LOW NORMAL HEART AND RESPIRATION RATES IN INDIVIDUALS PRACTICING THE TRANSCENDENTAL MEDITATION TECHNIQUE

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Low levels of heart rate and respiratory rate occurred in subjects practicing the Transcendental Meditation technique during and outside of the period of the technique, suggesting greater relaxation and physiological efficiency.—EDITORS

Heart rate, respiration rate, skin resistance, heart rate variability, and finger-pulse volume were measured in 12 people regularly practicing the Transcendental Meditation technique and 12 nonmeditator control subjects before, during, and after the two groups mediated and relaxed, respectively. The meditators demonstrated significantly lower heart \((p < .001)\) and respiration \((p = .002)\) rates than the controls throughout pretest, test, and posttest periods, as well as a significant increase in skin resistance during Transcendental Meditation \((p = .017)\), which controls did not show during rest. No differences were found for heart rate variability or finger-pulse volume. The regular practice of Transcendental Meditation may reduce resting levels of sympathetic activity.

INTRODUCTION

The Transcendental Meditation (TM) technique, as taught by Maharishi Mahesh Yogi, is a process (7, pp. 50–59) that produces consistent, significant physiological changes characteristic of a rapidly produced state of "restful alertness" (18, 19, 20, 21). This state may result from an integrated neural response (20) that produces both mental alertness and a quiescence of the sympathetic nervous system (8, 19) and has been termed a distinct, fourth major state of consciousness (1, 17).

There is some evidence that people who regularly practice the TM technique show low resting levels of sympathetic activity outside of meditation as well. Relatively low resting systolic (106 mm Hg) and diastolic (57 mm Hg) blood pressures (averaging 75 mm Hg) have been noted in meditators (20). Orme-Johnson (11) found lower levels of spontaneous skin resistance responses and more rapid skin resistance habituation in meditators than in nonmeditators and concluded that the regular practice of TM may stabilize the activity of the autonomic nervous system. Wallace et al. (17, 19, 20) have suggested that the regular practice of TM may reduce anxiety symptoms and alleviate a variety of psychosomatic disorders. The present study assessed relative levels of autonomic activity, by means of five physiological measures, in a group of meditators and a nonmeditating control group before, during, and after meditation and relaxation, respectively.

METHOD

SUBJECTS—Subjects were 24 undergraduates—eight males and four females in each of two groups. Twelve subjects, 19–36 years of age (mean = 22.9 years), who had not been instructed in the TM technique (nonmeditators) comprised the control group. Twelve subjects, 18–26 years old (mean = 22.6 years), were regular meditators, having received consistent and uniform instruction in the technique through an organization specializing in teaching it, as described by Forem (3). The meditators practiced TM twice daily for 20 minutes each time and had been meditating from three weeks to 29 months (mean = 13.1 months). None of the subjects had eaten a major meal for at least one hour prior to testing.

APPARATUS—A Grass Instruments Co. model 7 polygraph recorded heart rate, respiration rate, skin resistance, heart rate variability, and finger-pulse volume. Heart rate and finger-pulse volume were measured by placing a Grass model PTTI photoelectric plethysmograph over the first phalanx of the left thumb. Measurements of heart rate variability were triggered from the digital plethysmograph through a Grass model 7P4C cardiotachograph preamplifier and recorded in mm pen deflection per beat.

A strain gauge attached about the chest directly over the diaphragm recorded respiration rate. Skin resistance was measured with two Grass 1 cm, contoured, silver—silver
chloride electrodes placed 5 cm apart over the volar surfaces of the first phalanges of the second and fourth fingers of the left hand (current density = 31.8 µ amps/sq cm). The contact medium was Grass electrode cream. Each subject was seated in a comfortable chair in a quiet, darkened, ventilated room separate from the polygraph and experimenter.

PROCEDURE—Meditators were given the following instruction: "Rest quietly with your eyes closed until I ask you to begin meditation, and continue to sit quietly with your eyes closed after I ask you to come out of meditation." Nonmeditator control subjects were given identical instructions with the word relaxation substituted for meditation and were also told, "When I ask you to begin relaxation, that means relax as much as possible without any strain." Each subject sat quietly with eyes closed for 15–20 minutes. During the last five minutes of this pretest period, resting measurements were taken. Each subject then meditated/relaxed for a 16-minute test period and was then instructed to come out of meditation/relaxation. Each subject then continued to sit quietly with eyes closed for five minutes during the posttest period. Every two minutes recordings were made for one minute (chart speed = 10 mm/sec). Heart and respiration rates were obtained by visually counting the number of spikes occurring during two minutes, and finger-pulse volume was determined by the height of the spikes in mm.

RESULTS

Means and standard deviations for the two groups at each measurement period are given in Table 1 and Figs. 1 and 2. The combined values from pretest, test, and posttest periods of heart rate measurements were significantly lower for meditators than for the nonmeditating controls; the mean for meditators was 67.5 beats/min and the mean for nonmeditators was 78.4 beats/min ($F = 14.4$, $df = 1/22$, $p < .001$). Similarly, the overall mean respiration rate for meditators was 13.4 breaths/min, compared with 15.8 breaths/min for nonmeditators ($F = 12.2$, $df = 1/22$, $p = .002$). In particular, the pretest resting levels of meditators were significantly lower than those of nonmeditators for both heart rate ($F = 10.5$, $df = 1/22$, $p = .0038$) and respiration rate ($F = 5.59$, $df = 1/22$, $p = .027$), as measured by tests for simple main effects (27).

The difference in skin resistance between the two groups was neither significant over all measurement periods ($F = 1.01$, $df = 1/22$, $p = .32$), nor significant for the pretest measurement period ($F = 2.85$, $df = 1/44$, $p = .098$). While analysis of variance did not yield a significant groups × periods interaction ($F = 2.43$, $df = 2/44$, $p = .10$), a $t$-test comparing the mean skin resistance for pretest with the mean for meditation was significant ($t = 2.43$, $df = 11$, $p = .017$). A parallel comparison of pretest and test means for skin resistance in nonmeditators was not significant ($t = 20$, $df = 11$, $p = .42$).

No significant differences were found between or within groups for heart rate variability or finger-pulse volume (table 1).

DISCUSSION

The significant increase in skin resistance during meditation is consistent with the findings of Wallace (17, 18, 19, 20), who observed increases in skin resistance during TM of greater magnitude and rapidity than increases encountered during sleep (4, 15). However, the magnitude of increase in skin resistance observed in this study was

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**TABLE 1**

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>MEDITATORS (N = 12)</th>
<th>NONMEDITATOR CONTROLS (N = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest (5 min)</td>
<td>TM (16 min)</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>S.D.</td>
</tr>
<tr>
<td>Heart rate (beats/min)</td>
<td>68.13</td>
<td>6.89</td>
</tr>
<tr>
<td>Respiration rate (breaths/min)</td>
<td>13.26</td>
<td>2.47</td>
</tr>
<tr>
<td>Skin resistance (kilohms)</td>
<td>65.55</td>
<td>31.90</td>
</tr>
<tr>
<td>Heart rate var. (mm/beat)</td>
<td>1.42</td>
<td>0.23</td>
</tr>
</tbody>
</table>
less than that observed by Wallace. The slight reduction in mean heart rate of 1.4 beats/min during meditation (table 1) is in the same direction as that reported by Wallace (19, 20), who noted a decrease of 3 beats/min in heart rate over a longer period of TM. Thus, the present findings are consistent with previous reports of a reduction in sympathetic activity during TM.

Control group means for both heart and respiration rates are in good accord with resting norms for this age group, and the mean values for the meditators in this study, while significantly lower, are not abnormally low (6; 9; 12; 16, p. 67). It may be argued that it is tenuous, if not invalid, to compare resting-level heart rates measured in different laboratories because of differences in experimental conditions (10). However, the present within-study findings of significantly different heart rates in two groups exposed to equivalent laboratory conditions suggest that the differences are not merely artifacts.

Heart rate is determined primarily by the balance between the excitatory and inhibitory effects of the sympathetic and parasympathetic branches of the autonomic nervous system (13). Wenger (22, 23, 24) has developed techniques for assessing the sympathetic and parasympathetic contributions to an individual's autonomic balance. Heart rate reflects the functioning of both branches of the autonomic nervous system (14, p. 36) and is a major indicator of autonomic balance (23, 24, 25, 26).

The meditators' significantly low resting levels of heart rate suggest that people who practice the TM technique demonstrate relatively low resting levels of sympathetic activity, even outside of meditation. Since respiration rate is also one of the most reliable indicators of autonomic balance (24), the low respiration rates noted for the meditators support this interpretation. Orme-Johnson (11) has made a similar argument to explain the relatively low resting levels of spontaneous skin resistance responses observed in meditators. Taken together, the low resting levels of heart rate, respiration, and spontaneous skin resistance responses suggest that the Transcendental Meditation technique increases the efficiency of the entire autonomic nervous system.

It seems quite likely, as Wallace and Benson (19) and Orme-Johnson (11) have suggested, that the regular reduction of sympathetic activity brought about by TM stabilizes with continued practice and results in lower resting levels of physiology outside of meditation. The differences between groups in pretest heart and respiration rates found in the present study could be interpreted in this way. This conclusion is qualified, however, by the possibility that some meditators in this experiment may have inadvertently started meditating during the pretest period, in which case their pretest results may be more characteristic of TM than of resting levels outside of meditation.
An alternative interpretation could be that people who choose to begin TM exhibit lower resting levels of sympathetic activity to begin with. Because practical considerations precluded the random assignment of subjects to experimental and control groups, such an interpretation cannot be entirely ruled out. However, the interpretation that the observed pretest differences between groups are due to meditation seems likely because the relatively quiescent sympathetic activity of the meditator group is consistent with evidence from clinical studies in which the TM program has been shown to be a beneficial therapy in the treatment of diseases associated with chronic sympathetic hyperactivity, such as hypertension (2) and bronchial asthma (5).

A longitudinal study is now planned that will monitor several autonomic variables in prospective meditators before and after they begin the TM technique and will compare these data over time with data for a matched nonmeditating group not inclined to begin the practice.

**SUMMARY**

An integrated physiological response characterized by a general quiescence of the sympathetic nervous system occurs during the practice of the Transcendental Meditation technique. There is some evidence that those who regularly practice TM show low resting levels of sympathetic activity outside of meditation as well. In this study normal resting heart and respiration rates averaging 78.4 beats/min and 15.8 breaths/min, respectively, were observed in 12 nonmeditating control subjects, while significantly lower yet not abnormally low heart and respiration rates averaging 67.5 beats/min and 13.4 breaths/min, respectively, were found in 12 regular meditators. The possibility exists, however, that some normal resting (pretest) results for the meditation group represent meditation rather than rest outside of meditation. The meditators also showed a significant rise in skin resistance during meditation, while control subjects showed no significant change in skin resistance during relaxation. Therefore, the regular practice of the Transcendental Meditation technique may reduce resting levels of sympathetic activity.

**ACKNOWLEDGMENTS**

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