

PSYCHOPHYSIOLOGICAL CHANGES AT THE TIME OF EXAMINATION IN MEDICAL STUDENTS BEFORE AND AFTER THE PRACTICE OF YOGA AND RELAXATION

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ABSTRACT

The effect of yoga and relaxation changes in psychophysiological parameters in response to the stress of examination in 75 medical students was studied. Initially five parameters (anxiety level, heart rate, blood pressure, galvanic skin resistance and choice reaction time) were recorded, a month before the examination and on the day of examination. Students were then randomly divided into 3 groups of 25 each. One group practiced yoga (Group-Y), and another group practiced relaxation (group-R) regularly for three months. The third group was control group (Group-C). All the parameters were recorded after the changes in anxiety level, heart rate, blood pressure, and galvanic skin resistance in response to stress of examination were significantly attenuated and there was significant improvement in choice reaction time in Group-Y and Group-R as compared to Group-C after yoga and relaxation.

Key Words : Yoga, relaxation, stress.

Yoga has been with us since times immemorial, but it is only during recent years that it has assumed world wide importance. Patanjali the foremost exponent of yoga, defined it as '*chitti vritti nirodha*'. '*Chitti*', here is the mind which stands between man and his environment. '*Chitti*' is all the time bombarded with ideas and thoughts, uncontrolled emotions and worries as well as with sensations clamouring for his attention through his eyes, ears, nose, mouth and skin. All these throw the mind in turmoil and cause a whirlpool (*vritti*) within it. '*Nirodha*' signifies control or restraint (Varma, 1984).

Number of scientific studies have reported the beneficial effects of practice of yoga. Its historical, philosophical and psychotherapeutic aspects have been dealt with by Neki (1975; 1977), Venkoba Rao (1978) and Varma (1984). Yoga therapy and relaxation has also been

found to be useful in neurotic and psychosomatic disorders (Vahia et al., 1973a, 1973b; Benson et al., 1974; Balkrishna et al., 1977). Physiological effects of the yogic practices have also been widely studied (Selvamurthy et al., 1983). Shukla & Nigam (1979) have reported the usefulness of systematic desensitization in examination phobia.

Thus it seems that the practice of yoga or relaxation, may be very useful in controlling the mind and keeping it in a state of peace and tranquility, even under the stressful situations and thus help an individual to adequately cope with the environment. Medical students are usually under stress due to a variety of reasons like vast curriculum, academic competition, examinations etc. During these stressful situations there might be increase in anxiety level and sympathetic discharge. This may in turn interfere with their performance and make them

more prone to develop psychosomatic disorders. It was hypothesized that regular practice of yoga or relaxation may be useful in attenuating the increase in anxiety level and sympathetic discharge. This in turn may improve their academic performance and make them less vulnerable to psychosomatic disorders.

In order to verify this hypothesis this study was undertaken. The aims of the study were : (i) to study the changes in anxiety level (as measured by Spielberger's anxiety rating scale) in medical students at the time of examination before and after the practice of yoga or relaxation and (ii) to study the changes in psychophysiological parameters like heart rate, blood pressure, galvanic skin resistance (GSR), and choice-reaction time in medical students prior to examination, before and after the practice of yoga or relaxation.

MATERIAL AND METHOD

The study was conducted at one of the medical colleges of Mumbai. Out of a class of 100 medical students in the first year of MBBS course, all the 75 medical students who were interested in participating in this study and who were not suffering from any major medical or psychiatric illnesses were selected for the study.

Following parameters were measured during the morning hours a month prior and also on the day of 2nd terminal examination of 1st MBBS.

1. Anxiety level : Spielberger anxiety rating scale was individually administered to each student to measure the anxiety level (Spielberger, 1970).
2. Heart rate : Heart rate was measured using a digital heart rate monitoring machine for 1 minute.
3. Blood pressure : Systolic and diastolic blood pressure was measured in right upper limb in sitting position using a sphygmomanometer.
4. Galvanic skin resistance (GSR) : It was measured with a constant 40 micro-ampere current circuit. Electrodes were placed on the

palms of the hands. Mean of 3 readings at 1 minute interval was taken to determine GSR.

5. Choice reaction time (CRT) : This was recorded with a electronic timer with a capacity to measure intervals as low as 10 micro-seconds. Four coloured lights were used as choice stimuli. For any light presented by the experimenter, the subject pressed the corresponding key to switch off the light. The time between the presentation and response was taken as reaction time. The stimuli was presented at random to avoid anticipation. The mean of three consecutive trials was recorded.

All the tests were made familiar to the subjects and they were allowed three practice trials prior to obtaining the baseline data.

The students were then randomly divided into 3 groups of 25 each. The first group (Group-Y) practiced yoga for an hour at a time, three times a week for a period of 3 months. The practice included various 'Yogic Asanas', 'Pranayam' (breathing exercise) and 'Savasana' (meditation).

The second group (Group-R) practiced relaxation for 30 minutes at a time, three times a week for a period of 3 months. The practice included sequential deep muscle relaxation from leg to head.

The third group (Group-C) was a control group. The students were asked to remain in a classroom and were allowed to do whatever they wished to do, like reading, drawing etc. for about 45 minutes at a time, three times a week, for a period of 3 months. At the end of three months all the above mentioned five psychophysiological parameters were measured again and also a month after that on the day of 'preliminary examination of 1st MBBS'.

Thus in all, 4 readings (a month prior and on the day of '2nd terminal examination' and a month prior and on the day of 'preliminary examination', of 1st MBBS) for each psychophysiological parameter in each group were obtained.

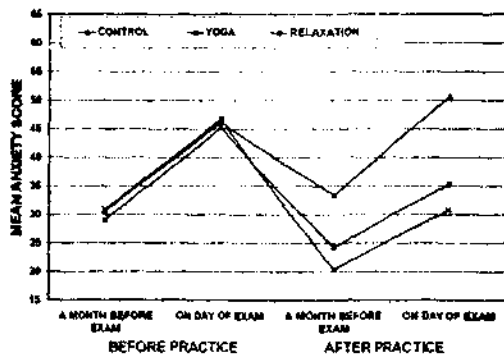
The changes in these five psychophysiological parameters, before and after the practice of yoga or relaxation, were then

compared in each group as well as amongst the three groups using appropriate statistical tests (paired t-test and ANOVA).

RESULTS

The age range of students in each group was 18 to 20 years with the mean age of around 18.5 years. There were 13 boys and 12 girls in each of the three groups.

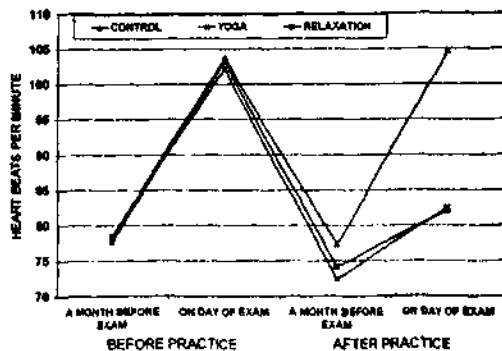
FIG. 1-MEAN ANXIETY LEVEL



As evident from figure-1, it was observed that the baseline mean anxiety score before the practice of yoga or relaxation, a month before the examination was around 30 points in all the three groups. On the day of examination this mean anxiety score increased by about 15 points in all the three groups and was around 45 points. In sharp contrast to the mean anxiety score of the control group (Group-C), after the practice of yoga or relaxation the mean anxiety score, a month before the examination was observed to be around 20 points in students practicing yoga (Group-Y) and around 24 points in students practicing relaxation (Group-R). This difference in the baseline anxiety score was found to be statistically significant in both the groups (Group-Y- $t=4.8$, $df=24$, $p<0.001$; Group-R- $t=4.02$, $df=24$, $p<0.001$). On the day of examination the mean anxiety score increased by about 10 points and was around 30 in students practicing yoga (Group-Y) and around 35 in students practicing relaxation (Group-R). While in control group (Group-C) the mean anxiety score was around 50 points on

the day of examination. This difference was also found to be statistically significant ($F=6.2$, $df=2, 72$, $p<0.001$).

FIG. 2-MEAN HEART RATE

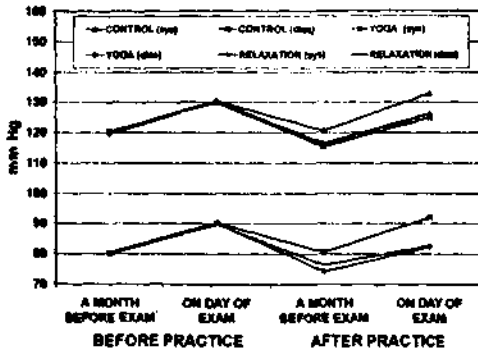


As far as the pulse rate (figure-2) was concerned, it was observed that before the practice of yoga or relaxation the baseline mean pulse rate a month before the examination was around 78 beats/minute which increased to around 102 beats/minutes on the day of examination in all the three groups. After the practice of yoga or relaxation for three months the baseline pulse was found to be 72 beats per/minute and 74 beats/minutes in students practicing yoga (Group-Y) and students practicing relaxation (Group-R) respectively. This difference in the baseline pulse rate, though very small, was found to be statistically significant in both the groups (Group-Y- $t=2.02$, $df=24$, $p<0.05$; Group-R- $t=2.12$, $df=24$, $p<0.05$). On the day of examination the mean pulse rate was found to be around 82 beats/minutes in students practicing yoga (Group-Y) and 85 beats/minutes in students practicing relaxation (Group-R) as compared to the mean pulse rate of around 104 beats/minutes in the control group (Group-C). This difference was also found to be statistically significant ($F=4.4$, $df=2, 72$, $p<0.001$).

Figure-3 shows the variations in the systolic and diastolic blood pressure. It was observed that before the practice of yoga or relaxation the baseline mean blood pressure a month before the examination was around 120/80 mm of Hg which increased to around 130/

90 mm of Hg at the time of examination in all the three groups. After the practice of yoga or relaxation for three months the baseline blood pressure was found to be 115/74 mm of Hg and 116/76 mm of Hg in students practicing yoga (Group-Y) and students practicing relaxation (Group-R) respectively. This difference in the baseline blood pressure was found to be statistically significant in both the groups (systolic blood pressure : Group-Y- $t=3.2$, $df=24$, $p<0.005$; Group-R- $t=3.2$, $df=24$, $p<0.005$ and diastolic blood pressure : Group-Y- $t=2.8$, $df=24$, $p<0.005$; Group-R - $t=2.6$, $df=24$, $p<0.01$). While at the time of examination the mean blood pressure was found to be around 125/82 mm of Hg in student practicing Yoga (Group-Y) and 126/82 mm of Hg in students practicing relaxation (Group-R) as compared to the mean blood pressure of around 132/92 mm of Hg in the control group (Group-C). This difference was also found to be statistically significant (systolic : $F=4.2$, $df=2,72$, $p<0.05$ and diastolic : $F=4.8$, $df=2,72$, $p<0.05$).

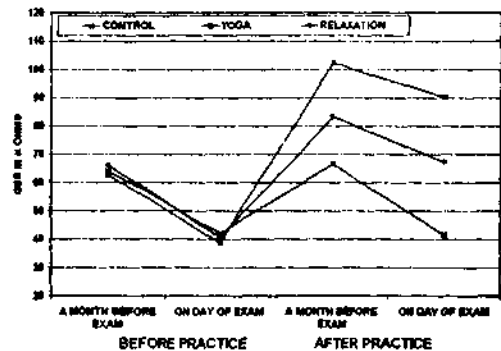
FIG. 3 MEAN BLOOD PRESSURE



GSR is one of the important parameter of sympathetic activity and anxiety level. It was observed (figure-4) that before the practice of yoga or relaxation the baseline mean GSR a month before the examination was around 64 k-ohms which decreased to around 40 k-ohms at the time of examination in all the three groups. After the practice of yoga or relaxation for three months the baseline mean GSR was found to be around 102 k-ohms and 83 k-ohms in students practicing yoga (Group-Y) and

students practicing relaxation (Group-R) respectively. This difference in the baseline GSR was found to be statistically significant in both the group (Group-Y- $t=5.2$, $df=24$, $p<0.001$; Group-R- $t=4.2$, $df=24$, $p<0.001$). At the time of examination the mean GSR was found to be around 90 k-ohms in students practicing yoga (Group-Y) and 67 k-ohms in students practicing relaxation (Group-R) as compared to mean GSR of around 41-k-ohms in the control group (Group- C). This difference was also found to be statistically significant ($F=11.5$, $df=2,72$, $p<0.001$).

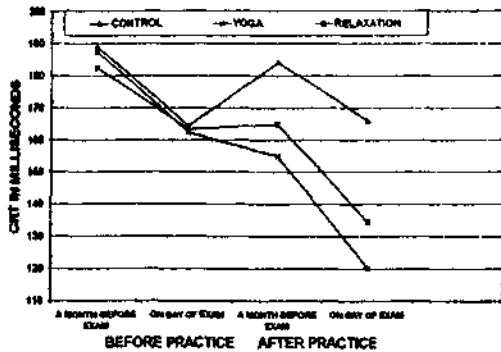
FIG. 4 MEAN GALVANIC SKIN RESISTANCE



Choice reaction time gives good idea about the speed and accuracy of information processing. It was observed (Figure-5) that before the practice of yoga or relaxation the baseline mean CRT a month before the examination was around 185 milli-seconds which decreased to around 163 milli-seconds at the time of examination in all the three groups. After the practice of yoga or relaxation for three months the baseline CRT was found to be around 154 milli-seconds and 164 milli-seconds in students practicing yoga (Group-Y) and students practicing relaxation (Group-R) respectively. This difference in the baseline CRT was found to be statistically significant in both the groups (Group-Y- $t=4.12$, $df=24$, $p<0.001$; Group-R- $t=3.8$, $df=24$, $p<0.005$). At the time of examination the mean CRT was found to be around 120 milli-seconds in students practicing yoga (Group-Y) and 134 milli-seconds in students practicing relaxation (Group-R) as

compared to the mean CRT of around 165 milli-seconds in the control group (Group-C). This difference was also found to be statistically significant ($F=9.8$, $df=2,72$, $p<0.001$).

FIG.5. MEAN CHOICE REACTION TIME



DISCUSSION

From the results it was evident that practice of yoga and relaxation reduces the baseline anxiety level and also reduces the increase in anxiety in response to stress like examination. Similar reduction in anxiety score have been reported in patients suffering from anxiety neurosis and reactive depression (Vahia et al., 1973a, 1973b).

It was also noted that practice of yoga and relaxation reduces the baseline pulse rate and baseline systolic as well as diastolic blood pressure. It also reduces the increase in pulse rate and systolic and diastolic blood pressure, in response to stress like examination. Similar decrease in heart rate and blood pressure has been reported with the regular practice of yoga (Joseph et al., 1981; Selvamurthy et al., 1983). Beneficial effects have also been reported in patients suffering from hypertension with relaxation, yoga and biofeedback (Benson et al., 1974; Patel, 1973).

Unlike pulse and blood pressure GSR usually decreases during the stressful situation and increases during relaxation. It was noted that practice of yoga and relaxation increases the baseline GSR and also reduces the decrease in GSR in response to stress like

examination.

Choice reaction time (CRT) is the measure of attentiveness and speed of reaction to the external stimuli. It was interesting to note that practice of yoga and relaxation reduces the baseline CRT and also enhances the further reduction in CRT in response to stress like examination. Improvement in attentiveness and speed of reaction is likely to improve the performance of candidate in the examination. Selvamurthy et al. (1983) have also reported improvement in simple as well as choice reaction time.

The findings of this study provides an evidence in favour of the hypothesis that the regular practice of yoga or relaxation may reduce the baseline anxiety level, pulse rate and blood pressure and also attenuate the increase in these parameters during stressful situations like examination. It also reveals that with regular practice of yoga or relaxation there is an increase in baseline GSR and decrease in reduction in GSR in response to stress, thus improving their ability to withstand the stress. This state of relaxation achieved by regular practice of yoga or relaxation also improves the baseline reaction time and further improves the reaction time during stressful situations. This may help medical students to improve their performance in the examination.

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