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COGNITIVE STAGE DEVELOPMENT IN CHILDREN PRACTICING THE TRANSCENDENTAL MEDITATION PROGRAM: ACQUISITION AND CONSOLIDATION OF CONSERVATION

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The children’s Transcendental Meditation programme was found to enhance cognitive development.—EDITORS

The Transcendental Meditation (TM) program has been shown to foster or “unfreeze” developmental processes that otherwise become prematurely fixed in early adulthood. The current study examines the potential application of the TM program, primarily the children’s version, for promoting cognitive stage development in childhood.

Forty-five children (mean age = 7.8) participating in the TM program (primarily the children’s version) and forty-seven control subjects (mean age = 7.7) were given a series of standard cognitive-developmental tasks of increasing difficulty measuring conservation. Acquisition and consolidation of conservation—the ability to recognize that certain attributes of an object remain invariant despite changes in other attributes—is considered a major landmark in the development of Piaget's concrete operational stage of cognitive development. These cognitive tasks measured conservation of: two-dimensional space, number, substance, continuous quantity, weight, discontinuous quantity, and volume, respectively.

The TM subjects’ mean total score on these measures was significantly higher (p<.01) than that of the controls adjusting for any possible demographic differences between the groups on age, grade, gender, and parental socio-economic status. The proportion of TM subjects fully mastering the series of conservation tasks (82%) was markedly higher than that of the control subjects (43%) (p<.0001). Similarly, the proportion of TM subjects (7%) who were in transition in the mastery of conservation skills (i.e., receiving between the minimum and maximum score) was substantially smaller than that of the control subjects (51%) (p<.0001). The youngest TM subject to fully conserve was four years and five months old (4.05), and all TM subjects from 5.08 – 11.00 fully mastered the series (with only two exceptions, at 6.09 and 8.03). In contrast, the youngest control subject to fully conserve was 6.05, and approximately half of the control subjects from 6.05 – 10.00 had not yet fully mastered the series.

Ordinarily, conservation is consolidated over a 5 to 7 year period, with conservation of volume not being obtained by many children till 11–12 years of age. The current data suggest that the TM program may lead to more rapid acquisition and, especially, consolidation of cognitive-structural development in childhood. The potential mechanism underlying this striking developmental finding is discussed in light of the theory of levels of mind in Vedic Psychology. The authors propose that the children’s version of the TM program promotes integration of thinking with perception and action, thus enhancing coordination with and mastery over the latter domains as reflected in greater competence in solving the series of conservation tasks.

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INTRODUCTION

Child development typically moves towards increasing differentiation of the self from the environment (Piaget, 1954; Orme-Johnson, Dillbeck, Alexander, Van den Berg, and Dillbeck, in press a). The progress of self-differentiation is in a dual direction of the objective world becoming more external to the self and of the activity of knowing becoming more internal and abstract (Piaget, 1954). At each further stage of development, a more stable and unified internal frame of reference is established, providing an increasingly comprehensive context within which information is processed and given meaning (Orme-Johnson et al., in press a).

Piaget identifies four basic stages of cognitive development from birth through adolescence or early adulthood (Piaget, 1970; Piaget and Inhelder, 1974). These are: 1) a sensori-motor period characterized by the moving of objects in relation to the body; 2) the preoperational level characterized by nonanalytical mentation and perception; 3) a concrete mental operations period characterized by the ability to perform internal, simple, logical operations on concrete observables; and 4) a formal operations period characterized by abstract or reflective thought and hypothetico-deductive reasoning. Although the specific ages at which a person achieves each stage varies, Piaget (1952) proposes that they form an invariant hierarchical sequence. According to Piaget’s structural-developmental theory, each earlier level is the logical and necessary condition for the following one, and all the abilities in the previous level are incorporated as a subset of the current stage.

It is recognized that there is a general correspondence between the level of maturation of the nervous system and the corresponding stage of cognitive development. For example, growth spurts in the brain and proportional increases in EEG alpha production tend to correspond with shifts to higher levels of cognitive-structural development (Epstein, 1974, 1980; Matousek and Petersen, 1973). The nervous system appears to develop from a relatively undifferentiated and primitive style of functioning to a more defined and differentiated style of functioning (e.g., Geschwind, 1967; Werner, 1957).

There is a striking correspondence between the sequence of Piaget’s four stages, from gross to subtle, and the levels of functioning of the individual as described by Maharishi Mahesh Yogi’s Vedic Psychology—action; perception; the active thinking level of the apprehending mind; and at a more abstract level, the decision-making processes engaged in by the discriminating intellect (Maharishi Mahesh Yogi, 1969; Orme-Johnson et al., in press a). From the perspective of Vedic Psychology, progressive maturation of the nervous system may be understood to permit activation and utilization of each of these increasingly subtle levels of mind. We propose that the successive activation of each subtle level of the mind may, in fact, provide the “deep structure” for the sequential unfoldment of each corresponding level of cognitive development as described by Piaget and others (Piaget, 1950; Flavell, 1963). During the course of ontogenesis, the identification of awareness with each successively subtle level of mind is postulated to underlie and give rise to a progressively higher expression of cognitive-structural development.

THE UNFREEZING HUMAN DEVELOPMENT HYPOTHESIS—Fundamental cognitive, moral, and self-development are typically believed to come to plateau during late adolescence or early adulthood, with stabilization of formal operations (Kohlberg, 1969; Piaget and Inhelder, 1974; Redmore and Loevinger, 1979). This freezing of fundamental psychological development is generally believed to occur because the central nervous system stops developing during this period (e.g., Tanner, 1970). Up to adulthood, physiological maturation appears to drive psychological development, permitting access to subtler levels of mind for performance of more abstract conceptual thought. When the physical nervous system stops developing, fundamental psychological development also typically ceases. The functional inter-relationship of mind and body, however, suggests that not only can changes in the nervous system stimulate change in level of cognitive development and self-awareness, but change in level of awareness can in principle act back upon the nervous system to promote further physiological development.

The Transcendental Meditation (TM) technique is considered as a developmental technology for “unfreezing” the process of ontogenesis or human maturation (Alexander, 1982). It is proposed that in directing awareness to subtler levels of mind this technology of consciousness leads to progressive
refinement and integration of the nervous system, and hence to the “unfreezing” of human development. TM is a simple effortless mental technique that is easily learned and practiced 20 minutes twice a day. TM has been defined as turning the attention inward to sublter levels of awareness (beyond the ordinary conceptual level) until consciousness transcends the experience of the subltest mental fluctuations and arrives at the source of thought, pure consciousness—content-free awareness (Maharishi Mahesh Yogi, 1966; Orme-Johnson et al., in press a). In pure consciousness, the knower is said to be fully awake within himself, beyond all thought, feeling or perception; in this experience the subject-object relationship is transcended, including all representational structures and categories (Maharishi Mahesh Yogi, 1972).

From our perspective, this postconceptual state of awareness may provide the foundation for development of stable postconceptual stages—or higher states of consciousness—beyond formal operations (Alexander and Oetzel, in press).

TM may be viewed as a post-language system which is as fundamental for promoting development through and beyond the ordinary language-based conceptual levels of thought to higher states of consciousness as language learning itself is for promoting development through and beyond the sensorimotor and preconceptual levels of early childhood to the conceptual level of ordinary adult thought (Alexander, 1982; Alexander and Boedeker, 1982). The capacity for language use, which may be inherent, is generally recognized to require informal and formal instruction to maximize its contribution to conceptual thought (e.g., Bruner, Oliver, Greenfield et al., 1966). In a similar fashion, the capacity to transcend the thinking process in the service of postconceptual development also may be inherent, and may be catalyzed by instruction in the TM program.

RESEARCH ON UNFREEZING HUMAN DEVELOPMENT—Research supports the hypothesis that the TM program acts to “unfreeze” human development (Alexander, 1982; Alexander and Oetzel, in press). During the TM technique, the EEG is characterized by an increase in high amplitude alpha activity in the frontal and central areas of the brain (Banquet, 1972, 1973; Hebert and Lehmann, 1977) and by an increase in interhemispheric and intrahemispheric EEG coherence (Dillbeck and Bronson, 1981; Orme-Johnson, 1977). These changes may represent functional reorganization and increased integration of brain activity concomitant with a new style of attention deployment and information processing during TM, which involves the directing of attention to finer levels of mental functioning (Alexander, 1982; Orme-Johnson, Wallace, Dillbeck, Alexander, and Ball, in press b). Such changes may provide the neurophysiological foundation for further growth to higher stages of human development in adulthood. This interpretation is supported by the finding that enhanced EEG coherence during TM is highly correlated with postmeditation behavior clearly indicative of advanced human development, including enhanced fluid intelligence, principled moral reasoning, concept formation and creativity, as well as more frequent report of higher state of consciousness experiences (Alexander, Alexander, Boyer, and Jedrczak, in press a; Dillbeck, 1982; Orme-Johnson et al., in press b).

Also, longitudinal studies with college students and young adults whose development generally is reaching a plateau, indicate that the practice of TM facilitates further development of cognitive-perceptual flexibility (Dillbeck, 1982), field independence (Pelletier, 1974), organization of memory (Miskiman, 1977b), fluid intelligence (Aron, Orme-Johnson, and Brubaker, 1981; Tjoa, 1977a, 1977b), and enhanced academic performance and personal and social maturity (Aron et al., 1981). Working with a high school population, Shecter (1978) found increased self-esteem, tolerance, innovation, and fluid intelligence.

Alexander tested this “unfreezing” development hypothesis with a number of populations, two of which are highly resistant to change—the institutionalized elderly and maximum security prisoners. In the elderly study, Alexander, Davies, Newman, and Chandler (in press b) randomly assigned 77 residents of homes for the elderly (mean age 80.7 years) to a nontreatment group or treatment groups identical in external structure and expectation-fostering features. Despite the similarity between the groups on pretest measures and expectation, TM subjects improved significantly more in comparison to a nontreatment group and treatment groups identical in external structure and expectation-fostering features. Despite the similarity between the groups on pretest measures and expectation, TM subjects improved significantly more in comparison to a nontreatment and a relaxation group on a variety of measures known to plateau in early adulthood and then go into decline in the elderly. Enhanced performance was observed on three measures of cognitive flexibility and learning, and on word fluency, systolic blood pressure, mental health, and self-ratings of behavioral flexibility and aging. After three years, survival rate (longevity) for the TM group was 100%
in contrast to lower rates for the other treatment conditions.

In the prison study, adjusting for pretest score and demographic covariates, both advanced TM (33 months' practice) and new TM subjects (17 months' practice) showed a highly significant improvement on Loevinger's (1976) measure of self- or socio-cognitive development—more than one step—while a wait-list control group and members of four other self-improvement groups remained relatively unchanged (Alexander, 1982). On the average, new meditators moved from a more concrete thinking "conformity" stage (1 - 3) to a more reflective "self-aware" level (1 - 3/4) of development on Loevinger's scale; regular advanced meditators moved from the self-aware (1 - 3/4) to the still more internalized, post-conventional "conscientious" stage (1 - 4).

The new meditators changed as much in one and a half years as college students typically do in four years of college, and at an age (26 - 29) and education level (only ninth grade) when such development would not typically occur. Assuming the advanced TM subjects started at a comparable level to the new TM group, they appeared to progress two complete steps during less than three years, which may indicate that there was no intrinsic upper boundary to their further growth. In fact, two of the advanced meditators attained to Loevinger's highest "integrated" stage, which is rarely achieved in the normal population (less than 1%). Loevinger's highest stage (Loevinger, 1976, pp. 26 - 27, 139 - 142) is said to correspond to the level of "self-actualization" which Maslow (1962) described as the pinnacle of human growth. According to Maslow (1972), individuals who achieve self-actualization are more likely to have access to "peak" or transcendent experiences.

This self-actualization level may reflect a transition between postconventional development and development beyond formal operations to postconceptual, higher states of consciousness (Alexander and Oetzel, in press). Indeed there are both cross-sectional and longitudinal studies indicating that practice of the TM program promotes both enhanced self-actualization and increased frequency of higher state of consciousness experiences in young adults according to self-report measures. In turn, increased frequency of higher state of consciousness experiences in meditating samples has been repeatedly correlated with increased self-actualization, increased capacity for absorption and nonpropositional thought, and enhanced fluency, flexibility and originality in creative thinking, suggesting a shift to a postconceptual mode of information processing (see overview of these studies in Alexander et al., in press a).

ENHANCING DEVELOPMENT IN CHILDREN—The above findings indicate that the TM program may facilitate fundamental cognitive and self-development shifts in adults whose development has typically leveled off. The research suggests that at least two such transitions may be facilitated: 1) from a more concrete operational, conformist stage through a self-aware transition to an advanced formal operational, conscientious stage, and 2) from a formal operational stage through a self-actualization transition to higher states of consciousness. The adult TM technique may be learned as early as ten years of age, during the period in which the shift from concrete to formal operations is typically beginning to take place. The advanced TM-Sidhi program may be learned later in adolescence to further enhance the rate of growth and consolidation of postconceptual experience in the development of higher states of consciousness. The children's version of the TM program may be learned as early as four or five years of age, the time during which a shift from preoperational to concrete operational thought is typically beginning to take place. The question that naturally arises is whether the children’s technique can promote a similar developmental transformation during childhood. Specifically, can this technique facilitate a shift from preoperational to the consolidation of concrete operational thought en route to full conceptual development?

A major hallmark in the development of Piaget's concrete operational stage is the acquisition and consolidation of conservation (Piaget, 1970; Ginsburg and Opper, 1969). Conservation is the ability to recognize that certain attributes of an object remain invariant in the face of changes in other attributes (Flavell, 1963).

During the preoperational period, the child relies upon immediate perceptual input when dealing with conceptual problems like Piaget's conservation tasks. For example, to solve Piaget's conservation-of-liquid-quantity task, the child must recognize that when water is poured from a short, stout beaker into a tall, thin beaker, the amount of liquid remains the same (i.e., is conserved). The preschooler is more prone to spatially "center" his attention on a salient feature of the current stimulus array to the exclusion
of other task-relevant features, and is therefore more likely to reach a faulty conclusion. In this case, he typically centers his attention on the higher level of water in the tall beaker and thereby reaches the false conclusion that the tall beaker contains more water.

Similarly, he is prone toward temporally centering on the immediately present state to the exclusion of state-producing transformations giving rise to the current state. In making his decision, he does not duly take into consideration that the same liquid has simply been poured (state-transformed) from one beaker to another (Flavell, 1977). In contrast, the concrete operational child employs a spatially and temporally "decentered" analysis of the perceptual array. "He therefore attains a broader and more inclusive purview of the stimulus field" (Flavell, 1977, p. 81). In reaching his decision that the amount of liquid has not changed, the concrete operator seems to be simultaneously taking into account that the beaker is not only taller but also thinner. He comes to consider not only the end-state of the current display, but the state-transformation that gave rise to it.

While the simplest conservation tasks may be mastered at 5–6 years of age, it has been consistently observed that full stabilization of conservation skills—the generalization of conservation across tasks of varying difficulty—requires a further 5 to 7 years. This phenomenon of temporal displacements or repeated delays in final consolidation of a general skill within a single developmental level is referred to as "horizontal décalage" (Flavell, 1963; Piaget, 1954). For example, conservation of number—i.e., the ability to recognize that a number of items remains the same despite changes in their spatial arrangement—is typically acquired around the age of 5–6. Nevertheless, it is usually not till the age of 7–8 that a child can conserve for liquid quantity; the age of 9–10 before he can conserve for weight; and conservation of volume is usually exhibited around the age of 11–12.

Even though each conservation task involves similar mental operations, these mental operations are tied to specific situations and perceptions and cannot be readily adapted to more demanding settings. This demonstrates how concrete the thinking of a child is at this age (Piaget, 1954; Ginsburg and Opper, 1969). Piaget believes that horizontal décalage may result from the child’s gradual and sequential assimilation of each new level of task complexity into his existing cognitive scheme. While this may suggest a partial explanation of horizontal décalage, nevertheless this prevalent phenomenon poses a fundamental problem to Piaget's theory of cognitive-structural development. If cognitive stages represent qualitatively distinct structured wholes which are acquired through a metamorphosis-like process of phase changes, then a child should not be at one level of cognitive development (as evidenced by mastery of conservation) in one setting and at a different level of cognitive development (as indicated by failure to conserve) in another setting (other "irregularities" in development have also been observed; see, for example, Flavell, 1977, pp. 219–256).

Piaget (1960) found that increased familiarity with materials used in conservation tasks shortens the time span of horizontal décalage. Cross-cultural studies support this concept (Wessells, 1982). Unless children are already in transition in the mastering of conservation tasks, attempts to teach conservation by demonstrating the logical operations involved or providing behavioral reinforcement generally meet with little success (for example, Ault, 1977; Smedslund, 1961). Gelman (1969) was successful in using feedback to teach children the relevant dimensions for determining conservation of length and number. However, she did not know how children naturally learn to attend to the relevant dimension.

Researchers working with a process-approach to development have suggested that the development of certain cognitive abilities like perceptual activity (O'Bryan and Boersma, 1971), memory and cognitive synthesis (Jamison and Dansky, 1979), sequential processing (Hamilton and Moss, 1974), and central information capacity or working memory (Pascual-Leone, 1970) may be a prerequisite for the transition to and consolidation of the concrete operational stage.

MECHANISM FOR CONSOLIDATING CHILD DEVELOPMENT—Following Piaget, Flavell (1963) placed emphasis not so much on the continuous growth of specific cognitive abilities in explaining the final consolidation of conservation but rather on the requirement for an underlying qualitative transformation in the relationship of the subject (or knower) to the object of experience:

The fact that the concrete operational child is still (relatively) bound to the phenomena here (requires him) to vanquish the various physical properties of objects and events one by one because his
According to the ontogenetic principle of development (Werner, 1957; Langer, 1969), the defining characteristic of a more developed system is that it is increasingly differentiated and hierarchically integrated. In this case, the children’s TM program would be fostering the differentiation of thought and perception and the hierarchical integration of thought with perception. Through regular practice of this procedure, awareness would no longer be primarily identified with—or “centered” upon—particulars of the current perceptual array but rather would come to be primarily identified with the hierarchically more comprehensive level of the apprehending mind. This more comprehensive—or “decentered”—level of mind would permit coordination of the particulars of the stimulus array, and allow a “broader and more inclusive purview” of the temporal and spatial field, thus allowing solution of conservation problems (Flavell, 1977).

HYPOTHESES—According to Piaget (1954) conservation of quantity, weight, and volume require greater degrees of departure from the field of immediate actions and perceptions in order to construct an adequate network of relations to explain phenomena increasingly remote from the surface appearance of objects in vision. Daily practice of the children’s TM program should more rapidly habituate awareness to function from the more comprehensive perspective of the thinking mind while engaged in perception and action, and hence accelerate the rate of consolidation of conservation. Through this process, when thought becomes completely differentiated or independent from the field of perception that it organizes (regardless of the complexity of the perceptual array), then according to Flavell’s dictum (1963) horizontal décalage would be minimized.2

If the children’s TM practice optimizes the natural process of growth in childhood, then it may be anticipated that the initial onset of conservation skills in children participating in this program would be accelerated. More important it would be predicted that the seeming developmental “irregularity” of prolonged consolidation of conservation skills—the phenomena of horizontal décalage—would be significantly foreshortened, and in some cases possibly eliminated in

2. Cognitive differentiation should not be confused with inner detachment or withdrawal. From a developmental perspective cognitive differentiation is a necessary condition for integration whereas inner withdrawal may actually impede mind/body coordination (Werner, 1948).
children practicing the TM program. These important theoretical and practical predictions motivated the current study, which to our knowledge is the first investigation ever conducted on cognitive-stage development in children practicing the TM program.

In the context of this cross-sectional study it is specifically hypothesized that:

1. On the average, children practicing the children's TM program will achieve significantly higher scores on a series of conservation tasks (of increasing difficulty) than a control group equivalent in age range, education, and socio-economic status. Also examination of the raw data should reveal earlier initial onset times of conservation skills in the TM group.

2. A significantly greater proportion of the TM group should exhibit full consolidation of conservation as indicated by complete mastery on the series of conservation tasks (i.e., receiving a maximum score) and significantly fewer TM subjects should display horizontal decalage as indicated by a transitional score in mastering of the conservation series (i.e., receiving between a minimum and maximum score).

METHODS

SUBJECTS—Two groups of children participated in the study. The experimental group included 45 subjects (24 females and 21 males). Thirty-two of the children were from the Cambridge, Massachusetts area. Thirteen of the children were from Fairfield, Iowa which is the location of Maharishi International University (MIU) and the MIU preparatory school, a K-12 private school. Both institutions are fully accredited and offer a traditional academic curriculum supplemented by programs to provide knowledge and direct experience of the knower through the Maharishi Technology of the Unified Field (which includes the TM program). The control group was composed of 47 nonmeditating subjects—21 females and 26 males—from the Ryan Road School in Northampton, Massachusetts. Universities are located in and closely connected to each of these communities and the parental occupation/socio-economic status (SES) of both groups were similar in level.

The mean parental occupational SES level (U.S. Bureau of the Census, 1950) as determined by primary source of income was 58 for the TM group and 56 for the control group. The groups were also similar in grade and age. The TM group ranged in age from 4.00 to 11.00 with a mean of 7.8 years and the control group ranged in age from 5.00 to 10.00 with a mean of 7.7 years. The groups did not significantly differ on any of these demographic variables.

All of the TM subjects were practicing the children's TM program except for eight subjects—age ten—who had learned the adult technique. Since both the children's and the adult's techniques are predicted to enhance performance on developmental tasks, these eight subjects were included in the experimental group.

MATERIALS—1. The instrument used in testing both groups was the Concept Assessment Kit—Conservation Form A developed by M. L. Goldschmidt and P. M. Bentler (1968). The kit was developed to provide a standardized measure for assessing the principle of conservation. This instrument is the only commercially available standardized measurement of conservation and has been used extensively for research purposes. It includes six different tasks that sequentially test conservation of two-dimensional space, number, substance, continuous quantity, weight, and discontinuous quantity. The tasks were presented in increasing level of difficulty except for the last two tasks in which weight was presented before discontinuous quantity. Two tasks are included that require a “more” response rather than the usual “same” response to receive a correct answer, in order to reduce the effect of subject response set. Also, because the subjects had to explain their responses, the experimenter could determine whether the correct behavior was due to understanding the principles involved in the task, rather than just guessing or a superficial level of comprehension.

This instrument was augmented by a standard volume conservation task described by Ginsburg and Opper (1969, p. 163), so that the full range of complexity of conservation tasks could be measured. This task involves putting clay balls into two glasses filled with identical amounts of water. They are then taken out, and one of the balls is flattened into a pancake. The child is then asked the following question: "If the two pieces of clay were put back into the water, would the water rise up the same amount in each glass, or would it rise more in one glass or more in the other glass?"

The series of conservation tasks were scored as follows: one point was given for a correct response
on each task, and one point for a correct explanation of each response. This permitted a maximum score of fourteen points: twelve points for the six tasks in the Concept Assessment Kit, and an additional two points for the volume task.

2. A parental occupation/socio-economic background questionnaire (U.S. Bureau of the Census, 1950) was given to the parents to fill out, and the children's age, grade, and gender were recorded. These were obtained because the child's age, grade, and in certain studies parental SES have been found to correlate with performance on conservation tasks (e.g., Goodnow and Bethon, 1966).

PROCEDURE—Sampling procedures for the meditating group were virtually exhaustive. All of the available children participating in the TM program in Cambridge and the surrounding area (according to the Cambridge TM Center records) were canvassed and, with only one exception, every child agreed to participate in the study (with their parents' permission). Also, all the children then attending the MIU preparatory school in Fairfield who were in a similar age range participated in the study. The Ryan School in Northampton maintained an educational training program with Hampshire College; students from Hampshire College arranged for the testing of children of comparable ages and grades from the Ryan School. The principal of the school provided an approximately random sample of 9-10 children for each grade from kindergarten through fourth grade.

Each subject was tested individually. The testing time was approximately 15 minutes. The subjects were made to feel the procedure was a game, instead of a test in the usual sense of the term. The children were unaware of the experimental hypotheses under investigation. The test was given using the standard instructions for the Concept Assessment Kit and for the conservation of volume task.

ANALYSIS—To test the first hypothesis, analysis of covariance (ANCOVA) was utilized to determine whether the TM group would score higher than the control group adjusting for possible differences between the groups on the relevant demographic covariates of age, grade, gender, and parental SES.

A nonparametric test of proportion (Bruning and Kintz, 1968) was used to test the second hypothesis that fewer subjects in the TM group would be in transition (i.e., experiencing horizontal décalage on the tests of mastery of conservation) as indicated by: 1) a higher proportion of TM subjects than control subjects fully mastering the series of conservation tasks, and 2) a smaller proportion of TM subjects than control subjects still in transition in mastery of these tasks.

RESULTS

As predicted, mean conservation score was found to be significantly correlated with age \( (r = .56, p < .0001) \), grade \( (r = .53, p < .0001) \), and SES \( (r = .21, p < .05) \) but only moderately correlated with gender \( (r = .14, \text{NS}) \). These four demographic variables were entered as covariates.

All of the variables were normally distributed except for the raw conservation scores, which displayed a skewed distribution. However, more importantly, the residuals for the conservation variable (i.e., the portion of the observed score not explained by the treatment variable and covariates) appeared to be more normally distributed. Therefore it was appropriate to apply analysis of covariance. For the residuals, tests for skewness and kurtosis indicated that the assumption of a normal distribution of the residuals could not be rejected.

Figure 1 displays the mean conservation scores for the two groups adjusted for the covariates of age,
grade, gender, and parental SES. The adjusted mean for the TM group (x̄ = 12.06, S.E. = .60) was significantly higher than the adjusted mean (x̄ = 9.87, S.E. = .58) for the control group (F(1,86) = 6.21, p<.01). Another ANCOVA was performed on the MIU subgroup (N = 13), the Cambridge TM subgroup (N = 32), and the control group (N = 47) considered separately. A contrast on this ANCOVA indicated that within the TM group as a whole, there was no significant difference in adjusted mean score between the MIU and Cambridge TM subgroups (t(85) = -0.60, NS).

Figure 2 shows the percentage of subjects in the TM group and the control group who achieved full mastery of the cognitive-developmental tasks measuring conservation. A markedly higher percentage of the TM subjects achieved full mastery of the tasks (82%) than control subjects (43%). Employing a nonparametric test of proportion (Bruning and Kintz, 1968) this difference was highly significant (z = 3.85, p<.0001).

Figure 3 indicates the percentage of subjects in each group who were in transition on mastery of conservation tasks, i.e., solving simple conservation tasks but not complex ones. The proportion was substantially lower for the TM group (7%) than the control group (51%). This difference was again highly significant (z = 4.50, p<.0001).

It is striking that the TM subjects either fully mastered the conservation tasks or did not appear to conserve at all. The scatter plot in fig. 4 provides an overall picture of the raw scores by age. The TM group had a small cluster of very young subjects (younger than any control subjects) who did not conserve on any of the tasks, and three subjects still in transition (two of whom were also quite young). However 82% of the TM subjects, ranging in age from four years, five months (4.05) to eleven years, zero months (11.00) exhibited full mastery of the conservation tasks. This profile distinctly differs from that of the control group, whose distribution of scores more closely resembles what is usually seen in a population of children. Generally, once children begin to master simple conservation tasks they take a number of years—typically five to seven years in horizontal décalage—before fully mastering more complex tasks. The control group had a small cluster of relatively young children who did not conserve at all, and then there was a general trend toward increasing competence in performance on conservation tasks with increasing age, rather than a sharp phase transition to complete mastery as seen in the TM group.

FIG. 2. PERCENTAGE OF SUBJECTS MASTERING ALL CONSERVATION TASKS. Eighty-two percent of the children practicing the TM technique exhibited full mastery of the cognitive-developmental tasks measuring conservation (N = 45). In contrast, significantly fewer control subjects (only forty-three percent) exhibited full mastery on this series of tasks (N = 47). The two groups were similar in age, grade, gender and parental SES.

FIG. 3. PERCENTAGE OF SUBJECTS IN TRANSITION ON MASTERY OF CONSERVATION TASKS. Only seven percent of the children practicing the TM technique were in transition (N = 45) in mastering the cognitive-developmental tasks measuring conservation. In contrast, significantly more control subjects (fifty-one percent) were in transition in mastery of the series of conservation tasks (N = 47). They had mastered some simple conservation tasks, but not more complex ones. The two groups were similar in age, grade, gender and parental SES. This suggests more rapid consolidation of conservation in children practicing the TM technique.
In addition to a more marked phase transition to full conservation in the TM group, the TM subjects appeared to begin acquisition of conservation skills at an earlier age than the control subjects. This is in part reflected in the higher adjusted mean conservation score for the TM group, and apparent on visual inspection of the data (fig. 4). In the age range including 4.00–5.03, four of the eight TM subjects were displaying conservation skills, two of whom had already fully mastered the conservation series. Strikingly, from 5.08–11.00 years of age, all of the TM subjects were fully conserving with the exception of two individuals (at 6.09 and 8.03). In contrast, the youngest control subject to fully master the conservation series was 6.05. In the range 5.00–5.10, six of the nine controls were in transition and three were totally nonconservers. From 6.05–10.00, only slightly more than half (20 of 38) of the controls had fully mastered the series.

DISCUSSION

REVIEW OF RESULTS IN LIGHT OF HYPOTHESES—
The results clearly indicate that practice of the children’s TM program is positively related to performance on a series of cognitive-developmental tasks measuring conservation. Both experimental hypotheses were supported.

First, the TM subjects appeared to begin acquisition of conservation skills at an earlier age than the control subjects. This is in part reflected in a significantly higher adjusted mean conservation score for the TM group and is further suggested by inspection of the raw data. For example, the youngest TM subject (4.00 years) was displaying minimal conservation skills and two TM subjects younger than five (4.05 and 4.08) were already fully conserving. In contrast, the youngest control subject to fully conserve was 6.05 years of age.

Second, a significantly greater proportion of the TM group exhibited full consolidation of conservation, as indicated by complete mastery of the conservation series, and significantly fewer TM subjects displayed horizontal décalage, as indicated by a transitional score on the conservation series.

While the average adjusted conservation scores for each group significantly differed quantitatively, they

![Figure 4: Number of Conservation Tasks Mastered for the TM Group and the Control Group.](image-url)

FIG. 4. NUMBER OF CONSERVATION TASKS MASTERED FOR THE TM GROUP AND THE CONTROL GROUP. Eighty-two percent of the TM subjects ranging in age from 4.05 to 11.00 exhibited full mastery of the conservation tasks. The TM group has only a small cluster of young subjects who did not conserve on any of the tasks, and three subjects still in transition. The control group also has a small cluster of young subjects who did not conserve on any of the tasks. However, the rest of the subjects exhibit a general drift to increasing competency in performance on the conservation tasks with increasing age, rather than a phase transition as seen with the TM subjects.
did not clearly reveal a major qualitative distinction in the mode or level of cognitive processing of the two groups. Rather, the finding suggested a somewhat earlier onset time of acquisition of conservation skills in the TM group. However, as initially recommended, if one takes as the primary measures of interest the relative proportion of subjects in each group exhibiting complete consolidation of conservation, i.e., not displaying horizontal décalage, then a striking qualitative difference between the two groups emerges. Horizontal décalage was the exception rather than the rule for the TM subjects. If the TM subjects succeeded on a simpler task, they appeared very likely to master all the more complex conservation tasks as well. They seemed to be able to generalize this basic cognitive ability across different measures, regardless of the apparently increasing difficulty of the tasks. The control subjects’ performance was more representative of what is generally observed in young populations. Mastery of more complex conservation tasks occurred with increasing age, as seen in the upward drift in the controls’ raw test scores in fig. 4. The larger number of control subjects still in horizontal décalage is far more typical for children in this age range.

In fact, the control group itself appeared to score well above the norms collected by Goldschmidt and Bentler (1968) on this series of tasks for children of comparable ages (albeit their norms seem to be based on samples drawn from a somewhat lower socioeconomic level). While Ginsburg and Opper (1969) do not report precise norms on their standard volume conservation test, they state (along with Piaget and Inhelder, 1969, p. 99) that volume conservation is not typically attained till 11–12 years of age. Interestingly, in Piaget’s seminal study on conservation (Piaget and Inhelder, 1941), which employed the exact same conservation of volume procedure, only 11% of the 180 Swiss children aged 4–10 years attained conservation of matter, weight and volume.

In marked contrast, in the current study, 82% of the TM group (similar in age range) fully mastered the series. Again, the current control group appeared to score relatively well as indicated by 43% of the controls mastering the entire series. In general, the relatively high level of performance for the controls is probably due to their similar demographic make-up to the TM group—for example, their residential location in a college environment and a generally high level of occupational SES attainment by their parents. This indicates that the substantially higher proportion of stabilized conservers in the TM group is not due to a poorer performance by the control group than the general population. Indeed, the generally high rate of conservation among the controls in comparison to the larger population suggests that it may have provided a relatively conservative comparison group.

The TM subjects’ performance suggests phase transitions between stages rather than prolonged temporal displacement. The possibility that under optimal conditions cognitive development could follow a more stage-like progression through discrete phase transitions would certainly be consistent with the general structural-developmental model which describes cognitive stages as structured wholes acquired through qualitative phase changes (Kohlberg, 1969; Flavell, 1971).

A striking implication of this accelerated consolidation finding is that optimization of the natural growth process in childhood through the TM program may result in a substantial foreshortening and, in some cases, possible elimination of the developmental “irregularity” of horizontal décalage. Given that virtually all TM subjects were fully conserving by 5.08 years and that complete conservation does not typically occur till 11 or 12 years of age, the strongest possible interpretation of these data would suggest that practice of the children’s TM program may accelerate consolidation of conservation by as much as 5–7 years in comparison to the larger population.

EXPLAINING THE DEVELOPMENTAL FINDINGS: TM AND THE LEVELS OF THE MIND—As a developmental technology, the children’s practice of TM is complementary to the role of language learning and use in child development. Language provides a medium for the internal representation of perception and thought, and for subsequent communication. While one can imagine thought without language, language provides a powerful symbol system for the elaboration of preconceptual and conceptual processes (Bruner et al., 1966; Kendler and Kendler, 1970). Though language may help release the very young child from the constraints of sensori-motor life by providing a vehicle for internal representation, it also provides its own constraints. The preoperational child becomes “egocentric” with respect to language and thought (Flavell, 1963). The young child is prone to confuse “thoughts with things” (Elkind, 1974). He finds it very difficult to treat his
own thought processes as objects of thought. As Kegan (1982) has aptly stated, at this stage I am my perceptions and thoughts, rather than I have perceptions and thoughts. In our theoretical terms, at this stage the child’s awareness is totally “identified” with his percept and simple mentation.

Once the child’s awareness has become identified with perception and simple mentation rather than sensori-motor action, then the children’s TM practice may facilitate the process whereby awareness becomes de-embedded from perception and simple mentation and instead becomes primarily identified with the more comprehensive thinking level of the mind. From the thinking mind, perception and simple mentation can be more effectively coordinated. We predicted that through daily practice of this simple procedure, thought would become rapidly differentiated from and hierarchically integrated with the field of perception that it organizes, and hence, according to Flavell’s dictum (1963) horizontal décalage would be minimized. This was the apparent result observed.

Once awareness is differentiated from perception, regardless of how complex the perceptual array may be, it would follow that the child should no longer slip back into centering on only the dominant features of the array. As a result of shifting the primary locus of awareness from perception to thought, conservation would become a conceptual problem—based on the mind’s internal capacity to spontaneously compare and integrate simple perceptual and mental representations—rather than primarily a perceptual problem. Indeed, such a shift from “on-the-surface” perceptual representation to simple internal conceptual processing is a milestone in the development of concrete operational thought (Flavell, 1977, p. 79).

Obviously it is ideal for human development to take place under optimal external conditions. However, an important theoretical and practical implication of this study, and our previous developmental investigations, is that learning (e.g., Bandura, 1969) or dynamic interaction within an enriched external environment (e.g., Kohlberg, 1969; Piaget and Inhelder, 1969) may not be as essential or necessary for promoting fundamental human growth as has been previously considered. Especially in the prison and elderly experiments mentioned earlier, subjects were clearly not exposed to richer environments or more external learning opportunities. Rather, in these set-
tings typically recalcitrant to change (e.g., Sechrest, White, and Brown, 1979) fundamental cognitive, self, and social development was promoted by turning attention inward to increasingly subtler levels of mind through the adult version of this technology of consciousness.

Interestingly, efforts at “training” in cognitive, moral or self-development in childhood and adulthood usually focus on tasks very much related to the outcomes being measured. For example, young children learning conservation will train on conservation-like measures that make increasingly apparent the contradictions in the way the children are attempting to solve the problems (e.g., Inhelder and Sinclair, 1969). Because of this popular training methodology, treatment is typically confounded with outcome measures, and it is difficult to interpret how much the results represent meaningful changes. Even with application of these approaches, structural-developmental stage change has proven surprisingly resistant to modification (e.g., Kohlberg, Kauffman, Scharf, and Hickey, 1974; Kuhn, 1974; Loevinger, 1979).

In this and the prior two investigations, subjects received no training in test-related materials nor exposure to belief systems, nor did they maintain close contact with trainers or testers. Nevertheless, in all these studies striking differences were observed between the TM group and various control conditions (which in the case of the prison and elderly study were quite rigorous).

On a practical level this suggests that the Maharishi Technology of the Unified Field (which includes the child and adult versions of the TM program and the advanced TM-Sidhi program) may be a highly efficient and powerful developmental technology for promoting human growth across the life span—from early childhood to late adulthood—that requires no alteration of the external environment for its effects. On a conceptual level, these findings challenge the fundamental tenet held widely by different psychologists and educators—from B. F. Skinner (1974) to Jean Piaget (1970)—that interaction with the external environment in some form, is the critical factor in cognitive growth. For example, for Piaget (1954) the primary mechanism for transition through cognitive stages is the dynamic equilibration of assimilation and accommodation through interaction with the physical and social world. Each experience of the world involves some kind of cognitive restructuring. Once a new experience is assimilated into a present
scheme it tends to change the structure to some degree and through this change makes possible further accommodation (Flavell, 1963). For Piaget, cognitive stages reside neither in the organism nor in the environment but are actively constructed by the knower in his effort to come to know the external world (Kohlberg, 1969; Piaget, 1970). In fact for Piaget, it is primarily through "cognitive conflict," through active efforts to solve apparent discrepancies or disequilibria in experience, that cognitive growth takes place.

While we recognize the importance of learning and interaction with the world for the growth especially of specific knowledge, according to Vedic Psychology (Maharishi Mahesh Yogi, 1972) the deep structures for knowing ultimately reside in or are inherent in the knower himself.

From our viewpoint, Piaget's four cognitive stages derive not so much from interaction with the external environment as from the inner unfolding of deeper levels of mind. Fundamental knowledge may not be so much "constructed" (e.g., Piaget, 1954) as it is "detected." An extensive body of research on perceptual training conducted by the Gibsons (1966, 1969) suggests that with extensive experience and practice, subjects naturally come to detect distinctive features or invariant patterns in the rich flow of sensory stimuli that were always inherent but not initially appreciated. In this case, we are not concerned with visual detection of latent features of the external stimulus array, but rather with the capacity to foster, as it were, insight into the latent structure of mind. Regular practice of the adult version of the TM program may enhance capacity to detect and enliven in conscious awareness the inner features and structures of deeper levels of mind.

These inner structures of mind, however, are not believed to be isolated from the outer structure of natural law in the physical world. Indeed, it is proposed that the ultimate source of both mind and of the outer objective world is one and the same underlying unified field of natural law (Hagelin, 1984; Maharishi Mahesh Yogi, 1978). It may be this fundamental isomorphism and ultimate unity between the inner and outer structure of natural law that permits fundamental new cognitive knowledge of the world to be spontaneously gained by fathoming deeper levels of mind. (For a more detailed treatment on the relationship between consciousness and unified field theories in physics see Clements, Hagelin, Weinless, Sarma, and Badawi, in press.)

Physiological maturation is proposed as the primary mechanism for promoting fundamental cognitive development during the first decade of life because development of the brain may naturally cultivate more powerful detection and activation of each more abstract level of mind. Nevertheless, the results of the current study suggest that even during this period the fostering of integration of thought with perception and action through the practice of the children's TM program can act back upon the physiology to optimize the rate of neurophysiological integration and development.

If the adult version of this technology, which promotes the transcending of subtler levels of mind, were learned at the earliest appropriate time, then growth through formal operations to higher states of consciousness might naturally occur without the freezing of development typically observed in adolescence or early adulthood. This process of development through TM can be conceptualized in terms of Piaget's twin processes of assimilation and accommodation, but only if they are modified and applied in an inward direction to explain growth of knowledge or awareness about the inherent structure of mind. Through regular practice of TM, awareness may come to gradually accommodate to latent structures of mind as they are simultaneously being assimilated into conscious awareness. Once conscious awareness has come to entirely identify with a more comprehensive underlying level of mind, then a fundamental stage change in cognitive development would spontaneously occur. Outward piecemeal assimilation and accommodation of each new bit of knowledge in order to consolidate cognitive structures (as is experienced in horizontal décalage at various developmental levels) would be substantially reduced due to direct inner incorporation of more comprehensive structures of mind into conscious awareness.

According to Vedic Psychology, however, this process of inner expansion involves or requires no cognitive conflict for the very reason that these structures of consciousness constitute the inner nature of oneself. One does not have to actively stretch the mind to adapt to the outer world, but rather a natural vehicle is discovered for "returning home" to the Self (Maharishi Mahesh Yogi, 1972). Given the appropriate inner direction through the adult version of the TM program, awareness is said to naturally traverse deeper levels of mind due to the principle of "increasing charm" (Maharishi Mahesh Yogi, 1972). Each
The experimental designs of college students indicate that practice of TM and action, the children's version of TM naturally achieved through the mechanism of transcending the thinking process during the adult practice of the TM technique. Abrams, 1977; Miskiman, 1977a; Dillbeck, 1982); through the integration of thinking with perception of conceptual thought, but it can be effortlessly acquired through the mechanism of transcending the thinking process during the adult practice of the TM technique.

Two clarifications are in order. First, while it has been said that the primary identification or stationing of awareness at each subtler level of mind underlies the unfoldment of Piaget's four cognitive stages, it should not be misunderstood that this is strictly a linear process with each level of mind coming to exist or participate at only one level of cognitive development. Because the levels of mind constitute the inherent structure of consciousness, they exist at all times, lying at the basis of the development of each thought as well as the development of every cognitive stage. Instead, it is the ability to fully appreciate and utilize each of these inherent structures of mind on the level of conscious awareness that develops over time. Also, our emphasis on underlying qualitative transformations in consciousness is not to minimize the potential contribution of such process-oriented factors as attention, memory, or learning in the acquisition of conservation. A number of studies with college students indicate that practice of TM enhances information processing capacity (e.g., Abrams, 1977; Miskiman, 1977a; Dillbeck, 1982); similar changes in the TM children could be contributing to a higher level of conservation performance. We emphasize the integration of the thinking level of mind with perception and action because of its proposed primary, causal contribution to cognitive development in childhood. It is postulated that through the integration of thinking with perception and action, the children's version of TM naturally makes available greater attentional or processing resources which in turn may partly mediate improved task performance.

CONSIDERATION OF ALTERNATIVE EXPLANATIONS FOR RESULTS—The experimental designs of the prison and elderly studies were sufficiently rigorous to allow the drawing of strong causal inferences about the role of the TM technique in promoting self-development and cognitive growth in adulthood. However, there are potential confounds inherent within the type of design (Cook and Campbell, 1979) employed in the current study of child development which require examination. Thus far in the discussion, we have offered the strongest possible interpretation of our data because such outcomes were predicted in advance, and in order to draw out as much as possible our conceptual model to account for such potential effects.

Cross-sectional testing assumes that differences observed between groups are due to changes over time resulting from treatment effects. In the current study the finding of few TM subjects in horizontal décalage implies that this phenomenon was substantially diminished. Nevertheless, to unequivocally demonstrate this finding, it would be ideal to have multiple observations on each subject over an extended period of time. Such a longitudinal experiment involving multiple observation is currently being undertaken.

In the current study, the possibility must be addressed that observed differences between groups resulted from initial differences between the subjects due to self-selection rather than treatment effect. In the developmental literature, two demographic variables highly associated with ability to conserve are chronological age and education level. These variables may reflect two important determinants of cognitive-developmental level: neurophysiological developmental and learning/educational opportunities, respectively. In fact in this study, both age and education were highly correlated with conservation score and with each other, as would be anticipated. Therefore, within the constraints of available sampling opportunities, an effort was made to initially match the two groups on age and educational level.

Also in the research literature and the current study, socio-economic status has been found to be correlated with conservation performance. Occupational status/SES of parents may be associated with the educational and social opportunities, physical health, and intelligence quotient of the child, all of which may influence the rate of cognitive develop-
ment. The two groups in this study were also highly similar on parental SES. For the purpose of comparison of mean conservation scores, even slight differences between groups on age, education, SES, and gender were statistically controlled. Intelligence quotient was not directly entered as a covariate because it has also been seen to change through practice of TM, and therefore might be confounded with the treatment. The two groups in this study were also highly similar on parental SES. For the purpose of comparison of mean conservation scores, even slight differences between groups on age, education, SES, and gender were statistically controlled. Intelligence quotient was not directly entered as a covariate because it has also been seen to change through practice of TM, and therefore might be confounded with the treatment.

Though the overall means and standard deviations of the age distribution were rather similar for both groups, the tails on the TM distribution did appear to be somewhat more extended. This could not have accounted, however, for the difference observed between the two groups in terms of the proportion of subjects fully conserving. While six TM subjects were older than all control subjects and were more likely to be fully conserving, seven subjects were younger; therefore the potential influence of extreme scores on proportion of subjects fully conserving should have been counterbalanced. On the other hand, the differential age spread could have had some influences on the measure of proportion of subjects still in horizontal décalage in each group, but was not sufficient to account for the major differences observed between groups. In fact, inspection of the data revealed that of the seven TM subjects who were younger than all controls four were nonconservers, while three of the youngest controls were nonconservers. In any event, the horizontal décalage result is closely related to the finding on proportion of subjects fully conserving and the statistical interpretation of the latter is relatively unambiguous.

Though this study appears to control for these critical demographic variables and presumably the underlying influences that they reflect, there may have been other potential initial differences between the groups that influenced outcome. One such possibility is that the meditating parents, while similar in SES, differed along other dimensions that could have influenced their children’s rate of development. However, a large number of studies have indicated that adults who choose to participate in this program tend to be similar across a wide variety of demographic variables to their peers. More importantly, many random assignment experiments (e.g., Alexander et al., in press b; Dillbeck, 1982; Miskiman, 1977b; Shecter, 1977) have clearly identified that positive long-term personality and cognitive differences between TM and control groups are attributable to regular practice of this technology and not to initial differences between groups. If the potential parental influence were due to belief system or lifestyle (and the educational practices they may engender) rather than TM practice, one might anticipate more extreme effects for the TM children who came from the MIU School in Fairfield, Iowa. There was, however, no difference in adjusted mean scores for the TM subgroups in Cambridge and MIU. Therefore, while the current design cannot exclude the possibility that positive differences exist between TM and nonmeditating parents that influenced child development, such differences would be likely to be attributable to the parents’ practice of TM rather than to nontreatment variables. Hence, it is possible that both child and parental practice of TM are jointly contributing to the observed differences between groups. We would predict, however, that the children’s practice would produce the primary influence due to its proposed direct effect on cognitive processes underlying the acquisition and consolidation of conservation.

A final potential confound to be considered is instrumentation. The test employed, the Concept Assessment Kit, is the most widely used and standardized measure for evaluating conservation. Each session was conducted according to a set testing procedure for instruction and evaluation. The tasks on this measure are presented in a graded sequence from easy to more difficult, except for the last two tasks in which weight was presented before discontinuous quantity. Piaget also presented conservation tasks in order of increasing difficulty, and a methodological review on conservation testing recommended this sequence as the preferred approach (Hobbs, 1975).

Nevertheless, some research has shown that such a sequence of presentation results in a higher performance level than is achieved when the tasks are presented in an order from hard to easy (Miller, 1978). This order effect was interpreted by Pascual-Leone (1969) as resulting from a learning factor. According to such a view, a superior performance on the conservation tasks by the children practicing TM could possibly be due not only to superior logical competence but to enhanced learning ability. In light of prior findings indicating enhanced learning ability in young adults practicing TM (e.g., Abrams, 1977; Miskiman, 1977a), this possibility cannot be dismissed. Nevertheless, even if enhanced learning ability as well as logical competence is involved in superior performance by the TM group, both may result from facilitation of the same general process of
The conservation of volume task described by Ginsburg and Opper (1969) is also the most common procedure employed for measuring volume and was used by Piaget in his seminal study on conservation (Piaget and Inhelder, 1941). It has been claimed, however, that such a procedure may not adequately distinguish between conservation of volume and the somewhat easier task of weight conservation. Several studies have indicated that children often believe that the amount of water displaced by an object is related to the object's weight (Hobbs, 1975; Goodnow and Bethon, 1966). The method of measuring volume conservation in the current study may not have discriminated between such apparent conservation and true conservation of volume responses. In other words, some of the TM subjects who scored perfectly on all the conservation tasks including volume, may only in fact have been conserving weight. Hence, caution should be applied in assuming that horizontal décalage was virtually eliminated in the TM group.

Nevertheless, since both groups in the current study were tested under similar conditions and with the same instruments, differences in scores between the groups should still reflect performance differences and should not be an artifact of the test instruments. In fact, the general reports that volume conservation typically occurs around 11 – 12 years of age (Flavell, 1963; Ginsburg and Opper, 1969; Piaget and Inhelder, 1941) are based on conservation of volume as measured in the current study and on presentation of tasks from easy to more difficult. It may even be that a more stringent test of conservation and the presentation of items from difficult to easy would lead to normative data that set back the average achievement of volume conservation to a still later age level.

Thus, while the absolute level of conservation attainment by the TM group may not be fully assessed by the current study, the relatively higher level of conservation in comparison to both the control group and normative data could not be attributed to the method of measurement employed. Indeed, as mentioned earlier, the finding of a generally higher level of conservation for the control group in comparison to normative data on these measures suggests that the nonmeditating subjects selected for this study may even have provided a relatively conservative comparison group.

**CONCLUSION**

The results of this first study on cognitive stage development in children practicing the children's Transcendental Meditation program are striking. These findings suggest that the children's TM program may accelerate the rate of acquisition and especially consolidation of conservation in childhood. The transition process in the mastery of conservation—horizontal décalage—appears to be substantially reduced. Conservation is a hallmark in the development of Piaget's concrete operational stage. The development of concrete operations is characterized by a growing capacity for conceptual thought, the ability to communicate effectively and understand the viewpoint of others. The consolidation of conservation provides an essential foundation for taking full advantage of primary education which traditionally begins at the age most children begin to acquire concrete operations.

Although these developmental findings are promising, they require longitudinal replication under more controlled conditions. Such a replication is currently being undertaken. Nevertheless, an accelerated consolidation of conservation was predicted in advance and is consistent with and extends results supporting the unfreezing human development hypothesis. In fact in this context, the unfreezing phenomenon may now be considered as a special case of the more general finding that the Maharishi Technology of the Unified Field acts to optimize the natural growth of human development across the life cycle. In adolescents and young adults this may involve the unfreezing of development; in the advanced aged, the reversal of developmental deficits en route to further growth; and in the young, the accelerated consolidation of growth processes already taking place but in a slower and less integrated fashion.

Based on approaches like Piaget's that emphasize dynamic interaction with the environment, efforts to promote cognitive stage development through environmental and cognitive enrichment programs have generally met with little success. In contrast, this technology of consciousness has been consistently seen to directly catalyze substantial stage development even in populations otherwise recalcitrant to change. It now appears that at least three fundamental qualitative phase transitions are facilitated.
through the Maharishi Technology of the Unified Field. Practice of the children's TM program may be capable of promoting a shift from a preconceptual to a conceptual level of thought. In turn the Transcendental Meditation and TM-Sidhi program may foster development to a more abstract level of thought and, ultimately, to postconceptual or higher states of consciousness that lie beyond the ordinary endpoint of human development.

REFERENCES


