice began after a baseline period of four weeks. Treatment BPs were determined 9-12 weeks after initiation, and six months later, although subjects were not supervised during the follow-up period. Tests of statistical significance of treatment effects were performed on individual rather than group data. When BP determinations took place at the clinic, four out of the seven subjects showed reliable reductions in both systolic and diastolic pressure, whereas one individual exhibited a significant increase. From an average baseline blood pressure of 138.8/97.7 mm Hg, the mean decrease for the whole group was 4.2/1.6 mm Hg, systolic and diastolic pressure respectively.

When BP was recorded at home, six out of seven subjects demonstrated reliable decreases in systolic pressure and five out of the seven, showed significant decreases in diastolic pressure, the average being 7.5/6.1 mm Hg respectively from mean pre-treatment levels of 154.0/101.8 mm Hg. By the six month follow-up, medication had been increased for two subjects, clinical BP data was missing for one participant, and home BP data was missing for two subjects. Reliable decreases were exhibited by three out of the four remaining subjects in systolic and/or diastolic pressures recorded at the clinic, and three Ss displayed decreases for pressures recorded at home (Blackwell et al. 1976).

Patel (1973) used a treatment derived from yoga, previously explored in India by Datey et al (1969). Twenty subjects were treated in sessions lasting for half an hour, three times weekly as well as with home practice for three months. They were instructed to 'relax' in a supine position and to concentrate on phrases similar to those used in autogenic training, such as subvocalizing 'relax' with each expiration. In addition, they were instructed to diminish 'sympathetic activity' by modifying auditory feedback provided of their electrodermal activity. Although subjects did not receive immediate BP feedback, at the end of each session they were told the values of their BP prior to and after practice.

After training, the mean reduction of BP was 24.6/14.4 mm Hg, from an average pre-treatment level of 159.1/100.1 mm Hg. Medication had also been cut by 41%. Only four of the Ss obtained neither a reduction in medication nor a reduction in BP. One year later, the changes in systolic and diastolic pressures were still statistically significant ($p < .001$) (Patel, 1975).

Single-group outcome studies, however, provide limited evidence concerning the efficacy of treatment for hypertension. Several possible alternative explanations may be proposed to account for the reported effects. For example, results may be influenced by nonspecific factors relating to the therapy situation, such as regular visits to a clinic, enthusiastic attention from the experimenters or therapists, exposure to other patients with similar problems, and expectation of beneficial results (Brady et al. 1974; Shapiro et al. 1954). Other potential factors contributing to treatment outcome include the effects of changes in diet, medication and 'life-style', as well as the effects of environmental changes unrelated to therapy such as alterations in physical and social surroundings.

Moreover, in studies using medication dosages as a dependent variable, the obtained reduction in the amount of drug required may have occurred even without the intervention of therapy. Indeed it has been shown that BP may remain low following the

reduction of medication even without other changes in management (White, 1973). The force of these alternative explanations may be lessened by the inclusion of control groups. Ideally, these should be equivalent to the treatment group in all aspects which might potentially affect BP, except for the treatment itself.

In one control group study, Stone & DeLeo (1976) reported changes in BP resulting from a treatment based on Buddhist meditation. Initial (baseline) BP levels were established by averaging 14 pre-treatment determinations (7 supine and 7 upright) for each subject. Previously participants had been diagnosed as borderline to mild hypertensives, and they were selected for the experiment on the basis of their ability to comprehend instructions, their motivation and their capacity to adhere to the program. The non-randomly-assigned control group was seen for BP determinations once a month for six months. Blood pressure levels at the six month follow-up were determined by the same procedure used to establish baseline levels. Subjects were told to locate a quiet and secure environment, to sit in a upright chair, loosen tight clothing, relax their muscles, and to focus their 'minds' on counting their respirations. After five 20-minute training sessions, they were instructed to repeat the procedure for 10-15 minutes, twice daily.

In addition to the determinations of BP, several clinical assays were conducted including determinations of plasma dopamine-B-hydroxylase (DBH) levels (a proposed index of sympathetic nervous system activity) and plasma renin activity. None of the subjects were taking medication and no restrictions were placed on salt intake. After six months the treatment group exhibited significant reductions in both systolic and diastolic pressures compared with their pre-treatment baselines and the control group.

Unfortunately, the control group in this study (5 subjects) was approximately one-third the size of the treatment group (14 subjects) making it difficult to draw conclusions concerning treatment differences. Also the validity of the assumptions of the t-test procedures used to compare groups have been called into question. In this the population variances of the two groups were assumed to be equal and a statistically significant difference between them was reported at the .05 level. Jacob et al (1977) conjectured that if these population variances were in reality unequal, then the probability levels could be anywhere between .17 and .006. The general clinical opinion was that the great difference in group size mars this otherwise well-designed and properly-executed experiment. Also the authors' conclusion that BP reduction during treatment was associated with reduced peripheral adrenergic activity and possibly with alterations in the renin-angiotensin system has not withstood critical examination (Jacob et al, 1977).

Studies such as these still lack the methodological rigor associated with the random assignment of subjects to treatment or control groups. This type of design is meant to control for differences in the characteristics of subjects or their environments and its use can aid attempts to control for 'placebo' or 'nonspecific' effects such as expectation of improvement, attention from therapists, or credibility of the alternative treatment.

Patel & North (1975) were aided by Miall, an experienced epidemiologist, in an expansion of the therapy used by Patel (1973, 1975). This included the presentation of educational materials about hypertension, a concern for the effects of emotions on bodily processes, a study of the physiology of relaxation, and the use of biofeedback and self-control. Also opportunities were provided for the patients to freely discuss their problems with each other and the doctor. The practice of relaxation techniques was incorporated into the daily routine of each patient. Treatment lasted for 12, bi-weekly sessions and home practice was carried out twice daily. During the relaxation exercises in the later sessions, EMG feedback was given instead of the previously-used skin resistance feedback. Again, significant reductions in blood pressure were achieved.

Elsewhere, several factors which seemed to enhance the effectiveness of treatment in the administration of meditation and other relaxive techniques have been detailed (Patel, 1976). When a confident practitioner was involved, the importance of the placebo effect was stressed. The patient must persist in complying with instructions until the target reduction in BP is achieved. The modification of emotional responses was another major objective and the appropriateness of the patient's emotional reactions to arousing stimuli throughout the day was reviewed. It was made clear to the patient that compliance with the biofeedback and the muscular relaxation are not goals in themselves, but were being used to facilitate a calm state of mind. But for this to occur, it is not enough to practice relaxation twice a day; the patient's life style and behaviour when not meditating must be modified to reduce conflict and promote 'peace'.

C. Discussion

Psychosomatic diseases affect large numbers of people in the Western world. Many psychological problems together with several physical complaints are being increasingly attributed to stress and anxiety. Widely-accepted models propose that there are large differences in individual predispositions to anxious behaviour in reaction to environmental and social demands. A

variety of therapeutic interventions aimed towards the relief of these disorders have emerged, but no ideal form of treatment has been forthcoming. The conservative administration of medication has most often been the method of choice, and although an essential element in most therapeutic regimens, it may be associated with unpleasant side-effects or addiction. Hence, in addition to this predominant intervention, alternative approaches to the relief of stress have attracted much attention.

Often the concept of the 'unconscious' plays a central role in explanations of the psychological effects of meditation and discussions typically revolve around the consciousness-expanding consequences of meditation. These are seen to be brought about primarily by the manipulation of attention. The adoption of an appropriate attitude, usually (but not always) passive in nature, is also considered to be important.

Meditation, as a form of therapy, has been seen from several perspectives: psychotherapy, behavioural interventions of various types, and transpersonal psychology among others. Advocates of psychotherapy view meditation as 'adaptive regression' in the service of the 'ego', as Freudian 'primary thought processes', and as a Jungian 'Royal Road' to the unconscious. Carrington & Ephron (1975a,b) have suggested that the 'unstressing' process induced by the practice of meditation is a form of catharsis by means of which previous traumatic or stressful events are released spontaneously. On the other hand, behavioural therapies envision meditation as a relaxation technique which counteracts the harmful effects of everyday anxiety and stress that are detrimental to both psychological and physiological well-being.

These therapies are applied on the grounds that a particular disorder has its source, directly or indirectly, in idiosyncratic individual responses precipitated by stressful environmental demands. It has been suggested that the beneficial effects of meditations in which a 'mantra' is used in practice (such as TM), may be derived from the stimulus qualities of the sound becoming classically conditioned to a state of relaxation (Boals, 1978). It may also act as systematic desensitisation (Goleman, 1971), and reciprocally inhibit intruding or painful thoughts associated with anxiety (Greenwood & Benson, 1977). However certain individuals showing signs of mild psychological disturbance appear to be more predisposed to benefit from the use of meditation (Delmonte, 1984d).

A number of studies have suggested that the practice of transcendental meditation may bring about remarkable reductions in the abuse of drugs and alcohol. As well as such behavioural consequences, the practice of meditation has been associated with subjective feelings of well-being and reduced physiological

been accepted within every society since the beginnings of recorded history (Frank, 1973). In medicine, the concept of the 'placebo' is associated with the striking effectiveness of new procedures, especially when administered by enthusiastic proponents of their efficacy (Frank, 1973; Shapiro, 1971). This concept arose from the apparent therapeutic effectiveness of almost all newly introduced pharmaceuticals, and eventually, it became common practice in medicine to test all new drugs by comparing them to pharmacologically inert substances or placebos. As pharmacological studies proliferated, clinical improvement, in itself, was judged insufficient to support either the specific action of a remedy or its theory of cure. Indeed, Shapiro (1971) has argued that the history of medicine, until the 17th century, was largely an account of this non-specific effect.

Critical accounts of the history of psychotherapy have pointed out that it has drawn heavily on chemotherapeutic approaches. (Rosenthal & Frank, 1956). In research using chemotherapy, psychological events are looked upon as being among a host of potential nonspecific (placebo) effects. Therefore it has been argued that psychotherapy is concerned with those events that chemotherapy views as artifactual and seeks to eliminate. Recently, psychotherapy has been called a 'powerful placebo' in that it involves very effective non-physiochemical therapeutic procedures (Wilkins, 1984). Similarly, biofeedback techniques has been described as the 'ultimate' placebo (Plotkin & Rice, 1981). By extension, as meditation has been perceived as psychotherapy and grouped with other methods such as biofeedback, it may also be viewed as a placebo. Methods are needed to evaluate the inevitable claims of superior effectiveness for particular new therapies and of 'specific activity' for their active ingredients.

III. PHYSIOLOGICAL EFFECTS

Introduction

In addition to the normal mental states of waking, sleeping and dreaming, Buddhist scriptures detail over a hundred altered states of consciousness which may be induced by various types of meditation. Davidson (1976) has pointed out that the goal of some of these involve the induction of drastically altered states of consciousness, thought to be unique to their practice. The most valued transcendental state, Nirvana, is difficult to characterize as an actual 'state of consciousness' however, as it is considered the negation of all 'conditional' or 'relative' existence. Given the shortness of human life, it is virtually never achieved by any meditators. Other profound changes in consciousness however, may be infrequently experienced by dedicated meditators. The rarity of some of these states obviously contributes to their resistance to scientific study and interpretation.

Nevertheless, many proponents of meditative techniques (Yoga, Buddhism and TM among others) have held the view that at least the mundane effects of meditation occur frequently enough to be studied by the methods of Western science. Hence, meditators have approached universities, to provide testimonials concerning the benefits of meditation, and have volunteered to be studied. Therefore, opportunities have arisen for the experimental study of both the psychological and physiological effects of meditation. It is claimed that some 'transcendental' states of consciousness, reportedly experienced during the practice of meditation, are associated with unique concomitant physiological alterations.

A vast amount of nonscientific literature relating to the metaphysics, the mechanisms and the outcome of meditative practices may be found in religious sources and their commentaries. However, Tart (1969), in discussing the relationship between meditation and altered states of consciousness, concluded that there is no scientific knowledge concerning the effects of the practice of meditation. Since then, however, numerous experiments have been conducted in an effort to establish a scientific database regarding meditation. This was due, in part, to the assertion that the unusual psychological events purportedly characteristic of the meditative state are also reflected physiologically.

Although these physiological concomitants have been described and interpreted in several ways, the study of the electrical activity of the brain during meditation has been a common area central to both psychological and physiological

research, and will be presented first. Metabolic, autonomic and somatomotor correlates of meditation will then be addressed, especially in the context of TM. This will be followed by a discussion of physiological changes associated with such feats of endurance as pit burials. These changes resemble those associated with the Relaxation Response which is broached later in this section.

A. Electroencephalography and Meditation

Electroencephalography (EEG) is both a technique and a science. Electrical activities of the brain - electroencephalograms - are recorded by electrodes placed on the head. These recordings are then interpreted and related to normal and abnormal activity of the cerebral cortex and by extension, to other neural and somatic processes. Of particular interest have been the cortical electrical concomitants of states of consciousness, clinical syndromes, and traumatic insult and injury to the nervous system. In principle, the EEG spectrum measured from living brains may range in frequency from less than one to greater than 75 Hz (cycles per second). The brain may generate frequencies in excess of the latter value which can be submitted to computer analysis. However, conventional pen-writing instruments significantly attenuate these higher frequencies making their description and interpretation difficult.

There is general agreement among electroencephalographers concerning characteristic electrical activities of the brain which are exhibited in normal, healthy adults. In general, the frequency spectrum is separated into four 'bands':

- 1) Delta - less than 4hz.
- 2) Theta - 4-7 Hz.
- 3) Alpha - 8-13 Hz.
- 4) Beta - greater than 13 hz but most commonly studied between 13 and 35 Hz.

Typically each of these bands or 'rhythms' forms the dominant background EEG activity associated with certain behavioural states. During the three major states of consciousness: waking, sleeping and dreaming, the brain reliably generates patterns of electrical activity which distinguish each from the others. If a person is awake, alert and attending to immediate environmental events, 'beta' activity is observed. 'Alpha' activity emerges when vigilance is relaxed and when a resting posture is assumed. 'Theta' activity is commonly identified during the transition from waking states to sleep. The large amplitude, slow delta activity is a hallmark of deep sleep, and is periodically punctuated by rapid eye movement (REM) activity (The International Federation of Societies for EEG and Clinical Neurophysiology, 1983).

The specific details of EEG topography vary from one report to another. However, an overall pattern has emerged, especially concerning the profile of TM. Soon after a meditation session begins there is an increase in the amplitude of the slower frequencies of the alpha rhythm (8-13 hz) as the intensity of these frequencies (8-9 hz) becomes greater in the central and frontal regions. The increased alpha activity tends to begin over the parietal lobes and then migrates anteriorly, possibly as far as the prefrontal area. Bursts or 'trains' of frequencies of the slower theta rhythm also intermittently occur, often concomitantly with alpha. Frequencies of the sleeping delta rhythm are much less common but have been reported. More often, the broad-banded, fronto-central beta rhythm punctuates the alpha activity, a phenomenon known as beta 'spindling'.

Electroencephalographers have recorded beta activity over the frontal and central regions of the brain in healthy, waking adults. In contrast, meditation studies have observed both beta and the slower theta frequencies during the so-called 'deep' states achieved by experienced meditators (Anand *et al.* 1961a,b; Hirai, 1974). Banquet (1973) used spectral analysis to evaluate the EEGs of twelve TM meditators, and reported three distinct stages during the course of their 30-minute sessions: first alpha, then theta, and finally beta. The latter stage was attained by only four of the meditators, and consisted of high amplitude (30-60 uV) beta waves at 20 and 40 Hz, which were prominent over the whole scalp.

(1) Alpha Activity and Meditation

Alpha activity of the EEG is usually seen when the eyes are closed as well as during sedentary mental activity, and it is associated with relaxed, but awake, states which may border on light drowsiness. If a loud noise occurs or the eyes are opened under such conditions, the frequency of the dominant background EEG activity increases and alpha activity may be replaced by the faster, less synchronous beta activity. Several studies (Kasamatsu & Hirai, 1963; Wallace *et al.* 1971; Fenwick, 1974; Corby *et al.* 1978) have reported slowing of electrocortical activity during meditation. Others have repeatedly noted substantial increases in alpha activity, particular in the Zen (Kasamatsu *et al.* 1966), Yogic (Anand *et al.* 1961a,b), and Transcendental (Wallace, 1970; Banquet, 1973) types of meditation. The magnitude and duration of these changes, however, varies from study to study.

This implies a state of cortical relaxation consistent with other behavioural processes. However, none of these studies included an eyes-closed control group but compared meditation with a premeditation eyes-closed rest procedure. Such methodological inadequacies introduce the possibility of

a variety of alternative explanations for the observed effects, yet these are infrequently entertained (Delmonte, 1984e).

Increases in alpha activity during meditation appear to be similar to those associated with such techniques as relaxation-hypnosis, alpha biofeedback training, progressive relaxation or simply eyes-closed rest (Morse *et al.* 1977; Warrenburg *et al.* 1980). However, one study on TM (Travis *et al.* 1976) and another on 'Christian' meditation (Akers *et al.* 1977) failed to find increased alpha production during meditation. Moreover, Lukas (1973) randomly assigned subjects to groups, and reported that a 'mock' mantra control group exhibited significantly more alpha activity than the TM or resting group. Hence, to date, there is not enough evidence to affirm that meditation has a unique effect in terms of EEG patterning compared with other hypnoidal techniques. Finally, the pleasant subjective experiences which have been reported during states of enhanced alpha activity (the alpha experience) are not unique to the method of induction (meditation, biofeedback, etc.) and may not even be related to alpha levels at all (Plotkin *et al.* 1976).

(ii) Alpha Blocking Studies

In normal, awake subjects, presentation of external stimuli (usually lights and tones), or engagement in mentally effortful tasks produces a sudden shift in the EEG spectrum towards faster frequencies. This is known as 'alpha blocking' or 'disinhibition', a well-established phenomenon and one which is of great interest to researchers (Adrian & Matthews, 1934). Typically, with repeated stimulation, these 'blockages' attenuate and gradually disappear or habituate (Becker & Shapiro, 1981).

During meditation, however, it has been reported that alpha blocking either does not occur at all, as in the case of the Yogic 'samadhi' (ecstatic) state (Das & Gastaut, 1957) or that it does not habituate to repeated external stimuli (Kasamatsu & Hirai, 1966). These findings seem to be consistent with the goals of the types of meditation involved, i.e. Zen meditation attempts to turn attention outward, and regards all stimuli as 'novel' events to be dispassionately observed but not reflected upon. On the other hand many Yogic forms of 'concentrative' meditation urge the inward direction of attention to the exclusion of all external stimuli (Delmonte, 1984b).

(iii) Theta and TM

The association between alpha activity and meditation initially received considerable attention. However, more

recently the theta state has been the focus of speculation. This is possibly because the psychological variables, most consistently related to changes in theta activity, have been subsumed under the general heading of 'attention'. For example, converging evidence suggests that low voltage, irregular theta activity, with an overlay of beta components, may be the principle EEG characteristic of the hypnagogic state (drowsiness) (Dement & Kleitman, 1957; Liberson & Liberson, 1965; Foulkes & Vogel, 1965; Stoyva, 1973).

This state is characterized by decreasing ability on the part of the organism to actively interact with the environment. Furthermore, psychological phenomena such as autonomous, vivid visual and auditory imagery (Stoyva, 1973), kinaesthetic experiences (Oswald, 1962), and alterations in thought (Vogel et al. 1966, 1972) reportedly accompany low voltage theta activity during the hypnagogic state.

Wallace (1970), studying TM, reported low-voltage theta which appeared to be similar to EEG wave-forms seen during drowsiness in four out of 15 subjects. Wallace et al. (1971) noted the same effect in five out of 36 subjects. In these subjects, theta appeared in the frontal area simultaneously with alpha dominance in other cortical areas. Ishihara & Yoshii (1973) and Legewie et al. (1969) also noted this phenomenon in studies investigating theta states and problem solving. Banquet (1973) pointed out that spectral analysis of the EEG of meditators showed that power was largely concentrated in the 5 hz region of the spectrum. In contrast, in four control subjects power was distributed between theta and other frequencies, suggesting drowsiness. However, the 5 hz unimodal peak is not consistent with the known characteristics of theta waves which accompany drowsiness (Schacter, 1977). Methodologically, due to the complex nature of theta activity, this study might have been improved had statistical analysis of the EEG spectra been reported.

EEG patterns characteristic of drowsiness, as well as slow eye movements have been observed by Fenwick et al. (1977), indicating the hypnagogic state in a TM group during meditation. They conjectured that TM may form a technique for holding the level of consciousness constantly in the hypnagogic state. Similarly, Younger et al. (1975) studied eight practitioners of TM, and found that, on average, about half of the meditation-time was spent in waking alpha whereas the other half passed in states of drowsiness or Stage II sleep.

Pagano et al. (1976) reported that during ten sessions of meditation by each of five experienced transcendental meditators, 39% of the meditation-time was accompanied by wakeful EEG, 19% by drowsy EEG, and 40% by sleep stages II, III, and IV. They

further noted that EEG ratings of drowsiness and sleep compared well with the subject's introspective identification of these states. It is worth noting, however, that visual inspection of the records was the only method of EEG analysis reported in these three studies. Hence, it is difficult to compare the properties of theta, reported in these experiments, with the features of the meditational theta activity claimed by Banquet (1973).

(iv) Long-term EEG Changes

Other investigations have compared the responses of meditating groups with eyes-closed control groups and have found increases in both alpha and theta activity in meditators (Banquet, 1973; Elson *et al.* 1977; Hebert & Lehmann, 1977; Lehrer *et al.* 1980). These studies did not randomly assign subjects to groups, nor did they pursue any potential long-term effects of meditation, but compared self-selected (experienced) meditators with controls on a single occasion. A longitudinal design which included a three, six and nine month follow-up was employed by Vassiliadis (1973). During the pretest condition meditators and controls did not show any significant differences in terms of frontal and occipital alpha activity. There were still no significant differences between groups after three months.

However at six months, increased levels of occipital alpha activity were noted in the meditation group. At the nine month follow-up session there were no significant changes in frontal alpha associated with this practice. Nevertheless, the meditating group had reliably increased occipital alpha activity as well as theta activity compared to controls. Moreover, these increases appeared to be a direct function of the length of practice of TM - a finding consistent with results from systematic studies of Zen and pit burials of yogis. However, it is not clear to what extent meditation was responsible for the EEG effects observed, as meditative practice over time is a self-selective process and the degree of experience may be a significant factor (Delmonte, 1984e).

(v) Comment on the EEG Studies

The studies reviewed here pose several basic questions of interpretation. A number of authors have observed large variability in alpha production within groups of subjects (Banquet, 1973; Westcott, 1974; Younger *et al.* 1975), whereas others have noted a similar trend with regard to theta production (Elson *et al.* 1977; Corby *et al.* 1978; Warrenburg *et al.* 1980). Westcott (1974) speculated that EEG patterns are related to individual neurological traits which are enhanced during the practice of meditation. It has also been suggested that large individual variations in base-line alpha may be related to

genetic and early environmental influences (Paskewitz, 1977).

Some explanations of the 'alpha experience' which have come from studies using alpha biofeedback training emphasise the importance of social psychological variables such as expectation (set), demand characteristics of the experimental setting and the degree of experienced success at the task (Plotkin, 1977).

Delmonte (1984e) has identified two interpretations emerging from the evidence linking meditation, psychological states and electrocortical activity:

- 1) Meditators may represent a self-selected group of individuals who tend to take up and maintain the practice of meditation. These individuals also tend to be high alpha and theta producers compared with controls. This view has received support from findings showing that meditators exhibit higher alpha or theta levels than controls even when not meditating (Kras, 1977; Tebecis, 1975).
- 2) 'STATE' effects of meditation may evolve into 'TRAIT' effects. Two longitudinal studies have suggested that the alpha activity of meditators is significantly greater than that of controls both during and following meditation (Glueck and Stroebel, 1975; Vassiliadis, 1973).

Theta activity, during Zen and TM, might be expected as these procedures emphasize the role of focused attention and concentration during meditation. However, similar techniques encourage entry into hypnagogic states (Stoyva, 1973) which are also associated with theta. In addition, Bohlin (1971) has argued that monotonous repetition of the mantra may induce a sleep-like state. This latter interpretation is supported by the finding that theta, during TM, is structurally similar to theta associated with drowsiness, and subsequent sleep. There is obviously a need for further research in this area to discover whether features of theta activity, during meditation, reflect those seen in 'normal' subjects performing tasks which elicit similar psychological states.

B. Transcendental Meditation and Associated Physiology

TM has attracted millions of followers, mainly due to its presentation as an effortless, automatic technique which may be used to experience not only 'Being' but also profound levels of relaxation. Maharishi has associated relaxed states with a lowered bodily metabolism, and has claimed that this is due to the calming of the mind and nervous system by the practice of TM. Indeed, a state of deep relaxation is a necessary prerequisite for the experience of increasingly subtle levels of thought and,

by extension, transcendental Being. Hence, the repetition of a particular word (the mantra) is held to calm the nervous system, which together with 'softer' breathing induces a lowered metabolic state. The deeply relaxed bodily state is however, accompanied by an alert mental state. Maharishi (1966) claimed that the repeated experience of this state 'de-stressed' the nervous system, thus alleviating the effects of excessive arousal and anxiety. Furthermore, these induced states of 'maximum relaxation' were asserted to be psychologically and physiologically unique to TM which has been advocated as a viable replacement for psychotherapy:

"It is time that the medical professions in different countries considered the value of Being and put to the scientific test the physiological and psychological effects of transcendental meditation so that the mental and physical health of all people may benefit from Being. At this time, in almost every country of the world, there are people practising transcendental meditation who would make good subjects for tests to determine the physiological and psychological changes due to the influence of Being. Many thousands of people have found that their health becomes better, their behaviour towards other people improves and harmony in the atmosphere is maintained at all levels."

(Maharishi, 1966, p.208-209)

If validated, such claims could have important consequences for the practice of Western medicine. Metabolic levels are closely associated with behaviour: a low metabolism reflects relaxation, quiescence or sleep whereas a high metabolic rate is associated with arousal and movement. Sustained, excessive levels of arousal or anxiety are believed to occur in response to environmental stressors which, in turn, are perceived to be principle 'risk factors' in the aetiology of psychosomatic pathologies. Therefore, the experimental study of TM and its unique states seems to be a worthy enterprise.

Maharishi (1966) has given an account of the physiological effects of transcendental meditation from which proponents rarely deviate. In this, he explained that:

"during meditation, as the mind proceeds to experience the finer stages of thought, the whole body becomes calm and quiet.

This quieting of the body naturally allows an unusual degree of rest which itself stores energy to an unusual degree. Certainly activity of the mind and the nervous system is least in this state and the mind quietens and becomes calm."

(Maharishi, 1966, p.329)

This state is said to be brought about by a fall in the partial pressure of CO₂ in the plasma, which in turn leads to a lessening of respiratory amplitude. Respiratory frequency may also decrease. Together these reductions are held to account for the apparent diminished oxidative metabolism. Although hyperventilation or 'forced overbreathing', may cause a similar fall in blood CO₂ levels and subsequently lower metabolism, it's occurrence was denied in this case.

Wallace (1970) was the first to conduct a systematic investigation of TM using contemporary laboratory techniques to measure the accompanying physiological processes. Some of his more impressive findings included 20% decreases in VO₂ from rest and a lowering of HR by an average of 5 bpm; values consistent with those reported for Zen monks (Kasamatsu & Hiraï, 1963). However, in both studies the briefly-reported results were derived from only a few selected subjects. Independent replication of these studies would prove difficult if based solely on the published information.

Subsequently, a series of reports emerged reporting significant reductions in a number of physiological variables during the practice of meditation. These have included heart rate, blood pressure, ventilation rate, cardiac output, oxygen consumption, carbon dioxide elimination and blood lactate concentration. In addition, it has been reported that the asynchronous, mixed frequencies characteristic of the 'awake' EEG shifted to lower alpha frequencies, and the galvanic skin resistance increased dramatically. This evidence has been generally cited to affirm the view that meditation affects physiological as well as psychological arousal.

(1) Heart Rate

Pioneering studies of Yogis in India concerning the effects of meditation on heart rate (HR) yielded confusing results. During various types of Yogic practices, HR increases (Das & Gastaut, 1957; Wenger & Bagchi, 1961), as well as HR decreases (Anand *et al.*, 1961a) have been reported. However, other researchers have noted inconsistent or insignificant changes in HR during similar practices (Karambelkar *et al.*, 1968). The frequently cited Japanese investigations of the physiological effects of Zen meditation (Akishige, 1968) did not report HR and other physiological data in a systematic fashion, although decreases in HR may be inferred from the direction of change of other physiological variables. Broadly speaking, HR decreases have been reported in studies either lacking a control group or using a design insensitive to temporal effects such as comparing values during meditation with pre-meditation rest levels.

Many investigators (Morse *et al* 1977; Puente, 1981; Malec & Sipprelle, 1977; Travis *et al* 1976) have failed to report significant decreases in HR during meditation. Furthermore, experiments which have noted significant reductions in HR during meditation following eyes-closed rest also report that such changes do not differ significantly from those observed in a control group (Walrath & Hamilton, 1976; Warrenberg, *et al*, 1980).

Those which have used stronger experimental designs such as randomly assigning subjects to either meditation or control conditions failed to find significant HR differences between groups. Changes in HR from pre-meditation to follow-up periods varying from 2-12 weeks have also failed to reach statistical significance (Benson, *et al*, 1978; Rogers & Livingston, 1977; Peters, *et al*, 1977; Patel & Carruthers, 1977; Surwit, *et al*, 1978; Kirsch & Henry, 1979). Nonetheless, other longitudinal studies have reported reliable decreases in HR associated with meditation compared with both controls and pre-initiation levels (Kubose, 1976).

(11) The Galvanic Skin Response

Wallace *et al* (1971) and Orme-Johnson (1973) have emphasized the stress-reducing properties of TM. The galvanic skin response (GSR) is an important physiological variable in meditation research because it reflects activity of the sympathetic nervous system. An increase in the frequency of 'spontaneous' GSRs or a fall in GSR baseline implies greater sympathetic activity. A state of relaxation, or autonomic stability is inferred from a rise in GSR baseline and fewer 'spontaneous' responses. An experiment by Orme-Johnson (1973) is heavily cited in discussions of the therapeutic value of meditation. The results of this study indicated that meditators produced significantly fewer spontaneous GSRs than resting non-meditators, and suggested that meditation reduced arousal. Recently however, Holmes (1984) convincingly argued that Orme-Johnson's results may be accounted for by the 'Law of Initial Values', a well-established principle that should be considered in the interpretation of psychophysiological data.

Morse *et al* (1977) found that there were no significant differences between meditation, instructed relaxation and relaxation-hypnosis with regard to GSR. This finding is consistent with the results of other studies which have reported no significant state differences between the electrodermal activity of meditating subjects and controls (Puente, 1981; Malec & Sipprette, 1977; Walrath & Hamilton, 1975; Curtis & Wessberg, 1976; Cauthen & Prymak, 1977).

As well as looking at levels of electrodermal activity, others have studied reactivity in this domain to stressful stimuli, and reported equivocal results. For example, using relatively mild laboratory 'stressors', Lehrer *et al* (1980) and Bradley & McCanne (1981) reported no significant differences in electrodermal responsivity between meditation and control groups exposed to aversive auditory stimuli. However Goleman & Schwartz (1976), using the cold-pressor test, found more rapid recovery (habituation) to the noxious stimulus in the meditating group compared with controls. It was also noted that naive subjects, meditating for the first time, showed a recovery pattern similar to those of more experienced meditators, only less marked. All of these studies were conducted with practitioners of TM, who for purposes of analysis, may be considered a self-selected group (Delmonte, 1984f).

(iii) The Electromyogram

Electromyographic activity (EMG) reflects muscle tension and is extensively reported in investigations using biofeedback, progressive relaxation, autogenics, etc. However, as revealed in the compilations of two prominent reviewers there is a dearth of EMG data relating to meditation research. Woolfolk (1975), within the context of the 'psychophysiological correlates of meditation', does not even mention EMG. Holmes (1984) reviewed the experimental evidence that meditation lowers somatic arousal, but devoted only one sentence to 'EMG Activity'. Two out of four studies that apparently assessed EMG during meditation suggested that the meditating group experienced less muscle tension than a resting group. However, no citations were given. Woolfolk (1975) speculated that the almost immobile posture assumed by many meditators, might have led to the opinion that EMG recordings are redundant.

Nevertheless, Das and Gastaut (1957) found no muscular electrical activity whatsoever during the practice of Raja Yoga meditation, and Banquet (1973) reported similar findings with respect to TM. Delmonte (1984c), using a counterbalanced design, found that subjects had significantly lower frontalis EMG levels during TM than during eyes-closed rest. This finding agreed with a previous study which reported that meditators demonstrated significantly lower frontalis EMG compared to resting controls (Malec & Sippelle, 1977). Morse *et al* (1977) found that both TM subjects and novice meditators taught Benson's method showed significantly lower scalp - frontal, temporal, parietal and occipital - muscle activity during meditation than during either relaxation/hypnosis or simple eyes-closed relaxation. In contrast, Travis *et al* (1976) noted no significant differences between meditators and controls with respect to frontalis EMG levels. Similarly, Warrenberg *et al* (1980) reported that meditators were not significantly different in terms of frontalis EMG during meditation and eyes-closed rest.

although, they apparently showed significant decreases from baseline.

Zaichkowski *et al* (1975) compared biofeedback, TM and Benson's method in terms of EMG and reported that all treatment groups produced significant decreases in frontalis EMG levels over three months, compared with the control condition. In this study all groups were randomly assigned except to the TM condition, but all were pre-tested before intervention began. Raskin *et al* (1980), in a longitudinal study lasting more than three months, found no significant differences between subjects with chronic anxiety who were randomly assigned to TM, EMG biofeedback or relaxation therapy; all groups showed significant decreases in EMG activity. The decreases in muscle tension, however, were not related to reductions in anxiety.

(iv) Comment on HR, GSR, and EMG Studies

Studies focusing on autonomic (HR and GSR) and somatomotor (EMG) indices have generally found little difference between effects of meditation and those associated with rest and relaxation. Electrodermal evidence suggests that sympathetic activity is reduced during meditation indicating lowered arousal. Reductions in HR have also been associated with meditation although these are often of negligible magnitude, and some studies have even reported increases in cardiac activity. The majority of EMG studies have directed attention towards activity in the frontalis muscles. Less activity in this and other muscle groups has been demonstrated, although similar effects have been seen during relaxation. In general, the published reports regarding both long-term and short-term effects of the practice of meditation on physiological responsiveness are contradictory and equivocal. Claims that meditation produces changes in autonomic and somatomotor activity beyond those normally found in eyes-closed rest, has received little support. However, the physiological states associated with meditation have been utilised by practitioners to facilitate certain feats of endurance. These will be reviewed in the next section.

C. Control of Metabolic Rate and Associated Feats of Endurance

There is a widespread belief, long held in the East, that as well as bringing spiritual enlightenment, the practice of yoga and meditation can aid the voluntary control of certain 'involuntary' or autonomic physiological functions. More recently, reports attesting to such control have gained wide currency in the West, particularly since the emergence within scientific psychology of new techniques such as biofeedback. Yogis have displayed such feats as breaking chains and cutting

palm leaves with the fingers, as well as displaying precise control of individual abdominal muscles. Other claims include the ability to endure great pain, stop the heart, markedly diminish muscular activity, and reduce ventilation to imperceptibility (Hoenig, 1968).

Perhaps the most remarkable skill involves the ability of some yogis to remain buried underground for prolonged periods - up to 28 days. These yogis not only survive, but apparently suffer few ill effects as a result of the experience. Of all the Yogic feats, the ability to endure 'burial' has perhaps had the greatest impact on the imagination of Western physiological investigators. Therefore, the results of these field studies have provided a powerful stimulus for the experimental investigation of meditation and yoga as techniques capable of modifying important physiological processes.

The control of bodily metabolism is a very complex affair involving behavioural, physiological, and hormonal processes. The link between respiratory activity and metabolic rate is well understood (Lambertson, 1974) and the metabolic costs of many everyday activities have been estimated (Conzolazio *et al.* 1963). Increases in oxygen uptake, above basal and resting levels, may be largely accounted for by variations in the activity of the striate muscles. In the eyes of Western science the results of pit burial studies suggested that bodily metabolism can be intentionally lowered to levels which have previously been considered incompatible with human life, and these features cause this to be one of the first Yogic practices to have been systematically studied.

(1) Pit Burials

Traditional writings do not describe 'Bhoogarbhā Samādhi' (pit burial) but it is by no means uncommon. The technique involves the total lack of movement together with respiratory manipulations which lower bodily metabolism (Hoenig, 1968). Typically-used methodology involves the confinement of volunteers in a board-covered 'pit' or, above ground, in an air-tight box. The meditative posture assumed under these circumstances is not the traditional lotus position, however, but Shavasana - the 'corpse pose', a prone posture of virtual immobility. Reports of prolonged confinement lasting days or weeks have not been experimentally investigated, and in published studies subjects have rarely remained in air-tight isolation for more than a few hours. Nevertheless, such feats have made a deep impression on Western observers, and have aroused interest in the Yogic assertions that breathing exercises are responsible for inducing states of lowered metabolism.

These exercises, called pranayama (a pause or holding in the breathing cycle), involve manipulation of both respiratory rate and the temporal ratios between inspiration, retention, and exhalation. The time relations of the different parts of the respiratory cycle are of considerable importance to practitioners, and their adroit management is difficult. Once mastered, however, pranayama purportedly enables the practitioner to become 'independent' of bodily needs. In the language of Eastern traditions the effects of the manipulation of ventilation endowed the meditator with supernatural powers.

Regarding 'pit burials', Vakil (1950) witnessed a yogi, Shri Ramdasji, sealed in an air-and water-tight underground concrete cubicle in which the six internal walls were lined with thousands of rusty iron nails. After the yogi had been encased for 56 hours, 1400 gallons of water were introduced into the cubicle through a small hole made in the roof, which was afterwards immediately sealed. A further six and a half hours elapsed until the chamber was opened and the yogi, in a state of stupor, was lifted out. Upon examination, his heart rate, blood pressure and respiration were within normal limits. Unfortunately, these relevant measures were not determined during the 'experiment' per se, although, after a whiff of smelling salts the yogi appeared none the worse for wear. Shri Ramdasji was confined for a total of sixty-two hours, making this stay the longest recorded in Western scientific literature. Although unknown in the West, such demonstrations are apparently not uncommon in India where they may draw large crowds - 10,000 in this case.

Reports of such feats of endurance attracted much attention in the West. Those published in scientific journals have had an impact on the perception and the experimental study of meditation which has extended far beyond that which their number merits. In India, they have also aroused official interest, and funding has become available for their study.

In 1960 the Indian Government set up a Committee to scientifically investigate yogic practices as a part of a more general examination of 'indigenous systems of medicine'. The committee consisted of representatives of the Health and Education Ministries as well as medical researchers. The primary object of this project was to ascertain and assess the potential use of yogic techniques in the management of psychosomatic disorders, and involved trained medical personnel as well as the use of modern electronic instrumentation. The major recipients of governmental funding for this enterprise were two Institutes: the Kaivalyadhama Lonavla Institute and the All India Institute of Medical Sciences. Both are noted for their scientific research and for a lack of emphasis on the spiritual aspects of meditative techniques. Furthermore, most experimental investigations of meditation conducted by Western researchers

have directly or indirectly involved these institutes.

The Chairman of the Committee, Dr. B.K. Anand, was also director of research at the All India Institute, and he was particularly interested in the metabolism of yogis during 'samadhi' (deep meditation). This interest was also shared by Drs Bhole, Vinekar and Karambelkar, the directors of research at Lonavla. Moreover, official interest in meditation has centered around the efficacy of yogic claims concerning improved health - a fascination shared by the West. One of the first methodological problems encountered was the selection of a 'real' yogi as a subject for planned experiments. It was reasoned that expert practitioners would generate results which more accurately expressed the true effects of meditation compared with those of novices or frauds.

Subject selection can present difficulties in all areas of psychological and physiological research, but it becomes a particularly acute problem in the experimental study of meditation. At times, experimenters have been besieged by yogis volunteering to be studied. On the other hand, the strict life style of some practitioners may demand the complete avoidance of contact with other people.

Wenger and Bagchi (1961) noted that among their subjects were individuals who only practiced yoga for physical exercise or for exhibition as well as many who were 'sincere followers of the path' giving 'excellent cooperation'. Some of the yogis approached, however, 'refused any form of cooperation' including conversation or the observation of their practices. Even under less extreme conditions, appropriate subject selection continues to be an issue hindering contemporary meditational research. It does not, however, preclude experimental study. Anand et al (1961), for example, solved this problem in their initial study of yogic abilities by choosing as their subject Sri Ramanand Yogi, co-director of the Patanjali Yoga Research Institute, and an expert yoga instructor.

Anand et al (1961a) twice sealed Sri Ramanand in an air-tight box. The first time a candle burned in the box with the yogi. It went out after about three hours but Sri Ramanand remained confined for a further five hours. The yogi's oxygen uptake was inferred from the intermittently determined values of total oxygen and carbon dioxide in the box. However effects relating to the first three hours are confounded as the amount of oxygen burned by the candle was an unknown factor, thereby rendering comments on the yogi's oxygen uptake during this period speculative. During the remaining five hours, however, the Yogi's average oxygen uptake was 12.2 liters/hour or 7.3 liters less than his relatively high basal value of 19.5 liters/hour.

On the second occasion the yogi stayed in the box, without a candle, for ten hours. This time the average rate of oxygen uptake was 13.3 liters/hour, slightly higher than during the previous experiment. Oxygen uptake initially increased, then fell as low as 10 litres/hour, and although it rose again during the latter part of the session, values remained below those expected under basal conditions. The activity levels of other measured physiological indices, however, were not consistent with the apparent lowered metabolic rate. For example, heart rate was 85 bpm upon entering the box. It then fell to between 60 and 72 bpm until the last hour when it again rose above 80 bpm. Respiration rate began at 20 breaths/minute, and generally remained stable until the last two hours when it increased to 26 breaths/minute. Values given for oxygen and carbon dioxide concentrations at the end of the experiment were 15.8% and 4.4% respectively. The authors noted "... that in spite of breathing an air whose oxygen content had fallen below 16% and CO2 content risen above 4%, Sri Ramanand did not show any hyperpnoea or change in heart rate" (Anand *et al.* 1961a, p.89). Carbon dioxide levels of this magnitude are not, however, associated with significant alterations in the activity of the heart, blood pressure, oxygen uptake and related physiological processes.

Hence, these values are by no means abnormal considering the experimental circumstances and the yogi's relatively high initial metabolic rate. Nevertheless, the results were interpreted as indicating that Sri Ramanand Yogi could voluntarily reduce his oxygen uptake to significantly below basal requirements, seemingly by as much as an impressive 40-50%. Anand *et al.* (1961) postulated that such effects were due to 'conditioning' of the limbic system, a chain of thought that is consistent with that of Western psychology. The process being as follows:

- 1) somatic activities are 'voluntary' and are regulated by the neocortex (conscious brain).
- 2) visceral functions are 'involuntary' and are regulated by the limbic system.
- 3) visceral functions cannot be influenced 'voluntarily'.
- 4) through yogic practices the limbic system is 'conditioned'.

The assumption that the neocortex is the brain structure responsible for consciousness and for voluntary movement of the body has been a prominent part of Western psychological doctrine. Similarly, the notion that visceral processes are insensitive to neocortical influence and are solely regulated by subcortical mechanisms is an extension of this argument. Whereas psychologists use electronic instruments to 'condition' the activity of neural structures controlling visceral responses, yogis may carry out an analogous process through mental activities such as meditation.

In an effort to replicate the experiment of Anand *et al.*

(1961a), Karambelkar *et al* (1968) studied four subjects. One was a professional yogic meditator, one was a novice and two were non-yogis. The professional was 54 years old with a reported basal oxygen uptake of 13.7 litres/hour. The other subjects were younger; 14, 15 and 27 years of age with basal oxygen uptakes of 18.0, 17.7 and 21.6 litres/hour, respectively. Each subject was encased in an air-tight box for 12 to 18 hours. During the confinement, the VO₂ of each subject was less than that expected on the basis of their respective basal oxygen uptake values. However there was a large between-subjects variance in VO₂, ranging from 2-34% of subject's basal values.

These reductions were more marked at the beginning of the session, and gradually decreased as confinement progressed. The reduction in VO₂ exhibited a direct relationship to the subject's prior experience of the breathing exercises used - pranayama. All the subjects suffered great discomfort when CO₂ levels in the box reached 5%, after which marked increases in heart rate, blood pressure and respiration rate were recorded. The professional subject sustained CO₂ concentrations as high as 7.7% before the experiment was terminated. However, such levels of carbon dioxide caused the yogi considerable distress.

Although VO₂ decreases were seen in all subjects (Yogi and non-Yogi), none could demonstrate such a change outside the box. Karambelkar *et al* concluded that the reductions in VO₂, during confinement, represented normal physiological responses to the steadily increasing CO₂ levels. They suggested that pranayamic techniques help to develop tolerance to the stress produced by elevated CO₂ levels. This, in turn, would induce muscular relaxation, and so reduce metabolic rates. As Karambelkar *et al* have pointed out, the results of these studies are consistent with the detailed studies of respiration by Haldane (1917).

This pioneer in respiratory physiology studied human subjects in air-tight chambers and noted that CO₂ concentrations above 5% were sensitive predictors of physical discomfort and increased respiration rate. In contrast, O₂ concentrations were relatively unimportant sources of psychological or physiological distress. For example, oxygen concentrations as low as 8-9% did not significantly alter breathing. In agreement with Haldane, Consolazio *et al* (1947) found that an atmosphere composed of 5% CO₂ and 12% O₂ did not significantly impair the psychophysiological efficiency of subjects. However, they noted that CO₂ levels above 5% were not well tolerated by normal, healthy persons. Haldane once enclosed himself in an air-tight tank for an hour without harm. In his opinion the oxygen requirement of a man, lying perfectly still, is only about 1/2 cubic foot/hour. If these figures are applied to the pit burial studies, they can account for the survival of yogis buried for the periods under consideration.

For example, the air-tight box used by Anand et al (1961) measured 6'x4'x4', with a capacity of 96 cubic feet. This would provide enough air space to allow 19.2 hours of breathing time. As Sri Ramanand stayed in the box for only 10 hours, he was performing well within his capabilities. The box used by Karambelkar et al (1968) measured 6 3/4' x 4' x 3 1/2', yielding 94.5 cubic feet or 18.9 hours breathing time. These subjects were confined up to 18 hours, thereby approaching their theoretical limits. Hence, rising CO2 levels were reported and the experiences of the subjects were consistent with the environmental conditions, suggesting that experimental results obeyed known physiological principles.

Similarly, Vakil (1950) accounted for the feat of Shri Ramdaji by noting that the 216 cu.ft. capacity of the concrete cubicle contained sufficient oxygen for 86 hours breathing time. Hence, in principle the confinement could have continued for a further 14 hours, although this would have been reduced somewhat by the introduction of the water which would fill approximately 186 cu.ft. He was deeply impressed by the fact that the middle aged, 'emaciated' yogi has survived confinement for 62 hours completely surrounded by rusty nails, 6 1/2 hours of which he was up to his neck in water.

The experimenter's perception of metabolic function may also colour reported results. For example, Hoenig (1968) noted that the burial of Shri Krishna Iyengar was terminated for fear of the yogi's life. However the yogi asserted that he could have remained incarcerated for a further 36 hours, and volunteered to do so, but his offer was rejected on medical grounds. The dimensions of the pit were 2.5' x3' x4' (approx. 30 cu.ft.) or large enough to meet the yogi's needs for the time period he specified. In this sense, the yogi seemed to be more cognizant of his metabolic needs than the researchers conducting the study. Hoenig (1968) similarly accounted for the performance of Shri S.R. Krishna Iyengar during burial at the All India Institute on three occasions. In each case oxygen uptake was not directly measured, and discussion focused on the levels of carbon dioxide at burial termination. All three experiments yielded similar results - slightly less than 4% carbon dioxide concentrations in the pit.

Regarding these points, Ikegami (1970) systematically studied Zen postures and their metabolic costs. He reported that the activity levels of selected muscles varied from posture to posture. Since the metabolic rates of muscles differed, the metabolism of the meditator also fluctuated. Zen priests apparently exhibited markedly less (between a third and a half) muscle activity than laymen. Ikegami (1970) suggested that postural stability and the 'mental attitude' of the meditator are salient features in Zen Buddhism. Thus, subtle alterations in posture, exhibited by novice meditators and measured by the EMG,

may significantly increase metabolism.

(ii) Comment on Pit Burial Studies

Although meditation has been practised by Eastern devotees for many centuries, it is only relatively recently that associated scientific study has been conducted in the Western world. Attention has focused particularly on feats of endurance claimed by practitioners. One of the most dramatic of these is the ability to remain confined with limited supplies of oxygen for longer periods of time than has previously been thought possible. By controlling their respiration and adopting certain postures Yogis are able to perform in an apparently supernatural way.

However respiratory activity is closely related to metabolic rate and certain ventilatory manoeuvres result in hypometabolic states. A lowered metabolism allows survival under conditions of restricted oxygen availability, and might well explain the success of pit burials. The limiting factor in such studies appears to be the increasing levels of carbon dioxide. Under these conditions the behaviour of the volunteers obeys known physiological laws. However, many of the studies in this area are methodologically flawed, especially concerning the establishment of appropriate baselines against which the experimental effects can be gauged.

D. The Relaxation Response

Consistent with the physiological changes associated with pit burials are those comprising the Relaxation Response. This is thought to rely on an 'innate mechanism': a 'universal human capacity' which allows a decrease in sympathetic nervous impulses and hence a reduction in the activity of several vital physiological functions. However, unlike the reflexive 'Fight or Flight' response of Cannon, to which it is a counterpoint, "the Relaxation Response can be evoked only if time is set aside and a conscious effort made" (Benson, 1975, p.125). It has been asserted that the benefits attributed to the Relaxation Response may be acquired with relative ease.

Benson, a cardiologist, has been actively conducting research into the physiological effects of meditation for the last 15 years, occasionally in collaboration with Wallace. These two prominent researchers are in agreement concerning the general experimental results of such studies. They differ greatly, however, in their interpretation both of their own experiments and those of others. Wallace has maintained that the practice of TM induces definite psychophysiological states,

including a specific state of consciousness. This has been identified with the 'Transcendental' state of consciousness described by Maharishi Mahesh Yogi.

Marked increases in VO₂, HR, BP, RR and EMG are characteristic of increased energy expenditure, and are reliably seen in situations demanding behavioural responses which are expressed by the striate musculature. Cannon (1914, 1932) systematized the experimental study of these variables by his formulation of the 'Fight/Flight response', which is characterized by a dramatic activation of a hypermetabolic bodily state in both humans and animals. Increased arousal and the predominance of sympathetic control is a central feature of this response, which Cannon interpreted as an 'Emergency Reaction'. Subsequently, Hess (1957) demonstrated that electrical stimulation of the posterior hypothalamus also increased activity of the same physiological processes. He termed this the Ergotropic Response and it is associated with the mobilization of energy which prepares the organism for motor expression in terms of work. Today, the 'Emergency Reaction', the 'Ergotropic Response' and the 'Energy Mobilization Response' are regarded as closely-related or even equivalent phenomena.

Hess (1957) elicited a further response from the anterior region of the same structure. This pattern of activity was termed the Trophotropic Response, and was marked by quiescence and relaxation. Gellhorn (1965) extended this formulation by convincingly associating the Trophotropic Response with dominance of the parasympathetic branch of the autonomic nervous system (ANS). Cannon, Hess, and Gellhorn emphasized that the multiple (effector) response systems mediated by the ANS act in concert. The behaviour of effectors innervated by the ANS was seen as an outcome of integrated activity, possibly orchestrated by the hypothalamus.

Benson (1975) has reviewed the findings of meditation studies both within Eastern and Western religions and among cults embraced by lay populations. He concluded that the various effects, especially of TM, could be interpreted in terms of the Relaxation Response. He claimed that altered states of consciousness, described in the religious literature, comprised testimonials from individuals who had experienced the Relaxation Response in a religious context. As a result of his review, Benson distilled the methodological minimum necessary to elicit this response. This bears a striking similarity to procedures, traditionally used in the East, which facilitate the practice of meditation. In addition to using a mantra composed of numbers, these are:

- (1) a quiet environment - the quieter the better.
- (2) a mental device - to counteract 'mind-wandering'.
- (3) a passive attitude - considered by Benson to be the most

- important element in eliciting the relaxation response.
(4) a comfortable position - to prevent undue muscular tension.

Each of these features has a direct parallel in other 'non-cultic' types of meditation, such as Carrington's (1977) 'Clinically Standardized Meditation' (CSM). When speaking of these components collectively, the term Relaxive Meditation (RM) is used, to distinguish them from the Relaxation Response (a physiological entity).

Benson and his associates (1974a,b, 1978) have systematically investigated the evocation of the Relaxation Response by meditation, and have concluded that the physiological profile, characterized by reductions in the activity of a variety of physiological processes, could be interpreted as a hypometabolic bodily state. Such a physiological state is in direct contrast to that elicited by stressors and associated with sympathetic activation together with autonomic, somatomotor and humoral changes oriented towards increased energy expenditure.

It has been denied by Benson that any type of meditation can induce 'specific' physiological changes or states of consciousness. He noted that many meditative techniques produce a physiological state similar to those associated with such 'relaxation strategies' as autogenics, biofeedback, hypnosis and progressive relaxation.

E. Discussion

The 'early' literature studies of Yogic practitioners and meditators were intriguing but methodologically unsatisfying. A wide variety of physiological indices were either measured or inferred relating to metabolism, respiration, the viscera and the striate muscles, but there was no adherence to strict experimental procedures. In each case, the methodology arose from whatever arrangements the experimenters could strike with the subject at the time. Measurements and techniques were inconsistent from study to study, and variables such as VO₂ were sampled in different ways. Also the experimental oxygen uptake values were compared with standard basal metabolic rates. Basal states are difficult to achieve and require specific pre-experimental behaviour and exacting test conditions. The meeting of such criteria was apparently neither attempted nor achieved in the early studies.

The subject population available for study has largely determined the course of research on meditation. Due to the self-imposed restrictions of communication and mobility, many serious meditators cannot be approached. A considerable proportion of research has used Westerners engaging in TM due to

their relative prevalence and the purported ease of the technique. Naturally this subject selection has coloured the results of investigations on meditation. A number of authors have commented on such methodological difficulties and the preliminary nature of many results. However, these have been largely ignored and the results of 'pioneering' efforts have set the trend for later studies, and as a consequence the evidence is confusing, equivocal and occasionally contradictory.

Claims that meditation precipitates unique physiological as well as psychological states have led to extensive investigation of the associated bodily changes. As well as inducing passive physiological changes, the practice of meditation and yoga have been used as a means of achieving control of certain autonomic functions which are normally regarded as being involuntary. In particular, the ability of some yogis to survive pit burial has stimulated laboratory-based studies aimed at the replication of the hypometabolic states associated with prolonged confinement. The proportions of oxygen and carbon dioxide available seem to be of critical importance in determining the duration of confinement and the degree of discomfort experienced by the subject and are not significantly different for meditators and nonmeditators.

A lowering of metabolism has been attributed to TM, and the associated relaxation has been advocated as a means of alleviating stress. Meditation, and TM in particular, have been claimed to produce a unique physiological state. However Benson has proposed that engagement in meditation forms one of a number of strategies for inducing relaxation. A theoretical framework which has emerged from this research suggests an interpretation of the experimental results in terms of an Arousal - Relaxation continuum. Both of these states are characterized by an ensemble of co-varying phenomena including prominent cardiorespiratory, striate muscular and nervous system components. Arousal is characterized by an increase in the magnitude and/or frequency of activity in these response systems whereas relaxation has been associated with decreases. In addition, the former state has been identified as a response to stress. It follows that relaxation may be viewed as an 'anti-stress' response with potential therapeutic value. Meditation has been advocated as a possible means of achieving this state.

Fenwick *et al* (1977) reported that subjects often fall asleep during meditation. This is consistent with other findings that drowsy and sleep-like states can occur during meditation. On this basis, these authors have challenged the assertion that meditation induces a unique state of relaxation superior to that of sleep. Similarly, Corby *et al* (1978) have questioned the current relaxation model of meditative states, suggesting that states of arousal may be observed in some meditators. Doubts have also been raised concerning the efficacy of several 'behavioural strategies' - meditation,

biofeedback, and progressive relaxation - when used as sole courses of treatment for chronic anxiety, although as adjunct therapies they may be helpful (Raskin *et al.* 1980).

Nonetheless, the conception of meditative states as *hypometabolic* is pivotal to most current physiological interpretations of meditation. This state of lowered metabolism has been inferred from measurable changes in several physiological systems - respiratory, cardiovascular, electrodermal and skeletal-muscular. Changes in functioning of each of these indices must be interpreted with caution, however. Decreases in the activity of one of these variables may occur independently of changes in any other variables, and without a concomitant lowering of metabolism. EEG indices of arousal may not relate to other measures such as autonomic activity in the straight-forward manner often assumed by researchers in meditation. Darrow *et al.* (1946) suggested that the correlation between EEG and autonomic changes was opposite in direction depending on whether the individual was in a resting or a highly aroused state. Stennett (1957) found a curvilinear relation between alpha amplitude and skin conductance values. These covaried positively over the upper range, but in opposite directions over lower ranges of electrodermal activity.

IV. METHODOLOGICAL ISSUES

The selection of a theoretically relevant issue or hypothesis may be viewed as an important point of departure for research and indeed many scientific controversies focus on what constitutes an adequate experimental test of a scientific hypothesis (Kuhn, 1962). It has been suggested that the probability of having conducted the 'wrong' experiment is a major type of error to which experiments are prone (Mitroff & Featheringham, 1974). Regarding meditation research, many experiments apparently fail to test a relevant hypothesis or theoretical prediction. Researchers have also argued about which hypothesis may be the most experimentally fruitful, although no single experiment is crucial to such evaluations (Shapiro & Walsh, 1984; Lakatos, 1970).

The authors of several major reviews of meditation research (Smith, 1975; Shapiro & Giber, 1978; Holmes, 1984; Shapiro & Walsh, 1984; Delmonte, 1985b) are in general agreement that future research should attempt to clarify precisely the theoretical rationale connecting the independent and dependent variables. This would help elucidate the conceptualization of meditation as a psychotherapeutic technique, a self-relaxation strategy, an altered state of consciousness, a mode of salvation, etc. We, therefore, commence a discussion of methodological issues in meditation research by considering explanations that have been advanced to account for the phenomena associated with this area of research.

A. Explanations of the Effects of Meditation

In the East, most systems of meditation possess techniques of intentional manipulation of attention and respiration, and they have largely been seen and used as methods of salvation - with great emphasis placed on induced mystical experiences. Procedurally, an erect sitting posture is assumed together with a passive attitude. If conducted in a quiet environment, this practice purportedly enables mental functions which are normally unconscious to emerge in awareness, a major goal being to develop an objective (non-attached) 'mental set' to these and all other experiences. However, Veith (1958) noted that the East and West are more markedly different in their respective concepts of psychic function than in almost any other aspect. In light of the fact that some of the most influential formulations of meditation are derived from systems of the Indian sub-continent, mechanisms of meditation are often formulated in terms and concepts which are pregnant with ambiguous connotations; such as soul, mind, being, etc. All of these concepts evolved early in the history of thought and, in the East, have remained largely unchanged.

In the West, they have had various attributes added or deleted, as their responsibilities regarding psychic function expanded and contracted. They still lack precise definition, and while useful on a spiritual level of discourse, few experimentally testable hypotheses have been proposed or systematically implemented. Despite consistent attempts to strip it of its spiritual overtones, meditation presently carries many mystical connotations that are refractory to scientific study. Nonetheless, debates have emerged in the scientific literature relating to mystical experiences and consciousness and their possible neurological foundations. Psychological and physiological discussions, for example, include meditation as a type of relaxation training. In this, generalized anxiety and its accompanying mentation are thought to be inhibited by the practice of meditation, either by reciprocal inhibition of the meditative state, or by evoking a classical conditioned relaxation response. In both cases, the 'unstressing' process claimed to occur during meditation links psychological interpretations of meditation with physiological ones.

Although psychiatry has long recognized the potential contributions of meditation to theories of mind, Jung (1936) cautioned against its practice in the West. Nevertheless, by indentifying the meditative state with his concept of the 'collective unconscious', he set the tone of later psychiatric interpretations of meditation. Freud wrote less extensively on meditation but nonetheless emphasized its similarity with pathological regressive processes.

Many of the mechanisms described in the meditational literature revolve around the concepts of attention and attitude. Techniques which restrict attention by focusing on respiratory movements, a sound or visual image are gaining wider currency in Western psychiatry. While maintaining a passive attitude, progressive restriction of the field of attention - finally to a single object - purportedly induces a states of non-analytical thought. In this state other mental activity is thought to interfere with meditation. Several important psychophysiological changes ranging from deep relaxation to marked alterations of emotional and cognitive content, including 'mystical states' may also be experienced. It has been suggested that whereas several techniques induce similar physiological effects, the 'attentional focus' of each may differ in such a way as to permit classification on these grounds.

Much of the evidence about the effects of meditation has been drawn from studies involving the determination of peripheral physiological changes during its practice. Benson *et al* (1974), and Benson (1975) have proposed the collective term 'relaxation response' for the inferred state of reduced arousal. It has also been pointed out that many of these physiological changes

are consistent with decreased sympathetic activity, possibly by alterations in end-organ responsivity to norepinephrine. Gellhorn & Kiely (1974) modelled the effects of meditation on the 'trophotropic' response, inferring a dominance of parasympathetic activity. The results of experiments measuring peripheral physiological changes are by far the most numerous and constitute consistent but inferential evidence for fluctuations in central nervous system activity.

Studies measuring EEG during meditation offer evidence of a more direct nature concerning alterations of brain processes. Generally increases in activity of the alpha and theta bands have been reported during meditation, and although the details of experimental results differ, similar EEG changes have also been noted during the practice of other relaxation techniques. An increase in hemispheric 'coherence' has been another prominent observation. The speculations surrounding these periods of synchronous brain activity during meditation have been influential in the formulation of models of meditation function, and it is usually inferred that right hemisphere activity increases relative to the left.

Davidson (1976) has proposed that activation of the right hemisphere of the brain leads to the emergence of nonverbal, intuitive modes of experience which may underlie 'transcendental' and other altered states of consciousness - peak experiences. In addition, increased activity of the higher nervous centres of the right hemisphere was implicated in the experience of transcendental states. On both experimental and clinical grounds, Geschwind (1982) associated the control of attention also with the right hemisphere. As attention is regarded as a central feature of meditation, this hypothesis is consistent with Davidson's proposal.

Mechanisms of meditation are however, not restricted to cortical processes and several subcortical structures and neurotransmitter systems have also been implicated. Mandell (1980) has suggested that 'hypersynchronous' activity between the richly interconnected limbic, hippocampal-septal systems and the temporal lobe may be responsible for the experience of transcendental states. These shifts in neural activity are mediated by inhibitory transmitter systems. Such notions allow the formulation of testable concepts regarding meditation for they suggest that specific neuroanatomical structures subserve specific subjective phenomena. Meditation and other practices may alter the activity of these structures and so induce altered states of consciousness. All of these ideas are largely speculative however, and have yet to be systematically investigated.

B. Psychology and Behaviour

The experimental literature broadly supports the conclusion that the practice of meditation leads to a physiological state of relaxation or 'least excitation'. It is also claimed by some researchers that this state of bodily relaxation is accompanied by a calm but alert mental state, lasting at least the duration of the session and possibly beyond. Many of the beneficial claims made for meditation involve its ability to attenuate or prevent the effects of stress on the central and autonomic nervous systems through the induction of these states. However, the experimental bases of these claims have been criticized on several methodological grounds, such as subject selection, experimental bias, and lack of control groups among others.

Research indicates that meditation is not significantly different from more traditional techniques such as psychotherapy, and behavioural procedures in inducing states of relaxation. Proponents of meditation have cast these results in a favorable light by suggesting that, in terms of clinical improvement, it may be at least as efficacious as other procedures. However, these more established interventions, against which the effects of meditation are assessed, have themselves been subjected to grave criticisms concerning their own efficacy as therapeutic procedures. This subject is not discussed in most literature reviews of meditation. The value of meditation as a therapeutic technique should therefore, be established using the same criteria as are used in this general area of research.

A survey of members of the American Psychological Association (APA) found that the Journal of Consulting and Clinical Psychology (JCCP) was considered one of the most prestigious periodicals among clinical psychologists in terms of where they wished to publish and where they expected to find important psychological material (Koulack & Keselman, 1975). Articles reporting the effects of meditation and comparative therapeutic results were increasingly among those published in this and other journals at that time - 1970's. During this period, clinical researchers maintained that 'the fulfillment of immediate responsibilities' was an important reason for their studies, and the fundamental motivation that these researchers attributed to themselves (for publishing in JCCP) was a concern with social and scientific responsibility (Kendall & Ford, 1979). However, in areas investigating and comparing the efficacy of various therapeutic treatments, general methodological laxity and equivocal experimental results have been reported.

Maher (1978), then editor of JCCP, noted that of the 3500 papers submitted during his tenure, serious methodological flaws accounted for the rejection of four of every five manuscripts

involving experimental research. He stated that "... it is not possible to complete an editorial term without inferring reluctantly that current doctoral research training, as reflected by recent submission to this journal, is deficient to the point of being disastrous" (Maher, 1978, p.595). In an attempt to redress this state of affairs, a special issue (1978, Vol.46, no.4) was published which consisted of discussions of major methodological problems in the evaluation of contemporary experimental and clinical research. Several of the many excellent papers included in that issue have a direct bearing on important debates surrounding the efficacy of meditation and are drawn upon below.

Extensive discussions of experimental designs and methodologies have noted many common pitfalls (Campbell & Stanley, 1966; Kazdin, 1973). Such problems as inadequate replication, poor specification of the independent variable(s), lack of random assignment to experimental conditions, and inadequate data gathering and presentation, were among those seen as important.

In a critical examination of this area of research Frank (1979) noted that the choice of experimental variables has been guided by the need to produce publishable results, and not by the pursuit of knowledge. Moreover, tacit assumptions in a meditational or other program may be misleading concerning therapeutic outcome, and the independent variables are too often actuarial ones, such as age, sex, and social class, which have been seen as indirectly related to the subject's responsivity to a given procedure (Frank, 1979).

In addition to these difficulties, other problems have arisen which affect the evaluation of meditation and other therapeutic procedures. Giles (1984), for example, claims that although there is considerable evidence of the 'special merits' of behavioural treatment techniques, the acceptance or rejection of this class of interventions has not been based purely on empirical evidence. Instead, clinical researchers have been influenced by political and economic considerations within the profession; a view shared by Wilson (1982) who also noted that the treatments used for psychological disorders may be determined and maintained by politico-economic factors.

This state of affairs has been observed in relation to meditation as well. Kutz *et al* (1985) proposed that the difficulties encountered in attempting to integrate meditative techniques with psychotherapy have arisen from the entrenched attitudes of psychotherapists. The separation of the two techniques "...originates not only from a clash between different philosophies but, on a deeper level, from the growth of defensive sectarianism in modern mainstream psychiatry" (Kutz *et al*).

1985, p.2). Although an APA Task Force proposed the serious investigation of meditation as a therapeutic method in 1977, currently the ethical guidelines endorsed by the American Psychological Association and the American Psychiatric Association do not include recommendations for the general use of behavioural therapies as effective techniques for psychological disorders (Giles, 1984).

In attempts to evaluate the efficacy of meditation and other treatment procedures, adequate control for factors other than those of immediate experimental interest have proven difficult. Hence, in a clinical situation, patients (clients, subjects) seek a particular treatment because they believe that it will be effective. It is apparently a common clinical experience for patients to have heard about a particular treatment and/or therapist by word of mouth. Thus, the assignment of subjects to various groups may be selective, particularly in the clinical situation where individuals exert some choice on this factor. Indeed, investigations have indicated that being able to select treatment is highly related to therapeutic outcome, independently of the specific technique that is actually experienced (Devine & Fernald, 1973; Gordon, 1976). In the same vein, the results of some investigations have suggested that treatment effects also depend on the context in which therapy is presented. 'Context' refers to the 'atmosphere' of the treatment facility as well as to the descriptions of techniques employed by the therapist (Frank, 1973).

The 'set' of the subject on the initiation of treatment or experiment, and the manner in which it is presented may differ markedly across research laboratory and clinical settings. The situation is further complicated by increasing cognizance of ethical standards of research which require investigators to explicitly convey the nature of the treatment to the recipient. This may include whether it is experimental in nature or possible benefits and risks, and often involves the procurement of informed consent. As this information may alter the context and manner in which the treatment is provided, generalizing results from a research to a clinical situation becomes more difficult. It has been suggested that generalizability depends in part on the similarity of the manner in which the treatment is presented and the sets of the individuals who participate in treatment (Kazdin, 1978).

This brief description of experimental difficulties emphasizes the parallels between methodological problems associated with investigating meditation and those examining psychotherapy and relaxation techniques. They are but some of the many methodological pitfalls facing researchers investigating the efficacy of the various procedures used to treat 'psychophysiological' syndromes. The merits and shortcomings of various experimental designs and their implications for research

are discussed in publications by Hersen & Barlow (1976), Kazdin (1973), and Greenwald (1976).

C. Meditation

Until recently, most of the published studies of meditation have been conducted by researchers who were either meditators themselves or who had close affiliations with meditators and their organizations. Moreover, when adducing evidence to support their claims, many of the proponents of meditation, particularly those of TM, have drawn heavily on studies which have not met the standards of peer review.

Other fundamental problems which hamper the objective study of meditation is that it may not be appropriate to the general climate of Western societies. For example:

"Contemporary psychology is a product of modern civilization. Its main aim is help the mentally disturbed to greater adaptations to the conditions of our society, to keep them going within it. The meditations outlined here, on the other hand, are meant for people who not only do not want to adapt themselves to modern civilization, a phenomenon unknown to them, but also to any form of social life, and who want to get out of the world altogether."

(Conze, 1972, p.38)

The early study of Wallace (1970) noted that the greatest obstacle to experimental research of meditation was subject selection. He tried to solve this problem by employing practitioners of TM, who he assumed were a homogeneous population regarding the practice of meditation. This assumption receives some support from several well-planned sociological studies of religion which have been concerned with identifying those segments of the population that have been attracted to meditative practices. In general these studies have found that Zen, Yoga, and TM attract similar kinds of people, as far as the variables measured are concerned.

Wuthnow (1978) conducted a comprehensive survey of 1000 people in the San Francisco Bay Area regarding their attitude toward new religions, personal religious beliefs and practices, political opinions, values, and life styles. Data was gathered by professional interviewers from the Survey Research Center, University of California (Berkeley) as part of a larger study, funded by the National Institute of Mental Health on changing life styles. Subjects comprising the survey sample were drawn to be representative of the three million people living in the San Francisco-Oakland Standard Metropolitan Statistical Area,

excepting Marin County.

The results of two panel studies conducted at three year intervals found four conditions which seem to greatly enhance the likelihood that a cultural innovation such as meditation will take root and grow. Meditation flourishes in social conditions where: (i) aspirants are exposed to it, (ii) they have the opportunity to experiment with it, (iii) are motivated to adopt it, and (iv) it carries legitimizing aspects that make it believable (Wuthnow, 1978).

Those drawn to TM, Zen, and Yoga showed a significantly greater tendency than the general Bay Area population, to believe in occult and psychic phenomena of all types. For example, it was reported that 75% of those showing a strong attraction to TM were sure extra sensory perception (ESP) existed whereas only 38% of those 'turned off' by it were so positive in their belief. Intensity of belief was also associated with the experience of ESP phenomena of various types (clairvoyance, telepathy, precognition, etc.): 81% of the group strongly attracted to TM claimed to have experienced ESP compared with 58% of those not so inclined. Actuarially, those that are drawn to meditation tend to be white, young, college educated and possess liberal values. Many have only superficial interest in such things as the traditional family and civic duties, whereas they exhibit stress and excessive concern about problems such as money, job plans and 'finding meaning in life'. As this report indicates, researches into the effects of meditation have drawn on the same and similar subject populations when conducting experiments in this geographical area.

Not only subjects, but experimenters too may be biased. Smith (1984), in an account of his investigations of the effects of meditation, called the decade of the seventies the 'messianic' period of such research. He noted that many researchers (including himself) were new converts to meditation and seemed to be more interested in substantiating beneficial claims than conducting 'objective research'. Typically, experiments were designed to demonstrate rather than evaluate meditation. Smith noted that an enthusiastic experimenter may greatly enhance the probability of 'positive' treatment outcomes or 'significant' experimental results, and indeed he attributed his own early successes to this factor. Unlike many others however, he attempted to tighten experimental methodology to control for factors which he concluded had previously been largely ignored; subject expectancy of treatment outcome and the effects of 'just sitting'. Expectancy of treatment outcome was controlled for by giving subjects a treatment rationale and requiring that they follow a daily routine comparable to that of TM. After six months, no reliable differences between groups were evident. A subsequent experiment involving the addition of an 'anti-meditation' group and the measurement of over thirty

variables of therapeutic change again produced no differences among groups (Smith, 1976, 1978).

These cogent points of experimental methodology have, however, been largely ignored. Indeed, some researchers have considered the interaction between expectant patient, credible treatment rationale and confident therapist to be the principle features of a satisfactory treatment. Therefore rather than 'control' for these factors, it has been suggested that a positive outcome may be more readily obtained if the experimenter practices the same type of meditation as the one under study. Shapiro & Walsh (1984) conjectured that researchers experienced in the practice of meditation may be able to interpret the effects more adequately than nonmeditators, particularly in a therapeutic setting.

These authors have also noted that experimenter bias, subject expectation, treatment rationale and their interaction are rarely controlled in experiments evaluating meditation. Other critical reviews of the literature have suggested that the application of increasing methodological rigor greatly diminishes or completely eliminates the differences between meditation and control treatment groups. (Davidson, 1976; Holmes, 1983, 1984; Delmonte, 1985b).

Similarly, Carr-Kaffashan & Woolfolk (1979) noted the need for assessment of, and control for expectations of the subject. In a study of the effects of meditation on insomnia, these authors concluded that a major methodological difficulty in quantifying the therapeutic efficacy of various behavioural strategies was the lack of comparable rationales and credibility of treatments between groups. The control of the interaction between the subject's expectation of treatment outcome and the actual outcome of the procedure is perceived to be salient to current experimental designs, regardless of whether such procedures as meditation, biofeedback or progressive relaxation are used. Furthermore, reports of the experimental methodologies used, statistical analyses of experimental data, interpretation of results and subsequent conclusions have been too brief to be comprehended. It is imperative that experimenters fully and accurately report details of procedures used, thereby encouraging attempts at independent replication.

Of equal importance are inadequacies concerning an explicitly stated hypothesis which would be tested by the experiment. Similarly theoretical rationales, which may link independent experimental variables and the selection of dependent variables are rarely articulated. Furthermore, instead of raising alternative explanations that may account for experimental results, there has been a proclivity among researchers to uncritically accept unsubstantiated authoritative

assertions. This has led to important issues being obscured and neglected, encouraging mystification rather than an elucidation of the phenomena. In response to this situation, the issues outlined in this section have been emphasized in critical reviews of the meditational literature and there is a growing insistence that these must be seriously addressed if progress is to be made in this area of research (Smith, 1975; Woolfolk, 1975; Davidson, 1976; Shapiro & Giber, 1978; West, 1980; Shapiro & Walsh, 1984; Holmes, 1984; Delmonte, 1985a,b).

D. Assessment of Physiological Responses

In most cases, reports of impressive psychophysiological changes during meditation have occurred when the value of such changes were compared with those determined during either a pre-treatment baseline period, a post-treatment recovery period, or both. Baseline/recovery periods, however, usually have not been long enough to permit an accurate determination of the values of initial or resting levels of physiological activity. These determinations are crucial because of the powerful effects that these levels of activity have on the interpretation of those subsequently recorded during experimental periods. Sometimes the duration of pre/post-treatment baselines have been as short as five minutes, with the values gathered during this period being compared with those of a meditation period lasting five to six times longer. Occasionally the establishment of a post-treatment baseline has been ignored altogether.

More often, pre/post physiological baselines are in the order of twenty minutes duration, with a similar length for the treatment period. Although these designs suggest a methodological improvement, they have usually been marred by the experiments consisting of only a single session. Less frequently, studies with three or four sessions are reported and those using five, ten or more sessions are rare. For the most part, essential longitudinal 'follow up' data are missing.

In cases where such data have been gathered, they tend to involve only a single determination of the variable of interest at between three and six month intervals. At best, this state of affairs greatly curtails the ability to generalize the results beyond the experimental situation, and, at worst, may give a misleading or inaccurate representation of the effects of the meditative practices. The important temporal aspects of the experimental designs have been much neglected variables, although other longitudinal studies, unconcerned with meditation, indicate that there can be statistically significant differences along a number of physiological dimensions due to the passage of time alone (Garfield, 1978).

Since the Relaxation Response has been claimed to induce a hypometabolic state, the reliable documentation of reductions in metabolic rate, assumes critical importance. Oxygen uptake reflects the overall metabolic cost of all physiological processes, and knowledge of its value is essential for the coherent assertion of lowered metabolic states. Therefore hypometabolic states may only be confidently inferred if metabolic rate is actually measured. Despite results suggested by both preliminary studies in India and later laboratory experimentation, a number of unresolved methodological problems remain.

One such issue concerns the manner in which VO₂ is measured. In earlier work this variable was typically assessed at different points during the experimental procedure. Most researchers, using intermittent sampling of VO₂, tended to report relatively large decreases compared with levels measured during 'rest'. Benson *et al* (1975) attempted to replicate the results of Beary & Benson (1974) using continuous, rather than periodic, measurements. They found that the mean decrease in VO₂, while significant, was greatly reduced, compared with earlier reports. Only a 5% reduction in VO₂, from control periods, was reported. This was in contrast with the 13% noted by Beary & Benson (1974). However, reductions of a greater magnitude than 5% were observed for short periods during meditation, and Benson concluded that these data were consistent with earlier findings.

Another methodological issue concerns the VO₂ baselines used to assess this measure during meditation. Fenwick *et al* (1977) found reductions in VO₂ of 4-5%, during meditation (TM) compared to control conditions (sitting in an easy chair). These were similar to the observations of Benson (1977). However, differences in VO₂ levels increased to 10% when the seated control conditions involved a hard, compared with an easy, chair. Thus, apparently minor alterations in procedure may significantly affect experimental outcomes. Fenwick *et al* (1977) concluded that 'true' basal VO₂ values representing states of genuinely relaxed somatic activity need to be established. VO₂ levels during meditation may then be compared to these basal values. Similar recommendations have also been advocated concerning the measurement of other physiological variables. The failure to establish valid baselines will almost certainly result in erroneous conclusions.

Warrenburg *et al* (1980) have also addressed the problem of appropriate physiological baselines against which the effects of meditation might be assessed. In this study, both meditation and progressive muscle relaxation were associated with 4-5% reductions in VO₂. It was suggested that these results, although reliable, may be explained by the use of a 'low-stress' baseline which might more accurately reflect true basal metabolism. Extending the use of such baselines to Wallace's

(1970) findings, it is conjectured that his use of arterial cannulation may have acted as a 'stressor' which elevated basal levels and enhanced the apparent decreases in VO₂. Methodological intrusiveness has been repeatedly condemned as an impediment to the achievement of relaxed states.

Thus, some of the variance in experimental results may be accounted for by the degree to which subjects are allowed to reduce their basal metabolism before commencing meditation (Delmonte, 1984f). For example, Wallace *et al* (1971) found decrements in VO₂ of 17% below baseline, and a decline of 15% in CO₂ elimination. Significant decreases in respiratory frequency (three breaths/minute) and minute ventilation (one liter/minute) were also reported. This experimental design, however, used short periods of time to establish baseline data. Similar results were obtained in a repeated measures experiment - a 13% decrease in VO₂ occurred during the practice of relaxive meditation compared with a seated, eyes-closed control period (Beary & Benson, 1974). These studies have been criticized for their failure to employ control groups, as well as for their neglect of 'order effects' in the experimental design. Also they did not address the effects of normal temporal change and habituation to the laboratory (Delmonte, 1984f).

Factors such as the amount of time which has passed between the ingestion of food and the experimental session may also significantly affect the experimental outcome. Fenwick (1974) reported a negligible reduction in CO₂ elimination (2%) in a group of fasting meditators, whereas a non-fasting group exhibited substantial (10%) decrements. Also meditators, rating themselves as relaxed, experienced decreases in VO₂ of only 2% of the initial baseline, whereas subjects describing themselves as tense, demonstrated a decrease in VO₂ of 12%. Warrenberg *et al* (1980) found only a 4% decrease in VO₂ in a group of meditators whose food intake had recently been curtailed. They suggested that fasting and relaxation is associated with a 'floor effect' (which obeys the law of initial values).

Most critical reviews agree with Delmonte (1984f) regarding the use of VO₂ as an index of relaxation; the effects of meditation do not appear to be significantly different from those associated with other techniques fostering low arousal. In general, data concerning the metabolic effects of meditation seem to support Benson's (1975) bipolar model of the Relaxation Response rather than the multi-process model of Schwartz *et al* (1978). It seems that the practice of meditation is no more effective in lowering metabolism than are established relaxation techniques, and the attribution of special effects to meditation is unwarranted (Delmonte, 1984f).

The experiments of Wenger & Bagchi (1961) and Wenger, Bagchi & Anand (1961) have been singled out by Wallace as comprising the first systematic electrophysiological research of yoga practitioners. These were considered to be 'careful studies' which reported reliable changes in GSR and ventilation rate, although no consistent changes in HR, BP and EEG during meditation were noted. Regarding the subjects used, Wenger and his colleagues suggested 'the possibility' that few of them were skilled practitioners of yoga and meditation, but instead possessed expertise in 'physical exercises and breath control'. Hence, Wallace interpreted the experimental results of Wenger & Bagchi (1961) in terms of modification and control of autonomic functions (autonomic balance) as distinct from the 'unique' effects meditation.

To rectify this state of affairs Wallace (1977) conducted a study in which twenty-seven 'normal' subjects each acted as their own control in a one-session experiment. Each session comprised four phases and lasted for a total of seventy minutes divided into seven 10-minute blocks for data analysis:

- 1) a pre-measurement period of 15-30 minutes during which the subject sat quietly with eyes open.
- 2) a 'precontrol' period in which measurements were recorded for 5-15 minutes with eyes open and for 10-20 minutes with eyes closed.
- 3) a meditation period of 20-40 minutes.
- 4) a 'postcontrol' period with eyes closed for 10 minutes and with eyes open for 5-10 minutes.

It is not clear, however, how long subjects actually spent in each of the four phases of the session. For example, from the text of the study it appears that some subjects spent 15 minutes in 1), 15 minutes in 2), 20 minutes in 3), and 5 minutes in 4), whereas others spent 30, 35, 40 and 10 minutes respectively. Assuming these values to be correct, it seems that some subjects participated in sessions which were twice as long as others. Such a feature in the experimental design casts suspicion on the results, and the interpretation of physiological activity.

Although ten physiological variables were recorded, they were not all determined for any given subject. Thus there was no consistency in the way in which mean values were derived. For example, data from 26 subjects contributed to the average EEG value, VO₂ was measured in 20 subjects, skin resistance in 15, and HR in 11. Arterial blood gases and BP were determined in 10 but not the same subjects, cardiac output in 5, respiration rate in 6, minute ventilation in 4 and blood lactate in 2. Thus the blood lactate findings, which have been widely cited in the literature, were based on intermittent sampling of two subjects. VO₂ data was pooled even though it was measured using two systems

(open and closed circuit), and despite the fact that the latter was considered to be technically questionable. Moreover these important recordings were complete for only six subjects and VO2 mean values were derived from all 20 subjects in only three of the seven 10-minute blocks. Nevertheless, Wallace's 1970 study is viewed as 'seminal' in this area and has lent impetus to the examination of the physiological effects of meditation.

It has not been the intention in this section to overemphasize the inadequacy of attempts to use experimental methods in the refinement of therapeutic techniques. Science, being a human endeavour, is fallible. Many experiments yield conflicting results, some contradictory; few studies, however, are totally devoid of potentially useful information. Moreover, it has been suggested that our inadequate understanding of the nature of science contributes to the current state of affairs and that "At this point in time ... no acceptable criterion has been established for the demarcation of science from nonscience" (Mahoney, 1978, p.660). Therefore, the aim of future experimentation is not so much conducting the perfect experiment but conducting ones which are progressively less fallible. Among other things, this requires paying close attention to the adequacy of current research methods and cautious interpretation of their results.

V. CONCLUSIONS

Over the past 25 years there has been considerable growth in the scientific examination of meditation. This has been encouraged primarily by its perceived potential as a cost-effective therapeutic method for the treatment of stress-related disorders. Basic research on the subject has also been stimulated by reports that the psychological and physiological changes that accompany meditation are unique to its practice. However, a generally-accepted corpus of knowledge has yet to emerge. In part, this stems from a lack of consensus about what meditation is, how to achieve it, and what its purposes are. The picture is complicated by methodological problems that are encountered in all attempts to examine the therapeutic value of behavioural interventions. For example, there is a growing body of opinion that therapeutic effectiveness may not lie in the specific effects of particular methods but results from the personal qualities of the patient, the therapist and their interactions (Frank, 1979). Such explanations may account for the few cases where meditation has been shown to be as effective as other treatments (e.g. for hypertension).

A. What is meditation?

Meditation as it is practiced in the East is markedly different from the Western variety. In its original form, it requires great commitment and assiduous practice which in turn, leads to the development of a mode of life and an associated spiritual state that enables the individual to rise above the mundane world. Western lifestyles only permit brief excursions from the mundane and cannot easily assimilate the value systems which provided the indigenous context of meditative practices. Consequently, Western versions tend to be comprised of certain procedural elements that have been extracted from their religious-cultural contexts and tailored to meet the needs of technological man. Nevertheless, Western meditation continues to be embedded in a mystical superstructure, albeit one that is quite distinct and in many ways antithetical to that from which it stemmed.

From an objective (some might say, superficial) perspective, meditation may be defined in terms of the procedures which are employed for its induction. These involve prominent postural and respiratory manoeuvres coupled with a focusing of attention on a repetitive stimulus. This practice gives rise to bodily relaxation as manifested by a reduction in cardio-pulmonary activity, striate muscular quieting and synchronous EEG patterns. It is also reported to produce a narrowing of the field of attention and results in state of consciousness that many find pleasurable. The potential value of these effects in the treatment of stress-related diseases has attracted the interest of the scientific community. Although few well-controlled

studies have verified the more extravagant claims made by proponents of meditation, the relaxation effects outlined above have been verified. Regardless of its outcomes, scientific research on this subject has done much to raise the profile of meditation in the West and to enhance the credibility of its claims.

B. How does it work?

Ideally, the answer to this question would be provided by tracing the pathways that mediate the effects of meditative practices on the body and nervous system. This sort of answer could in principle be approached in relation to the objectively-verifiable bodily effects of meditation. However, the question of how meditation achieves its psychological and therapeutic effects is far more complex and its answer would be considerably more convoluted. This is so because, as discussed below, the answer would have to take account of how the credibility of the technique is established.

The pathways through which the bodily effects of meditation are produced have been studied but not to the extent that they would seem to merit. Throughout recorded history, breathing techniques have been central to the induction of the meditative state. It seems highly probable that the breathing exercises required of meditational aspirants are importantly implicated in producing both its physical and psychological effects. An obvious pathway for both classes of effects is through alterations in blood chemistry. That modifications of breathing patterns may influence psychological state through this route is indicated clearly in studies of the hyperventilation syndrome. Excessive ventilation of the lungs which arises from, and exacerbates, anxiety has a number of clearly defined physical and psychological effects which are the opposite of those engendered by Yogic breathing exercises. When these breathing exercises are coupled with exclusive concentration on rhythmic respiration or the repetition of a mantra, a vacant and relaxed state of consciousness is apparently produced. This seems quite plausible and conforms with expectations based on established psychological and physiological principles.

The subjective appreciation of these changes may provide the novice practitioner with proof of the effectiveness of meditational practices although s/he may not be led to attribute the subjective effects to alterations in blood chemistry brought about naturally through normal bodily processes. Indeed the novice meditator is primed with less technical, and to some, more appealing explanations. The capacity to produce a discriminable change in consciousness by following a behavioural prescription provides the practitioner with 'proof' of the power of "self-control" and a conviction in the validity of promised but yet-to-

be-experienced effects. For example, meditation is presented as a route to superior knowledge which transcends that produced by sense data alone.

Available evidence suggests that in the West, meditation tends to be practiced by White, college-educated individuals who are somewhat more anxious and neurotic than average. Often, they have an interest in, and report experiencing, psychic and supernatural phenomena. It is also possible that converts to meditation are attracted by its mystical qualities: it permits excursions into realms that may be forbidden by established Western religions.

In trying to understand how the initiate first encounters the practice of meditation, one cannot overlook the importance of the effective advertisement and propaganda campaigns that have been mounted in bringing meditation to the West. It has after all, received the blessings of prominent figures as diverse as the Beatles, Ram Das, Hans Selye and Buckminster Fuller. Meditation grew most vigorously in the West during the "cultural revolution" of the 1960s and 70s. During this period, there was much experimentation with alternative lifestyles and explorations of other 'ways of being'. Meditation was offered as a socially-sanctioned alternative to drugs for achieving altered states of consciousness and was brought to a wider audience through popular music, television programmes and films. As mentioned earlier, the respectability of meditation in the West has also been established by presenting it in the context of scientific investigation. Papers in highly respected scientific journals by prominent researchers have provided evidence that may be wholly convincing to the layman.

C. Does meditation have any tangible value?

The potential value of meditation has been perceived by the medical and psychological communities to lie in its claimed effectiveness in counteracting the effects of 'stress'. These claims may be traced to the fabled ability of Yogis to reduce their metabolic rates to fractions of what has been considered necessary for the maintenance of vitality. Although the phenomena in question appear to have been somewhat exaggerated, it is clear that practitioners of Yoga do have a highly developed ability to relax under circumstances that in laymen would produce panic. If this ability could be inculcated in patients afflicted by stress-related diseases, it might have great value. Indeed, many segments of the population could profit from the ability to regulate the stress response.

Some research has shown that treatment packages which include meditation are effective in decreasing blood pressure in both medicated and non-medicated hypertensive patients. Moreover, with continued practice such decreases may be maintained. Reductions in anxiety and drug-use have also claimed to result from the practice of meditation. However, it is not clear from this research that the effects observed are a specific outcome of the bodily relaxation induced unconditionally by the practice of meditational procedures (e.g. controlled respiration, repeating a mantra, etc.). It may be argued that they are determined by such ephemeral processes as the patient's belief in meditation and the therapists' confidence in the treatment. Furthermore, it has not been shown that meditation is more effective in promoting the relaxive anti-stress response than other behavioural interventions. When such doubts are raised concerning the unique effects of meditation, its proponents frequently cite anecdotal reports that support its superiority. Although perhaps convincing to the converted, such reports do little to shift the scientific balance of evidence.

Nevertheless, the medically-relevant claims made for meditation as in the treatment of anxiety and pain are worthy of further investigation as are its effects on sustained attention.

D. What would increase our understanding of meditation?

(1) Better experimental design.

The meaning of experimental data reported in the literature is often difficult to evaluate because factors such as subject and experimenter expectations are not controlled for, baselines are not adequately established and experiments are of short duration. Furthermore procedures are often not reported in sufficient detail to enable independent replication.

(ii) Brain process studies.

Although the data on the peripheral manifestations of meditation are reasonably complete, there is little hard data available on the central effects. The EEG studies provide suggestions that during meditation, the electrical activity of the brain moves towards the synchronous firing that is associated with lowered arousal. Although these data are more directly related to brain function than recordings taken from peripheral effectors, they do not have very high resolution. It would seem that recently developed techniques for examining regional blood flow and metabolism in the brain could be employed effectively to resolve a number of outstanding issues concerning the central effects of meditation and the pathways through

which its psychological manifestations are produced.

(iii) Investigations of the processes that lead individuals to adopt meditation.

It has been shown that whether a patient has confidence in a treatment is one of the most powerful determinants of its efficacy. This appears to apply to meditation as well and implies that establishing such confidence has important therapeutic potential. Some studies described in this report have found that certain cultural milieus foster the growth of meditative practices and encourage its adoption. Further studies along these lines could help to shed light on the psychosocial mechanisms that underly the growth of meditation in the West. Such processes may be held responsible for establishing the context in which the practice of meditation achieves the most profound effects.

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