THE UNIVERSITY OF CALGARY A STUDY INVESTIGATING THE TM TECHNIQUE SELF-ACTUALIZATION AND INFORMATION PROCESSING

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The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled, "A Study Investigating the TM Technique, Self-Actualization and Information Processing" submitted by Stephen Truch in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

A total of 156 subjects completed a battery of tests which included the Personal Orientation Inventory, the Eysenck Personality Inventory, the Stroop Color Word Test, the Group Hidden Figures Test and the Paragraph Completion Test. Data on age, sex, IQ, education and occupation were also collected. Half the subjects were experienced practitioners of the TM technique.

It was hypothesized that meditators would score higher on the vector of means because of the regular experience of a refined physiological state gained during meditation practice. In turn. the refined physiological differentiation should spontaneously enhance psychological differentiation. This should therefore appear on the variables used in this study since each one measures, to some extent, an aspect of psychological differentiation. The hypothesis was confirmed (p <.0001) using a multivariate analysis of covariance which adjusted for differences between groups in age, sex, education, occupation and IQ. A step-wise discriminant function analysis indicated a combination of 18 of the original 30 variables maximized the separation between groups. Length of time meditating did not contribute to an increase in scores but being a TM teacher did. As a result, the first hypothesis was retested dropping the TM teachers from the analysis. The remaining meditators (N=56) still scored significantly higher (p < .001) on the vector of means using a multivariate analysis of covariance. Lower educated meditators (N=27) scored higher on the Lie variable from the Eysenck Personality Inventory when compared to their non-meditating counterparts (N=8). Additionally,

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this group did <u>not</u> score higher on the vector of means, indicating they did not gain from the TM experience.

A second hypothesis predicted that high self-actualizers (based on scores on the POI) would score higher on the Stroop, Hidden Figures Test and Paragraph Completion Test variables. This prediction was based on David Wexler's theoretical discussion of self-actualization as an optimal mode of information processing. According to Wexler, high self-actualizers are able to optimally organize and process incoming information. Using an analysis of covariance, it was confirmed that the high self-actualizers scored better (p < .001) than the low selfactualizers on a composite information processing index derived by averaging scores on the Stroop, the Hidden Figures Test and the Paragraph Completion Test.

Results of this study are consistent with the theoretical areas used as a rational for the hypotheses. Consistent with the hypothesis that the TM technique enhances physiological and concomitantly psychological differentiation were the over-all higher scores from the meditators on the vector of means. Consistent with the interpretation of self-actualization as an optimal mode of information processing were the higher scores on the information processing variables from the high selfactualizers. The results were discussed with regard to the relevant literature. Limitations of the present study and several suggestions for future research were also presented.

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CHAPTER 1

THE PROBLEM

Traditional eastern accounts of man's nature and potential have characteristically been related to esoteric practices or ascetic lifestyles unsuited to most westerners. Consequently, prior to the late 1960's, very little in the way of eastern meditation techniques had been absorbed into western lifestyles, psychological theory or scientific research.

However, since 1970, considerable research has been conducted on the TM technique (Orme-Johnson and Farrow, 1976) introduced by Maharishi Mahesh Yogi (1966). This technique seems especially suited to the pace of western civilization and has become increasingly popular since 1958. It is easy to learn, requires no change in lifestyle or beliefs and takes a minimum of time-20 minutes twice daily-to practice. TM centres are found in over 120 countries and all teachers are trained to impart the technique in a standard fashion.

Maharishi (1966) postulates that the TM technique produces an altered style of physiological functioning-a fourth major state of human consciousness-during the 20 minutes of the practice. Regular experience of this state is claimed to have profound personal and social implications. Results of studies in areas of physiology (Wallace and Benson, 1972; Banquet and Sailhan, 1974) and psychology (Seeman, Nidich and Banta, 1972; Hjelle, 1974) have given some support to

these claims.

Recently, Campbell (1975) proposed that the TM technique takes advantage of a natural cycle of differentiation. His discussion is mainly in terms of physiological differentiation and can be linked to some of Eysenck's (1967) and Fine's (1973) terminology in this area. The concept of differentiation as proposed by Campbell could also be extended to the psychological domain, for example to Witkin's (Witkin, Dyk, Faterson, Goodenough and Karp, 1962) concept of psychological differentiation and to Wexler's (1974) recent attempt to integrate self-actualization theory with physiological data using an information processing model.

Wexler proposes an interpretation of self-actualization based on an information processing model and on earlier work by Butler and Rice (1963) who proposed that the biological basis for self-actualization lay in a drive of "stimulus hunger." Self-actualization according to Butler and Rice reflects the individual's ability to create new experiences for himself via his own cognitive functioning whereas traditionally, self-actualization is explained as the inherent unfolding of one's potential (Rogers, 1963; Maharishi, 1966; Maslow, 1968). Wexler criticizes the latter interpretation because of its lack of clarity with respect to a biological foundation. In Roger's case for example, he merely states but nowhere provides convincing evidence for the view that the organism is basically motivated towards self-enhancement and growth. The same criticism could be applied to Maharishi's statements regarding the "unfolding of one's potential."

Wexler states further that if part of self-actualization means being "open to experience" in Roger's sense, then the individual would be continually bombarded with stimuli that could not possibly be processed. However, if self-actualization is seen instead to involve an active differentiation and integration of stimuli, then self-actualization theory could be related to the internal organization and processing of information. As such, it would be more consistent with modern views of cognitive processing, would be more firmly rooted in a biological foundation, would lead to more specific empirical predictions and would help clarify the ambiguity and inconsistency in traditional presentations (Wexler, 1974). Some empirical support for this interpretation came from a correlation study involving 61 undergraduates (Wexler, 1974). However, apart from one other major study on personality integration and cognitive processing (Thomas and Seeman, 1972), the whole area remains largely unexplored.

Wexler's theoretical presentation of self-actualization as involving the degree to which a person engages in an information processing mode wherein he is the source for creating his own differentiation and synthesis of experience can also be linked to the effects of the TM technique. Previous studies by Seeman, Nidich and Banta (1972), Nidich, Seeman and Dreskin (1973), Shapiro (1974) and Hjelle (1974) indicate. that the TM technique enhances the self-actualization process. According to the cognitive view of self-actualization, it

follows that self-actualized persons would be capable of organizing a greater amount of information in a more complex way. If TM enhances self-actualization, it should simultaneously increase the ability to process information. Some empirical work (Miskiman, 1973; Pelletier, 1974) conducted on meditators indeed indicates that TM enhances information processing capability, but these studies could be greatly extended and made conceptually more rigorous if related to Wexler's theory.

This thesis concerns itself with these areas. It is expected that a group of meditators will score higher than non-meditators on measures of self-actualization and information processing. If the TM technique refines the natural cycle of physiological differentiation and if in so doing there is a spontaneous and concomitant differentiation on the psychological level, then meditators should score higher on psychological tests which measure differentiation and integration.

It also follows from Wexler's work that, regardless of the TM variable, the person who is more self-actualized is able to process information more efficiently than the person who is less self-actualized. This thesis was therefore designed to investigate hypotheses derived from the writings of David Wexler and Maharishi Mahesh Yogi.

CHAPTER 2.

THEORY AND RESEARCH

This chapter is concerned with background theory and studies related to the TM technique, to self-actualization and to differentiation. The cycle of differentiation described by Campbell (1975) will be discussed first in relation to the TM technique and then to the work of Eysenck (1967) and Fine (1973). The other major areas of this studyself-actualization and cognitive differentiation-will then be discussed. The former will be discussed as traditionally presented in the writings of Carl Rogers and then in terms of information processing theory. Under each of the major headings, the relevant empirical studies will be discussed after the theoretical issue is presented.

THE TM TECHNIQUE AND THE CYCLE OF DIFFERENTIATION

The TM technique is described as a simple, natural process (Maharishi, 1966). During meditation, the individual repeats a meaningless Sanskrit syllable called a mantra, whenever it comes to mind. The mantra acts as a "vehicle" which allows the attention to focus inward towards "finer levels" of the thought process. At times, the individual may experience moments of no mantra and no thought, or "transcending." Details of the practice are presented else-

where (Truch, 1977). However, it is crucial to understand that a meditator does not practice the TM technique in order to have any particular kind of experience, such as seeing flashing lights, visions or having experiences described as "extraordinary." Rather, the individual meditates so that the unique experience of restful alertness gained during TM will provide the basis for more rewarding, efficient and enjoyable experience during the day, much as a good night's rest allows a person to perform better. Campbell uses just this point in his definition of the TM technique which he says is the "progressive refinement of the nervous system through the regular alternation of rest and activity" (Campbell, 1972, p. 2). The question arises as to what "refinement" means in this context.

In a further work (Campbell, 1975), the idea is made more precise by exploring what he calls the "cycle of differentiation." According to Campbell, this cycle represents the mechanism of evolution, whether we are talking about the growth of a species, an individual nervous system, a business, or the process of creative thinking itself. The cycle has four stages: (1) imbalance-in which an organism or system is thrown into disorder to some extent because of the demands of growth. This leads to (2) reorganization-in which the system differentiates itself by becoming more complex and thereby meeting the demands created by the first stage. This differentiation leads to (3) balance-which is, however, only temporary because the system's increased complexity, created by differentiation, has given rise to (4) new capacity-capacity

of the system has now increased and just because capacity is greater, new demands are made on the system which leads once more to a state of imbalance, thereby starting the cycle anew.

Now let us apply this analysis to a physiological aspect, for example, to cortical growth. Approximately 80% of the human cortex is "unprogrammed" or "undifferentiated" as to function at birth (Penfield, 1975). Certain areas of the cortex are devoted primarily to certain modalities and functions but these are, by and large, learned and therefore develop in interaction with the environment. As such interaction occurs, a particular cortical area becomes localized or differentiated for a specific function. This new capacity of the cortex gives rise to more demands-for more stimulation and active "information seeking."

The cortex is not solely involved of course. In fact, the brain stem appears to be even more basic since all sensory stimuli pass first through the brain stem on the way to different cortical locations. There exist between the brain stem and cortex important circuits or "loops" which are involved in almost all human activities. Experience serves to differentiate and to "bias" these loops (Pribram, 1971). However, in the course of experience, it is also possible that any point on the circuit may experience an overload or "stress" and thereby be inhibited somewhat as to function (Campbell, 1975). As one matures, the stresses may continue to accumulate and the functioning of the nervous

system thereby be impeded. The extent of such stress will of course, fall on a continuum ranging from mild to severe. It is assumed that such physiological stress will impede certain psychological functions, such as information processing, storage, retrieval and the like.

Campbell and others (Banquet and Sailhan, 1974) echo Maharishi's claim that the practice of the TM technique serves to release or normalize such physiological stress and thereby simultaneously and spontaneously improve the psychological functioning of the individual. "TM does not introduce a new principle," says Campbell. "Rather, it takes advantage of the fundamental principle on which the nervous system works" (Campbell, 1975, p. 97). During meditation there is a natural and spontaneous reorganization of existing "information" because of the basic brain mechanisms which TM seems to affect. Therefore, when one opens one's eyes after a period of meditation, the new brain patterns built during the meditation are "tested," the "sensitivity" of the system is increased (differentiation occurs), the world is perceived slightly differently ("integration" occurs) and the individual is better able to perform. This "fine tuning" of the nervous system occurs with regular meditation regardless of the original condition of the nervous system. Thus, "output" or "software" is continually enhanced by physiologically refining the "hardware."

Some individuals are of course already more integrated and differentiated without having had recourse to any sort

of technique and techniques other than TM may produce the same or similar results so long as similar "tuning mechanisms" are involved.

PHYSIOLOGY AND PERSONALITY

The relationship between physiology and psychology has been explored considerably in the last 15 years. With it has come new and more detailed understanding of the relationship between subjective experience and physiological activity. The Soviet psychologists in particular have long explored nervous system typology (Nebylitsyn and Gray, 1972) but have generally failed to correlate such work with traditional paper and pencil personality measures. On the other hand, western psychologists have generally done research the other way around. Eysenck (1972) has been calling for a synthesis of these two approaches, particularly with reference to his concept of introversion-extraversion and neuroticism. He argues that one may schematize genotypic and phenotypic differences between organisms in such a way that physiological variables are seen as the basis for psychological and even social behavior. Eysenck's scheme is strikingly similar to one proposed by Maharishi (1966) and an elaboration of the physiological-psychological relationship discussed in the previous section.

There are five stages in Eysenck's scheme: (1) basic genetic endowment (2) basic psycho-physiological responses

(3) conditioned psycho-physiological responses (4) personality and behavior patterns and (5) social behavior. The relationship between the stages is thought to be linear, starting from "basic endowment."

Eysenck's scheme is an elaborate attempt to link personality with physiology. The general advantage of such a framework, says Eysenck, is that it "gives rise to a large number of specific predictions which are amenable to empirical verification" (Eysenck, 1972, p. 173). It may also give rise to modifications of the theoretical scheme. Fine (1972) for example, was able to link Witkin's concept of field-dependence-independence with Eysenck's introversionextraversion-neuroticism dimensions. Fine predicted that field-dependent introverts would have a higher incidence of neuroticism than any other combination of the field-dependent and extraversion dimensions. The relationship was supported from six separate studies (Fine, 1973). Fine then attempts to link these personality dimensions with genetic and physiological variables:

> ...it is intriguing to hypothesize very basic, even genetic differences in differentiation of the nervous system as being responsible for the differences in behavior associated with field-dependenceindependence. By differentiation we refer to the extent to which the nervous system is developed, ultimately referable, possibly, to differentiation of individual cells and related, in a total sense, to the sensitivity of the nervous system to stimulation. This concept is in contrast to extraversion-introversion which, according to Eysenck's hypothesis, refers to

a central nervous system excitation-inhibition dimension which manifests itself in greater or lesser control by higher cortical centers over lower ones. The excitation-inhibition dimension would appear to be theoretically referable to genetically defined differences in the strength of the nervous system. Thus, perhaps one can refer to not only "strong" (introvert) vs "weak" (extravert) nervous systems but can hypothesize "insensitive" (field-dependent) vs "sensitive" (field-independent) nervous systems as well...Conceptualizing strength and sensitivity dimensions in interaction obviously leads to predictions not available from either dimension separately.

(Fine, B.J., 1972, pp. 950-951)

In a further experiment, Fine (1973) studied the differentiated nervous system, predicting, as above, that the field-independent person (who presumably has a more differentiated nervous system) would perform better on tasks requiring fine discriminations. This prediction was confirmed in both visual and tactile discrimination tasks.

Using Eysenck's scheme as a conceptual tool, to what extent does the research support that the TM technique accelerates physiological and psychological differentiation? Research by Allison (1970), Wallace, Benson and Wilson (1971), Wallace and Benson (1972) and Jevning, Wilson and Smith (1975) are in accord with the hypothesis of a "fourth major state of consciousness." These studies fall into stages I and II in Eysenck's five-stage scheme. They provide some evidence that a mechanism of physiological differentiation may be at work. Orme-Johnson (1973) found rapid GSR habituation and low levels of spontaneous GSR in a sample of

meditators. Berker (1974) found that this increase in autonomic stability occurred after only one week of TM practice. Therefore, in terms of Eysenck's scheme, psycho-physiological individual differences (such as those which measure GSR and which form stage II in the scheme) are shown to change via the TM technique. In turn, these changes would be postulated to arise from even more basic changes at stage I, a stage Eysenck considers genotypic, but which is still amenable to some environmental interaction. Because the TM technique possibly affects the reticular formation (Wallace, 1970) and the neocortex (Banquet, 1973) and because such changes are measureable by such traditional methods as the EEG, we have a model which enables us to predict personality changes based on physiological considerations of nervous system differentiation as affected by TM. For example, it could be predicted that the TM technique would reduce neuroticism. Eysenck (1968) says the neuroticism factor is closely related to inherited lability of the nervous sys-The regular practice of the TM technique appears to tem. affect such lability as the Orme-Johnson study (1973) indicates. We would therefore expect that there would be a concomitant lowering of neuroticism. Several studies (Orme-Johnson and Farrow, 1976) confirm this prediction. In one of these, (Williams, Francis and Durham, 1976), researchers found that over a six month period, regular meditators became less neurotic (using Eysenck's PEN Inventory as a measure of neuroticism) and the degree to which this happened was directly related to the regularity of

meditation practice.

Eysenck's five-stage model would also enable us to predict that the TM technique might produce changes in what Eysenck calls "special phenomena" (stage V) such as accident proneness and crime. Indeed, changes in meditating prisoners and declines in crime rates in cities with large numbers of meditators have been claimed (Orme-Johnson and Farrow, 1976).

A further prediction is related to field-independence. According to Witkin (1962) field-independence is an analytic style of perception, one which allows individuals to experience items as distinct from their background as opposed to field-dependence, which is more undifferentiated in terms of perceptual style. Therefore, if the TM technique serves to differentiate the nervous system, changes in meditators in a direction of field-independence should also take place. Pelletier (1974) reports results supporting this prediction. Forty unpaid volunteers were randomly assigned to one of two groups-instruction in the TM technique or sitting with eyes closed for 20 minutes and relaxing. After three months, the meditators (males and females) significantly improved on all three measures of field-independence-the Autokinetic Test, the Embedded Figures Test and the Rod and Frame Test. Pelletier concludes that "...these observed differences can be attributed to an alteration in the individual's deployment of attention due to meditative practice" (Pelletier, 1974, p. 1034). In turn, this altered deployment of attention could be the result of some change in the reticular activa-

ting system which the TM technique presumably affects (Wallace, 1970). These physiological changes would be considered as stage II changes in Eysenck's scheme.

In summary to this section, it can be said that Campbell's postulated cycle of differentiation appears reasonable and leads to specific predictions for effects on physiology and concomitantly on personality due to practice of the TM technique. The cycle of differentiation can be subsumed under Eysenck's five-stage scheme linking physiology with personality. The predicted effects arising from this model have received some empirical support. This is not to say that such effects are due solely to the technique or that TM is the only means of achieving them or that the research is as yet sufficiently replicated or convincing. These are strictly empirical considerations which await further research. At the moment the evidence at hand is consistent with expectations and that is the most that could be claimed.

SELF-ACTUALIZATION

In the previous section, the concept of physiological differentiation was discussed. The concept was discussed in terms of Eysenck's five-stage model and related to his introversion-extraversion and neuroticism dimensions. Perceptual style was also discussed in the above terms. In this section, the concept of psychological differentiation

will be extended to also include self-actualization theory. To do so, Wexler's conception of self-actualization as a cognitive process rather than the traditional view as an "unfolding of one's potential" will be employed.

Wexler (1974) criticizes Carl Rogers, who represents only one of several self-actualization theorists (others, like Abraham Maslow, will not be considered in detail here since Wexler's criticisms are by and large also applicable to Maslow's assumptions regarding "potential") on several grounds. First, he says, there is a lack of clarity regarding the biological basis of self-actualization as stated by Rogers. Secondly, there is also ambiguity as to specification of what the nature of any "inherent potentials" might Because of their vagueness, these concepts have stibe. mulated little in the way of systematic psychological research. The traditional concept of self-actualization is molar, ambiguous and difficult to operationalize, says It would seem, he says, "...that a conception of Wexler. self-actualization that is ... clearer... might be possible if it were not defined in terms of the realization of potentials but were instead explicitly based on a well-defined theoretical model for the experiencing process" (Wexler, 1974, p. 52). Such a model is provided by cognitive psychologists he says, and the information processing approach.

Information processing is the active processing, organization, storage, retrieval and output of sensory stimuli. The active nature of such a model polarizes it with a more

passive model in which the organism is seen as the inactive recipient of stimuli. For example, Rogers says that if an individual were fully "open" to experience "...every stimulus-whether originating within the organism or in the environment-would be freely relayed through the nervous system without being distorted by any defence mechanisms" (Rogers, 1961, pp. 187-188). This statement clearly assumes a passive mode of information reception. Wexler criticizes it by saying that if such were the case, the person would find himself completely overwhelmed by the bombardment of multitudinous stimuli. Hence, something more must be involved, such as the active selection or attenuation of stimuli. Wexler says that "Experience is not something that already exists to which we may be open or not open, but is created by the activity of processing information" (Wexler, 1974, p. 56). In the information processing model, meaning is created by the individual. Things do not have meaning in them apart from such creation. As a result, there is a need for an internal organization and ordering of experiences. In this respect, Wexler says:

> Through his ability to create meaning, man has the potential to be his own source for creating reorganization and change in experience by distinguishing and synthesizing new facets of meaning in the diverse and complex information in his life. (Wexler, 1974, p. 66)

As the studies on stimulus deprivation (Butler and Rice, 1963) illustrate, the elimination of sensory stimulation

leads to psychological imbalance. Therefore, a need for sensory stimulation is postulated and can be considered a biological drive as necessary as the drive for food, says Wexler.

An added dimension with respect to differentiation in Wexler's account, is the concept of integration. In order to achieve balance, new information must not only be differentiated, but it must be integrated as well. "Both processes," says Wexler, "take place within the constraints and capabilities of information processing and represent an ideal balancing of the needs for organization and new experience" (Wexler, 1974, p. 68). Differentiation is a measureable process involving the elaboration of meaning(s) while integration is the creation of a superordinate structure which actively captures the similarity across the differentiated facets. This too is a measureable process.

How do differentiation and integration relate to selfactualization? This question is answered by first distinguishing the unproductive modes of information processing. Wexler says these are of three kinds: (1) the depressed mode in which the individual seems listless and his affections are bland and impoverished. Such persons, he claims, frequently complain of a meaningless life. This is due to "...the fact that they do little in the way of actively differentiating and integrating new facets of meaning to produce change and reorganization in experience" (Wexler, 1974, p. 87). Then there is (2) the rigid mode in which information is actively processed but only towards fitting

pre-existent cognitive structures. Such a mode, says Wexler, fails to generate affect. Finally, there is (3) the disordered mode which lies in an inability to synthesize and integrate information. This produces a disorganized field and accompanying high anxiety. Information in this mode is greater than what the individual can optimally process. In turn, "optimal processing" is the activity of differentiating and integrating meaning so as to create a richness of experience.

Experiencing is productive and optimal when the individual's cognitive processes are functioning to their fullest capacities (within the constraints of the information-processing system) to create change and reorganization in experience through vigorous differentiation and integration of meaning. Optimal processing also means the person can organize more information and has more information available for future processing. In effect, long-term memory storage is enhanced. Self-actualization can now be defined as the characteristic "...propensity to engage in an optimal mode of experiencing" (Wexler, 1974, p. 90). And further:

> ...the self-actualized person will be continually renewing his interest in his environment by re-creating it. It is not that he is completely open to all external stimulation; rather he creates new experience from his environment by allocating his attention and processing capacities to distinguishing and synthesizing new facets of meaning in it. Although the self-actualized person then, will tend to process and organize a richness of information from his external world, he is not dependent on the external environment for providing a source for new experience. He is also autonomous in being able to create new experience and change for himself via his

own cognitive functioning...The affect of the self-actualized person is likely to be rich and varied; not because he symbolizes feelings, but because he creates them in the process of distinguishing and synthesizing new facets of meaning in his experience.

(Wexler, 1974, p. 91)

This active information processing view of self-actualization allows Wexler to make specific predictions of the behavior of self-actualized persons in various cognitive areas. Firstly, the self-actualized person should have available and utilize a wider range of rules in processing and organizing In turn, rules may be operationally defined information. and their complexity measured as in Schroder, Driver and Streufert (1967) using such instruments as the Paragraph Completion Test. It could also be predicted that selfactualized persons are capable of processing a greater amount of information. Their short and long-term memory capabilities should therefore be greater because differentiation and integration of information would be more vigor-This would have the effect of imposing an increased ous. organization on the incoming information which in turn would enhance long-term memory store. Short-term memory store, in which information is simply held for processing, would likewise be enhanced. Attention should similarly be affected. If the self-actualized person has an increased capacity to handle information, then this might entail an increased ability to attend simultaneously to a variety of informational inputs. Thus, self-actualized persons would be expected to perform better on a task such

as the Stroop Color Word Test (Jensen and Rohwer, 1966) which requires that information be processed under strong competing stimuli.

For the most part, there is no empirical evidence to support or deny these predictions, although an extensive review of the literature did reveal a few related studies. Zimring, Nauman and Balcombe (1970) found the greater the elaboration of emotional experience (affective differentiation), the more information that could be attended to in a selective attention task. Wexler (1974) found that the degree to which persons were able to describe emotional experiences (affective differentiation) related significantly to scores on the Personal Orientation Inventory, a paper and pencil measure of self-actualization. Thomas and Seeman (1972) found high personality integration (measured by the Tennessee Self Concept Scale) related to greater cognitive complexity as measured by a picture classification task. And finally Doyle (1975) found a low but significant correlation between scores on a measure of field-independence (cognitive differentiation) and the Personal Orientation Inventory. These results, scant as they are, are consistent and predictable from Wexler's theoretical conceptualization.

The TM Technique and Self-Actualization

To what extent, if any, does the TM technique enhance

self-actualization? And, if it does, have any studies been conducted showing increased information processing capabilities in those areas predicted by Wexler's theory? Although the research is not extensive, there are indeed studies showing results for meditators consistent with the interpretation of self-actualization as an optimal mode of experiencing. The first of these was conducted by Seeman, Nidich and Banta (1972). These researchers found increased scores in self-actualization (measured by the Personal Orientation Inventory) after two months of regular meditation. Experimental subjects were 15 volunteer college students about to learn the TM technique. Controls were 20 college students from the same university who received no treatment. Experimental and control subjects did not differ on any of the POI variables prior to TM instruction. Similar results were obtained in a replication study involving 18 subjects in two groups (Nidich, Seeman and Dreskin, 1973). Hjelle (1974) administered the POI to 15 experienced and 21 novice meditators and found significantly higher self-actualization scores on seven of the 12 POI variables for the experienced group. It would appear from these studies that the TM technique may be a significant factor in fostering selfactualization, at least in college students. A more critical discussion of these studies is reserved for the fifth chapter.

What about cognitive or information processing variables? Besides the study by Pelletier (1974) discussed earlier on

field-independence and meditation, one study (Pirot, 1973) has been done on auditory discrimination and another (Miskiman, 1973) on secondary organization. In Pirot's study, 32 meditators serving as their own controls were asked to discriminate 40 pairs of 1,000 Hz, 30db tones. In each pair, one tone was 2,000 milliseconds while the other was 2,225 milliseconds. Subjects performed the task after being randomly assigned to one of four conditions of meditation or relaxation. Analysis of variance of the results substantiated the superiority of the meditation condition, but no control subjects were used who were also non-meditators or who practiced some other form of relaxation or medita-In Miskiman's study, 120 volunteer subjects were rantion. domly assigned to instruction in the TM technique or resting with eyes closed twice daily. Subjects were pretested on measures of secondary organization (ability to abstract a property of an object and generalize that property to all appropriate objects) and post-tested after 40 days of either the TM or relaxation condition. Meditators performed significantly better on the Index of Clustering under presentation of a random or clustered list and under conditions of two, four and six minute recall delays. The interesting result of this experiment is that after the six minute delay, the meditators were recalling as many items as after a two minute delay (rehearsal was prevented by having subjects do filler arithmetic tasks). No such phenomenon was observed in the controls, who showed the usual decay curve. This result perhaps provides some empirical support for

Wexler's prediction of improved long-term store in selfactualized persons. If we can assume Miskiman's meditators were becoming more self-actualized (the study should be replicated and a personality measure such as the POI included) as a result of practicing the TM technique, then a simultaneous information processing enhancement should, according to Wexler and according to previously discussed theories, also be occurring. Both short and long-term memory store should therefore improve. In this case, since rehearsal was prevented, the memorized lists had to be recalled from long-term store. This implies that the original learning of the lists was more efficient in the meditating group.

SUMMARY

The cycle of differentiation, formulated by Campbell (1975) as an explanation for the effects of the TM technique, has both a physiological and psychological component. As such, it is similar also to Eysenck's five-stage scheme of physiology and personality. David Wexler's interpretation of self-actualization as an optimal mode of information processing can also be related to the above theoretical interpretations. Research pertinent to this model was discussed.

The model is therefore quite complex and involves the simultaneous interaction of many variables. As such, re-

search which employs it as a rationale might best be approached using a multivariate statistical model, a procedure chosen for this study.

CHAPTER 3

RATIONALE AND HYPOTHESES

RATIONALE

Based on the theory and review of research discussed in the previous chapter, the following interpretation is presented: the TM technique, consistent with Campbell's formulation, serves to enhance physiological differentiation by "fine tuning" certain brain mechanisms. In turn, physiological differentiation has psychological and possibly sociological concomitants (Eysenck, 1972). These may therefore be measured in such traditional ways as paper-andpencil personality tests. Cognitive information processing variables, closely related to the former, may also be affected and could be measured in terms of such variables as field-independence, cognitive complexity, "interference effect," memory, and the like.

If the TM technique enhances physiological differentiation and if this is accompanied by psychological differentiation and integration, then meditators should score higher on tasks of psychological differentiation and integration, regardless of whether these tasks are measured by personality or cognitive tasks. Both are aspects of one dimension, namely, psychological differentiation. This relationship may be simplified diagrammatically as:



The relationship between the cognitive and affective components of psychological differentiation is schematically represented as:



Finally, the cognitive and affective aspects of psychological differentiation are not to be as clearly separated as the above diagram implies. They are more intimately related:



The mediating link or "intervening variable" between the cognitive and affective domains could be served from

different theoretical perspectives. For example, using Wexler's theory of self-actualization as an optimal mode of information processing as the intervening variable in the above diagram, the relationship between self-actualization as traditionally measured and various information processing tasks, such as visual discrimination, memory, etc., could be investigated. Or Eysenck's personality dimensions of extraversion-introversion and neuroticism-stability could serve as the mediating link and the investigation might then concern itself with the relationship between say, neuroticism and field-independence. It is obvious that one could pose numerous questions for empirical investigation using the above model.

HYPOTHESES

The present investigation addresses itself to two preliminary questions arising from the foregoing interpretation: 1. Will a group of meditators score higher on a battery of personality and cognitive tests measuring areas of selfactualization and information processing?

2. Will a group of persons who see themselves as highly self-actualized also score higher on selected aspects of information processing?

The two following hypotheses, arising from the above questions, will be tested in the null form.

Hypothesis One

 H₀: There is no significant difference in the vector of means representing personality and cognitive dimensions in meditators and non-meditators.

The alternative hypothesis is stated as:

H₁: The vector of means for the meditators is significantly greater than the vector of means for the non-meditators on the personality and cognitive dimensions.

Hypothesis Two

The second hypothesis deals with the relationship between self-actualization and optimal information processing.

2. H_0 : There is no difference in the mean of information processing scores obtained by persons who score high on a measure of self-actualization compared to those who score lower on a measure of self-actualization.

The alternative hypothesis states:

H₁: The mean of information processing scores obtained by persons who score high on a measure of self-actualization is greater than for those who score lower on a measure of self-actualization.

CHAPTER 4

EXPERIMENTAL DESIGN AND PROCEDURES

This chapter is concerned with the instruments used for this study, the experimental procedures, the sample groups and the statistical treatment of the data.

THE INSTRUMENTS

The following measures were selected for their suitability to the present study. A description of each instrument and its validity and reliability scores follows. The first two inventories relate to the area of personality, the last three tests to the area of information processing.

The Personal Orientation Inventory (POI)

This instrument was developed by Everett Shostrom (1963) specifically to measure personal growth as theorized by Abraham Maslow, Carl Rogers and other humanist writers. It consists of 150 pairs of two-choice items and is scored for two major scales (Inner-Directed and Time Competence) and 10 sub-scales (Self-Actualizing Value; Existentiality; Feeling Reactivity; Spontaneity; Self-Regard; Self-Acceptance; Nature of Man Constructive; Synergy; Acceptance of Aggression and Capacity for Intimate Contact). The subscales represent five major self-actualizing areas with two
related but contrasting sub-scales in each area. The test can be used with subjects as young as age 15. There is only one form.

Nine-week test-retest reliability was .96 as reported by Foulds (1969) and .91 and .93 by Shostrom (1963) but with no mention of time lapse. Ilardi and May (1968) report test-retest reliability scores on the 12 subscales ranging from .52 to .82 with a median of .705 after 50 weeks.

Construct, concurrent, factorial and predictive validity in several studies substantiate the POI as a useful personality measure (Tosi and Lindamood, 1975).

The Eysenck Personality Inventory (EPI)

This inventory, which may be used individually or for groups, was developed by H.J. Eysenck and Sybil Eysenck (1968) to measure personality in terms of two pervasive but orthogonal personality dimensions-introversion-extraversion (E) and neuroticism-stability (N). There are 57 items on the EPI designed to tap these traits. A response distortion scale is also included (Lie). Administration time is approximately 10 minutes. Two forms, A and B, are available.

Test-retest reliabilities of .81 to .97 after one year are reported in the manual. Split-half reliability scores from .80 to .95 are also given. Validity is reported in terms of factorial, construct, concurrent and "nominated groups" studies. Numerous research investigations (Bendig, 1960; Burt, 1948; Eysenck, 1956 and Farley, 1967) substantiate Eysenck's theoretical conception of the two dimensions.

Jensen (1965) reviewed Eysenck's earlier Maudsley Personality Inventory and the EPI. The EPI correlates sufficiently with the Maudsley so that earlier experimental findings using the Maudsley, which are considerable, almost certainly also apply to the EPI.

The following three tests are considered to tap some aspect of information processing. The reader might well wonder why the author chooses to call these tests information processing rather than using their traditional label of cognitive style. This was done because cognitive style is seen in the rationale as an aspect <u>of</u> information processing. Consequently, the following tests and label of information processing were chosen. Future investigations might well concern themselves with the relationship between say, cognitive style and visual discrimination or simultaneous and successive processing, etc.

The Group Hidden Figures Test

This test is an adaptation of the Gottschaldt Figures Test (1926) used by Witkin (1949) in studies of field-independence. It consists of two parts with 16 items in each part. At the top of each page are five simple geometric figures which subjects are required to find "embedded" in more complex geometric configurations below.

Boersma (1968) and Conklin (1968) report a test-retest reliability of .71 after six weeks. Concurrent validity was assessed by Jackson, Messick and Myers (1964) who found correlations of .56 to .75 between the group and individual embedded figures test. Additionally, West (1968) reported a correlation of .50 with the Rod and Frame Test. This low but significant correlation is no doubt partially due to the fact that the embedded figures tests are one step removed from the original defining test of perceptual style, the Rod and Frame Test.

The Paragraph Completion Test (PCT)

The Paragraph Completion Test was designed to measure complex integrative thinking in the area of interpersonal affairs. The person responding is asked to complete five item stems in paragraph form under a time constraint of 130 seconds per stem. The following stems, those traditionally used in the PCT, were also used in this study: "When someone disagrees with me...", "When I am in doubt...", "Rules...", "When others criticize me it usually means...", and "Confusion...".

The test is not scored for content of response, but for

the complexity of underlying cognitive rules presumed to underlie the response. Responses generated from a single rule are scored as 1, those giving alternate but unconnected concepts are scored as 3, those indicating a relationship between two different perspectives are given a score of 5 and those indicating multiple, complex relationships are given a score of 7. Points 2, 4 and 6 are intermediate. The complexity of the individual's thinking is therefore judged on a continuum ranging from very simple to very complex. A manual and scoring service is available (Schroder, 1971).

Gardiner and Schroder (1972) report reliability and validity scores of the PCT. Validity has been studied in various experimental contexts with scores on the PCT congruent with theoretical expectations. Low but significant correlations have been found with other measures of complexity and negative correlations with authoritarianism and dogmatism. Performance on the PCT is not related to IQ scores, to verbal fluency or to social desireability, especially in college students (Schroder, 1971). Interrater reliability scores ranging from .80 to .95 can be obtained when raters are trained for approximately three days. The five items internally correlate from .60 to .75. Test-retest reliability has been reported at .67 for a three month interval and .59 for a nine month interval.

The Stroop Color Word Test

This instrument was first introduced to America by J.R. Stroop in 1935. There is no standard test however and various versions have been developed. Almost all versions consist of three pages. The first page consists of printed color words written in black ink (eg., red, brown, blue). The second page consists of symbols printed in colored ink (usually five different colors are employed) which the subject must name. The third page consists of color words printed in incongrous colors (eq., red printed in blue ink). The subject must name the color of the ink ignoring the word it spells. A subject's score is the time it takes to complete each page or the number of items completed on each The third page, the source of the "interference page. phenomenon" is the one most interesting to researchers. Studies using the Stroop in areas of cognition, personality and psychiatric disorders are reviewed by Jensen and Rohwer (1966) who suggest that "resistance to interference" is a basic cognitive process. Golden (1975) suggests that this basic process may be the ability to select relevant input from a person's environment while ignoring irrelevant or competing stimuli.

A group version of the Stroop developed by Golden (1975) is the one used in this study. This test has three stapled pages. Each page has 100 items printed in five columns. Items on the second page are XXXX's printed in red, green or blue ink. Items on the final page are the same three colors printed in incongruous ink. Golden reports correlations of .73 to .89 between the individual and group forms of this test. Golden has also conducted a series of research studies using this instrument to diagnose brain damage, to measure creativity and to relate it to areas of personality (Golden, 1975; Golden, 1976).

The Quick Test

The Quick Test (QT) is a brief individualized measure of intelligence based on perceptual-verbal performance. It was developed by R.B. Ammons and C.H. Ammons (1962). The individual taking the test is given a plate with four separate drawings on it. He is to choose the picture which best fits the meaning of a word chosen from a column of 50 standard items. There are three forms of the QT, each with a separate set of plates and column of 50 words. Administration time is from five to ten minutes per person. Intelligence is estimated from single forms or combinations with the best estimate coming from a combination of scores on all three forms.

The test was standardized "...on the responses from 458 children and adults, a sample controlled on a simultaneous quota basis for age, sex, educational level and own or father's occupation" (Ammons and Ammons, 1962, p. 147).

Mean inter-form reliabilities of .60 to .96 are reported in the manual. Validity is reported by comparing the

QT to the Full Range Picture Vocabulary Test (FRPV). Validity correlations range from .62 to .97 depending on the combination of forms used. The authors state that the QT and the FRPV Test are so highly intercorrelated that they could be used interchangeably. In turn, the FRPV Test correlates very well with the Stanford-Binet and the WISC (.77 to .96).

THE SAMPLE

The sample for this study consisted of 156 unpaid volunteers. There were 78 subjects in each group consisting of 33 males and 45 females respectively. The meditators were mainly from the Calgary area although 13 subjects were from Victoria, B.C. All had been personally instructed in the TM technique by qualified teachers and most had considerable experience with the technique. The average length of time the subjects had been meditating regularly was 55.2 months. A significant number (N=26) were also teachers of the TM technique.

The non-meditators were all from Calgary or vicinity. This group consisted of a large number of volunteers from a summer school course conducted in July and August, 1977 (N=45). As such, there were a considerable number of female schoolteachers in the sample.

The meditators tended to be a more diverse sample, covering a wider range of occupations. A more detailed

description and comparison of the sample groups is given in Appendices A, B and C.

PROCEDURE

All data were collected between June and September of 1977. Subjects were not informed of the purpose of the study prior to taking the tests but were de-briefed afterwards. All subjects took the same battery of group tests in the same room (except for the Victoria sample) at the University of Calgary. The groups were generally small (as small as four and usually no larger than 12 persons) except for the non-meditating schoolteachers who were administered the group tests in a larger group setting (N=45).

All persons took the Quick Test individually. All tests were administered by the author. Total test time for the battery was from $1\frac{1}{2}-2$ hours per group tested.

All tests were hand-scored by the author. Inter-rater reliability for the Paragraph Completion Test was obtained in the following way: four separate random samples of 12 subject protocols were re-scored. One sample was re-scored using Schroder's (1971) scoring service. The other three were scored jointly by the author and another graduate student, independently of the author's first scoring, which had been some months previous. The median inter-rater reliability of the four samples was calculated at .795. This figure was considered acceptable for the purposes of this study.

All subjects took all the tests only once. Three of the tests were timed. Once these were completed, subjects were instructed to complete the two personality tests under untimed conditions. While they were doing so, they were tested one at a time on the Quick Test in a separate room until everyone in the group had been tested.

TREATMENT OF THE DATA

Both hypotheses were tested using different statistical procedures from the SPSS programs (Nie, Hull, Jenkins, Steinbrenner and Bent, 1975).

Hypothesis One

This hypothesis was stated in such a way as to be amenable to multivariate statistical procedures. Two main multivariate procedures were used: (1) discriminant and classification function analyses and (2) multivariate analysis of covariance. Additionally, univariate analyses of covariance and t-tests were used where appropriate for some of the sub-analyses.

Hypothesis Two

This hypothesis was tested by using a univariate analy-

sis of covariance on the entire sample of subjects (N=156). Firstly, the self-actualization I scores (the single best measure of self-actualization on the POI-Tosi and Lindamood, 1975) were recoded as 1 (I scores of 84 or lower) or 2 (I scores of 85 and above). Group 1 were the low self-actualizers while Group 2 were considered high self-actualizers. Next, scores on the Stroop, the Hidden Figures Test and the Paragraph Completion Test were combined and averaged to form a single information processing dependent variable. These scores were then subjected to an analysis of covariance where self-actualization was the main independent variable and age, sex, IQ, occupation and education formed the covariates.

For both hypotheses, a significance level of \ll =.05 was set for acceptance or rejection. Each hypothesis was tested in the null form and because a direction was specified for the alternate hypothesis, tests were all onetailed.

CHAPTER 5

RESULTS

The format for this chapter is as follows: first, each of the variables measured in this study are described. Next, the first hypothesis is re-stated and the results and sub-analyses presented. Finally, the second hypothesis is re-stated and the results presented.

VARIABLES MEASURED

The variables in this study were as follows. They are presented according to the instrument used to measure them.

The Personal Orientation Inventory

1. TC-Time Competence-measures the degree to which a person appears to live in the here-and-now. Such a person ties present and past into a meaningful continuity. The self-actualizing person uses the past for reflective thought and the future is tied to present goals (23 items).

2. I-Inner-Directed-measures the degree to which a person appears to have incorporated an "internal gyroscope" for independent action. The other-directed person relies on others for approval and may be controlled primarily by feelings of guilt and/or anxiety (127 items).

3. SAV-Self-Actualizing Value-measures the degree to which a person holds and lives by the values of persons clinically judged as self-actualizing, eg., "I live in terms of my wants and desires" (26 items).

4. XE-Existentiality-measures the flexibility in applying self-actualizing values in one's own life (32 items).

5. FR-Feeling Reactivity-measures the sensitivity to one's own needs and feelings (23 items).

6. S-Spontaneity-measures the ability to express feelings in spontaneous action (18 items).

7. SR-Self-Regard-measures the ability to like one's self because of one's strengths as a person (16 items).

8. SA-Self-Acceptance-measures acceptance of one's self in spite of weaknesses or deficiencies. More difficult to achieve than Self-Regard (16 items).

9. NC-Nature of Man Constructive-high scores mean that one sees man as essentially good (16 items).

10. SY-Synergy-measures the ability to see the opposites of life as meaningfully related, eg., work and play are not really seen as opposites by self-actualizing persons (9 items).

11. A-Acceptance of Aggression-measures the ability
to accept anger or aggression within one's self as natural
(25 items).

12. C-Capacity for Intimate Contact-measures the ability to develop meaningful relationships with other human beings (20 items).

Since the POI is a 150 item test, it can be seen that there is a large item overlap in the variables.

The Eysenck Personality Inventory

13. EXTR-Extraversion-Introversion-high E scores indicate extraversion. Such individuals tend to be outgoing, impulsive and uninhibited, having many social contacts and frequently taking part in group activities (24 items).

14. NR-Neuroticism-high N scores indicate emotional lability and over-reactivity. Such individuals tend to be emotionally over-responsive and have difficulty returning to a normal state after emotional experiences (24 items).

15. LY-Lie-measures the tendency to "make a good impression" (9 items).

The Stroop Color Word Test

16. CWA-the first page of the Stroop Color Word Test (Golden, 1975). Tests the subject's ability to read a list of color words quickly.

17. CWB-the second page of the Stroop. Tests the subject's ability to name colors guickly.

18. CWC-the third page of the Stroop Color Word Test. Considered to be a cognitive measure of a person's ability to select relevant input from the environment and screen irrelevant or competing stimuli.

19. ATN-This score, called "attention" in this study, is a derivative of the other Stroop scores. It is equal to CWC scores minus the contribution of the CWB score to the over-all results. It is considered a "purer" measure of interference, since it statistically corrects for a speed in color-naming effect (Golden, 1974).

The Group Hidden Figures Test-Cf-1

20. HFTA-the number of figures correctly disembedded from a total of 16 complex figures.

21. HFTB-the number of figures correctly disembedded from a separate sample of 16 other complex figures.

Variables 20 and 21 are considered measures of fielddependence-independence or the ability to experience one's surroundings analytically, with objects experienced as discrete from their backgrounds. The field-dependent person passively conforms to the influence of the prevailing field or context (Witkin et al, 1962).

The Paragraph Completion Test

22. PCA-subject's response to the stem, "When someone disagrees with me...".

23. PCB-subject's response to the stem, "When I am in doubt...".

24. PCC-subject's response to the stem, "Rules...".

25. PCD-subject's response to the stem, "When others criticize me it usually means...".

26. PCE-subject's response to the stem, "Confusion ... ".

The Paragraph Completion Test is designed to measure cognitive complexity or the degree to which an individual processes information using simple or complex internal rule structures. Higher levels or conceptual structure (more complex) are associated with flexible, adaptive orientations to stress and greater resistance to its various forms (Schroder, Driver and Streufert, 1967).

Additionally, information on the following variables was also collected:

27. Age-the subject's age in years.

28. Education-the highest level of education achieved by the subject.

29. Occupation-the full-time occupation of the subject.

30. IQ-the subject's intelligence was estimated by administering all three forms of the Quick Test, averaging the scores and then using the norms provided by Ammons and Ammons (1962).

31. Length-TM group only-the length of time in months the subject had been practicing the TM technique regularly.

Data on education and occupation were recoded according to the scales used by Broverman (1964). The scales and their assigned scores are shown in Appendix D.

The results of this study are now presented according

to the hypothesis tested.

HYPOTHESIS ONE

This hypothesis stated:

H₀: There is no significant difference in the vector of means representing personality and cognitive dimensions in meditators and non-meditators.

The alternative hypothesis stated:

H₁: The vector of means for the meditators is significantly greater than the vector of means for the non-meditators on the personality and cognitive dimensions.

This hypothesis was tested in two ways: (1) discriminant and classification function analysis and (2) multivariate analysis of covariance. For these analyses, the terms independent and dependent variables will be used as a matter of expedience in reporting results. The author is fully aware of the post hoc nature with reference to the "treatment" (TM) in this study and the fact that this variable was not under laboratory control. However, for the sake of convenience in discussion, the terms will be employed. Results are presented under each analysis.

Discriminant and Classification Function Analysis

A discriminant function analysis from the SPSS program calculates whether two (or more) sub-groups can be separated beyond chance expectations in respect to the variables used. The program can therefore answer the question: Are these samples drawn from the same or from different populations? A discriminant function index is calculated which mathematically maximizes the separation between groups on combinations of scores from the variables used in the analysis. If the groups can be considered distinct, then individuals are assigned, on the basis of similarity to a criterion score, to either of the subgroups. The program can therefore also calculate the accuracy with which this classification of individuals to groups takes place since actual group membership is known beforehand.

Results of the discriminant function analysis first of all indicate that there is a significant difference between the two groups (lambda=.50 which is approximately a chi-square of 96.34 with 29 d.f. resulting in a p < .0001). The results of the ensuing classification analysis are summarized in Table 1. They show that on the basis of scores on this battery of tests, individuals can be classified into either meditators or non-meditators with an over-all accuracy of 83.3 percent. This level of accuracy is well beyond that which would occur by chance (chi-square= 69.33 resulting in a p < .0001). We can say with confidence then, that the two groups are statistically different, but on which variables?

A step-wise discriminant function analysis was performed to answer this question. All 30 original variables

Table 1	
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Prediction Results of The First Classification Function Analysis

			·····			
Actual Group	N		Predic	ted Group	Membership	
			Group	> 1	Group 2	
Meditators	78		66 (84.6	58)	12 (15.4%)	
Non-meditators	78		14 (17.9	18)	64 (82.1%)	
Over-all Accurac	y=83.3% Of	Known	Cases	Correctly	Classified	

Chi-Square=69.33 p <.0001

·

were sequentially entered into the step-wise analysis by magnitude of explained variance until the increase in predictive power by any additional variable was statistically insignificant. Table 2 shows the 18 variables which, in combination, maximized separation between the two groups.

Multivariate Analysis of Covariance

A multivariate analysis of covariance was done in which the effect of TM and the possible effect of a TM by sex interaction on the 26 dependent variables was assessed. The covariates were age, education, occupation and IQ. Results of this analysis revealed no significant differences on the dependent variables between groups on the sex or TM by sex interaction. However, the effect of TM alone produced a highly significant difference between groups (p < .00001). These results are summarized in Table 3.

Results of the discriminant function and multivariate analysis of covariance lead us to therefore reject the null hypothesis and accept the alternative hypothesis, namely, that the vector of means for the meditators is significantly higher than the vector of means for the non-meditators, even when covariates are adjusted.

Additional Analyses

Although a significant difference between groups was demonstrated, this experiment, because of its very

Table 2

Results of Stepwise Discriminant Function Analysis

Step	Variable Entered	F	Wilk's lamda	p-values for increased prediction
1	NR	16.27	.90	.001
2	NC	9.99	.85	100.
3	CWB	7.42	.81	.003
7 5		9 87	• / /	.003
6	SA	8 02	.09	.001
7	S	6.84	.00	001
8	PCD	6.57	.61	.001
9	HFTB	4.43	.60	.006
10	A	3.58	.59	.013
11	PCC	2.58	.59	.031
12	CWA	2,90	.57	.021
13	HFTA	1.67	.57	.075
14	TC	2.03	.56	.048
15	XE	1.38	.55	.099
16	PÇB	1.35	.55	.099
17	ATN	1.48	.54	.083
T8	CWC	2.84	•23	.015

design, cannot directly answer whether the TM variable alone is responsible for the significant difference between groups.

In an attempt to pursue this issue, further analyses were conducted. To test whether a main contributing factor upon scores was the TM variable, the following was if TM is a major factor, then more experience reasoned: with the technique should increase scores on the dependent variables. In turn, "more experience" could be defined in two ways: (1) length of time in months meditating and (2) whether or not the subject was a TM teacher. TM teachers are trained in courses lasting up to one year or more. During such time, as well as learning the mechanics and theory needed to train students in the practice of meditation, the participants also do a program of "rounding" during which, under supervised conditions, they meditate considerably more than twice daily. It is claimed the effect of such "rounding" facilitates the release or normalization of deeply-rooted stresses in the nervous system. As discussed earlier, this would improve physiological differentiation and in turn affect psychological differentiation. Such a course of "rounding" is claimed to dissolve stress much faster than just meditating twice daily. As a consequence, scores on the dependent variables for these persons might be higher than for those who just meditated regularly.

The number of TM teachers in the TM sample was 26, or

Table 3

27% of the meditating sample. Several correlation and multivariate analyses as well as t-tests were computed on the dependent variables with and without the TM teachers. Length of time meditating or being a TM teacher were considered to be independent variables for these analyses.

Results of the Correlation Analyses

Pearson product-moment correlations were calculated using (1) all TM subjects and (2) TM teachers only. All the test variables including age, sex, education, occupation and IQ were correlated with length of time meditating. Of 155 possible correlations, only 11 reached significance and were of small magnitude, a result which might be obtained by chance anyway. Ten of the 11 significant correlations all associated opposite to the expected direction. It would therefore appear there is no association with length of time meditating and scores on the variables. However, that conclusion cannot be upheld from a correlation analysis only. As a consequence, a more powerful statistical analysis was conducted where the effects of covariates could also be considered.

Results of Multivariate Analysis of Covariance

A multivariate analysis of covariance was used on the scores of the 52 subjects who were meditators but not TM

teachers. Length of time meditating was divided into four categories: 4=lowest through 12 months regular TM; 3=13 to 24 months regular TM; 2=25 to 48 months regular TM and 1=49 or more months regular TM. These categories were entered into the analysis as independent variables along with sex. Education, occupation and IQ were covariates. Results indicated no length by sex interaction effect, no sex effect and no length effect.

Results of this analysis clearly indicate that length of time practicing the TM technique does not contribute to any difference in scores on the dependent variables.

Results With The TM Teachers

If length of time meditating does not contribute significantly to scores on the dependent variables, then perhaps being a TM teacher does, since, as explained earlier, TM teachers also have had more experience with the technique. To test this possibility, the TM teachers (N=26) were compared to the non-meditators (N=78). t-tests for independent samples were computed as was Hotelling's T^2 to test the overall level of significance. Results are presented in Table 4.

It becomes obvious by inspecting Table 4 that the TM teachers are contributing substantially to the difference between groups. They are significantly higher than the non-meditators on six of the 12 POI variables, they are

·····									
Variable	TM Tea	achers		Non-me	edit	ators		t	a
	X	S.D.		X		S.D.			
TC	18.61	2.38		17.06		3.92		-2.41	.009
I	89.65	11.06		83.08		17.07		-2.26	.013
SAV	22.73	1.51		19.33		4.22		-6.04	.001
XE	21.26	3.94		20.29		5.15		-1.01	.159
FR	15.84	3.19		15.61		3.61		-0.31	.379
S	14.26	2.18		12.00		3.13		-4.08	.001
SR	14.15	1.56		12.01		3.01		-4.66	.001
SA	15.42	3.31		15.92		4.36		.61	.270
NC	13.57	1.36		11.35		2.75		-5.40	.001
SY	7.19	.98		7.00		1.62		-0.72	.236
A	15.19	3.44		15.74		3.82		.69	.247
С	18.57	3.74		17.80		4.30		-0.87	.193
EXTR	12.80	2.84		11.64		3.82		-1.65	.052
NR	6.26	3.71		10.00		5.00		4.04	.001
LY	2.30	1.51		2.32		1.56		.04	.485
CWA	119.80	20.64		115.73		16.83		-0.91	.184
CWB	83.23	11.51		83,44		13.69		.08	.468
CWC	45.30	10.09		44.73		12.12		-0.24	.406
ATN	43.92	9.41		42.24		9.91		-0.78	.220
HFTA	5.50	3.28		5.24		2.82		-0.36	.362
HFTB	6.26	4.35		6.17		3.36		-0.10	.462
PCA	2.88	.31		2.24		.92		-3.35	.001
PCB	2.88	.99		2.66		.89		-0.99	.163
PCC	2.92	1.54		1.91		1.19		-3.05	.002
PCD	2.57	.75		2.12		.91		-2.48	.008
PCE	1.69	1.12		1.28		1.08		-1.63	.055
AGE	27.84	6.58		27.44		8.71		-0.24	. 40.4
EDU	2,65	1.01		2.87		.88		.98	.168
OCCUP	3.84	.36		3.94		.96		.78	.218
IQ	114.23	10.36		104.11		9.39		-4.41	.001
Hotelling	T ² =195.00	F=4.24	with	32, 71	d.í	. <u>p</u> <	.óo	001	

Table 4

t-Tests Comparing TM Teachers And Non-meditators

more extraverted and less neurotic and they score higher on four of the five cognitive complexity variables. Additionally, they are significantly more intelligent than non-meditators. They are no different on any of the Stroop or field-independence variables however. A closer examination of the data was made in an attempt to discover why. When the means and standard deviations of these variables were examined by group and by sex, it was discovered that the female non-meditators had distinctly different means and standard deviations than any other group on the Stroop variables (the same was not true for the field-independence variables). This is shown in Table 5.

This would appear to indicate the either female nonmeditators are significantly better on the Stroop than female meditators, that the scores are perhaps spuriously high or that other factors, such as covariates, have not been taken into account. Significantly, the female nonmeditators were the only group administered the Stroop in a large group setting (N=42) by comparison to the others. It is therefore possible that the results are inflated. This would seriously affect interpretation of the results and cast doubt on the validity of a group form of the Stroop Color Word Test.

To test which of the possibilities was most likely, an analysis of covariance was computed using female subjects only (N=90), first with the TM teachers in the sample and then excluding the female TM teachers. TM in this

Table	5
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Stroop Scores For Meditators And Non-meditators

	Me	editato	rs		Non-	Meditat	ors	
	Male		Femal	.e	Male		Femal	.e
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
CWA CWB CWC ATN	113.81 79.66 44.84 44.75	21.06 12.94 10.50 7.66	113.62 80.86 42.46 42.08	17.08 12.32 10.47 8.68	111.57 79.30 42.15 41.69	18.33 12.49 9.46 8.24	118.7786.4846.6242.64	15.13 13.87 13.54 11.05

analysis was considered the independent variable with CWA, CWB, CWC and ATN entered separately as dependent variables. In each case, education, occupation, IQ and age were entered as covariates. Results are presented in Table 6. These results indicate that when covariates are entered, female meditators are not worse compared to nonmeditators on the Stroop variables. They are in fact, better on CWA, CWB and CWC, but not significantly so. Once more, the contribution of being a TM teacher is indicated by the low F-ratios when this group is removed. The high scores on the Stroop by the female non-meditators are therefore likely accounted for by the fact that covariates were not yet adjusted. The Stroop scores should therefore not be considered spurious.

Scores on the two tests of field independence indicate that meditators and/or TM teachers do not score higher on these variables as was expected.

In conclusion to this section of the sub-analyses, it is apparent that length of time meditating does not contribute to higher scores on the dependent variables. However, being a TM teacher does. This may be due to greater experience with the TM technique or to a self-selection process where the more educated, intelligent, less neurotic, more self-actualized meditator also goes on to become a teacher of the technique.

In the course of the sub-analyses, results from two other variables, IQ and Lie on the Eysenck Personality In-

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Analysis Of Covariance On Stroop Variables--Female Subjects

	Wi TM	th Female Teachers (N=90)	With TM	out Female Teachers (N=75)
Variable	F	Significance	F	Significance
CWA CWB CWC ATN	1.594 2.102 1.745 .047	.210 .151 .190 .829	1.454 .793 .534 .008	.232 .376 .467 .928

ventory, were seen to deserve some further discussion.

#### The IQ Variable

When this study was first proposed, it seemed important to include intelligence as a variable in order to control for its effect on other scores. However, when initial t-tests were computed using all 156 subjects on all variables, it was noted that the meditators as a group were, among other things, significantly more intelligent (p < .005) even though they were significantly less educated (p<.042). This rather curious finding was pursued in the following way: an analysis of covariance was performed between groups with IQ as the single dependent variable and TM considered as the independent variable. Sex, education, occupation and age were entered as covariates. All 156 subjects were entered into the first analysis. TM teachers were then dropped from the sample and the remaining 130 subjects formed the basis for the second analysis. The results of these two analyses are presented in Table 7. Inspection of this table shows that as a group, meditators are significantly more intelligent than the non-meditators, but this difference is due primarily to the TM teachers as removing them from the sample results in a statistically insignificant difference (p < .110) between the groups on the IQ scores.

# Table 7

# Analysis Of Covariance On Intelligence

	With TM (N	Teache =156)	rs	Without (N=	TM Te =130)	achers
Source of Variation Covariates Sex Education Occupation Age	SS 4209.846 19.130 2907.862 197.453 1509.831	F 11.92 .21 32.94 2.23 17.10	p .001 .642 .001 .137 .001	SS 3067.52 1.07 1604.70 114.37 1527.98	F 9.04 .01 18.9 1.3 13.0	p .001 .910 .001 .248 .001
Main Effects TM	1001.052	11.34	.001	219.24	2.58	.110

### The Lie Variable

The Eysenck Personality Inventory contains a number of items considered to screen individuals who are responding in such a way as to make a good impression. When the means and standard deviations of the two groups are compared (see Appendix G), there is no over-all difference between groups although the meditators score slightly higher. In the course of the sub-analyses however, the source of the contribution to the slightly higher mean was discovered. The lower educated meditators (N=27) with scores of 5, 6 or 7 on the Education Index were far more prone to trying to make a good impression on the EPI than their non-meditating counterparts (N=8). This is shown in Table 8.

No such differences were found in the higher educated meditators. Although the Lie scores are still below what Eysenck considers necessary to invalidate the test results, they do indicate that the lower-educated meditator is much more prone to trying to impress. Is this subject also gaining less from the TM experience? t-tests comparing this sub-sample to non-meditators shows the meditators score higher only on SR (p < .02), NR (p < .001), CWC (p < .045), PCC, (p < .001) and PCE (p < .0001), but the over-all difference does not reach significance when Hotelling's T² is computed (p < .720).

It would appear that the lower-educated meditator scores no differently than a non-meditator counterpart on

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Scores On Lie Scale

		······································		
Meditators	Non-me	ditators		
X S.D.	X	S.D.	t	р
3.29 1.63	2.00	1.30	2.32	.018

.

the battery of tests. This conclusion can only be tentative however, because of the small number of subjects in the non-meditating group and because of the confounding influence of other covariates. In an attempt to pursue the matter further, a more powerful statistical test was used. A multivariate analysis of covariance was therefore computed. For this analysis, TM was entered as the main independent variable. Scores on the dependent variables were adjusted for the covariates of sex, occupation, IQ and age. This analysis therefore compared scores on the dependent variables, adjusted for covariates, for the lower educated members of the respective sample groups.

Results of the analysis showed no main effect for the TM variable (p < .125) though there is a trend towards statistical significance. The corresponding univariate F-ratios showed the lower educated meditators were less neurotic (p < .003) and higher on the PCE variable (p < .005). Though not higher on PCC, there is a very strong trend in that direction (p < .06). Interestingly, the lower-educated meditators are more field <u>dependent</u>(p < .03) than their nonmeditating counterparts. As well, the meditators still score higher on the Lie variable (p < .02) when covariates are adjusted.

Results of the multivariate analysis of covariance seem to indicate that in general, the lower educated meditator does have less to gain from the TM experience.

This conclusion is based on a small sample and should therefore be considered tentative. Additionally, this group would appear to have gained <u>something</u> from the TM experience (disregarding considerations of design weakness for the moment) since they scored lower on the neuroticism dimension than the nonmeditators. However, they were also more field <u>dependent</u>, which was contrary to expectation.

### Reanalysis of the First Hypothesis

Results of all the sub-analyses have some important implications for re-testing Hypothesis 1. It was found that TM teachers contributed very significantly to the discrimination between groups on the dependent variables. Would the groups still differ on a discriminant function and multivariate analysis of covariance if the TM teachers were removed from the analyses? Hypothesis 1 was re-tested with this consideration in mind.

#### <u>Results of a Second Discriminant Function Analysis</u>

A discriminant function analysis from which the TM teachers were excluded from the analysis was performed. This analysis indicated that the groups could still be separated with little loss of classification accuracy (see Table 9). Wilk's lambda in this analysis was .519, which is comparable to a chi-square value of 74.629 with 30 degrees of freedom resulting in a p-value of .0001 for the single discriminant function. The very small loss in classification accuracy

C1	ediction Re assificatio	sults Of The Second on Function Analysis	•
Actual Group	N	Predicted Group	Membership
		Group 1	Group 2
Meditators	52	44 (84.6%)	8 (15.4%)
Non-meditators	78	14 (17.9%)	64 (82.1%)
Over-all Accurac	y=83.1% Of hi-Square=5	Known Cases Correctl 6.89 p<.0001	y Classified

Table 9
seems rather puzzling but inspection of the means and standard deviations of the discriminant analysis revealed that accuracy was maintained because the meditators without TM teachers did significantly worse on the Hidden Figures Test.

### Results of a Second Multivariate Analysis of Covariance

A multivariate analysis of covariance was done in which the effect of TM on the dependent variables was assessed. For this analysis, the TM teachers were not included. Age, sex, education, occupation and IQ were covaried. The effect of TM, adjusted for the covariates, still produced a significant difference between groups (largest root criterion= .422 with s=1, m=12¹/₂ and n=47¹/₂ yielding a p-value of .001). Putting the TM teachers back into the analysis increases the p-value (p<.0001) as might be expected.

### Comparison of Univariate F-Ratios

It is interesting to compare the univariate F-ratios and their significance levels when adjusted for either four covariates (sex, education, occupation and age) or five covariates (the preceeding four and IQ), with and without the TM teachers. This comparison and breakdown was thought necessary in view of the preceeding discussion of the results of the IQ variable and the contributing effect from the TM teachers. Results of the univariate F-ratios are presented in Tables 10 and 11. It can be seen by inspection of the tables that the TM teachers contribute substantially to increasing the differences on most variables. In fact, without the TM teachers, the meditators do better only on S, NC, NR, PCA, PCC and PCD.

Additionally, considering IQ as either a dependent variable or a covariate has some bearing on interpretation of the results. In particular, considering IQ as a covariate increases the F-ratios in favor of the non-meditators on the Hidden Figures Test when TM teachers are not included in the analysis. In this case, the meditators do significantly worse on the Hidden Figures Test. Other variables are affected in a minor way only.

## Summary Regarding the First Hypothesis

Results of the first and second discriminant function and multivariate analyses of covariance lead us to reject the null hypothesis in each case and accept the alternative hypothesis. The vector of means on the variables used in this study are over-all significantly greater for the meditators than for the non-meditators.

Table	10
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F-Ratios With Four Covariates

Variable	Meditato	ors Only	With TM	Teachers
	F	ą	F	p
TC I SAV XE FR S SR SA NC SY A C EXTR NR LY CWA CWB CWC ATN HFTA HFTB PCA PCB PCC PCD PCE IQ	2.59 $1.79$ $1.73$ $2.04$ $.27$ $3.69$ $3.04$ $.06$ $4.32$ $.11$ $.83$ $1.04$ $.47$ $14.40$ $2.84$ $.33$ $.85$ $.00$ $1.08$ $2.82$ $2.42$ $6.87$ $1.45$ $5.00$ $11.02$ $3.36$ $2.58$	.10 .18 .19 .15 .60 .05 .08 .79 .03 .73 .36 .30 .49 .0002 .09 .56 .35 .98 .29 .09 .12 .09 .12 .009 .23 .02 .001 .06 .11	5.31 4.50 9.45 2.51 .48 11.19 10.43 .00 14.32 .00 .73 1.76 .02 20.43 1.61 .00 .81 .00 1.51 1.02 1.01 10.75 1.62 10.97 13.61 .4.56 1.24	.02 .03 .002 .11 .48 .001 .001 .94 .0002 .95 .39 .18 .88 .00001 .20 .98 .36 .94 .22 .31 .31 .001 .20 .001 .0003 .03

Variable	Meditators	Only	With TM	Teachers
	F	р	F	р
TC	3.45	.06	6.71	.01
I	2.26	.13	5.11	.02
SAV	2.33	.12	10.08	.001
XE	1.96	.16	2.13	.14
FR	.56	.45	1.20	.27
S	4.53	.03	12.14	.0006
SR	4.14	.04	11.13	.001
SA	.04	.83	.02	.86
NC	4.25	.04	12.82	.0004
SY	.02	.87	.06	.80
A	.44	.50	.17	.67
С	1.56	.21	2.89	.09
EXTR	.08	.76	.48	.48
NR	15.93	.0001	21.48	.00001
LY	3.88	.05	3.10	.08
CWA	1.10	.29	.93	
CWB	1.22	.27	1 55	21
CWC	.10	.75	.37	• <del>~ -</del> 5 3
ATN	.56	. 45	.37	.53
HFTA	4,95	.02	3.49	•04 06
HFTB	3,67	.05	3 36	.00
PCA	6.23	.01	9 29	002
PCB	1.07	.30		.002
PCC	3.39	.06	6.28	.01
PCD	10.94	.001.	13.16	0003
PCE	3,30	.07	3.76	0500

Table 11

F-Ratios With Five Covariates

#### HYPOTHESIS TWO

This hypothesis stated:

 $H_0$ : There is no difference in the mean of information processing scores obtained by persons who score highly on a measure of self-actualization compared to those who score lower on a measure of self-actualization.

H₁: The mean of information processing scores obtained by persons who score highly on a measure of self-actualization is greater than for those who score lower on a measure of self-actualization.

This hypothesis follows directly from David Wexler's (1974) interpretation of self-actualization as an "optimal mode of information processing." It was tested in the following manner: the I variable of the Personal Orientation Inventory, which is the single best predictor of self-actualization (Tosi and Lindamood, 1975) was recoded so that subjects with scores up to 84 on this variable fell into the first group, the "low self-actualizers." Subjects with scores of 85 or better on the POI were considered "high self-actualizers" and formed the second group. The raw score of 85 was chosen as a cut-off score because it closely approximates the I mean for a normal population (Shostrom, 1963). There were 65 subjects who fell into group one and 91 subjects who fell into group two. All subjects were used for this analysis, regardless of group membership. Of the 65 "low self-actualizers," 28 were

meditators and 37 were non-meditators. Of the 91 "high self-actualizers," 50 were meditators and 41 were non-meditators. A chi-square analysis showed that this distribution was not statistically significant. TM was therefore not a confounding variable.

Next, an "information processing index" was computed as follows: scores on the variables CWA, CWB, CWC, ATN, HFTA, HFTB, PCA, PCB, PCC, PCD and PCE were added together and divided by 11, the number of variables. Each variable was considered to contribute equally to the "information processing index."

An analysis of covariance was then run with self-actualization as the single independent variable. Sex, education, occupation, IQ and age were entered as covariates. Results were as predicted (see Table 12). The "high selfactualizers" performed significantly better on the "information processing index" (p < .001) than the "low selfactualizers."

The "information processing index" was broken into its constituent instruments-the Stroop, the HFT and the PCT and analyses of covariance were run separately for each instrument. These results are also shown in Table 12. When the analyses are run separately for each instrument, only the Stroop variables reach significance.

Summary Regarding the Second Hypothesis

Results of the analysis of covariance lead us to re-

# Table 12

# Analysis Of Covariance On Self-Actualization And Information Processing

			·	·
Variable		F		P
Information	Processing Index	13.874	1	.001
Stroop HFT PCT		13.420 1.722 2.423	) 2 3	.001 .191 .122

ject the null hypothesis in favor of the alternative hypothesis. Persons who score higher on the self-actualization measure also score higher on the mean of information processing scores.

### CHAPTER 6

### DISCUSSION

In the previous chapter, the two major hypotheses of this study were accepted in light of the statistical analyses that were done. Firstly, meditators were found to score significantly higher on a battery of psychological tests than a group of non-meditators when a multivariate approach was used. As can be expected from such statistical procedures, they did not score higher on <u>all</u> the variables used in the study. And, in fact, when TM teachers, who contributed significantly to the difference between groups, were removed from the analysis, the meditators scored worse on the Hidden Figures Test when IQ was considered a covariate.

Secondly, high self-actualizers were found to score higher on a mean of information processing variables than low self-actualizers.

In this chapter, the results are discussed under each of the hypotheses. Limitations of the study and recommendations for further research are also presented where appropriate.

### HYPOTHESIS ONE

The predicted hypothesis stated that a sample of meditators would score higher on a battery of psychological tests representing personality and cognitive variables than

a sample of non-meditators. Both discriminant and classification function analysis and multivariate analysis of covariance supported this hypothesis at a high level of statistical confidence.

However, interpretation of which variables contributes to such differences varies with the type of multivariate procedure used and the sample under consideration. Comparing Table 2 with Table 11 for example, reveals the following: only four of 18 variables (NR, NC, S and PCD) overlap in contributing to a statistical difference between the groups using the two methods of discriminant function analysis (stepwise) and multivariate analysis of covariance. Four more variables (HFTA, HFTB, TC and PCC) are statistically significant and overlapping between the two statistical procedures depending on whether one includes the TM teachers or not. A further eight variables (CWA, CWB, CWC, ATN, XE, SA, A and PCB) discriminate between groups on the stepwise analysis but not on the multivariate analysis of covariance. Finally, two variables (IQ and education) are included in the stepwise analysis but are considered covariates in the multivariate analysis.

It is noteworthy that all variables from the Stroop are omitted from the multivariate analysis but contribute to discrimination in the stepwise procedure. This is likely due to the samples used for this study. The non-meditators scored higher on the Stroop variables in general but did not do so when covariates were adjusted. These

variables therefore added to the separation between groups in the stepwise procedure but in this case the separation would be "in favor of" the non-meditators, whereas separation on the other variables was "in favor of" the medita-That the difference on Stroop performance was due tors. to the type of samples used was demonstrated in Table 6 which showed no difference in favor of either group when an analysis of covariance was done. Additionally, there was little loss of classification accuracy when TM teachers were not included in the analysis (see Table 9 and compare to Table 1). Not including the TM teachers however, increases the importance of the Stroop variables on the classification function coefficients (because now the means shift "in favor of" the non-meditators on Stroop variables) and thus leads to little loss in classification accuracy.

Keeping the above considerations in mind, the first hypothesis can now be discussed in terms of the rationale offered in chapter three.

# Psychological Differentiation-Neuroticism

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The rationale in chapter 3 stated that physiological differentiation contributed to psychological differentiation and that TM affects physiological differentiation Campbell, 1975):

Differentiation Psychological Differentiation

It was postulated that the physiological nature of the TM technique was instrumental in bringing about changes which would be manifested on a psychological level. Therefore any psychological differences obtained between groups might be attributable to underlying physiological mechanisms affected by the technique. This rationale is consistent with Eysenck's five stage model and was in fact, subsumed under it.

It is therefore interesting that the single most discriminating variable between groups was neuroticism. This held true regardless of the educational or occupational level of the subjects and regardless of whether or not TM teachers, who contributed substantially to over-all differences on the measures employed, were included for the analyses.

Eysenck (1972) postulates two pervasive but orthogonal personality dimensions-extraversion-introversion and neuroticism-stability. Each of these dimensions, says Eysenck, are related to basic but essentially separate underlying neurological mechanisms (Eysenck, 1967). The extraversionintroversion dimension he says is related to central nervous system excitation-inhibition while neuroticism-stability is related more to autonomic nervous system activity. The former would be associated more with attentional processes while the latter with emotional or affective processes.

The results of this study are consistent with this

interpretation. Presumably, the autonomic nervous system would be easier to regulate through a self-monitoring system such as TM than would CNS excitation. This means that neuroticism, which is associated with autonomic lability, would be perhaps one of the first aspects of "personality" to change because of TM practice while extraversion-introversion would be more difficult to affect. Consistent with this also is the fact that meditators over-all were no more or less extraverted than non-meditators, but TM teachers were found to be slightly more extraverted. Presumably more experience with TM via "rounding" as discussed earlier, could have influenced some of the central nervous system circuitry associated with the extraversion dimension.

Also consistent with this interpretation are the numerous studies indicating changes in autonomic nervous system functioning as a consequence of TM practice. Orme-Johnson (1973) for example, found greater autonomic nervous system stability in a group of meditators versus non-meditating controls as measured by spontaneous galvanic skin resistance responses. Orme-Johnson also found that meditators habituated much faster to loud, noxious noises than did non-meditators, a finding also confirmed by Wilcox (1973) and Berker (1974). Berker found this effect with as little as one week's regular practice of TM, again supporting the contention that autonomic responses are easier to regulate via procedures like TM than are CNS processes.

Perhaps this also explains why TM subjects scored no

differently than controls on any of the Stroop variables. The Stroop test measures some aspect of the attentional process (Keele, 1973). Attentional processes are closely tied to the reticular activating system in the brain stem. This CNS mechanism would be more difficult to change and therefore meditators and TM teachers alike may not show any difference on these variables although the teachers, because of rounding, might have been expected to perform better. They did, but not significantly so.

Inconsistent with the above interpretation however, are the findings of Wallace and others (Wallace, 1970; Wallace, Benson and Wilson, 1971 and Wallace and Benson, 1972) that TM affects such central nervous system functions as respiration rate, blood pressure, oxygen consumption and electrical brain activity. Wallace postulates that TM affects both the hypothalamus (and consequently autonomic functions) as well as the reticular activating system. Obviously further research is needed to help clarify this ambiguity and the intricate relationship between physiology and personality and the possible influence of the TM technique on physiological differentiation. More studies need to be conducted in which physiological and psychological variables are simultaneously assessed.

# Psychological Differentiation-Self-Actualization

It was previously stated that psychological differen-

tiation has two aspects-cognitive and affective. So far, only the affective aspect has been discussed and this only in relation to neuroticism and extraversion. The discussion will now focus on another aspect of affective differentiation, namely self-actualization as measured by the POI. Discussion will be restricted mainly to the I variable since there is a large item overlap on this instrument and the I variable is the best single indicator of self-actualization.

A discriminant function analysis did not include the I variable among the 18 most discriminating variables between groups. However, this does not mean that it did not discriminate statistically but only that the information the I variable contributed was already included in one or more of the other variables. By inspecting Table 11 however, it becomes clear that meditators without TM teachers are not more self-actualized than non-meditators (p < .13) though there is a trend in that direction. TM teachers are clearly more self-actualized than meditators or non-meditators since including them in the analysis raises the level of statistical significance to an acceptable level (p < .02). Once again, it is possible that the effect of "rounding" makes the difference.

The results obtained in this study are also ironically consistent with a traditional view of self-actualization. For example, Maslow (1968) states that deficiency needs must first be compensated for before higher growth moti-

vation can take place. Therefore, one would expect that such traits as neuroticism and anxiety would first have to be normalized before a person could begin a process of selfactualizing. Results of this research are consistent with that view. Also consistent is a study by Fehr (1974), one of the few studies in the area in which a longitudinal approach was used.

Fehr administered the Freiburger Personality Inventory, a German-standardized instrument to a group of 37 subjects on three occasions-before they learned TM, seven weeks later and finally, 55 weeks later. Twelve subjects had discontinued TM by the end of the year and were treated as the control group. Comparison of the mean pretest scores of the 25 regular meditators with the 12 who had discontinued showed they were not significantly different on any of the variables. At the end of 55 weeks however, the regular meditators were less nervous, depressed, irritable, inhibited and neurotic. Additionally, they were more sociable, extraverted and self-reliant. Fehr also used a statistical method of calculating changes in scores over the course of the year and found that the first seven weeks of meditation produced greatest decreases in negative characteristics such as neuroticism with a leveling off thereafter while more of the growth-oriented characteristics such as sociability predominated over the remaining 48 weeks.

In terms of the results of this study, meditators, even

though meditating regularly over a great length of time, were not able to move past the first stage of normalizing. They did decrease neuroticism, and did move towards improving some of the facets of self-actualization as measured by the POI such as spontaneity, self-regard and seeing the nature of man as constructive, but they were not significantly higher than the non-meditators over-all, as measured by the I variable.

Previous studies on TM and self-actualization have consistently shown that the TM technique enhances selfactualization and moreover, in a short period of time. For example, Seeman, Nidich and Banta (1972) found that two months of TM practice significantly improved scores on six of the 12 POI variables in a group of 15 college students compared to 20 controls who received no treatment. The POI variables that were found to improve were I, SAV, S, C, A and SR. Since all subjects in this study were college students, it is possible that this group might change in a direction of self-actualization much faster than the subjects used in this study. This might account for the discrepancy between the Seeman, Nidich and Banta results and those of this research.

Hjelle (1974) found that POI scores were significantly greater for 15 experienced meditators (mean length of time meditating=22.63 months) than for 21 persons about to start TM practice. Experienced meditators were higher on I, TC, SAV, FR, S, NC, SY and C. Hjelle did not specifiy however, how many of the experienced meditators were also TM tea-

chers. In view of the findings in this study, this is a very important factor which should be reported in future TM studies. This factor may have been responsible for the discrepant results of Hjelle's research and this one. Additionally, Hjelle did not include a control group of non-meditators.

# Psychological Differentiation-Cognitive Variables

Since the cognitive variables involved in the Stroop Color Word Test were already previously discussed, only the results from the Hidden Figures Test and the Paragraph Completion Test are included in this section.

## Hidden Figures Test

The Hidden Figures Test is considered a measure of field-dependence-independence, an important aspect of psychological differentiation delineated by Witkin (1962).

Results of this study do not support the hypothesis that meditators are more field-independent than non-meditators. In fact, the non-meditators as a group appear to do slightly better on this test and significantly better when IQ is covaried and TM teachers are removed from the analysis.

These results are not as expected nor do they support Pelletier's (1974) very well-controlled double-blind study

on TM and field-independence. Pelletier randomly assigned 40 individuals (20 males and 20 females, all college students) to a condition of either TM or sitting quietly with eyes closed twice daily for 20 minutes. After three months of practicing either technique (Pelletier does not provide results as to regularity of respective practices) the TM group improved significantly on the Autokinetic Test (p<.001), the Embedded Figures Test (p < .001) and the Rod and Frame Test  $(p \lt .001)$ . Witkin used these tests as the defining ones in his original studies on field-independence. They may therefore be purer measures of the field-independence construct than the Group Hidden Figures Test. This may partially explain the difference between Pelletier's results and those of this study. In view of the fairly low correlation (.50) between the Group Hidden Figures Test and the Rod and Frame Test, the former may have been a poor choice for inclusion in this study.

Another study which includes other measures of fieldindependence than the Group Hidden Figures Test should be conducted on a more diversified sample than college students. This recommendation is based on the finding in this study that the lower educated meditator is more field <u>dependent</u> than the lower educated nonmeditator.

### Paragraph Completion Test

The Paragraph Completion Test was designed to measure cognitive complexity or "levels of conceptual structure."

This refers to "the way an individual receives, stores, processes and transmits information" (Schroder et al, 1967, p. 8). It is also an important way of looking at personality. Say the authors:

Although personality is often described in terms of a profile of the directionality and magnitude of needs and attitudes, the evidence...appears to us to argue for the inclusion of information based on structural variables.

It is well known for example, that two persons may express the same attitude but use it differently in thinking, arguing and decision making. The same is true for expressions of conformity, assertiveness and so on. In many situations, particularly where complex decision making and intergroup and interpersonal relations are involved, it would seem appropriate to weigh the way a person thinks about a given problem more highly than what he thinks. (Schröder et al, 1967, pp.8-9).

When the individual has more rules and interconnecting linkages in his conceptual structures, Schroder contends, then the individual is more flexible and adaptive to stress, has more ways to relate to objects and persons and is better able to generate new aspects of relating. This sounds very similar to Wexler's claims that the self-actualizing person is able to create new facets of meaning by processing information in an optimal manner. If TM is a technique which helps to optimize information processing through a process of physiological refinement, then there should also be a change in cognitive complexity towards more complex conceptual structures used in the thinking process. The results of this study are consistent with this interpretation.

Conceptual complexity also depends on developmental

conditions and therefore can vary if these conditions also vary. "According to this view," says Schroder, "most persons are integratively simple in a number of content areas and complex in others." Therefore, "the level of information processing in a given area is not held to be necessarily static over time" (Schroder et al, 1967, p. 9). It is therefore consistent with theoretical interpretations that samples from different populations would do better or worse on different sentences from the Paragraph Completion Test. Inspection of Table 10 shows meditators without TM teachers do significantly better than controls on PCA ("When someone disagrees with me..."), PCC ("Rules..."), and PCD ("When others criticize me it usually means..."). They are no different than non-meditators on PCB ("When I am in doubt...") or PCE ("Confusion..."). Adding the TM teachers into the analysis brings every variable except PCB to a level of acceptable statistical significance. The mainly interpersonal nature of these sentence stems indicates that, consistent with theoretical expectations, meditators are able to generate more complex ways of relating to people. Considering IQ as a covariate (Table 11) reduces PCC to an unacceptable level of statistical confidence (p < .06)but the trend remains very strong for that variable.

Schroder, Driver and Streufert also see cognitive complexity as a measure of self-development. They say, "The more integratively complex the information processing structure, the more the 'self' enters as a causal agent in

generating new perspectives and new ways of relating ... " (Schroder et al, 1967, p. 9). Therefore the Paragraph Completion Test may be considered a measure of self-development in much the same way as the Personal Orientation Inventory. Thus we see the close (but not identical) theoretical relationship between cognitive and affective variables, a relationship delineated in the rationale for this study. Further research is therefore needed to explore the empirical relationships between such cognitive measures as the Paragraph Completion Test and traditional measures of selfdevelopment such as the Tennessee Self Concept Scale and the Personal Orientation Inventory. For example, groups of subjects could be administered the POI, the TSCS and the PCT and then asked to relate to persons in a conversational setting. The "complexity" of the conversation could be assessed by independent raters and then related to scores on the three tests. The Paragraph Completion Test could be as good or better a predictor of scores on the dependent variables than the other two since it can be adapted to be very situation-specific.

It is important to know the extent to which social desireability enters the Paragraph Completion Test since a particular subgroup of meditators were shown to be more prone to "faking good" on the Eysenck Personality Inventory. Studies on the PCT by Edwards (1957) showed no relationship between scores on the PCT to either social desireability or verbal fluency. Therefore, the results of this study for the most part indicate that PCT differences between medita-

tors and non-meditators remain significant across covariates and any influence of social desireability. These results also indicate that the Paragraph Completion Test may be a powerful instrument for (1) assessing complex information processing and (2) level of self-development.

## Intelligence

As mentioned in the previous chapter, there was some question as to whether IQ should be considered as a covariate or as a dependent variable for analyzing the results of this study. Meditators were initially found to score higher on the Quick Test than non-meditators even though they were less educated than the non-meditators. However, this was due mainly to the contribution of the TM teachers as removing them also removed statistical significance between groups. However, consistent with the view that "rounding" may affect certain variables, it is also possible that it may affect scores on intelligence tests, since TM teachers scored significantly higher than the meditators or non-meditators. This is consistent with two previous studies (Tjoa, 1972 and Tjoa, 1975) showing that TM may influence IQ measures of a non-verbal nature. This intriguing possibility deserves consideration in future research efforts.

Limitations Regarding the First Hypothesis

How can we explain the higher scores of the TM subjects? These results cannot support an effect for the TM variable since the "treatment" was already given. That is one limitation in this study. A second limitation concerns the assumptions underlying the statistical techniques used in the analysis. These assumptions are: (1) that samples are drawn from multivariate normal distributions with equanl means and variance and (2) that samples are selected randomly. The second assumption was violated and it is not possible to determine anything concerning the first assumption. These results could support two opposing explanations: (1) meditators are a self-selecting group already possessing the characteristics thought to be affected by TM or (2) TM does have an effect which is further enhanced by becoming a TM teahcer.

Inconsistent with the first possibility are the several studies (Seeman, Nidich and Banta, 1972; Stek and Bass, 1973; Nidich, Seeman and Dreskin, 1973) showing that meditators and control subjects do not differ on the POI prior to TM instruction. Fehr (1974) also found that regular meditators did not differ from irregular meditators on any variables from the Freiburger Personality Inventory. Did these studies go deep enough however, into exploring the relationship between regularity of TM practice and certain pre-TM instruction variables? Shapiro (1974) for example, examined self-actualization and other variables in 211 subjects prior to and after TM instruction. Of these, 180 completed both a pre and post-test after 17 weeks of TM practice. Small but significant correlations were found between regularity of TM practice and certain pretest personality characteristics. More specifically, those individuals highest in self-actualization (measured in Shapiro's study by the Northridge Developmental Scale) and lowest in depression, neuroticism and anxiety on the pretest tended to be the most regular in TM practice and benefit the most. Extrapolating those correlations to this study, we could speculate that the person who goes on to become a TM teacher is the one most regular in TM practice and likely the one who was more self-actualized and less neurotic, etc., to begin with. However, this explanation would not appear to explain the magnitude of the differences found between the meditator and the TM teacher, nor does it support the subjective claims made by meditators and TM teachers for profound changes in personality once starting the technique.

The "intervening variable" which likely explains this is the technique itself. It seems reasonable to speculate in terms of personality development that: (1) the wellintegrated person is prone to continuing the practice on a more regular basis than the lesser integrated person (2) benefits <u>do</u> come in an <u>interactive</u> way from practicing the technique for those individuals and (3) a significant number of those same persons also eventually become teachers of the TM technique. This group has therefore had considerable experience with "rounding" as previously explained. In turn, "rounding" does make a big difference in personality integration.

Or is it just that such persons know they <u>should</u> be less anxious, more integrated, less neurotic, etc., because they have invested much time and money in something which is supposed to accomplish just that? The lower educated meditator seems to fit this explanation, since it was found that this person was not significantly different on the variables but did nevertheless try to make a good impression on the Eysenck Personality Inventory. The more educated meditator however, does not seem to fit this description, since neither he nor the TM teacher scored higher than the non-meditator on the Lie variable. Additionally, the POI is difficult to "fake good" (Shostrom, 1963) so the effect of "rounding" may still be a viable alternative for this group.

When extrapolating from correlations, it is important to keep in mind that this does not mean that <u>only</u> the selfactualized person will possibly gain from the TM experience. In addition to previously discussed research showing a decline in negative personality characteristics, Glueck and Stroebel (1975) found that TM was also extremely beneficial to a psychiatric in-patient population. Obviously, there is room for more research to investigate the apparently complex relationships between personality, education and experience and results with the TM technique.

More investigation should concern itself for example, with the effects of "rounding." Only one Study (Penner, Zingle, Dyck and Truch, 1974) could be found in the litera-

ture which directly addressed this question. Significant personality changes were found in a TM group taking a onemonth in-depth course. However, there was no control group. Scores of the TM subjects were merely compared to the norms given in the Omnibus Personality Inventory manual. Interestingly, response bias was also a factor in this study. Meditators were more prone to "trying to make a good impression" on this inventory. Even though the mean difference was significant, the actual difference on this scale of the OPI was small, so there could have been a contribution made from a specific sub-population of the meditators, as was the case in this study. No demographic data were published with the Penner study however, so that possibility is not open to investigation.

More future research should also be longitudinal in nature. Is the more self-actualized person in the Shapiro study for example, also the one who does go on to become a TM teacher as speculated? What is the relationship between pre-TM variables and regularity of TM practice? What is the relationship between pre-TM variables, regularity of practice and results on personality and cognitive variables?

Finally, all future studies on TM should state clearly the nature of the sample, i.e., how many subjects were also TM teachers, their age, sex, education and occupational status. Additionally, the number of "rounding" courses taken by the meditator should be considered as another important factor which needs to be either co-varied or treated as an

independent variable depending on the nature of the research question asked.

Some data on these considerations could provide the basis for a more rewarding experience with the technique. If a TM teacher knew for example, that a particular subject who wanted to start TM would also likely stop practicing it within say, three months, then a more structured follow-up for that person could be provided than is currently the case. This information would also be valuable to the professional who wishes to refer certain clients to TM centres for instruction in the technique. Which client is likely to benefit the most from such an experience?

# HYPOTHESIS TWO

This hypothesis predicted that the mean of information processing scores obtained by persons who score highly on a measure of self-actualization would be greater than the mean of scores obtained by persons who score low on a measure of self-actualization.

Analysis of covariance (see Table 12) supported this hypothesis at the .001 level of confidence. The information processing tests used in this study were the Stroop, the Hidden Figures Test and the Paragraph Completion Test. Rather than entering each test separately (the contribution of each instrument however, is also given in Table 12) as the dependent variable, it was reasoned that more informa-

tion might be gained if the important variables from each test were added together to form a composite "information processing index." Therefore scores from all the variables on all three instruments were added together and divided by 11, the number of variables. The resulting score was the "information processing index" and formed the single dependent variable for the analysis of covariance in which self-actualization was the independent variable. Consistent with Wexler's theory, it was predicted that high self-actualizers would process information more efficiently and therefore score higher on the "information processing index" than low self-actualizers. The results shown in Table 12 support Wexler's theoretical interpretation of self-actualization as an optimal mode of information processing.

These results are also consistent with Wexler's own research (1974) in which high scores on the Personal Orientation Inventory were significantly related to a measure of describing emotional experiences (affective differentiation). Wexler's rationale was that the individual is his own source for creating new experiences and integrating them. The degree to which he is capable of differentiating and then integrating the new facets of meaning in his life is the degree to which the person is actualizing his self. "Differentiation" means the creation of symbolic cognitive structures which distinguish a particular facet of experiencing for that person. "Integration" means the

ability to create a cognitive structure which synthesizes the common meaning of the various differentiated aspects. In this respect, Wexler and Schroder, Driver and Streufert seem to be saying something very similar.

Thus, "information processing" takes on a broader meaning, incorporating both language and emotion. Moreover, this interpretation is very situation specific and continuously changing, based as it is on the moment-to-moment ongoing processing of information entering any of the sensory channels. Accordingly, Rice and Wagstaff (1967) created a voice-quality classification system which has proven to be a reliable indicator of the person's moment-to-moment creation of new experience. Subjects in Wexler's study (61 undergraduates) were taped while describing the feelings they experience under three emotions--anger, sadness and joy. Scores of "differentiation" and "integration" were derived from the taped descriptions based on Rice and Wagstaff's classification system. All subjects also took the Personal Orientation Inventory. As predicted, there was a significant correlation (r=.478,p <.0001) between "differentiation" and "integration" and scores on the POI. Additionally, there were significant correlations in the predicted direction between POI scores and two of the three voice quality categories. They were focused (r=.591, p<.0001) in which voice quality indicates a fluid mode of processing when new experience is being created; externalizing (r=-.434, p < .001) which points to a rigid, vigilant style where little new experience is generated and fi-

nally <u>limited</u> (r=-.09, n.s.) which indicates a passive, depressed style with little involvement in the creation of new experience.

These results, Wexler concludes, support the view that creating new experience involves increased differentiation and integration and that self-actualization is the tendency to engage in a mode of processing where new experience is created (thus forming the basis for increased differentiation and integration).

In this regard, we often hear the term "expansion of awareness" from self-actualization theorists (and, incidentally, from meditators). On this point, Wexler says that "awareness is not some internal entity looking at what is being attended to and processed (Wexler, 1974, p. 79). It is rather the <u>activity</u> of attending to, processing and organizing information and:

Awareness is likely to be expanded by engaging in an optimal mode of information processing because the person has increased his capacity to process a greater richness and complexity of information and thus tends to create, handle and organize more information in his system at any given moment in time. (Wexler, D., 1974, p.79).

Wexler's study involved only the processing of "emotional" information. Extensions to more cognitive processing tasks are obvious but little or no studies have been done in the area. For example, we would expect that high self-actualizers would do better on tasks of memory, attention and perception. In partial support of this prediction, Zimring, Nauman and Balcombe (1970) found that the more elaborate a person's conceptual activity with reference to emotional experience, the more information he could attend to in a selective attention task.

Bringing the TM variable back into the discussion at this point also seems appropriate. For example, Miskiman (1972) found that TM improved performance on a maze learning task. He found that meditators could attend to relevant cues and be distracted less easily by irrelevant ones. Subjects were 10 randomly selected (from volunteer undergraduate students) regular meditators and 10 randomly selected non-meditators equated on SES indices and IQ. Results from the Stroop test from this study do not support Miskiman's research in terms of an improved "selective attention" from the meditators. It is therefore important as recommended earlier, to look carefully at the nature of the attention task. More research needs to address itself to the different kinds of operational definitions of "attention" and the possible influence of TM on them.

Finally, we see a means whereby the two major hypotheses of this study could be integrated under one experimental design: subjects could be randomly assigned to a group which received TM instruction, one which received a relaxation control treatment and one receiving neither. Subjects would be pre and post-tested on traditional measures of self-actualization like the POI and on more "informational" measures as the Paragraph Completion Test or Rice and Wagstaff's voice-quality classification system.

Additionally, they would be pre and post-tested on measures of memory, attention and perception. Indications from this study and previous work would lead us to predict that TM would significantly improve scores on the self-development measures and on the cognitive information processing variables. A second issue such a study could explore would be the various inter-relationships between the cognitive and affective variables. Such a study should be undertaken at a future date.

# SUMMARY AND FUTURE CONSIDERATIONS

A total of 156 subjects completed a battery of psychological tests which tapped either a cognitive or affective aspect of psychological differentiation. It was hypothesized that psychological differentiation depended to a large extent upon physiological differentiation and that the TM technique profoundly affected the latter via a "fine tuning" of underlying physiological mechanisms. It was therefore expected that a group of meditators would score significantly higher on the vector of means of the instruments used in this study. This hypothesis was confirmed but no cause-effect relationship between TM and the dependent variables could be postulated since subjects were not randomly drawn and then randomly assigned to a treatment condition. More longitudinal research involving randomizing subjects to treatment is required.

It was also discovered that lower educated meditators did <u>not</u> score higher on the vector of means, implying that this group had very little or nothing to gain from TM practice, at least to the extent measured by the variables chosen for this study. This finding has not previously been reported in the literature on TM and certainly deserves more consideration in future research. Length of time meditating was also found to have no effect on the dependent measures, but being a TM teacher did. This finding also needs to be considered in other TM studies.

Further research could be conducted using the rationale for this study. Some questions which need to be answered are:

1. What is the relationship between psychological and physiological differentiation? In this study, the relationship was presumed, but no physiological variables were included. These should be more precisely delineated and then rigorously studied. For example, if self-actualization involves an optimal mode of information processing then presumably an attention span factor is involved. In turn, this is known to be associated with activity in the reticular activating system. Precisely what changes in physiology occur in the RAS as a consequence of TM practice? Are these differences also found in a group of high self-actualizers regardless of exposure to TM?

2. What is the relationship between cognitive and affective differentiation? The relationship is close but not identical according to the rationale. Again, what are the underlying neural mechanisms involved?

3. What is the relationship between cognitive style and say, visual and auditory discrimination? Or long and short-term memory? What is the relationship between cognitive style and simultaneous and/or successive information processing? What is the relationship between Wexler's four modes of information processing and traditional measures of cognitive style?

4. What is the relationship between self-actualization and other cognitive tasks such as short and longterm memory or simultaneous and successive information processing?

5. Finally, to what extent does the TM technique modify the intricate relationships between physiological, cognitive and affective variables? How can TM (and related techniques) be explained theoretically using the information processing model?

The results of this study are consistent with the assumption that physiological and psychological differentiation are related. The TM technique may be one means of affecting physiological and simultaneously, psychological differentiation.

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#### Appendix A

Description of Samples

# Meditators (N=78)

#### Occupations

Males (N=33)

Accountant--2 Auto Mechanic--1 Clerk--1 Computer Operator--1 Commodity Broker--1 Cook--1 Electrician (Apprentice) -- 1 Electronic Technician--1 Employment Supervisor--1 Floor Trader--1 Graduate Student--2 Housepainter--1 Laborer--1 Meter Reader--1 Parole Officer--2 Peace Officer--1 Photographer--1 Postal Worker--1 Research Assistant--1 Schoolteacher--1 Social Worker--2 Student--4 TM Teacher (Full-time)--2 Trades Consultant--1 · Unemployed--1

Females (N=45)

Advertising Salesperson--1 Bank Teller--1 Bill Deliverer--3 Child Care Supervisor--1 Clerk--3 Draftsperson--1 Hairdresser--1 Homemaker--6 Library Assistant--1 Meter Reader--1 Nurse--2 Office Worker--1 Realtor--2 Receptionist--1 Schoolteacher--6 Secretary--3 Student--4 TM Teacher (Full-time)--2

Average Length Of Time Meditating For All Subjects=55.24 Months

#### Appendix B

#### Description of Samples

# Non-meditators (N=78)

Occupations

Males (N=33)

Apprentice Carpenter--1 Building Manager--1 Carpenter--1 Chemical Technologist--1 City Planner--1 Graduate Student--2 Laborer--2 Library Clerk--1 Meat Inspector--1 Parole Officer--2 Photographer--1 Pressman--1 Salesman--1 Schoolteacher--3 Student--9 Surveyor--3 Warehouseman--1 Welder--1

Females (N=45)

```
Day Care Worker--1
Driver Examiner--1
Hairstylist--1
Homemaker--1
Infant Development Worker--1
Parole Officer--1
Schoolteacher--13
Secretary--3
Student--23
```

# Appendix C

## Comparison Of Occupational ` And Educational Status

v	. <u></u>							
		τ-:	rests Be Educ	tween Gr	roups			
• .			Daac	X	S.D	).	t	a
Meditators Non-Meditators				3.15 2.87	1.1	2 3 1.	73	.0
			Occu	pation	* *** ***			
				X	S.D.	t	ą	
Meditators Non-meditators				4.02 3.94	.939 .966	.50	.61	
			Medi	tators	6 Ind 200 An An An An An An An		ene car <b>e</b> ne <u>e</u> ne	,
		Males			Fema	les		
	X	S.D.			x.	S.D.		
EDUC OCCUP	2.96 4.30	1.10 1.31			3.28	1.14 ,44		•
			Non-me	ditators	5			
		Males	· ·		Fema	les		
	X	S.D.			X	S.D.	\$	
EDUC OCCUP	2.87 4.27	1.13 1.30			2.86 3.71	.66 .50		
······································			· · ·		· · · · · · · · · · · · · · · · · · ·		·····	

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#### Appendix D

## Education And Occupation Scales

#### The Education Scale Education Assigned Score Graduate Training 1 Standard University Graduate 2 Partial College Training 3 High School Graduate 4 Partial High School 5 Junior High School 6 Less Than Seven Years Of School 7 The Occupation Scale Occupation Assigned Score Higher Executives; Major Professionals 1 Business Managers; Lesser Professionals 2 Administrative Personnel And Minor 3 Professionals Clerical And Sales Workers; Technicians; 4 Owners Of Small Businesses Skilled Manual Laborers 5 Unskilled Employees 6 Unemployed 7

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#### Appendix E

#### Correlation Matrix Adjusted For Five Covariates

TC I SAV XE FR S SR SA NC SY A C EXTR NR LY CWA CWB CWC ATN HFTA HFTB PCA PCB PCC PCD TC I 69 58 79 SAV XE 65 81 55 46 75 59 50 FR 56 80 67 60 64 S 67 71 72 51 43 58 SR 61 79 47 76 51 58 45 SA 46 65 65 46 50 50 52 39 NC 46 65 75 58 43 52 50 45 53 SY 46 78 62 59 72 63 50 61 43 58 Λ С 58 85 58 78 71 69 57 64 43 47 69 EXTR 07 13 12 08 10 24 12 08 03 09 19 11 -37 - 27 - 16 - 21 - 01 - 25 - 42 - 31 - 07 - 03 - 03 - 26 - 06NR LY 07 01 09-12-00-00 15-09 08 07-07 00-22-15 03 19 21 16 15 24 13 09 18 11 12 15 13-11 -07 CWA CWB  $02 \ 16 \ 12 \ 15 \ 06 \ 21 \ 10 \ 10 \ 14 \ 11 \ 04 \ 14 \ 08 = 16 \ -06 \ 59$ CWC -01 05 01 10-05 07 02 08 01 10-01 03-01-08 -02 43 57 ATN -03-04-06 02-10-05-03 04-07 05-03-05-06-00 02 08-00 80 HFTA 16 23 17 14 16 25 19 21 09 17 17 18 05-14 06 22 30 30 17 HFTB 17 23 21 19 16 26 19 16 14 25 15 17 01-09 07 18 30 29 14 54 PCA -01-01 01-01-00-01 06-01 04 11-12-01 01-22 16 04 02 04 03 03-00 PCB 18 17 18 12 21 12 22 08 12 21 15 08 00-07 03 07 08 11 09 08 10 35 PCC -08-01-14 02-01-05-06 07-10-13 01 01-08-19 -10 12 04 10 11 14-04 23 24 PCD 00 05 07 03 09-02 09 05 03-02 07 04 00-13 03 18 03 03 02 05-03 23 27 20 PCE. -05-05-01-03-02-01-01-08 01 02-09-03 04-08 -14 00 00 11 13-11-07 18 18 21 19

## Appendix F

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## Correlations of Covariates

Age Sex Educatio	Sex .13 n	Education .10 .07	Occupation 27 27 .45	IQ .22 .01 38 - 18
Occupati	on			18

# Appendix G

Means	Standard	Deviat	lions	and	F-Ratios
For	Meditator	s and	Non-r	nedit	ators

Variable	Medita	Meditators		Non-meditators			F-Ratio
	x	S.D.		х	S.D.		
TC I SAV XE FR S SR SR SA NC SY	18.14 87.51 21.03 21.34 15.88 13.37 13.23 15.97 12.69 7.00	2.56 10.84 2.96 3.98 2.90 2.45 2.00 2.90 1.68 1.27 3.24		17.06 83.09 19.33 20.29 15.61 12.00 12.01 15.92 11.35 7.00	3.92 17.07 4.22 5.14 3.61 3.13 3.01 4.36 2.75 1.62 3.82	·	4.12 3.72 8.52 2.03 .26 9.26 8.83 .01 13.30 .01 85
C EXTR NR LY CWA CWB CWC ATN HFTA HFTB PCA PCB PCC PCD PCC PCD PCE AGE	$     18.60 \\     11.55 \\     7.03 \\     2.71 \\     113.70 \\     80.35 \\     43.47 \\     43.21 \\     4.53 \\     5.17 \\     2.65 \\     2.82 \\     2.48 \\     2.57 \\     1.58 \\     29.23 \\     3.15 \\     $	3.32 3.58 4.12 1.65 18.73 12.52 10.49 8.32 3.04 3.80 .93 .97 1.35 .78 1.08 8.64 1.12		17.80 11.64 10.00 2.32 115.73 83.44 44.73 42.24 5.24 6.17 2.24 2.66 1.91 2.12 1.28 27.44 2.87	4.30 3.82 5.00 1.56 16.83 13.69 12.12 9.91 2.82 3.36 .92 .89 1.19 .91 1.07 8.71		1.66 .02 16.27 2.36 .50 2.16 .47 .44 2.24 3.02 7.54 1.05 7.93 10.82 3.14 1.64 3.00
OCCUPATION IQ	4.02 108.48	.93 11.90		3.94 104.11	.96 9.39		.25 6.48