THE TM-SIDHI PROGRAMME AND AGE-RELATED PSYCHOLOGICAL VARIABLES

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Length of time practising the TM-Sidhi programme was found to be predictive of higher scores on seven age-related psychological tests measuring visual memory, creativity, field independence, perceptual speed, motor speed, reaction time, and non-verbal intelligence. Furthermore, length of practice was found to be a predictor of a younger functional age, as compared to chronological age, indicating that the Transcendental Meditation and TM-Sidhi programme produces changes in the opposite direction to those which usually occur with the ageing process.—EDITORS

As part of a continuing study, age-related psychological tests were administered to subjects practising the Transcendental Meditation and TM-Sidhi programme. Data was analysed for 147 of the subjects who took seven group administered tests, and for 86 of this group who were also given six individually administered tests.

Multiple regression analyses showed that:
a) when age, education, and sex are held constant, partial regression coefficients for length of practice of the TM-Sidhi programme significantly predicted better scores on several of these tests measuring visual memory, creativity, field independence, perceptual speed, motor speed, reaction time, and non-verbal intelligence;
b) age predicted poorer scores on all the above tests except for creativity.
c) A measure of functional age was calculated separately for both the group tests only, and all the tests together. When chronological age was subtracted from functional age, and age and sex were held constant, months of practice of the TM-Sidhi programme was a significant predictor of this difference in a younger direction.

These results, which are valid irrespective of control data, provide additional support for the hypothesis that the Transcendental Meditation and TM-Sidhi programme produces change in an opposite direction to that normally occurring with ageing.

INTRODUCTION

Clements and Clements (1980) reviewed the research on the Transcendental Meditation and TM-Sidhi programme in terms of the ageing process, and found a) that a number of variables which normally deteriorate with ageing are found to change in the opposite direction as a result of Transcendental Meditation, and b) Transcendental Meditation improves factors known to be associated with longevity.

A study which investigated the hypothesis that the Transcendental Meditation and TM-Sidhi pro-
programme can produce a reversal of the ageing process was carried out by Wallace et al. (1982), who used an index of 'biological' age constructed from hearing threshold, near point of vision, and systolic blood pressure (Morgan's Adult Growth Examination). Wallace et al. found a significant correlation between length of practice of the Transcendental Meditation and TM-Sidhi programme and the difference between biological and chronological age (in a younger direction), providing some direct evidence to support the hypothesis. Very similar findings were reported by Toomey et al. (in press).

This paper presents initial findings from a continuing study into the effects of the Transcendental Meditation and TM-Sidhi programme on age related psychological variables.

The findings presented here are primarily concerned with the TM-Sidhi programme. Future reports will present results on subjects practising only the Transcendental Meditation technique.

METHOD

SUBJECTS—To date 147 subjects practising the Transcendental Meditation and TM-Sidhi programme, have returned a questionnaire requesting biographical data and have taken seven group administered tests. Eighty-six of these have also completed six individually administered tests. Due to the wide difference in numbers between these two categories, they were treated separately for analysis.

The first category consisted of 82 males and 65 females, mean age 465 months (range 236 to 944 months), with a mean length of practice of the Transcendental Meditation technique of 104 months, and of the TM-Sidhi programme 44 months.

Of the subjects who took all the tests 47 were males and 39 females. The mean age was 476 months, (range 244 to 944 months), the mean length of practice of the Transcendental Meditation technique 107 months, and of the TM-Sidhi programme 46 months.

All subjects were in good health.

ANALYSIS—A. Multiple regression analyses were performed on the data gathered. The following measures were used as independent variables, with each test variable being used as the dependent variable in successive analyses:

1. Age (months)
2. Sex (Male = 1, Female = 0)
3. Educational level (number of years formal education since age of ten)
4. Length of practice of the TM-Sidhi programme (months)

Multiple regression analysis enables the effect of each of the independent variables to be seen when all the other independent variables are held constant (Kerlinger and Pedhauzer, 1973). In the present context it was used to investigate the significance of the relationship between variables, rather than to discover the factors which would maximally predict the dependent variables.

The number of months of practice of the TM-Sidhi programme was examined for exploratory purposes to see if there were any linear relationships of the programme with the dependent variables which could be studied more closely in future longitudinal work. Length of practice of the TM-Sidhi programme was chosen in preference to the length of practice of the Transcendental Meditation technique for variable 4, because it reflects a much stronger influence of the TM-Sidhi programme. However, it should be noted that this measure includes the effects of previous and continuing practice of Transcendental Meditation.

B. Secondary analyses based on a suggestion by Webster and Logie (1976) were conducted. These authors show that a measure of 'functional' age can be obtained from age-related measurements on a large sample, and that the difference between this measure and chronological age can then be used to explore the data further.

The method involves a stepwise multiple regression using chronological age as the dependent variable, and the test scores as independent variables (taking care to avoid multicollinearity). For the present data this was terminated at the point before which the t-value for the last regression coefficient to be added was not significant.

The resulting formula was then used to compute each subject's predicted (i.e. functional) age. If the functional age was greater than the chronological age, then that subject showed greater ageing relative to other people in the sample in terms of the variables.
used. In the present study chronological age was subtracted from predicted age, and thus negative values were indicative of a younger functional age than chronological age.

The difference variable was then examined with respect to the number of months of practice of the TM-Sidhi programme.

This procedure was followed for data taken from the group tests only, and all the tests taken together.

INSTRUMENTS—For brevity only the tests for which the number of months of practice of the TM-Sidhi programme was a significant predictor (Section A), in addition to those used in computing functional age (Section B), are described below.

SECTION A

NON-VERBAL INTELLIGENCE—The Picture Arrangement Test from the Wechsler Adult Intelligence Scale (Wechsler, 1955) was administered and scored according to the standard instructions.

VISUAL MEMORY—This consisted of a slightly modified version of the Shape Memory Test from the Kit of Factor Referenced Cognitive Tests (Ekstrom et al., 1976). The test was in two parts. Each part included two minutes to study a page of meaningless shapes, and 40 seconds to indicate whether 16 samples were contained in the study page or not. The score was the number of problems correctly answered minus the number incorrectly answered.

CREATIVITY—Five minutes was given for subjects to list as many unusual uses as they could for cardboard boxes. This is the same task used in the Torrance Tests of Creative Thinking, Verbal Form A (Torrance, 1974). Fluency, flexibility, and originality tend to be highly intercorrelated, and to simplify scoring only fluency (the number of ideas generated) was used.

FIELD INDEPENDENCE—The measure of field independence used was adapted from the Kit of Factor Referenced Cognitive Tests (Ekstrom et al., 1976).

Five simple figures were presented at the top of each page, and a letter was printed below each of 24 complex figures indicating which simple figure could be located within it. The task was to draw the simple figure over the lines of the complex figure, and the score was the number of problems correctly completed in five minutes.

REACTION TIME—The apparatus for a simple reaction time experiment consisted of four lights arranged in a square which lit one at a time in a random sequence. At a random interval from the beginning all four lights lit together, and the subject had to press the button as quickly as possible. The average response time (milliseconds) from ten experimental trials was used.

PERCEPTUAL SPEED—Adapted from the Kit of Factor Referenced Cognitive Tests (Ekstrom et al., 1976), this required subjects to match a key object with sample objects. Eighty seconds were allowed for the test, the score being the number of problems correctly completed.

MOTOR SPEED—This measure was a simple motor task adapted from Botwinick and Storandt (1973) which involved putting a horizontal line through as many vertical lines as possible in thirty seconds.

SECTION B

CRITICAL FLICKER FUSION—Four stimulus lights arranged in a square automatically increased in the rate of flicker at the rate of 1Hz per second. When the subject pressed a button to indicate that the lights had ceased to flicker, a descending sequence was followed which was ended by the subject pressing a button when he first noticed that the lights started to flicker. The average of three ascending and three descending trials to the nearest tenth of a Hz was taken as the score. The decline in sensitivity in tasks of this nature that is usually found with ageing is hypothesized to be due to central factors related to the time taken to ‘clear’ a stimulus from the nervous system, in addition to the more obvious deteriorations in peripheral functioning (Botwinick, 1978).

NON-VERBAL INTELLIGENCE—The Digit Symbol Test from the Wechsler Adult Intelligence Scale (Wechsler, 1955) was group administered and scored according to the standard instructions.

MOTOR SPEED—The first measure was the time taken to sort a pack of cards into two piles—those which had ‘A’ printed on them and those which had ‘B’ printed on them. The second variable used was the ‘Psychomotor Speed’ variable taken from the
Opposites Test of the Test of Behavioral Rigidity (Schaie and Parham, 1975). The first two sections of this test involve subjects writing firstly antonyms and then synonyms to simple words. The number of correct answers to each section combined was the speed measure.

FLEXIBILITY—Two measures which have been related to flexibility were used. The Opposites Test from the Test of Behavioral Rigidity (Schaie and Parham, 1975) yields two flexibility scores, which were averaged to avoid a ceiling effect in one of them (R1) and reduce the number of variables. The Stroop Test was also administered according to the specifications of Comalli et al. (1962). This involves reading aloud as quickly as possible the contents of three cards. The first card contains names of the colours red, blue, and green, printed in a random order, while the second card is composed of squares of the same colours. The third card consists of the above colour names written in a different colour to the name. The time taken in seconds to complete each card is the score.

The Stroop Test, Picture Arrangement, Reaction Time, Critical Flicker Fusion, and Card Sorting measures were all administered individually, and the rest were group-administered.

RESULTS

Table 1 presents details of the equations for which length of practice of the TM-Sidhi programme (in months) was a significant predictor.

It can be seen that the multiple correlations for all the equations are very significant. Age was a significant predictor of poorer score on six of the seven variables.

Months of practice of the TM-Sidhi programme was a significant predictor on seven tests, measuring visual memory, field independence, non-verbal intelligence, creativity, reaction time, perceptual speed, and motor speed. (Further analyses indicated that this was not due to the variable acting as a 'suppressor'.)

Education was a significant predictor of performance on tests measuring creativity, field independence, and perceptual speed, while sex was not a significant predictor of any of the variables, although there was a trend to significance in some cases.

FUNCTIONAL AGE ANALYSIS—The stepwise multiple regression for all the tests taken together yielded the following equation to predict chronological age, with a multiple R of .81 and an R² of .65 ($p < .01$) (all the regression coefficients were significant):

$$\text{Chronological age (months)} = 1021.92 - 0.14 (\text{Critical Flicker Fusion}) + 11.53 (\text{Card Sorting speed}) - 2.28 (\text{Flexibility, Opposites Test}) - 6.77 (\text{Picture Arrangement}) - 5.85 (\text{Card 1, Stroop Test}) + 7.31 (\text{Card 2, Stroop Test}).$$

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<thead>
<tr>
<th>TABLE 1</th>
<th>MULTIPLE REGRESSION ANALYSES</th>
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<tr>
<td>DEPENDENT VARIABLE</td>
<td>Y-INTERCEPT</td>
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<td>Age</td>
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<td>Raw weight</td>
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<td>Shape Memory</td>
<td>15.68</td>
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<tr>
<td>Hidden Figures</td>
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<td>Fluency</td>
<td>9.60</td>
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<td>Line Crossing</td>
<td>82.76</td>
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<tr>
<td>Perceptual Speed</td>
<td>34.98</td>
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<td>GROUP ADMINISTERED (N = 147)</td>
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<td>INDIVIDUALLY ADMINISTERED (N = 86)</td>
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* Note that in the case of reaction time, negative regression coefficients are indicative of a shorter reaction time, i.e. faster reactions.

*p < .05  **p < .01  ***p < .001
GROUP TESTS ONLY—The stepwise regression for the group tests had a multiple R of .56 and an $R^2$ of .32 ($p < 2 \times 10^{-7}$):

Chronological age (months) = $901.01 - 7.79$ (Perceptual speed) $- 2.93$ (Digit Symbol) $- 2.25$ (Flexibility, Opposites Test) $+ 2.66$ (Psychomotor Speed, Opposites Test).

In both cases number of months of practice of the TM-Sidhi programme showed a significant correlation with a lower (i.e. younger) functional age compared to chronological age (all tests: $r = - .24$, df = 84, $p < .05$; group tests only: $r = - .26$, df = 145, $p < .005$). The partial regression coefficients for this variable were also significant when sex and education were held constant (all tests: $t = - 2.13$, $p < .05$; group tests only: $t = - 3.56$, $p < .001$).

DISCUSSION

The results confirm that, in general, age is predictive of poorer scores on the tests selected. They also show that length of practice of the TM-Sidhi programme is predictive of scores in the opposite direction, even when age, sex and education are held constant. It is interesting that an accompanying analysis of reports of higher states of consciousness found that frequency of clear experiences on the TM-Sidhi techniques was significantly correlated with the digit symbol, fluency, and hidden figures variables, with a trend to significance for visual memory and perceptual speed (Jedrczak, in press, a).

The analysis concerning functional age upholds and adds an extra dimension to these findings. The results need to be treated cautiously due to sample size, and the specific value of regression coefficients can fluctuate quite widely between samples (Kerlinger and Pedhauzer, 1973). They do suggest, however, that the Transcendental Meditation and TM-Sidhi programme is actually producing a reversal of psychological ageing.

This suggestion is supported by the work of Wallace et al. (1982) and Toomey et al. (in press) who found that a younger norm-referenced biological (functional) age in comparison to chronological age, as measured by physiological variables, was related to length of practice of the Transcendental Meditation and TM-Sidhi programme. Presumably the psychological changes are related to differences in physiological functioning, and the interaction between the two could be fruitfully explored.

The results also support the longitudinal increases in field independence, creativity, intelligence, and motor speed found by Orme-Johnson and Granieri (1977) to occur as a result of learning the TM-Sidhi programme. In a pilot study carried out in a different context, which included two of the above measures, we also found that people practising the Transcendental Meditation and TM-Sidhi programme had high levels of creativity (figural fluency, flexibility, and originality, and verbal originality, as measured by the Torrance Tests of Creative Thinking), and field independence, as measured by the Group Embedded Figures Test (Witkin et al., 1971). In the latter case, even with half the normal time of five minutes for each section allowed for the test, the experimental group scored slightly higher than norms (Jedrczak, in press, b).

These results of course only indicate the degree of linear relationship existing between the dependent and independent variables. However, it is highly likely that major effects of the Transcendental Meditation and TM-Sidhi programme cannot be fully evaluated in this fashion.

It has been mentioned before that the TM-Sidhi variable used here obviously incorporates effects of Transcendental Meditation, and indeed previous studies have found that Transcendental Meditation improves performance on variables similar to those measured here, such as non-verbal memory (Pagano and Frumkin, 1977), field independence (Pelletier, 1974), creativity (Travis, 1979), reaction time (Holt et al., 1978), and intelligence (Tjoa, 1975). We will be conducting longitudinal studies to examine experimentally whether, in the context of ageing, the TM-Sidhi programme produces changes over and above those found with Transcendental Meditation as is suggested by previous work and the present findings.

It has recently been suggested (e.g. Botwinick, 1978) that a possible slowing of neural transmission and a decreased signal/noise ratio might be critical factors in the deterioration on speed tasks and a variety of other measures observed to occur with ageing. It may be noted that three of the tests in table 1 are directly related to perceptual motor speed, and Beresford et al. (in press) found a significant positive correlation between EEG beta coherence and perceptual motor speed, a negative correlation between beta coherence and age, and significant increases in beta coherence during the Transcendental Meditation and TM-Sidhi programme. Taken in conjunc-
tion with previous work, these results suggest that a simple increase in the speed of different neural and physiological processes (in addition to an enhanced signal/noise ratio) may be an important contributor to the improvements in performance found to result from the practice of the Transcendental Meditation and TM-Sidhi programme, both in general, and specifically in relation to age-sensitive variables. More direct tests of this hypothesis are clearly desirable.

In conclusion these results, although preliminary, are valid irrespective of control data and it is highly unlikely that the linear relationships found could be accounted for by differential levels of motivation or expectation. The present study has extended the range of variables studied by Wallace et al. (1982) and Toomey et al. (in press) to include psychological measurements, and provides additional support for the hypothesis (Clements and Clements, 1980), that the Transcendental Meditation and TM-Sidhi programme is producing change in the opposite direction to that which normally occurs with the ageing process.

REFERENCES


