Students in a rural Indian high school practising the Transcendental Meditation technique showed improvements in the ability to concentrate, in reading comprehension, and in memory over a six-month period as compared with matched control subjects.—EDITORS

The following is a revised version of the original paper which was presented at the International Conference on 'Veda and Science', Bangalore, India, 25-30 June 1975.

This study was conducted in the rural Indian high schools K.R.S. High School and Srirangapatna High School. Two control groups and one experimental group were selected by matching for this research. The experimental group consisted of 41 students from K.R.S. High School, control group C1 consisted of 40 students from the same high school as the experimental group, while control group C2 consisted of 28 students from Srirangapatna High School. Both boys and girls were included in each group. Students were matched on socio-economic conditions, education, age, sex, and the scores on each test.

Six psychological tests: 1. Raven's Progressive Matrices Test (sets A, B, C, D, E); 2. Letter Cancellation Test; 3. Ballard's Silent Reading Test; 4. Memory Test; 5. Eysenck's Personality Inventory; and 6. H. M. Bell's Adjustment Inventory were administered to all the students of both the schools in preliminary testing. After six months, the selected groups were retested. During this interval, only the students in the experimental group were instructed in the Transcendental Meditation (TM) technique.

It was found that memory, the ability to concentrate, and comprehension improved considerably with the regular practice of the TM technique. The class and sex differences were not significant. Scores on Eysenck's Personality Inventory and H. M. Bell's Adjustment Inventory did not reveal any consistency.

This study, taken together with previous studies in Western schools, shows that the TM technique has a value in educational systems independent of cultural background.

INTRODUCTION

The Transcendental Meditation (TM) technique is a simple, natural, effortless, and enjoyable procedure which brings about significant and spontaneous changes in physiological and psychological functions. Dr. R. K. Wallace in his address "Neurophysiology of Enlightenment" at the 26th International Congress of Physiological Sciences, New Delhi, India, on 20 October, 1974 (37) explained that the TM technique, by expanding individual consciousness, allows the unmanifest potentialities of man to be fully expressed (2, 9, 13, 33).

The scientific studies completed in the Western world on the TM technique have shown that many psychological functions such as intelligence (31, 32), learning (1, 20), memory (1, 21), ability to concentrate (38), personality (25, 28, 30), and adjustment (29, 30) improve to a very great extent with the regular practice of the TM technique. On the other hand, marked decreases in emotional instability (3, 23), depression (27), irritability (15, 27), anxiety (7, 19, 22, 35), and domination (10, 11)
have been shown to occur. In addition, the TM technique prevents mental illness (18, 26, 36) and preserves mental health (4, 8, 12, 31). Thus it has a therapeutic value.

Further studies have shown that the practice of the TM technique enables the individual to better adjust to his physical and social environment (5, 24).

We know that the academic achievement of the student depends largely on intelligence, ability to learn, memory, concentration, comprehension, and adjustment. The authors of this report have studied the effect of the TM technique on these psychological functions.

Before the execution of this project, both the authors were instructed in the TM technique, so that the results of the investigation could be interpreted better in the light of their personal experiences.

METHOD

SUBJECTS—Two higher secondary schools with a rural background were chosen for this study:

(a) K.R.S. Higher Secondary School (total strength = 250)
(b) Srirangapatna Higher Secondary School (total strength = 600)

Both are co-educational institutions. The socio-economic background and the educational level of the parents of the students of both the schools were almost the same.

From the K.R.S. Higher Secondary School, two groups of subjects were selected:

1. Experimental group E (subjects practicing the TM technique) —This group consisted of 41 students studying in VIII, IX and X standards. From each standard, both boys (N = 21) and girls (N = 20) were selected. The total number of boys and girls of this group were 21 and 20. The average age was 15 years in both sexes. These subjects belonged to a lower socio-economic group of low scale. The educational level of the parents of these subjects ranged from illiteracy to higher secondary education. Subjects in this group volunteered to practice the TM technique.

2. Control group C1 (subjects not practicing the TM technique) —This internal control group was also chosen from the K.R.S. Higher Secondary School. The number of subjects varied from 37 to 41 from test to test. This variation in number was unavoidable. These subjects were matched with the experimental group on age, sex, socio-economic condition, education of the parents, and the scores obtained on each test used for the study.

3. Control group C2 (subjects not practicing the TM technique) —This external control group was chosen from Srirangapatna Higher Secondary School to avoid the possibility of the mutual influence of experimental and control group (C1) from the K.R.S. Higher Secondary School. This group was also matched with the experimental group on age, sex, etc. The total number of subjects was 28 of which 14 were boys and 14 were girls.

PSYCHOLOGICAL TESTS—Six tests were used to study the effects of the practice of the TM technique on the following psychological functions: 1) intelligence; 2) concentration of attention; 3) comprehension; 4) memory; 5) personality; and 6) adjustment:

1. Raven’s Progressive Matrices (RPM) sets A, B, C, D, E (nonverbal culture-fair test of intelligence)
2. Letter Cancellation Test—to study the ability to concentrate
3. Ballard’s Silent Reading Test—to study comprehension
4. Two lists of meaningful, simple Kannada words of equal difficulty, 50 words in each list—to study memory
5. Eysenck’s Personality Inventory (EPI)—to study extroversion-introversion dimension and neurotic dimension of personality (same norms are used)
6. H. M. Bell’s Adjustment Inventory—to study adjustments in: (a) home, (b) health, (c) social behavior, and (d) emotion (same norms are used)

Note: tests no. 3, 5, and 6 had been rendered into Kannada language.

PROCEDURE

PRETESTING—All the students of K.R.S. Higher
Secondary School were administered the following six tests in the second week of August 1974:

1. Raven’s Progressive Matrices (RPM): This test was a nonverbal culture-fair test. There were five subtests in it. The test had no time limit. It was administered as per the instructions given in the test manual. The score was the total number of correct answers given by the subject.

2. Letter Cancellation Test: The subjects were instructed to cancel out some letters according to the instructions given in the data sheet. The time limit was three minutes. The score was the total number of letters correctly cancelled out.

3. Comprehension Test: The Kannada version of Ballard’s Silent Reading Test was administered. The subjects were instructed to read each passage and write the answer in the respective blank of the answer sheet. They were asked to answer accurately and as fast as possible. The time limit was ten minutes. The score was the total number of correct answers given by the subject.

4. Memory Test (recall test): List A was presented orally at the rate of two seconds a word. This list was presented five times with an interval of five seconds after each presentation. At the end of the fifth presentation, a five-minute distraction period was introduced. During this period, the subjects were asked to solve simple mathematical problems. Soon after the distraction period, they were asked to reproduce the words from the list, within a period of ten minutes. The score was the number of words correctly reproduced.

5. Eysenck’s Personality Inventory (EPI): The Kannada version of this test was administered according to the instructions given in the manual. Scoring and classification were made as per the manual.

6. H. M. Bell’s Adjustment Inventory: This test was administered, scored, and classified according to the instructions given in the manual.

Following the same procedure, the pretesting was made at the Srirangapatna Higher Secondary School for the selection of control group C2 in the first week of September 1974. The total number of subjects matched was 28. The matching basis has already been explained.

INSTRUCTION IN THE TRANSCENDENTAL MEDITATION TECHNIQUE—After the pretesting was over, the 41 students of K.R.S. Higher Secondary School (experimental group) were instructed in the TM technique by a trained teacher, Mrs. Dwarakanath, of Maharishi Institute of Creative Intelligence, Bangalore.

A short-term course was also given to provide an intellectual understanding of the range and application of the TM technique.

These students practiced the TM technique regularly, twice a day, under the supervision of the Headmaster of K.R.S. Higher Secondary School, Mr. Narasimhaiah, who also regularly practices the TM technique.

The other two groups, i.e. control group C1 and control group C2, were not instructed in the TM technique nor were they informed that they would be retested after six months.

POSTTESTING—Six and a half months after pretesting, in the second week of March 1975, the experimental group and the control group C1 of K.R.S. Higher Secondary School were retested. Control group C2 of Srirangapatna Higher Secondary School was retested in the first week of April 1975.

The results were statistically analyzed and compared class wise, sex wise, etc., on each test between the experimental group and the control groups. Only a brief report is given here.

RESULTS

Results of table 1 reveal that all the three groups showed an increase in the scores on the intelligence test, with the increase being more in the case of the experimental group, although not statistically significant (cf. fig. 1). This gain was more in the case of girls than in the case of boys, irrespective of their age and class. Further, it was observed that the VIII and X standard students showed a greater gain than the IX standard students on the intelligence test.

In table 2 it is shown that all three groups improved in the ability to concentrate within the lapse of six months. But the increase in the ability to
concentrate on the task assigned was more with the experimental group than with the control groups. The critical ratio for the difference in the mean gain of the experimental group and the control group C 1 was not statistically significant, but the difference in gain between experimental group and control group C 2 was significant beyond the .01 level (cf. fig. 2). Further analysis of the results reveals that there was no sex difference in the benefit gained by the experimental group. Classwise results reveal that the VIII standard students benefited more than the IX and X standards.

In table 3 it is shown that the gain in comprehension of the experimental group was five times more than both control groups compared separately. The critical ratio for the obtained mean differences between experimental group and control group C 1 , and the experimental group and the control group C 2 , were both significant at the .01 level (cf. fig. 3).

<p>| TABLE 1 | MEAN SCORES OF EXPERIMENTAL AND CONTROL GROUPS 1 &amp; 2, IN PRETESTING AND POSTTESTING ON RPM TEST |
|---|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>S. No.</th>
<th>GROUP</th>
<th>N</th>
<th>MEAN SCORES</th>
<th>MEAN DIFFERENCE</th>
<th>S.E.</th>
<th>C. R.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experimental</td>
<td>41</td>
<td>28.34</td>
<td>30.88</td>
<td>2.54</td>
<td>2.63</td>
<td>NS</td>
</tr>
<tr>
<td>2.</td>
<td>C 1</td>
<td>37</td>
<td>28.19</td>
<td>28.97</td>
<td>0.78</td>
<td>1.76 (E - C 1 )</td>
<td>1.79</td>
</tr>
<tr>
<td>3.</td>
<td>C 2</td>
<td>28</td>
<td>21.00</td>
<td>22.21</td>
<td>1.21</td>
<td>1.33 (E - C 2 )</td>
<td>1.70</td>
</tr>
</tbody>
</table>

<p>| TABLE 2 | MEAN SCORES OF EXPERIMENTAL AND CONTROL GROUPS 1 &amp; 2, IN PRETESTING AND POSTTESTING ON CONCENTRATION TEST |
|---|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>S. No.</th>
<th>GROUP</th>
<th>N</th>
<th>MEAN SCORES</th>
<th>MEAN DIFFERENCE</th>
<th>S.E.</th>
<th>C. R.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experimental</td>
<td>41</td>
<td>101.32</td>
<td>175.11</td>
<td>73.79</td>
<td>6.54</td>
<td>NS</td>
</tr>
<tr>
<td>2.</td>
<td>C 1</td>
<td>40</td>
<td>100.90</td>
<td>166.13</td>
<td>65.23</td>
<td>8.56 (E - C 1 )</td>
<td>5.98</td>
</tr>
<tr>
<td>3.</td>
<td>C 2</td>
<td>28</td>
<td>115.21</td>
<td>169.89</td>
<td>54.68</td>
<td>19.11 (E - C 2 )</td>
<td>6.18</td>
</tr>
</tbody>
</table>

<p>| TABLE 3 | MEAN SCORES OF EXPERIMENTAL AND CONTROL GROUPS 1 &amp; 2, IN PRETESTING AND POSTTESTING ON COMPREHENSION TEST |
|---|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>S. No.</th>
<th>GROUP</th>
<th>N</th>
<th>MEAN SCORES</th>
<th>MEAN DIFFERENCE</th>
<th>S.E.</th>
<th>C. R.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experimental</td>
<td>41</td>
<td>8.85</td>
<td>14.85</td>
<td>6.00</td>
<td>6.00</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>2.</td>
<td>C 1</td>
<td>41</td>
<td>8.27</td>
<td>9.17</td>
<td>0.90</td>
<td>5.10 (E - C 1 )</td>
<td>1.22</td>
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<tr>
<td>3.</td>
<td>C 2</td>
<td>28</td>
<td>9.04</td>
<td>9.96</td>
<td>0.92</td>
<td>5.08 (E - C 2 )</td>
<td>1.17</td>
</tr>
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<p>| TABLE 4 | MEAN SCORES OF EXPERIMENTAL AND CONTROL GROUPS 1 &amp; 2, IN PRETESTING AND POSTTESTING ON MEMORY TEST |
|---|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>S. No.</th>
<th>GROUP</th>
<th>N</th>
<th>MEAN SCORES</th>
<th>MEAN DIFFERENCE</th>
<th>S.E.</th>
<th>C. R.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experimental</td>
<td>41</td>
<td>28.17</td>
<td>35.80</td>
<td>7.63</td>
<td>7.63</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>2.</td>
<td>C 1</td>
<td>41</td>
<td>28.05</td>
<td>25.66</td>
<td>-2.39</td>
<td>10.02 (E - C 1 )</td>
<td>1.71</td>
</tr>
<tr>
<td>3.</td>
<td>C 2</td>
<td>28</td>
<td>27.86</td>
<td>26.68</td>
<td>-1.18</td>
<td>8.81 (E - C 2 )</td>
<td>1.69</td>
</tr>
</tbody>
</table>

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FIG. 1. INTELLIGENCE TEST—RAVEN'S PROGRESSIVE MATRICES, NONVERBAL CULTURE FAIR TEST OF INTELLIGENCE. The experimental group (subjects practicing the TM technique) showed greater gains than both control groups (subjects not practicing the TM technique), although the changes did not reach statistical significance.

FIG. 2. CONCENTRATION TEST—LETTER CANCELLATION TEST. This test, designed to measure the ability to concentrate, showed that the experimental group (subjects practicing the TM technique) improved significantly more ($p < .01$) than control group C2 (subjects from a different higher secondary school but not practicing the TM technique) and more, but not significantly so, than control group C1 (subjects in the same higher secondary school but not practicing the TM technique).

FIG. 3. COMPREHENSION TEST—BALLARD'S SILENT READING TEST. In this test, designed to measure reading comprehension, the experimental group (subjects practicing the TM technique) showed an increase five times higher ($p < .01$) than both control groups (subjects not practicing the TM technique).

FIG. 4. MEMORY TEST—WORD LIST TEST. This test, designed to measure memory, indicated that the experimental group (subjects practicing the TM technique) improved significantly more ($p < .01$) than both control groups (subjects not practicing the TM technique).
evaluation of classwise results revealed that the students of all three standards who were practicing the TM technique showed increases in comprehension. The greatest gain in comprehension was shown by the X standard followed by the IX and VIII standards. When boys and girls were compared, the boys showed more of a gain than the girls in comprehension scores.

Results of table 4 reveal that the practice of the TM technique contributes much to the improvement of memory. Of the three groups, the two control groups showed a considerable loss on the recall test, whereas the experimental group showed a considerable gain within a short period of six months. The difference in the mean gain between the experimental group and the control group C1 was 10.02 and between the experimental and control group C2 was 8.81 (cf. fig. 4). The reliability coefficients for these differences were far beyond the .01 level. The mean scores of the VIII, IX, and X standards before and after practicing the TM technique for a period of six months revealed a gradual increase from VIII to X standards. There was no significant difference in memory gain between boys and girls.

The results on Eysenck's Personality Inventory and H. M. Bell's Adjustment Inventory revealed a lot of variability and contradictions in the test results with the experimental and the control groups (C1 and C2).

**DISCUSSION**

The Raven's Progressive Matrices Test used in this study showed a trend towards the growth of intelligence as a result of the practice of the TM technique. Shecter, in a study conducted in Canadian high schools, also used Raven's Progressive Matrices Test and found that students practicing the TM technique did show a statistically significant improvement in intelligence ($p < .001$). On the basis of these results and the results in other studies (14, 32) the TM program should be considered by educators as a program for improving intelligence.

The Letter Cancellation Test, a study of the ability to concentrate, showed that the practice of the TM technique promoted the ability to concentrate on the task assigned. Development of concentration is an essential for academic achievements.

Ballard's Silent Reading Test indicated that comprehension was accelerated to a very great extent by the practice of the TM technique. This improvement in comprehension could be attributed to the state of restful alertness (34) and changes in the coherence of the EEG patterns (2) gained during the practice of the TM technique. Comprehension contributes to efficient learning and good memory. Hence, this development of comprehension allows the student to have a deeper appreciation of the knowledge in the curriculum.

The Word List Test showed that the experimental group had statistically significant gains in memory. The reason for the improvement of memory found in the students practicing the TM technique may be due to better consolidation and fixation of memory traces caused by learning (1). Success in the present examination system largely depends upon good memory, both recall and reproduction. The educators of India must take note of this cognizable improvement in memory due to the TM technique while drawing their curriculum.

H. M. Bell's Adjustment Inventory and Eysenck's Personality Inventory both showed considerable variability and contradictions with all three groups (experimental and controls). This lack of conclusive results may be due to the fact that both these tests were more suited to Western society and culture than to Indian society and culture.

This study on the effect of the TM technique in a rural Indian high school along with other similar educational studies in other countries (1, 6, 14, 16, 17, 20, 21, 28, 31, 32) indicates that the TM technique is applicable in a broad range of cultural settings, and that this procedure can enhance a student's development and improve the quality of educational systems.

**CONCLUSION**

In brief, it may be concluded that psychological functions such as the ability to concentrate, comprehension, and memory improved considerably with the regular practice of the Transcendental Meditation technique. The results of this experiment along with previous research showing improved academic performance (6, 14), intelligence growth rate (31, 32), and learning ability (1, 20, 21) indicate that the TM program should be introduced to a large number of higher secondary schools to evaluate its influence on large populations.
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5. Miss R. Shakuntala
6. Mr. Jagannatha Setty, Professor of Physics.

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