The Transcendental Meditation programme was found to reduce neuroticism, as measured by the Defence Mechanism Test, indicating decreased hidden mental turbulence.—EDITORS

The purpose of this investigation was to determine the effects, if any, of the practice of the Transcendental Meditation (TM) program over a certain period of time on the degree of neuroticism as measured by Defense Mechanism Test (DMT). A group of 15 applicants for pilot training with the Royal Swedish Air Force (RSAF) were chosen as subjects for the investigation. They had all been rejected due to inadequate DMT results, but had in all other respects been considered very suitable by the RSAF Drafting Committee. They were offered a retake of the test, if they would practice TM or some other technique—e.g. yoga or auto­genic training—that might have a positive influence on the mind. All of them reported that they were willing to do this and indicated that they intended to start TM. Later, seven of them considered themselves unable to carry out their undertaking, for the most part due to practical, concrete reasons. They were still allowed to retake the test and, in doing so, they replaced the previously planned control group. Their results were compared with the results of the eight people who had practiced TM. In the first test the results of the two groups were equivalent; the results of the retest showed a significant improvement for the TM practitioners relative to the controls.

The conclusion of the investigation is that the practice of TM seems to have an effect on the degree of neuro­ticism as measured by DMT.

INTRODUCTION

It is a general psychological question as to whether the personality can be modified after reach­ing maturity. In this context neuroses attract par­ticular interest, i.e. those personality traits which are considered to be the expressions of unconscious mental conflicts (9). This interest is partly due to the strong connection between the degree of neuroti­cism and the every day activities of a person’s work­ing life and his relation with others.

According to psychoanalytic theory the personal­ity is stable; it can be modified deliberately only through long-term, individually designed influ­
ences. The notion that the personality is stable is confirmed by experience with Defense Mechanism Test (DMT) (6, 11).

Among the phenomena that are measured by DMT are the existence, type, and degree of defense mechanisms, i.e. the processes of subconscious mental reactions connected with neuroses and aimed at protecting the mentality against discomfort (4, 10, 14). DMT research has been able to show connections between test results of adults and early childhood experiences as well as behavior, etc. several years after the test (12).

The Transcendental Meditation (TM) program, a simple technique of rest (1, 13), is said to be able to reduce measurably the degree of neuroticism, i.e. modify the personality in a positive direction, and to achieve this quickly (in about three months), without any individual modification of the technique. In the survey which led to this assertion (8) the degree of neuroticism was not measured by DMT, however, but by the Eysenck Personality Inventory, EPI (3). EPI seems to have the shortcoming of not being entirely insensitive to the so-called Hawthorn effect (5), nor to the enthusiasm about TM which seems to be common among TM practitioners particularly in the initial stage (1).

The stated null hypothesis of this study is that TM does not influence the degree of neuroticism. In 1976 an investigation was started, designed to illustrate the effect, if any, of the practice of TM on the degree of neuroticism as measured by DMT.

METHOD

THE TEST GROUP—Of those who were rejected for military pilot training (out of a group of 762 applicants, all of approximately 20 years of age), the 19 that were selected for this study were considered to be the most suitable for training in all respects except for their DMT scores. The 15 people who were able to participate in the investigation, were retested with DMT in the autumn of 1977, approximately 18 months after the test which they had failed.

NON-RESPONSE—Of the four people who had dropped out of the original group of nineteen, one had contracted an eye disease, one did not report for the investigation, and with regard to the other two, it was found that their DMT results were too good for them to be able to expect any improvement; their results had been difficult to interpret and they had been rejected, without being given the benefit of the doubt, for the flying safety reasons underlying the DMT procedure. It was not until the investigation had already started that their type of test result was established to be without objection.

THE TM GROUP (THE EXPERIMENTAL GROUP)—All fifteen test subjects had intended to start TM in the hope of being accepted for pilot training after perhaps improving their results in 1977. Eight of them had, according to their own statements, actually practiced TM before the retake of the test. They also produced testimonials as to their having attended a TM course. The most regular of them had practiced TM for at least a year, twice daily, as instructed, and without skipping any sessions; the least regular one had practiced TM for only three months at the beginning of the period between the offer to retake the test and the actual retake. Seven people had not learned TM at all.

THE NON-TM GROUP—Out of the seven people who, in spite of their intention to start TM, had neglected to do so, five stated mainly practical reasons: national service training, a long voyage overseas, shift work, the long distance to the TM center (i.e. the place where the course was held), or night work in order to support the family. One person stated that he would be too old for admission in 1977. One learned the technique, but did not practice it.

ATTITUDE TO TM—Out of those who started to practice TM, one had learned the technique a few years earlier, but had, at that time, stopped the practice after a couple of weeks. The others in the TM group stated that, when the offer of a retake came, they were ignorant about TM, and consequently were not prejudiced, either positively or negatively, towards the technique. Thus, for one person in each group, the attitude towards TM was probably important for his choice of group. Otherwise, judging among other things from the test and interview material collected either before or during the investigation, the grouping seems to have been independent of attitude towards TM.

TESTING AND MARKING OF TESTS—"Marking of tests" means the counting and marking of signs, shown in the test results, of defense mechanisms (among other things) according to rules laid down.
by Kragh (6) and Neuman (12). The testing and marking was handled by psychologists who, with the exception of one case (subject 1), were ignorant about which group (TM or non-TM) the subject belonged to. The marking was done separately by three psychologists. Afterwards they checked their results with each other.

**METHOD OF PRESENTING THE DMT RESULTS**—The psychologists presented their common marking results in the form of a "raw score" for five variables:

1. **Variable 1:** The number of signs (sign variants) of defense, introjection, and identification which have been assigned a weight at the evaluation of DMT results of the applicants for pilot training. There are some signs (variants) which have no attributed weight. The weights used for the others have been estimated relative to (among other things) the criterion of adaptation/non-adaptation (educational failures, breakdowns, psychosomatic disturbances, etc.) to service in the RSAF. It is not considered necessary for the understanding of this report to specify the weight attributed to each particular sign. For specific information on signs and weights, see Kragh (6), and Neuman (12).

2. **Variable 2:** Added weight of the signs (variants) in variable 1.

3. **Variable 3:** The value of variable 2 divided by the value of variable 1 ("mean weight").

4. **Variable 4:** The total number of signs (variants) including those with no attributed weight.

5. **Variable 5:** The number of pure signs of defense mechanisms (variants), independent of weight.

**THE METHOD OF COMPARING DMT RESULTS**—Clearly the raw scores of the DMT results were of different types for the different variables: number, added weight sums in marks, or average weight in marks. In order to facilitate the comparison between the collected results of the individuals and the groups, the following procedure was used:

1. The raw scores for the different subjects were ranked variable by variable.
2. The ranked raw scores were translated into rank points, so that the best and worst raw scores got rank point 1 and 15 respectively, the others the rank point that corresponded linearly with the position of the raw score between best and worst. Example: A raw score that was placed at exactly a quarter of the distance between "best" and "worst" would get the rank point of 4.5.
3. The rank points of the subjects in the five variables were added, subject by subject, into rank point sums.
4. The rank point sums were used for (a) final ranking, (b) calculation of group average, (c) a foundation for significance estimation for comparison between groups.
5. The calculation of percentage changes was made on the basis of the raw score.

**STATISTICAL ANALYSIS**—The mean value differences between the groups were analyzed by t-testing.

**INTERVIEWS**—In connection with the retake of the test the subjects were interviewed by a psychologist concerning, among other things, their attitude toward TM. Another psychologist interviewed the subjects about upsetting experiences they might have had, which could possibly influence the result

### TABLE 1

**RANK OF THE SUBJECTS ACCORDING TO DMT RESULTS IN TEST NO. 1**

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter code</td>
<td>M</td>
<td>L</td>
<td>A</td>
<td>T</td>
<td>S</td>
<td>N</td>
<td>D</td>
<td>B</td>
<td>R</td>
<td>F</td>
<td>U</td>
<td>E</td>
<td>F</td>
<td>C</td>
<td>G</td>
</tr>
<tr>
<td>DMT results</td>
<td>15.1</td>
<td>22.3</td>
<td>24.8</td>
<td>25.0</td>
<td>25.2</td>
<td>25.5</td>
<td>27.6</td>
<td>34.9</td>
<td>40.2</td>
<td>41.3</td>
<td>42.7</td>
<td>43.4</td>
<td>43.5</td>
<td>52.6</td>
<td>68.2</td>
</tr>
<tr>
<td>Rank</td>
<td>Lowest</td>
<td>Degree of Neuroticism</td>
<td>Highest</td>
<td>Best</td>
<td>Worst</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means*</td>
<td>TM Group: 32.4</td>
<td>Non-TM Group: 39.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*The difference is not significant (t = 0.93, df = 13).

**NOTE:** The subjects are ranked according to DMT results in test no. 1. Future TM practitioners are underlined. The letter code is the same as in the retake of the test. The sum of points states the sum of rank points in five characterizing variables of the DMT result. The rank point sum may vary between 5 (the subject is best at all the five variables) and 75 (the subject has the position of 15 in all the variables). As is evident from the table, there was at the starting point no significant difference in the degree of neuroticism between the future TM group and the non-TM group.
of the test (concerning mental crisis as a result of mental trauma, see Cullberg (2)). These psychologists did not participate in the testing and marking procedures. The subjects appeared before different psychologists under different designations given to them by the experimenter (the author). The groups were found to be equivalent in all respects determined in previous interviews and test results.

FIRST TEST—The results of the original test, which all the subjects in this experiment failed, are presented in table 1, in which the subjects are ranked according to their scores. No. 1 = the best result, the lowest degree of neuroticism. No. 15 = the worst result, the highest degree of neuroticism.

Table 1 also shows the positions within the group of the future TM practitioners (underlined) and the sums of points on which the ranking is based, the rank point sums previously referred to.

RESULTS

CONCEIVABLE RESULTS—In every DMT test there may arise a certain familiarization to the test (7), which may have an effect on the results of a subsequent testing. This accustoming phenomenon probably varies somewhat in intensity between different individuals. In the retesting of a group, the individual ranking from a previous test may therefore vary slightly. Several reasons for these small shifts can be hypothesized. However, there should not arise any considerable difference between the new mean results of the groups as compared to the first testing.

As was mentioned in the introduction, TM was not expected to have an effect on the degree of neuroticism. Accordingly, on a graph showing the correlation between the individual rank positions in the two testings, the marks of the individuals should be found near a 45 degree line starting at the origin.

However, if TM has either a positive or a negative effect the TM practitioners should move upwards or downwards respectively in the new ranking. There should then also be a difference between the groups as to the mean value in the degree of neuroticism.

RESULTS—1. The TM practitioners achieved a better result in points (raw score, see appendix) than the nonpractitioners: they were gathered upwards in the ranking (see figure 1). Figure 1 shows, along the horizontal axis, the rank point sums on the first test, previously presented in table 1, and, along the vertical axis, the rank point sums on the posttest.

RESULTS—2. The percentage improvement of the groups, mean raw score, is shown in figure 2. In all the variables, the difference between the groups on the first test was nonsignificant. The significance on the retest is clear from the graph.

DISCUSSION

The results do not confirm the null hypothesis that TM does not influence the degree of neuroticism. On the contrary, the conclusion that must be drawn from the investigation is that normally stable personality traits measured by DMT actually seem to be significantly influenced by TM in a positive direction.

However, the group investigated was small. More experiments need to be carried out before an estimate of the universality of the results can be made.

This need for further experimentation is illustrated especially by the results of subjects A and K:
they improved their results just as much as the TM group did, but without having practiced TM. However, this may be due to the fact that, at the time of the first test, they could have been in a state of "mental crisis", owing to events that took place about six months previously (a bad car accident and the death of a father, respectively). If that was the case, the crisis, following the general time pattern of crises, could have been in its so-called reaction phase at the time of the first test, a phase characterized by a mobilization of defense mechanisms (2). At the time of the second test the process of self-healing may have been completed, and thus the new test result may have been more representative of the normal personality of the subject. Of course this reasoning is speculative.

A possibly far-fetched thought is that it is not A and K that break the pattern but their fellow testees in the non-TM group. Thus, the normal results should be the point improvements of the TM group plus A and K; the results of the others would then imply a real deterioration. What makes this thought far-fetched is the notion that in that case four non-practitioners, subjects B, G, T, and U, should have deteriorated to the exact same extent, as they had the same relative positions in both tests.

The question as to whether both groups had at the start the same motivation for flying and were equally uninterested in TM (possibly relevant to the evaluation of TM) can never be answered with certainty. However, the presence or absence of real obstacles to the learning and practicing of TM can be easily ascertained. It can thus be considered likely that the practitioners would have become non-practitioners, and vice versa, if the obstacles had arisen differently. There is nothing in the experimental material that implies a general difference in disposition between the groups.

The question of whether or not the subjects reported to have improved their degree of neuroticism have reached a DMT status high enough to make them acceptable for admission to RSAF pilot training is beyond the scope of this paper. On the basis of this study, it may, however, be presumed—though not asserted—that good test results are equivalent to good results in the first test, when it comes to judging a person’s suitability for pilot training.

Future research should therefore be directed towards the validation of good posttest results against the criterion of approved/nonapproved for GFU (Basic Pilot Training). The probability for a student with a bad DMT result to fail the GFU was, according to previous experience, approximately 75 percent. Thus, the criterion is suitable both with regard to its great sensitivity, which meets, among other things, reasonable ethical demands, and with regard to the speed of its reaction—it gives a verdict within a year.

It seems that the validity of posttest results should be established before the effect of the practice of TM on DMT results can be properly evaluated.

REFERENCES

APPENDIX: TEST RESULTS IN RAW SCORES

<table>
<thead>
<tr>
<th>Subject</th>
<th>Variable</th>
<th>FIRST TEST</th>
<th>RETEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>A</td>
<td>6</td>
<td>9,5 1,58 7 3</td>
<td>2 2,6 1,30 4 2</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>11,8 1,48 8 5</td>
<td>4 6,6 1,65 6 4</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>11,4 1,63 10 7</td>
<td>1 1,2 1,20 3 2</td>
</tr>
<tr>
<td>D</td>
<td>7</td>
<td>9,0 1,29 8 5</td>
<td>3 3,6 1,20 3 2</td>
</tr>
<tr>
<td>E</td>
<td>9</td>
<td>13,2 1,47 10 6</td>
<td>4 5,1 1,28 5 3</td>
</tr>
<tr>
<td>F</td>
<td>8</td>
<td>12,6 1,58 9 6</td>
<td>2 2,6 1,30 3 3</td>
</tr>
<tr>
<td>G</td>
<td>9</td>
<td>14,2 1,58 11 8</td>
<td>7 10,3 1,47 10 5</td>
</tr>
<tr>
<td>K</td>
<td>12</td>
<td>20,2 1,68 13 8</td>
<td>3 3,6 1,20 4 2</td>
</tr>
<tr>
<td>L</td>
<td>3</td>
<td>5,4 1,80 7 4</td>
<td>2 3,0 1,50 4 2</td>
</tr>
<tr>
<td>M</td>
<td>6</td>
<td>7,5 1,25 7 2</td>
<td>2 2,4 1,20 3 1</td>
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<tr>
<td>N</td>
<td>4</td>
<td>8,3 2,08 5 3</td>
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<tr>
<td>R</td>
<td>7</td>
<td>10,9 1,56 9 7</td>
<td>4 6,9 1,73 4 2</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>7,6 1,52 7 5</td>
<td>6 13,3 2,22 7 7</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>8,1 1,62 7 4</td>
<td>4 4,7 1,18 7 4</td>
</tr>
<tr>
<td>U</td>
<td>7</td>
<td>13,0 1,86 9 5</td>
<td>5 8,4 1,68 8 5</td>
</tr>
</tbody>
</table>

The figures in variables 1, 4, and 5 denote number of signs, in variables 2 and 3 scores. List of variables see 'Method'.