THE EFFECTS OF TRANSCENDENTAL MEDITATION ON COGNITIVE AND BEHAVIORAL FLEXIBILITY, HEALTH, AND LONGEVITY IN THE ELDERLY: AN EXPERIMENTAL COMPARISON OF THE TRANSCENDENTAL MEDITATION PROGRAM, MINDFULNESS TRAINING, AND RELAXATION

CHARLES N. ALEXANDER,1 JOHN L. DAVIES,2 RONNIE I. NEWMAN,3 and HOWARD M. CHANDLER1

1 Department of Psychology and Social Relations, Harvard University, Cambridge, Massachusetts, U.S.A.*
2 Macquarie University, North Ryde, N.S.W., Australia*
3 Graduate School of Education, Harvard University, Cambridge, Massachusetts, U.S.A.

*Currently affiliated with Maharishi International University, Fairfield, Iowa, U.S.A.

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The Transcendental Meditation programme was found to be particularly effective in reversing declines in psychological and physiological functioning in the elderly in comparison to other treatments. Improvements were found in cognitive flexibility, word fluency, systolic blood pressure, behavioural flexibility, and mental health. Furthermore, results demonstrated that the reversal of ageing brought about by the practice of Transcendental Meditation leads directly to an enhancement of longevity.—EDITORS

This experiment assesses the effects of the Transcendental Meditation (TM) program on aging and examines whether such effects are produced independently of context, expectation, or simple relaxation components. Vedic Psychology predicts greater reversal of age-related declines through the qualitatively distinct state of restful alertness associated with TM than through either simple relaxation or an active thinking procedure.

Seventy-three residents of homes for the elderly (60 females, 13 males; mean age 80.7 years) were randomly assigned to either a no-treatment condition or to one of three treatments designed to be equivalent in external structure and expectation fostering features: the Transcendental Meditation program, an active thinking procedure (mindfulness training), and a relaxation program. Despite all groups being initially similar in expectancy of benefits and on pretest measures, after a three-month experimental period the TM group had significantly improved (p<.05 to p<.001; one-tailed) in comparison to one or more treatment conditions on three measures of cognitive flexibility (the Overlearned Verbal Task, the Stroop Color-Word Interference Test, and the Associate Learning Test for difficult word pairs), word fluency, two methods of assessing change in systolic blood pressure, self-report measures of behavioral flexibility and aging, and in nurses’ rating of mental health (after 18 months). Also, the TM subjects reported feeling more interested during their practice, and better and more relaxed immediately after their practice, than did the active thinking and relaxation subjects. Overall, more TM subjects found their practice to be personally valuable than did members of the other treatment groups. The active thinking group scored higher on a self-report measure of internal locus of control and, like the TM group, improved on word fluency, mental health, and, to a lesser degree than the TM group, on a measure of systolic blood pressure.
The most striking finding is that in addition to reversing age-related declines, Transcendental Meditation appears to directly enhance longevity: all members of the TM group were still alive three years after the program began in contrast to the other groups and to the 62.5% survival rate for the remaining population in these homes for the elderly (N=478).

INTRODUCTION

The Transcendental Meditation (TM) program is traditionally described in Vedic Psychology1 as a means for the mind to settle down to a silent state of heightened inner awareness (Maharishi Mahesh Yogi, 1969; Dillbeck, 1983a, 1983b; Dillbeck and Orme-Johnson, in press; Orme-Johnson, Dillbeck, Alexander, Van den Berg, and Dillbeck, in press). While it has been described as a means to reduce metabolic rate and decrease overall level of sympathetic tone (e.g., Wallace, 1971), a wakeful EEG pattern tends to dominate in TM that is topographically characterized by increased frontal and central, bilateral and homolateral EEG phase coherence, relative to resting with eyes closed in either the same subjects or relaxing controls (Banquet and Sailhan, 1974; Dillbeck and Bronson, 1981; Orme-Johnson, 1977; see also Hebert and Lehmann, 1977).

Evidence of enhanced alertness during the practice of TM, as distinct from ordinary relaxation, is further indicated by an increase in blood flow to the brain (Jevning, Wilson, Smith, and Morton, 1978), and maintenance of responsiveness to external stimuli (Wandhofer and Plattig, 1973). In a study with long-term meditators, Farrow and Hebert (1982) reported that the periods of deepest rest during meditation, as indicated by apparent breath suspension without compensatory hyperventilation and by absence of phasic GSR, in fact corresponded with the experience of "pure consciousness," or inner enhanced wakefulness without thoughts, as reported by button press after each experience. Increased EEG phase coherence in the alpha and theta range was also found during these periods, further indicating enhanced alertness (see also Badawi, Wallace, Orme-Johnson, and Rouzeré, 1984).

Also, many results accruing after the practice of Transcendental Meditation do not have an obvious connection with simple relaxation or somatic arousal reduction, and appear to be more associated with enhanced alertness and "adaptive efficiency" (Orme-Johnson and Dillbeck, 1984). Such findings include increased field independence (Pelletier, 1974), facilitation of H-reflex recovery (Wallace, Mills, Orme-Johnson, and Dillbeck, 1983), greater flexibility in overcoming habitual patterns or overlearned responses when it is adaptive to do so (Dillbeck, 1982), improved learning and memory (Abrams, 1977; Miskiman, 1977), enhanced creativity (Travis, 1979), improved hemispheric integration in response to task demands (Bennett and Trinder, 1977), longitudinal enhancement of fluid intelligence (Arnon, Orme-Johnson, and Brubaker, 1981), and socio-cognitive or self-development (Alexander, 1982).

Indeed, as Wallace, Dillbeck, Jacobbe, and Harrington (1982) and Clements and Clements (in press) have observed, many of these findings and other results of the TM program appear to be opposite in nature to the decline in cognitive alertness and increase in rigidity (Chown, 1961) of cognitive, behavioral, and physiological functioning usually associated with the process of aging.

By contrast, passive and repetitive simple relaxation procedures (from the perspective of mindfulness/mindlessness theory—Langer, 1981) might even tend to reinforce or exacerbate a cognitively rigid, "mindless" response tendency, especially for the elderly. Mindlessness is described as a state of reduced cognitive activity in which the individual processes cues from the environment in a relatively automatic manner without reference to novel (or simply other) aspects of these cues. The negative consequences of excessive reliance on mindless information processing, especially for the elderly, have been repeatedly documented by Langer and her colleagues (e.g., Chanowitz and Langer, 1981; Langer and Rodin, 1976).

TM may be described as a postconceptual or post-language system (Alexander, 1982; Alexander and Oetzel, in press) whereby conceptual thought and previously automatized information processing systems (Norman, 1981) are transcended as attention is deployed to subtler, nonconceptual levels of experience. Awareness is said to become gradually de-excited, and eventually reaches the state of pure consciousness (i.e., a state free of all thought content).
dental Meditation program appears to promote in-
deed observed to accompany the aging process, assess the impact of this program on aging.

The mindfulness training procedure was developed
on an advanced elderly population. Clearly it is the ad-

Nevertheless, there have been no studies yet re-
ported that directly evaluate the effects of Transcen-
dental Meditation (or other forms of meditation) on

The present study examines the general prediction
of greater reversal of age-related declines in the insti-
tutionalized elderly through the qualitatively distinct
state of restful alertness associated with TM than

Moreover, this experiment is designed to systemati-
cally control for confounding variables (e.g., self-
selection, expectation of results, attention from the
instructor, demand characteristics, time spent sitting
with eyes closed, and degree of subjects’ perceived
control over treatment) to which apparent improve-
ments on age-related variables with TM might other-
wise be attributed.

Three experimental procedures—the TM tech-
nique, mindfulness training, and relaxation—equiva-
ent in their external structure (following closely the
highly standardized format for the teaching and prac-
tice of TM) but differing in their purely cognitive
elements, are compared with a no-treatment condition.

The mindfulness training procedure was developed
in collaboration with the research group studying
mindfulness (ibid.) with the aim of directly pro-
gramming a mindful style of information processing

percepts or conceptual boundaries) that is experi-
enced as purely self-referral in nature, i.e., known
from within itself without mediation by thoughts and
percepts. Repeated experience of this state is seen as
allowing gradual differentiation of this self-referral
awareness from subsequent input and conceptual re-
sponses (Orme-Johnson et al., in press; Orme-
Johnson and Haynes, 1981; Farrow and Hebert,
1982).

TM may thus facilitate a “vertical” expansion of
the range of the conscious mind to include subtle cog-
nitive processes which, although exercising a per-
vasive influence on behavior, are otherwise unavail-
able to conscious apprehension and control (as de-
scribed by Libet, Gleason, Wright, and Pearl, 1983;
Marcel, 1983; and Zajonc and Markus, 1982). To the
extent that this vertical expansion and eventual dif-
ferentiation of awareness from conceptual bound-
daries continues after the practice, incoming stimuli
may no longer automatically occasion rigid response
sets. Being potentially accessible, different response
sets can be associated with different stimuli as ap-
propriate, so that the environment is viewed afresh
and adaptability enhanced.

Stimulated by the observation that the Transcen-
dental Meditation program appears to promote in-
creased flexibility of response in contrast to the
decline observed to accompany the aging process,
several recent studies have attempted to more directly
assess the impact of this program on aging.

In a cross-sectional study, Wallace, Dillbeck,
Jacobe, and Harrington (1982) found that long-term
meditators were younger biologically on the Morgan
scale (Morgan and Fevens, 1972) than short-term
meditators, who were in turn younger than nonmediti-
ating control subjects or population norms for an
equivalent age group, although the groups were
equivalent in chronological age (mean = 53 years)
and differences in diet were controlled for. Younger
biological age was correlated with length of time
practicing TM. Comparable results were also ob-
tained for larger meditating samples on systolic blood
pressure alone (one of the composite measures of the
Morgan scale) in comparison to population norms
across different age groups (Wallace, Silver, Mills,
Dillbeck, and Wagoner, 1983). Similar findings on
the Morgan scale were obtained for an even younger
population (mean = 32 years) by Toomey, Penning-
ton, Chalmers, and Clements (in press) and con-
firmed in a longitudinal study showing further reduc-
tion of biological age in the same meditating subjects
over an 18-month period (Toomey, Chalmers, and
Clements, in press). Correlations between length of
time meditating and improvement on a number of
age-related psychological (Jedrczak, in press) and
physiological (Wallace et al., 1982) variables have
also been reported.

The mindfulness training procedure was developed
in collaboration with the research group studying
mindfulness (ibid.) with the aim of directly pro-
gramming a mindful style of information processing
through engagement in novel conceptual activity (active distinction making), in contrast to the progressive de-excitation (refinement) of ordinary mental activity during TM. These researchers have attempted to enhance mindfulness, or the capacity to engage in the construction of new conceptual categories or distinctions, through environmental enrichment programs. Induction of active conceptual thinking, by expanding on what may be called the "horizontal" level of thought, may to some degree influence alertness in the elderly. From the perspective of Vedic Psychology, however, these effects should be less marked and general than those resulting from refinement of the thinking process, or vertical expansion of the range of conscious awareness, during the practice of the TM technique.

The mental relaxation procedure (MR) was developed to test a viewpoint that TM is equivalent to simple relaxation procedures or otherwise dependent for its effectiveness only on external or placebo factors (e.g., twice-daily sitting with eyes closed and expectancy of results: Smith, 1976). However, such an understanding ignores or regards as nonessential the special quality of the mantra and the method for employing it that, according to Vedic Psychology (Maharishi Mahesh Yogi, 1969), especially foster the transcending process of going to "deeper" or more expanded levels of mind and ultimately to the content-free state of pure consciousness.

Specifically, this experiment tests several competing hypotheses:

1. According to an extreme expectancy or placebo orientation all three treatments should give rise to similar results, in contrast to the no-treatment condition: it does not matter what subjects do when sitting with eyes closed.

2. According to the view that TM is simply a relaxation procedure, the TM and mental relaxation (MR) treatments should give rise to similar results in contrast to the mindfulness (MF) treatment and the no-treatment (NT) conditions: the treatments which allow subjects to become relaxed will be more effective.

3. According to classical Vedic Psychology the transcending process and experience of content-free, restful alertness in TM should lead to more positive results than for the relaxation, mindfulness training, or no-treatment conditions. While training in active thinking (mindfulness) may produce some influence of alertness (in contrast to simple relaxation), its benefits should be less marked and general than those associated with Transcendental Meditation.

**METHOD**

Subjects were 73 volunteers (60 females and 13 males) from six retirement homes, one nursing home, and one apartment complex for the elderly. Mean age was 80.7 years.

After pretesting, 77 subjects were initially assigned to one of four conditions by stratified random assignment. An equal proportion of subjects who scored as normal, borderline, or deteriorated on the Dementia Screening Test were randomly assigned to each condition within each of the eight homes, excluding those subjects rated as deteriorated who were considered to be unable to remember instructions from day to day. Twice as many subjects were assigned to each of the three treatment groups as were assigned to the no-treatment condition.

After assignment to specific treatment programs, four subjects dropped out prior to actual instruction (one in TM, two in MF, one in MR). These four, together with ten subjects who were rated as normal or borderline on the Dementia Screening Test but were not assigned after pretesting and did not posttest, were added to the no-treatment group for assessment of survival rate only. Final group sizes were: TM, 20; MF, 21; MR, 21; NT, 11 (25 for survival rate). For some comparisons, these numbers were reduced where subjects failed to complete specific tasks.

One-way analyses of variance revealed no differences among the four groups in gender ($F(3,69) = .07$, not significant (NS)), in age ($F(3,68) = .09$, NS) in number of months in residence ($F(3,69) = 1.00$, NS) or, in education ($F(3,67) = .10$, NS). Also there was no difference in mental or physical health among the four groups prior to treatment as indicated by nurses' ratings at pretest ($F(3,46) = .79$, NS), or as reflected in pretest scores either for the Dementia Screening Test ($F(3,69) = 1.37$, NS), or for the Self-Rating Depression Scale (related to pseudodementia: $F(3,66) = .50$, NS), or for systolic blood pressure ($F(3,63) = .21$, NS).

**Orientation and Assessment**

Two project administrators met with residents of each home and explained that as part of a research
project they would be offered simple mental techniques which were thought to be beneficial for the mental and physical well-being of other age groups, and that the project was an attempt to document the value of these programs for an elderly population. No deception was involved, in that there were research literatures supporting the construction of each procedure.

The programs to be offered were described in general terms, and interested residents were invited to attend a second meeting during which testing procedures were explained and informed consent forms signed.

Testing was largely individually administered, generally over four 1½-hour sessions, following the same order of tests for all subjects. Pretesting took place prior to assignment of subjects to the four treatment conditions; posttesting took place after a 12-week treatment period, and included some additional measures. Test administrators were blind as to subjects' assigned programs. Staff ratings of mental health were assessed after an 18-month interval, and longevity (survival rate) after 36 months.

Treatments

The three treatment conditions were structurally identical, and subjects in each condition were given the same expectations of outcome, in terms of improved mental and personal development, and improved physical health. They differed only in terms of the precise mental procedure to be followed while sitting with eyes closed.

Each treatment was introduced, taught, and practiced using standard materials and following a standard structure, carefully designed at each step to match the form, complexity, and expectation-fostering aspects of that used by the International Meditation Society and affiliated organizations teaching the TM program.

Each of the three treatment groups at each home attended two introductory meetings to explain the benefits and mechanics of the assigned technique, a private interview for questions, a private instruction session, and over the next three days, three group meetings to check correct practice and review the detailed mechanics of the technique and its benefits on the basis of experience and discussion. Meetings were generally held in the mornings.

Each subject then met with his or her instructor for about half an hour each week to verify correct and regular practice. Subjects were instructed to practice their technique for 20 minutes twice daily, morning and afternoon (preferably not after meals), sitting comfortably in their own room with eyes closed, and using a timepiece to ensure correct length of practice. Subjects were also requested not to reveal details of their practice to anyone outside their own group.

The distinctive features of the three treatments are as follows:

THE TRANSCENDENTAL MEDITATION (TM) TECHNIQUE—Subjects in this group were taught the TM technique according to the highly standardized procedures of the International Meditation Society and its affiliated organizations, except that they did not pay their own course fees. The meditation procedure is described as allowing the attention effortlessly to turn "inwards towards subtler levels of a thought until the mind transcends the subtlest state of thought and arrives at the source of thought" (Maharishi Mahesh Yogi, 1969, p. 470), experienced as brief periods of silent, content-free alertness or pure consciousness. The technique involves both a "mantra," a sound selected for its value in facilitating the transcending process, and a specific method for using it (mentally) without effort. The practice has been described in detail by Domash (1977), Bloomfield, Cain, and Jaffe (1975), and others, and is said not to require any changes in life style, belief system, diet, or external environment.

MINDFULNESS TRAINING (MF)—Subjects in this group were taught what was called the Guided Attention Technique. The technique involved both a structured word-production task and an unstructured creative mental activity task. The word-production exercise required subjects to think of a word, take its last letter, and find a new word beginning with that letter. The technique began on a simple level. However, subjects were not permitted to use any word more than once per session, and the level of demand of the practice was continually increased to keep it novel and challenging and increasingly more mindfulness-inducing. For example, after the technique was mastered, subjects were instructed to produce words relating to specific categories (e.g., animals, springtime, foods, places).

The creative mental activity task did not specify rules for thinking nor particular target thoughts. Rather, the individual was asked to take initiative by
thinking about any topic of choice but in new and creative ways. Illustrations were provided of such activity: e.g., thinking of unusual uses for common objects, picking a controversial topic and arguing the side contrary to one's established opinions. Subjects were asked not to lapse into daydreaming but rather to actively direct their thinking during the process. They were instructed to produce words for approximately six minutes, engage in creative mental activity for six minutes, and close with another six minutes of word production followed by two minutes of rest.

MENTAL RELAXATION (MR)—Subjects in this group were taught what was called the Cortical De-activation Technique.

The technique was designed to incorporate only what have been listed by Smith (1976) and others as the essential elements of TM. Thus, the vehicle of attention (the mantra or sound used in TM) is replaced for the relaxation procedure with a familiar verse, phrase, or brief song chosen by the subject for himself. The technique requires that subjects sit comfortably with eyes closed, relax for a few minutes, and then begin the practice. Instructions for the use of the verse, etc., and how to deal with thoughts, sleep, and disturbances were formulated again according to the guidelines of Smith. The last two minutes of each session were spent sitting easily with eyes closed after having stopped the practice.

NO-TREATMENT (DELAYED START) CONTROL (NT)—Subjects in this group were informed that their valuable role in the research was as a comparison, delayed start group. They were pre- and posttested and had no other exposure to project personnel.

Instructors

Twenty-one instructors, seven for each of the three treatment conditions, were all volunteers matched for gender, race, and level of education (graduate students, professionals, or college seniors), and of comparable age, and religious and socioeconomic background.

Instructors for the TM program had been trained by the International Meditation Society over a minimum period of three months.

Instructors for the mindfulness training and mental relaxation conditions were trained by project administrators. The training format was identical for these two conditions. They were given the rationale for their treatment program, supported by a teaching manual and charts describing claimed physiological correlates of the practice: the projected results of each treatment, in accordance with research and professional opinion in favor of each, being the same as for TM. Training sessions were held over a period of two months, and extensive home study of teaching manuals and preparation of materials was required so that instructors could pass a final exam to verify their competence and confidence in presenting each of the steps of instruction (cf., Smith, 1976).

Although instructors knew several treatments were being compared, they were blind as to the content of other treatment conditions, and through exposure to selected research literature that supported their treatment, believed that it was favored at least as much as the other programs. Instructors had signed agreements not to reveal the content of their own treatment outside the guidelines given for teaching. Further, they were blind as to the test instruments being used. All instructors were highly motivated, as evidenced by their willingness to devote considerable time without pay over several weeks in preparation, teaching, and follow-up treatment.

The effectiveness of the instructors and their equivalence in arousing subjects' expectations were assessed through evaluations of subjects' expectancy of benefit (after the two introductory talks but before personal instruction) and subjects' rating of instructor competence and likeability at time of posttest.

Dependent Variables

COGNITIVE FUNCTIONING—Dementia Screening Test (DST): The DST (phase one), a test battery developed for the Framingham Heart Study by E. Kaplan and M. Albert of the Boston Veterans Administration Hospital and the Department of Neurology, Boston University School of Medicine, provides an operational definition of dementia which can be used to assess the functioning of elderly subjects. The DST was used primarily for the purpose of matching subjects on levels of dementia prior to stratified random assignment of subjects to treatments at pretest. The DST battery includes: Associate Learning and Visual Reproductions (Wechsler Memory Scale subtests); Word Fluency (Neurosensory Center Comprehensive Examination for Aphasia subtest); Digit Span (forward and backward) and Similarities (Wechsler Adult Intelligence Scale subtests); Logical
Memory (immediate and delayed recall from a five-line story). Also for comparison of degree of change on DST scores in the present study, the mean z-score across all completed subtests was taken for each subject at pre- and posttest.

**Associate Learning:** Scores on the Associate Learning subtest of the DST (difficult word pairs only) are separately examined in light of research already reviewed indicating improved learning performance associated with TM, in contrast to studies indicating decline in performance on paired associate learning with aging (Arenberg and Robertson-Tchabo, 1977). Ability to recall difficult word pairs (i.e., words unrelated in meaning) is considered to be a measure of cognitive flexibility in that it requires formation and retention of novel associations rather than familiar overlearned associations.

**Word Fluency:** Scores on the Word Fluency subtest of the DST are also separately examined. The task is closely related to the word-production task which was basic to the mindfulness training procedure, and constitutes a minimum test of the effectiveness of MF training independent of its broader generalizability. Subjects are scored for the number of words generated within 60 seconds, beginning with each given letter, excluding proper names and changes of tense.

**Overlearned Verbal Task (OVT):** The OVT was developed for the present study as a direct, simple measure of cognitive flexibility, or the ability to change from overlearned to more adaptive responses when required. It is based on the overlearning by this elderly subject population of the original U.S. Pledge of Allegiance before it was changed in 1954 to include the words "under God." Subjects were asked to recount the pledge after reviewing an updated typewritten copy for 1½ minutes, and were scored correct if these two new words were included in their correct sequence (posttest only).

**Stroop Color-Word Interference Test (CWIT):** The CWIT (Stroop, 1935) involves timing subjects' performance, firstly, in reading words (printed across the page), secondly, in identifying the colors of groups of colored x's (in the same format as the reading task), then, thirdly, in identifying colors of words (the meaning of the words denoting a conflicting color, same format). On the third task, there is a tendency for subjects to respond to the meaning of the word (due to an overlearned reading response) rather than being able to readily identify the color of ink in which the letters of the word are printed. The interference score is the additional time taken on the third as compared to the second task (Jensen, 1965) and is reported to deteriorate with advanced age (Comalli, Wapner, and Werner, 1962), with poorer performance also being associated with defensive rigidity on the MMPI (Bush, 1975). The cognitive flexibility score in the present study is defined as the best (lowest) interference score over four trials (always the third or fourth) after covarying for score on first trial (posttest only).

**HEALTH—Blood pressure:** Systolic blood pressure was tested with an aneroid sphygmomanometer, the appearance of the first heart sound being taken as systolic pressure. The average of three readings taken at two-minute intervals was recorded with subjects sitting at rest following Morgan's procedure (Morgan and Fevens, 1972). For a few subjects in each group a single recording by a registered nurse taken with a standard mercury sphygmomanometer was relied upon when subjects were not available for the other testing procedure.

**Longevity (survival rate):** The percentage of subjects still alive after a mean period of 36 months was assessed from nursing home records, excluding subjects who had moved to another residence.

**Nurses' mental health improvement ratings:** These were given by nursing home staff after a mean period of 18 months for all surviving subjects. Subjects were rated on a five-point scale from considerably worse in mental health (1) to much better (5) over the 18-month period.

**PERSONALITY AND SELF-REPORT—State-Trait Anxiety Inventory (STAI A-Trait Scale) (Spielberger, Gorsuch, and Lushene, 1970).**

**Self-Rating Depression Scale (SDS) (Zung, 1965).**

**Internal Locus of Control Scale (LOC I-Scale):** A revised version of Rotter's (1966) original I-E scale (Levenson, 1974) was included because of the hypothesized relationship between mindfulness and control (Chanowitz and Langer, 1981).

**Subject evaluation of treatment:** Posttesting subjects were asked to rate on a series of seven-point Likert scales how they felt generally "these days" compared to three months before, and how they felt during and immediately following practice of their treatment. They were also asked whether "the program itself was valuable to you" and whether they would recommend their program to friends or others interested.
TABLE 1
COGNITIVE PERFORMANCE SCORES FOR THE ELDERLY AFTER THREE MONTHS' PRACTICE OF ASSIGNED PROGRAM

<table>
<thead>
<tr>
<th>Cognitive Functioning</th>
<th>TM</th>
<th>MINDFULNESS TRAINING (MF)</th>
<th>RELAXATION (MR)</th>
<th>NO-TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia Screening Test (z-scored: adjusted means)</td>
<td>0.02&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.04&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.03&lt;sub&gt;a&lt;/sub&gt;</td>
<td>-0.30&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Associate Learning (adjusted means)</td>
<td>5.98&lt;sub&gt;a,x&lt;/sub&gt;</td>
<td>5.01&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5.61&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.17&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Word Fluency (adjusted means)</td>
<td>36.87&lt;sub&gt;a&lt;/sub&gt;</td>
<td>39.15&lt;sub&gt;a,x&lt;/sub&gt;</td>
<td>33.37&lt;sub&gt;b&lt;/sub&gt;</td>
<td>31.79&lt;sub&gt;b&lt;/sub&gt;,&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Overlearned Verbal Task (% correct at posttest)</td>
<td>77.78&lt;sub&gt;a,x&lt;/sub&gt;</td>
<td>50.00</td>
<td>27.27&lt;sub&gt;b&lt;/sub&gt;</td>
<td>28.57&lt;sub&gt;i&lt;/sub&gt;</td>
</tr>
<tr>
<td>CWIT Interference Score (posttest means)</td>
<td>20.74&lt;sub&gt;a&lt;/sub&gt;</td>
<td>25.64</td>
<td>25.90</td>
<td>25.20</td>
</tr>
</tbody>
</table>

a, b. Cells with an "a" represent significantly better outcomes than those with a "b"; similarly "a'" better than "b'".

x. Cells with an "x" are significantly better than the other three cells combined.

RESULTS

Before assessing the relative effects of the treatments employed, a check was conducted to determine whether the groups were equivalent as to expectation of benefit, perceived competence and likeability of instructors, and regularity of practice.

Expectancy of benefit was assessed after the two introductory lectures but before actual instruction in the assigned treatment program. Subjects rated on six seven-point scales how much they expected to benefit from their assigned program in terms of physical health, relief of worries, ability to deal with problems, clear thinking, personal relationships, and personal development. A total expectancy score was derived as the sum of the scale scores. There were no differences in mean expectancy scores among the three treatment groups (F(2,42) = .09, NS).

Subjects were also asked at the time of posttesting to rate their Instructor on two seven-point scales, for competence and liking. Again, there were no differences among groups, either for competence (F(2,41) = 1.80, NS) or liking (F(2,41) = .54, NS).

Finally, regularity of practice was determined from weekly check sheets completed by subjects and from posttest interviews. There were no differences in regularity among treatment groups for subjects posttesting on any of the dependent variables (F<1.2, NS).

COGNITIVE FUNCTIONING—Adjusted means (post-test scores after covarying for pretest scores).² for the z-scored Dementia Screening Test, the Associate Learning scale and the Word Fluency scale, together with the proportion of subjects correct on the Overlearned Verbal Task and posttest means for the Stroop Color-Word Interference Test are presented for each group in Table 1.

Dementia Screening Test (DST): Analysis of covariance revealed a nonspecific treatment effect: each treatment group improved in comparison to the no-treatment group (TM: F(1,53) = 3.39, p<.05; MF: F(1,53) = 5.29, p<.05; MR: F(1,53) = 4.75, p<.05).

Associate Learning: Again, every treatment group scored higher than the no-treatment group (TM: F(1,51) = 7.81, p<.005; MF: F(1,51) = 3.35, p<.05; MR: F(1,51) = 5.88, p<.01). However, on this scale, TM subjects also scored higher than the other three groups combined (F(1,51) = 2.84, p<.05).

In light of the low average performance level on this task (less than 5 out of 12) and previous findings of improvement in paired associate learning with younger TM subjects (Abrams, 1977), performance was separately evaluated for subjects (N = 25) who had been rated as mentally alert and active by nursing home staff at the time of pretest. Group means for these subjects after adjusting for pretest scores were 7.79 for TM, 4.26 for mindfulness training, 5.78 for relaxation, and 3.26 for no-treatment. For the alert subjects, treatment effects were apparent only for TM, by comparison to no-treatment (F(1,21) = 10.7, p<.002), to all other groups (F(1,21) = 8.85, p<.002), and to mindfulness training (F(1,21) = 6.54, p<.025). Repeated measures analysis showed no interaction effect (trial x group) indicating that the requirement of homogeneity of regression lines for analysis of covariance of the combined scores had
FIG. 1. ASSOCIATE LEARNING SCORES (DIFFICULT WORD PAIRS ONLY) AMONG THE ELDERLY INITIALLY RATED AS ALERT (N=29). Adjusted group means on each of three trials covarying for pretest levels, after three months' practice of their randomly assigned experimental programs. (TM = the Transcendental Meditation program, MF = mindfulness training, MR = mental relaxation, and NT = no-treatment.)

been satisfied. Adjusted group means for these alert subjects on each of the three Associate Learning trials showing higher retention for TM subjects across trials are illustrated in fig. 1.

**Word Fluency:** Word Fluency scores were higher for TM ($F(1,52)=2.89, p<.05$) and mindfulness training ($F(1,52)=6.08, p<.01$) than for no-treatment. Mindfulness training also scored higher than relaxation subjects ($F(1,52)=3.74, p<.05$) and the other three groups combined ($F(1,52)=4.45, p<.05$, two-tailed).

**Cognitive flexibility—Overlearned Verbal Task:** The TM group performed better than the other groups combined ($\chi^2=7.62, p<.005$) and individually better than relaxation ($\chi^2=7.18, p<.005$) and no-treatment ($\chi^2=5.30, p<.025$). There was also a trend for TM to perform better than mindfulness ($\chi^2=2.50, p<.06$) (fig. 2).

**Cognitive flexibility—Stroop Color-Word Interference Test:** Greater reduction in interference scores (fig. 3) was found for TM than for the other three groups combined ($F(1,40)=2.98, p<.05$), and a trend for greater reduction with TM than with each of the other groups separately (MF: $F(1,40)=1.77, p<.10$; MR: $F(1,40)=2.25, p<.07$; NT: $F(1,40)=1.96, p<.09$).

**HEALTH**—Adjusted means for systolic blood pressure (posttest levels after covarying for pretest levels) and proportion of subjects improved in systolic blood pressure after three months, mean mental health ratings after 18 months, and survival rates after 36 months are presented for each group in table 2.

**Systolic blood pressure:** Comparison of adjusted group means (fig. 4) showed a greater improvement...
TABLE 2
SYSTOLIC BLOOD PRESSURE, MENTAL HEALTH IMPROVEMENT RATINGS, AND LONGEVITY (SURVIVAL RATE) OF THE ELDERLY FOLLOWING PRACTICE OF ASSIGNED PROGRAM

<table>
<thead>
<tr>
<th></th>
<th>TM</th>
<th>MINDFULNESS TRAINING (MF)</th>
<th>RELAXATION (MR)</th>
<th>NO-TREATMENT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic blood pressure (adjusted means at three months’ posttest)</td>
<td>125.44ax</td>
<td>130.30b</td>
<td>144.99b</td>
<td>135.29</td>
<td></td>
</tr>
<tr>
<td>Systolic blood pressure (% improved)</td>
<td>87.50ax</td>
<td>61.11b</td>
<td>33.33b</td>
<td>60.00</td>
<td></td>
</tr>
<tr>
<td>Mental health improvement rating (means after 18 months)</td>
<td>3.35ax</td>
<td>3.32a</td>
<td>2.86b</td>
<td>2.90b</td>
<td></td>
</tr>
<tr>
<td>Survival rate (% alive after 36 months)</td>
<td>100.00ax</td>
<td>87.50</td>
<td>65.00b</td>
<td>77.27b</td>
<td>62.55</td>
</tr>
</tbody>
</table>

Note: Other = remaining population in the same institutions not assigned to any group (N = 478; not included in statistical contrasts).
a, b. Cells with an "a" represent significantly better outcomes than those with a "b".
x. Cells with an "x" are significantly better than the other cells combined.

for TM than for the other three groups combined ($F(1,55)=3.84, p<.05$) and than for relaxation ($F(1,55)=7.51, p<.005$), with a trend toward better performance than no-treatment ($F(1,55)=1.90, p<.09$); mindfulness training also improved more than relaxation ($F(1,55)=4.24, p<.025$).

Because any reduction in blood pressure in this range is considered of value in reducing risk of cardiovascular disease for the elderly, (WHO/International Society of Hypertension, 1982) an alternative analysis of systolic blood pressure simply in terms of whether or not it improved for each subject over the period of intervention was conducted. More frequent improvement was found for TM (table 2) both as compared with the other groups combined ($\chi^2=6.47, p<.01$), and separately with both relaxation ($\chi^2=9.58, p<.001$) and mindfulness training ($\chi^2=3.03, p<.05$), with a trend also toward more
frequent improvement than for no-treatment ($\chi^2_1 = 2.62, p < .06$).

**Nurses' mental health rating:** Greater improvements were reported for both TM and mindfulness groups as compared to both relaxation (TM: $F(1,56) = 4.31, p < .025$; MF: $F(1,56) = 3.69, p < .05$) and no-treatment (TM: $F(1,56) = 3.59, p < .05$; MF: $F(1,56) = 3.06, p < .05$) respectively. TM subjects also improved more than the other three groups combined ($F(1,56) = 2.84, p < .05$).

**Longevity (survival rate):** The most critical and long-term of all the indices tested is longevity or survival rate, which is illustrated for each group in fig. 5. For this elderly institutionalized population the mortality rate is generally quite high. The survival rate over this 36-month period for the remaining population in the seven homes for which this data was available (N = 478, excluding experimental subjects) was 62.5%. Survival rate was higher for TM (in fact, 100% of the TM subjects were still alive after three years) than for the other groups combined ($\chi^2_1 = 5.61, p < .01$), than relaxation ($\chi^2_1 = 8.11, p < .005$), and than no-treatment ($\chi^2_1 = 4.92, p < .02$). There were trends toward a higher survival rate for TM than mindfulness ($\chi^2_1 = 2.52, p < .06$) and for the mindfulness group as compared to relaxation ($\chi^2_1 = 2.40, p < .07$).

**PERSONALITY AND SELF-REPORT MEASURES—** Adjusted means (posttest scores after covarying for pretest scores) for anxiety (STAI A-Trait), depression (SDS), and internal locus of control (LOC I-scale), together with means for each subject evaluation of treatment scale, and proportions of subjects finding their program valuable, willing to recommend it, and practicing regularly, are presented for each group in table 3.

**Trait anxiety and depression (STAI A-Trait and SDS):** Analysis of adjusted group means showed no difference among the four groups either for trait anxiety ($F(3,47) = .17, NS$) or for depression ($F(3,45) = .46, NS$).

**Internal Locus of Control (LOC I-scale):** The mindfulness group scored higher than the other three groups combined ($F(1,46) = 11.01, p < .002$, two-tailed) and separately (TM: $F(1,46) = 4.61, p < .05$, two-tailed; MR: $F(1,46) = 4.92, p < .025$; NT: $F(1,46) = 14.17, p < .0005$). There was also a trend toward TM scoring higher than the no-treatment group ($F(1,46) = 2.61, p < .06$).

**Subject evaluation of treatment—general outcome:** For these items, posttesting subjects were asked how they "generally feel these days" as compared to three months ago (i.e., before assignment to their program).

The TM group reported feeling less "old" than no-treatment ($F(1,40) = 3.94, p < .05$), and there was a trend (see footnote 3) for the TM group to feel less "old" than the other three groups combined ($F(1,40) = 1.72, p < .10$). The TM group also reported being better "able to cope with inconvenience" than the other three groups combined ($F(1,38) = 3.96, p < .05$), than relaxation ($F(1,38) = 3.85, p < .05$), and than no-treatment ($F(1,38) = 4.45, p < .05$). Similarly, the TM group reported feeling less "impatient with others" than the other three groups combined ($F(1,39) = 2.97, p < .05$) and than no-treatment ($F(1,39) = 4.02, p < .05$), and there was a trend for TM subjects to feel less impatient than mindfulness subjects ($F(1,39) = 1.78, p < .10$). Group means for these items (relating to aging and flexibility) are illustrated in fig. 6.

There were no differences between groups on other general outcome items which concerned quality of

![FIG. 5. PERCENTAGE OF THE ELDERLY (M = 80.7 YEARS; N = 77) STILL ALIVE 36 MONTHS AFTER LEARNING THEIR RANDOMLY ASSIGNED EXPERIMENTAL PROGRAM AS COMPARED TO THE SURVIVAL RATE FOR THE REMAINING POPULATION IN THE SAME INSTITUTIONS (N = 478). (TM = the Transcendental Meditation program, MF = mindfulness training, MR = mental relaxation, NT = no-treatment, and RP = remaining population in the same institutions.)](image-url)
TABLE 3
PERSONALITY AND SELF-REPORT SCORES FOR THE ELDERLY AFTER THREE MONTHS' PRACTICE OF ASSIGNED PROGRAM

<table>
<thead>
<tr>
<th></th>
<th>TM</th>
<th>MINDFULNESS TRAINING (MF)</th>
<th>RELAXATION (MR)</th>
<th>NO-TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety (STAI A-Trait)</td>
<td>37.59</td>
<td>36.32</td>
<td>36.65</td>
<td>36.26</td>
</tr>
<tr>
<td>Depression (SDS)</td>
<td>34.66</td>
<td>34.03</td>
<td>33.33</td>
<td>35.86</td>
</tr>
<tr>
<td>Locus of Control (I-Scale)</td>
<td>21.60&lt;sub&gt;b&lt;/sub&gt;</td>
<td>23.81&lt;sub&gt;a&lt;/sub&gt;&lt;sup&gt;x&lt;/sup&gt;</td>
<td>21.53&lt;sub&gt;b&lt;/sub&gt;</td>
<td>19.93&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

Subject evaluation (means)

—General outcome:

Feeling less (1)/more (7) "old" 3.65<sub>a</sub> 3.92 4.33 5.20<sub>b</sub>

Less (1)/more (7) able to cope with inconvenience 5.06<sub>a</sub> 4.58 3.89<sub>b</sub> 3.80<sub>b</sub>

Less (1)/more (7) impatient with others 2.75<sub>a</sub> 3.58 3.30 4.00<sub>b</sub>

—After each practice:

Better (1)/worse (7)* 2.44<sub>a</sub> 3.25<sub>b</sub> 3.64<sub>b</sub>

Relaxed (1)/tense (7) 2.00<sub>a</sub> 3.00<sub>b</sub> 2.60

More (1)/less (7) alert* 3.44 3.24 3.93

—During each practice:

Bored (1)/interested (7)* 5.67<sub>a</sub> 3.53<sub>b</sub> 3.57<sub>b</sub>

Better (1)/worse (7) 2.62 3.42 3.20

More (1)/less (7) alert 3.00 3.33 3.70

—Overall evaluation (%):

Felt program valuable to themselves 75.00<sub>a</sub> 38.46<sub>b</sub> 40.00<sub>b</sub>

Would recommend to others 87.50 76.92 60.00

Practiced regularly* 80.00<sub>a</sub> 47.62<sub>b</sub> 47.37<sub>b</sub>

*a, b. Cells with an "a" represent significantly better outcomes than those with a "b".

x. Cells with an "x" are significantly better than the other cells combined.

activity, appreciation of self or environment, having new ideas, or feeling bored with life, although there was a trend for TM subjects to feel less "bored with life" than relaxation subjects (F(1,39) = 2.43, p < .07).

Subject evaluation—immediate outcome: In these three items, subjects were asked how they felt immediately after practicing their 20-minute program as compared to immediately before.

The TM group reported feeling "better" more than the mindfulness (F(1,43) = 3.00, p < .05) and relaxation groups (F(1,43) = 6.61, p < .01). Transcendental Meditation subjects also reported feeling more "relaxed" than mindfulness subjects (F(1,34) = 4.59, p < .025) and than both mindfulness and relaxation groups combined (F(1,34) = 3.92, p < .05). There were no differences among groups on the alertness item.

Subject evaluation—experience during practice: In these three items subjects were asked how they felt during the practice compared to immediately before.

The TM group reported feeling more "interested" (less "bored") than mindfulness (F(1,43) = 8.86, p < .005) or relaxation groups (F(1,43) = 8.59, p < .005). There was also a trend for the TM group to feel "better" than mindfulness subjects (F(1,32) =
2.84, \( p<.06 \), and more “alert” than either relaxation subjects (\( F(1,33)=2.46, p<.07 \)) or mindfulness and relaxation groups combined (\( F(1,33)=1.78, p<.10 \)).

Subject evaluation—overall: More TM subjects reported their program was “valuable” to them than mindfulness (\( \chi^2=3.95, p<.025 \)) or relaxation subjects (\( \chi^2=3.19, p<.05 \)) (fig. 7).

Also, there was a trend for more TM subjects to recommend their program to others than for relaxation subjects (\( \chi^2=2.62, p<.06 \)). Because no differences in regularity between groups were found among those subjects attending for posttest (as noted earlier), this factor could not have differentially influenced outcomes on other variables. However, a practical consideration, independent of performance on outcome measures, is whether each program is self-maintaining, as indicated by degree of regular practice of all subjects (including those which did not posttest). When regularity of practice of each procedure was assessed including surviving subjects who did not posttest, more TM subjects practiced regularly (i.e., at least once per day on average through the treatment period) than either mindfulness (\( \chi^2=4.64, p<.025 \)) or relaxation subjects (\( \chi^2=4.51, p<.025 \)).

Also, fewer subjects in the TM group (10%) stopped practicing (i.e., not more than two sittings in the third month of treatment) than in either the mindfulness group (38%; \( \chi^2=4.39, p<.025 \)) or the relaxation group (47%; \( \chi^2=6.72, p<.005 \)). No other planned contrasts were significant.

### DISCUSSION

The results are consistent with the predictions derived from Vedic Psychology (hypothesis 3). Independent of relaxation, expectation, or contextual factors, the Transcendental Meditation program was particularly effective in reversing declines in psychological and physiological functioning in the elderly in comparison to the other treatment conditions.

For the TM group, improvements were indicated by—increased flexibility in producing correct responses on the simple (OVT) and complex (CWIT) cognitive tasks and on the paired-associate learning task (particularly among alert subjects on the latter); greater longevity (higher survival rate after three years); two indicators of lowered blood pressure; and enhanced mental health according to nurses’ rating, all in comparison to one or more of the three other
groups. Also, TM subjects reported becoming less impatient with others, better able to cope with inconvenience, feeling less "old," and possibly less "bored with life" after three months' practice of TM in comparison to one or more of the other groups. The TM group reported feeling more interested (and possibly more alert) during their procedure, and more relaxed and better immediately after their practice, than did the relaxation and mindfulness subjects. The active thinking procedure did appear to influence alertness to some degree but, as predicted, its effects were less general and marked than those of TM. This group scored higher on internal locus of control and like TM improved on nurses' rating of mental health, word fluency, and to a lesser degree on one measure of blood pressure, with a trend on longevity, in comparison to relaxation and/or no-treatment groups. Overall, more TM subjects reported their program as personally valuable than did the members of other programs.

Similar improvements were observed across all three treatment conditions on dementia (DST) score (and to some degree, when nonalert subjects are included, on paired-associate learning) which therefore may be ascribed to some combination of non-treatment-specific influences (twice daily sitting with eyes closed, expectation of benefit, attention from instructors, etc.). Lack of improvement by relaxation subjects on any of the other variables where TM (or mindfulness) subjects improved is in conflict with the expectancy hypothesis (hypothesis 1). According to this view, the three treatment programs, being matched for time spent sitting with eyes closed and all expectation fostering features, should have yielded similar results in contrast to the no-treatment group. This is clearly not the case. No differences among the groups were found as to expectancy of benefit or subjects' rating of instructors for competence or likeability, yet different patterns of change were found with each treatment.

According to the "relaxation" hypothesis (hypothesis 2), TM and relaxation programs should have given rise to similar benefits and they did not. Moreover, according to this view, these two groups should have been more similar to each other in their consequences than to the "nonrelaxing" mindfulness training program. In fact, while reporting themselves less relaxed after the practice than did TM (and possibly relaxation) subjects, the mindfulness subjects experienced greater benefits than the relaxation group. Also, contrary to the relaxation prediction, the consistent benefits associated with Transcendental Meditation contrasted most with the null findings for relaxation.

It could be argued that the relaxation program used in the present study may not have been fully representative or as effective as other available relaxation programs. However, the relaxation procedure does very closely conform to the requirements claimed by Smith (1976, p. 635) and others to be the important components of TM. Also, both initial ratings of expectancy of benefit and posttest ratings of teacher competence and likeability, as well as the non-treatment-specific improvements on the Dementia Screening Test, were as high for relaxation as for TM and mindfulness groups. Hence, differences between relaxation and TM cannot be attributed to non-treatment-specific or extrinsic influences (e.g., expectancy of benefit or exposure to instructor).

A recent metastudy comparing the effects of all meditation and relaxation procedures represented in the current research literature (Eppley, Abrams, and Shear, in press) found, on the basis of statistical power analysis, greater and more consistent reductions in trait anxiety across all age groups through the practice of TM than with relaxation or other meditation programs, after controlling for a range of potential confounds, including expectancy of benefit, regularity of practice, and experimenter bias.

In terms of the comparative effectiveness of the TM technique and relaxation programs, the present study is consistent with the metastudy findings. On the other hand, the lack of any difference on the measures of trait anxiety and depression between experimental and control groups in the present study may be due to the fact that at pretest subjects in all groups were already better than the norm for anxiety (Spielberger et al., 1970) and near to the norm for depression (Zung, 1965) for even the (younger) general population, in contrast to the great majority of subjects in studies covered by the metastudy.

It is apparent from the results of the present study and those reviewed by Eppley et al. (in press), that an explanation of TM based on relaxation alone is not sufficient. We have proposed a model that also includes the element of refinement or vertical expansion of awareness ("transcending"), in order to account for TM subjects' differential improvements in cognitive alertness, flexibility, and related variables. Enhanced alertness in this sense of silent inner wakefulness in TM must be understood and assessed as a
state qualitatively distinct from either somatic arousal (being on edge) or simple relaxation. An important implication of the finding of little or no results for the relaxation technique devised for the experiment is that care must be taken in construction or choice of even very simple therapeutic programs (fig. 5).

All of the cognitive measures on which the TM participants differentially improved can be conceptualized in terms of enhanced flexibility or adaptive efficiency; each requires the adjustment of long entrenched cognitive response patterns in favor of new behaviors appropriate to current task demands:

1. The Overlearned Verbal Task involving seemingly spontaneous readjustment of an overlearned response committed to memory several decades before.
2. The Stroop Color-Word Interference Test requiring sustained attention to the inhibition of the reading response acquired early in life in favor of a more novel color-naming response.
3. The Associate Learning Task necessitating the formation and retention of new (rather than familiar) associations in the recall of difficult word pairs.

From the perspective of Vedic Psychology, whereas training in active distinction making takes place on the familiar "horizontal" level of conceptual thought, the more marked and generalized improvements in adaptability associated with TM are attributed to vertical expansion of the range of conscious awareness. This vertical expansion appears to permit access to levels of input and conceptual response not otherwise available to conscious apprehension (Marcel, 1983) so that rigid, unconscious response sets (such as the premature cognitive commitments described by Chanowitz and Langer, 1981) need no longer be enacted and alternative responses can be explored.

The transcendence of all thought and conceptual boundaries during TM—experienced as the state of content-free wakefulness or pure consciousness—is predicted to have an especially broad and "novelizing" influence on subsequent thought and action. This experience is classically described as a state of "inner freedom" and as an incipient field of all possible thoughts and actions (Dillbeck and Orme-Johnson, in press). Like the null set in mathematics (Cohen and Hersh, 1967), it is seen as the basis from which all possible sets (cognitive categories) can be generated, hence promoting a flexibility in cognitive response which is in clear contrast to the experience of rigidity, boredom, and reduced possibilities, particularly among the institutionalized elderly. This increased flexibility and freedom appears to be experienced in terms of effortless attunement with the potential inherent within the self and the environment (Orme-Johnson et al., in press) rather than in terms of gaining a willful sense of control over the self and the environment. Though there was a trend suggesting a higher score by the TM group than the no-treatment group on Levenson's scale, the TM subjects may have perceived changes in their behavior more in terms of increased spontaneity and adaptive efficiency rather than in terms of the more willful sense of control measured by this scale.

It has also been conjectured that the quality of restful alertness attained during TM is a particularly efficient basis for release of stresses that underlie maladaptive and rigid response patterns and impede this expanded value of awareness, (e.g., Bloomfield et al., 1975; Eppley et al., in press). Our discussion has emphasized the role of enhanced alertness and expansion of conscious awareness (as opposed to rest alone in TM) due to its particular relevance for the elderly and because of the frequent lack of recognition of the centrality of expansion of awareness to the effects of TM. In fact, refinement of awareness during TM appears to allow, and directly correspond to, progressive de-excitation of metabolic activity such that, during the qualitatively distinct periods of pure consciousness in TM, indicators of maximal alertness (e.g., near maximum EEG coherence) correspond with profound values of rest (e.g., apparent breath suspension and absence of phasic GSR: Farrow and Hebert, 1982). It would appear to be on this basis that Vedic Psychology proposes that it is this qualitatively different state of restful alertness (as opposed to rest alone) that accounts for the distinctive effects of TM.

Interestingly, this vertical expansion of awareness in TM is reflected not only in increased cognitive flexibility but also in the improvements of TM subjects specifically on those self-report items most related to behavioral flexibility: becoming less impatient with others and better able to cope with inconvenience. Enhancement of flexibility in the functioning of consciousness may contribute in a fundamental way to the reversal of age-related physiological declines observed in earlier studies (Wallace et al., 1982;
Toomey et al., in press) and indicated in the present study by lowering of systolic blood pressure (reduced physiological rigidity) and in the report by TM subjects that they felt less "old." The physiological correlates of this experience in TM and its relationship to aging are also beginning to be understood. Increased cortical blood flow (Jevning et al., 1978) and frontal EEG phase coherence (Orme-Johnson and Haynes, 1981), both associated with this state, have also been correlated with greater cognitive flexibility and younger age. The present study is consistent with and extends this earlier research in that it gives direct evidence under controlled experimental conditions that not only physiological (blood pressure), but also cognitive age-related declines may be reversed with TM, even in the advanced aged.

The lower dropout rate and greater regularity of TM subjects together with subjects' reports (table 3) that TM was more interesting, left them feeling better afterwards, and was more valuable overall for themselves suggest that the TM program is subjectively more rewarding and therefore more self-maintaining than either the relaxation or the effortful mindfulness training program (when nonposttesting subjects are included). (Regularity was equivalent among groups, and therefore not a confounding variable, for those subjects attending posttest.) Quite apart from a program's effectiveness, this element of subjective appeal is essential for regular practice to be maintained and any benefit derived. The contrast between the effects of TM and those of other groups, presumably, may also have been more extreme if nonposttesting subjects (who were less regular in practice) had been included, since fewer TM subjects overall were irregular (see footnote 3).

The most striking finding of this study suggests that TM may not only reverse age-related declines but directly enhance longevity. All TM subjects were alive after three years, in contrast to other groups initially equivalent in age and physiological and psychological health. Although, for assessment of survival rate, group sizes are relatively small, the 62.5% survival rate of the baseline population (N = 478) suggests that the rates for the other experimental groups tended to be, if anything, above that for the general population of institutionalized elderly, yet the survival rate for the TM group was still clearly higher than for the other groups.

Traditionally, as the carriers of their culture and its knowledge base, elders provided a vital leadership role in the community. More recently, older people have lost much of their role as disseminators of culture and their advisory capacity in the household, due in part to the information explosion and their lack of ability to adapt in a rapidly changing society.

The Transcendental Meditation program may fill an especially vital role in safeguarding and enhancing the adaptability, lucidity, and longevity of the elderly, and hence restore to society an enormous resource in the experience, wisdom, and balanced perspective which should be the special contribution of older people to the community.

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