A randomized control trial of the effect of yoga on Gunas (personality) and Health in normal healthy volunteers

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ABSTRACT

Objective: To study the efficacy of yoga on Guna (yogic personality measure) and general health in normal adults.

Methods: Of the 1228 persons who attended introductory lectures, 226 subjects aged 18–71 years, of both sexes, who satisfied the inclusion and exclusion criteria and who consented to participate in the study were randomly allocated into two groups. The Yoga(Y) group practised an integrated yoga module that included asanas, pranayama, meditation, notional correction and devotional sessions. The control group practised mild to moderate physical exercises (PE). Both groups had supervised practice sessions (by trained experts) for one hour daily, six days a week for eight weeks. Guna (yogic personality) was assessed before and after eight weeks using the self-administered Vedic Personality Inventory (VPI) which assesses Sattva (gentle and controlled), Rajas (violent and uncontrolled) and Tamas (dull and uncontrolled).

The general health status (total health), which includes four domains namely somatic symptoms (SS), anxiety and insomnia (AI), social dysfunction (SF) and severe depression (SP), was assessed using a General Health Questionnaire (GHQ).

Results: Baseline scores for all the domains for both the groups did not differ significantly (P > 0.05, independent samples t test). Sattva showed a significant difference within the groups and the effect size was more in the Y than in the PE group. Rajas showed a significant decrease within and between the groups with a higher effect size in the PE group. Tamas showed significant reduction within the PE group only. The GHQ revealed that there was significant decrease in SS, AI, SF and SP in both Y and PE groups (Wilcoxon Signed Rank t test). SS showed a significant difference between the groups (Mann Whitney U Test).

Conclusions: There was an improvement in Sattva in both the Yoga and control groups with a trend of higher effect size in Yoga; Rajas reduced in both but significantly better in PE than in Yoga and Tamas reduced in PE. The general health status improved in both the Yoga and control groups.

Keywords: General health; guna; Yoga.

The present age of speed and competition has increased the stresses and strains resulting in an increasing prevalence of life-style-related health problems.[11] One of the increasingly popular tools to overcome this new challenge is physical activity. There is growing evidence that has established the benefits of physical exercises in preventing life-style-related diseases[6] such as primary prevention of diabetes,[3] prevention of cardiac diseases through control over major risk factors such as smoking, lipids, obesity and stress,[14] better quality of life of cancer patients,[5] positive health in normal persons through better physical fitness[6] and stress reduction.[7] Yoga which is considered to be a tool for both physical and mental development of an individual is being recognized around the globe only in the last century although it has been practised in India over several centuries to promote positive health and well being. It gives solace for the restless mind and can give great relief to the sick.[8,9] It has become quite fashionable even for the common man to keep fit.[10] Some use yoga for developing memory, intelligence and creativity.[11] With its multifold advantages, yoga is becoming a part of school education.[12] Specialists use it to unfold deeper layers of consciousness in their move towards spiritual perfection.[13] With growing scientific evidence, yoga is emerging as an important health behavior-modifying practice to achieve states of health, both at physical and mental levels. Several studies have demonstrated the beneficial effects of yoga on health.
While Yoga is getting popular, the relative roles of yoga and physical exercises have not been studied on gunas and health. Hence, the present study was designed to assess the changes in the personality and overall health status after yoga as compared to physical exercise in a randomized controlled study in normal healthy volunteers.

**METHOD**

**Subjects**

Of the 1228 adults who attended motivational lectures, 226 subjects consented to participate in the study and were randomly allocated to two groups of equal size. After attrition, the final sample sizes were 87 in both the yoga and control groups.

Inclusion criteria were: (a) normal healthy volunteers, (b) age 18–71 years, (c) literacy and (d) scores less than 4/5 in the General Health Questionnaire. The Vedic Personality Inventory (VPI) is a valid and reliable inventory that can measure the three patterns of behavior. Exclusion criteria were: (a) subjects with any ailment, (b) smoking and (c) substance abuse.

Source of subjects: Normal adults were recruited from five different locations in Bangalore after public talks at different institutions such as colleges, health clubs, Rotary Clubs, Lion’s clubs and big apartment complexes.

Informed consent was obtained from all the subjects who participated in the project and also from the institutional heads where the classes were conducted. The institutional ethical committee of SVYASA cleared the project proposal.

**Design**

This is a prospective, randomized, single-blind, controlled study aiming to compare the efficacy of yoga (Y) and physical exercise (PE) in normal healthy volunteers in a South Indian population. Introductory lectures were arranged in public centers such as colleges, health clubs, Rotary clubs, Lion’s clubs and apartment complexes. The classes were planned in five different centers in the city of Bangalore. Two hundred and twenty-six persons who consented to participate in the study and satisfied the inclusion and exclusion criteria were randomly allotted to two groups by using five random number tables (different table for each center) generated from the random number generator program. The experimental group was given Y practices and the control group was given PE for one hour daily on empty stomach (6 to 7 a.m.). The classes were conducted six days a week for eight weeks and attendance was maintained by the teachers. Trained experts (in yoga for the Y group and PT for the PE group) conducted parallel sessions for the two groups in different rooms in the same venue. It was ensured that there was no interaction between the subjects. The tests were self-administered before and eight weeks after the intervention. Arrangements were made for the subjects to sit in a quiet place free from distractions and influence from other people.

Masking: The answered questionnaires were coded and kept away for future scoring. A psychologist who was not involved in the subject allocation or supervision of the classes scored the questionnaires which were decoded only after the scoring of both the before and after data was completed.

**Assessments**

Assessments were done using the following questionnaires:

1. The Vedic Personality Inventory (VPI): In 1998, Wolf developed an inventory to assess three personality...
constructs (gunas) based on their description in the most ancient Indian scriptures called Vedas. Hence, this inventory was named the VPI and it measures the three gunas—Sattva, Rajas and Tamas. It has 30 items for the Sattva guna, 28 for rajoguna and 32 for tamoguna. VPI has good internal consistency and reliability with Cronbach’s alpha ranging from 0.850 for Sattva, 0.915 for Rajas and 0.699 for Tamas. In terms of discriminant validity, all but one facet had significant differences.\cite{24}

2. General Health Questionnaire (GHQ): The GHQ designed by Goldberg in order to identify psychiatric morbidity in general practice, is a self-administered questionnaire (English version). It has 28 items with four subscales to measure somatic symptoms (SS), anxiety and insomnia (AI), social dysfunction (SF) and severe depression (SP). It provides information about the recent mental status, thus identifying the presence of possible psychiatric disturbance. This questionnaire has acceptable psychometric properties and has good internal consistency and reliability with Cronbach’s alpha of 0.85 and validity of 0.76.\cite{24}

**INTERVENTION**

**Yoga group**

The Integrated yoga module was selected from the integrated set of yoga practices used in earlier studies on the effects of yoga for positive health.\cite{25} This integrated approach is developed based on ancient Yoga texts\cite{26} to bring about a total development at physical, mental, emotional, social and spiritual levels.\cite{27} The techniques include physical practices (kriyas, asanas, a healthy yoga diet), breathing practices with body movements and Pranayama, meditation, devotional sessions, lectures on yoga, stress management and lifestyle change through notional corrections for blissful awareness under all circumstances (action in relaxation). Yoga was taught by qualified yoga teachers.

**Physical exercise group**

The set of physical exercises were standard exercises\cite{28} meant to provide mild to moderate activity designed by experts in physical education.

**Data extraction**

The scoring of the questionnaires was carried out as per the instructions in the manuals. The structure of these questionnaires is described below:

1. VPI evaluates the Sattva, Rajas and Tamas gunas by using a 7-point Likert-type scale. Scores for the gunas are obtained by adding the responses for the items for a guna and then dividing by the number of items for that mode. For each subscale, a higher score indicates a greater predominance of that mode. The minimum and maximum possible scores for the three domains range from 1–7.

2. GHQ: This 28 item test using a binary method of scoring (0, 0, 1, 1) yields an assessment on four robust subscales: somatic symptoms (SS), anxiety and insomnia (AI), social dysfunction (SF) and severe depression (SP). A sum of the scores for these four subscales gives the score for total health. The lower the scores in the GHQ, the better the state of health. The cut-off scores for the GHQ used for this study were 4 or 5 (4/5).\cite{22}

**Statistical analysis**

Data was analyzed using the SPSS package version 10.0.

Based on a previous study,\cite{29} the effect size was calculated to be 0.8. With a power of 0.8 and alpha set to 0.05, the minimum sample size was found to be 164. This calculation was done using G power.\cite{30} The size of the sample actually used was 174.

Data at baseline was assessed for normal distribution using Shapiro-Wilk’s test for both the groups. Independent samples t-test was done for checking homogeneity of baseline scores of the two groups. Paired samples t test and independent samples t test were used for VPI which had normally distributed data and Wilcoxon’s signed ranks and Mann Whitney U tests were used for GHQ data which were not normally distributed. An independent samples t test was done to analyze between the groups and paired samples t test within groups. The effect size of the study (mean A – mean B)/ standard deviation (SD) of difference scores) is an absolute measure of the difference that exists between the populations for a parameter, a concept first introduced by the sociologist, J. Cohen.\cite{31}

As the study population had a wide age range, statistical analysis was also carried out by grouping them as juniors (age ≤ 24 years) and seniors (age > 24 years) based on the median age. The independent samples t-test for between groups and paired samples t test for within groups were conducted for the two age groups. The data was also analyzed using gender as a factor.

**RESULTS**

Figure 1 shows the study profile wherein of 1228 subjects who attended the motivational lectures, only 226 who satisfied the inclusion and exclusion criteria were selected and randomly allotted to the Y and PE groups. The reasons
for dropout of 52 subjects are shown in Figure 1.

Table 1 shows the demographic data. There were 87 subjects (40 females) in each group aged 18–71 years, the mean age being 29.44 ± 11.94 years. They belonged to different callings such as college students, professionals, housewives and retired persons.

The baseline values were normally distributed for Tamas (P = 0.209) and Sattva (P = 0.717) and were well-matched for all three domains (Independent samples t-test).

Table 2 shows the comparison of the baseline scores for the three gunas of the VPI with the norms provided in the manual. It showed that the scores are within the predicted normal range. The mean value is marginally higher for Sattva and lower for Rajas and Tamas in the South Indian population selected in the present study as compared to the norms from studies in the USA.

Table 3 shows the comparison of the baseline scores for the three gunas of the VPI with the norms provided in the manual. It showed that the scores are within the predicted normal range. The mean value is marginally higher for Sattva and lower for Rajas and Tamas in the South Indian population selected in the present study as compared to the norms from studies in the USA.

**Table 1: Demographic data for VPI**

| Age          | Sex  | Y (n = 87) | PE (n = 87) |
|--------------|------|------------|-------------|
|              |      | 31.33±11.9 | 32.35±11.32 |
| ≤ 24 years (Juniors) | Male (m±SD) | 26.79±12.20 | 28.00±11.76 |
|              | Female (m±SD) | 20.00±1.75 | 20.29±1.44 |
| > 24 years (Seniors) | Male (m±SD) | 20.61±1.82 | 20.73±1.89 |
|              | Female (m±SD) | 38.88±9.55 | 30.85±8.56 |
| Gender       | Male (m±SD) | 41.36±3.89 | 40.82±10.85 |
|              | Range 18–71 | 18–58   |
|              | Female 40 | 40     |
| Categories   | Male 40 | 40     |
|              | Students 40 | 44     |
|              | Employees 18 | 30     |
|              | Housewives 10 | 7      |
|              | Business 10 | 6      |

**Table 2: VPI scores for yoga and control groups—comparison of means (paired samples test)**

| Before | After | P value | Effect Size | Before | After | P value | Effect Size |
|--------|-------|---------|-------------|--------|-------|---------|-------------|
| Means±SD | Means±SD | | | Means±SD | Means±SD | | |
| Tamas   | 3.12 ± 0.51 | 2.97 ± 0.91 | 0.095 | 0.18 | 3.24 ± 0.67 | 2.99 ± 0.69 | 0.001 | 0.36 |
| Rajas   | 3.83 ± 0.62 | 3.72 ± 0.51 | 0.12 | 0.17 | 3.67 ± 0.62 | 3.43 ± 0.79 | 0.002* | 0.33 |
| Sattva  | 4.88 ± 0.52 | 5.26 ± 0.51 | <0.001 | 0.61 | 4.91 ± 0.53 | 5.21 ± 0.65 | <0.001 | 0.45 |

* Rajas showed a significant difference between the groups (P = 0.005) (Independent Samples Test); (Effect size = difference in means (after–before)/SD of the difference scores)

**Table 3: VPI scores in age groups - Age ≤ 24 years and > 24 years (paired-samples t test)**

| Age     | Before | After | P value | Before | After | P value |
|---------|--------|-------|---------|--------|-------|---------|
|         | Means±SD | Means±SD |         | Means±SD | Means±SD |         |
| Tamas   | 3.16 ± 0.49 | 3.20 ± 1.63 | <0.001 | 3.28 ± 0.67 | 3.16 ± 1.3 | 0.4    |
| Rajas   | 3.84 ± 0.66 | 3.99 ± 0.74 | 0.286 | 3.75 ± 0.63 | 3.56 ± 0.75 | 0.152  |
| Sattva  | 4.67 ± 0.47 | 5.26 ± 0.55 | <0.001 | 4.79 ± 0.44 | 5.14 ± 0.65 | 0.002  |

**Tamas**: The PE group showed a significant decrease in the Tamas score from 3.24 to 2.99 (P = 0.001) (paired samples t test). The senior subjects (age > 24 years) in both the Y (3.09 to 2.67) and PE (3.21 to 2.83) groups showed a significant decrease (P = 0.001). In gender analysis, females showed a decrease with Y (P = 0.040) and males showed a decrease with PE (P = 0.032).

**Rajas**: The PE group showed a significant decrease in scores from 3.67 to 3.43 (P = 0.002). Seniors in both the Y (3.81 to 3.51) (P = 0.002) and PE (3.62 to 3.31) groups (P = 0.015) have shown significant decreases. In gender analysis, males showed a decrease with PE (3.73 to 3.37) (P = 0.014). Significantly greater reduction was observed in the PE than in the Y group (P = 0.005) and in juniors (P = 0.012).

**Sattva**: Sattva scores have increased significantly in both Y (4.88 to 5.26) (P = 0.001) and PE (4.91 to 5.21) (P < 0.001) groups with a greater effect size in the Y
(0.61) than in the PE (0.45) group. Juniors, seniors, males and females in both the Y and PE groups have all shown significant increase in Sattva scores.

Table 5 shows the results for all variables of the GHQ.

**Somatic symptoms (SS):** SS symptoms have reduced significantly in both Y (0.57 to 0.29) \((P = 0.011)\) and PE (0.41 to 0.11) \((P = 0.001)\) groups. Juniors, seniors, males and females of the PE group have shown significant decrease in SS. Seniors and males in the Y group have shown significant decrease in SS. There was a significant difference between the groups.

**Anxiety and insomnia (AI):** AI symptoms have decreased significantly in both the Y (0.61 to 0.08) \((P < 0.01)\) and PE (0.49 to 0.18) \((P = 0.011)\) groups. Juniors, seniors, females and males in the in Y group have shown significant decrease in AI whereas only seniors and males have shown significant decrease in AI in the PE group.

**Social dysfunction (SF):** A significant decrease was observed in both the Y (0.60 to 0.15) \((P \leq 0.001)\) and PE (0.60 to 0.23) \((P = 0.001)\) groups. Juniors, females and males have shown significant decrease in SD with Yoga whereas juniors, seniors, males and females have shown significant decrease in SD due to PE.

**Severe depression (SP):** Both Y (0.44 to 0.22) \((P = 0.017)\) and PE (0.52 to 0.15) \((P < 0.01)\) groups have shown significant reduction in SP. Juniors, seniors, females and males have shown a significant decrease in SP due to PE. Only seniors and males have shown a significant decrease in SP due to yoga.

**DISCUSSION**

This is a randomized, controlled, prospective study in normal adults comparing the efficacy of yoga with a control intervention of PE of eight weeks in 174 normal adults on changes in their personality (guna) and General health as assessed by VPI and GHQ. The results showed that there was an increase in Sattva scores \((P < 0.001)\) in both Y and PE groups and a decrease in Rajas \((P = 0.002)\) and tamas \((P = 0.001)\) scores in the PE group. The scores for Tamas decreased significantly in seniors of both the groups (females in Y and males in PE) (paired samples t test). The increase in Sattva scores was higher in the Y group.
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Table 4: Gender-based VPI scores (paired samples t test)

|          | Before Means±SD | After Means±SD | P value | Before Means±SD | After Means±SD | P value |
|----------|-----------------|----------------|---------|-----------------|----------------|---------|
|          | Y               | PE             |         | Y               | PE             |         |
| Females  | Tamas           | 3.15 ± 0.52    | 2.80 ± 1.04 | 0.04            | 3.20 ± 0.71    | 2.97 ± 0.71 | 0.053   |
|          | Rajas           | 3.66 ± 0.62    | 3.43 ± 0.48 | 0.502           | 3.64 ± 0.63    | 3.50 ± 0.80 | 0.196   |
|          | Sattva          | 4.91 ± 0.42    | 5.20 ± 0.50 | 0.004           | 4.98 ± 0.58    | 5.23 ± 0.62 | 0.034   |
| Males    | Tamas           | 3.11 ± 0.50    | 3.10 ± 0.58 | 0.924           | 3.28 ± 0.65    | 3.01 ± 0.46 | 0.032   |
|          | Rajas           | 3.96 ± 0.63    | 3.96 ± 0.41 | 0.898           | 3.73 ± 0.63    | 3.50 ± 0.79 | 0.014   |
|          | Sattva          | 4.86 ± 0.60    | 5.33 ± 0.52 | <0.001          | 4.80 ± 0.49    | 5.19 ± 0.68 | 0.001   |

Table 5: GHQ scores (Wilcoxon signed ranks test)

|          | Before Means±SD | After Means±SD | P value | Before Means±SD | After Means±SD | P value |
|----------|-----------------|----------------|---------|-----------------|----------------|---------|
|          | Y               | PE             |         | Y               | PE             |         |
| SS       | 0.57 ± 0.91     | 0.29 ± 0.65    | <0.001  | 0.41 ± 0.80     | 0.11 ± 0.32    | 0.001   |
| AI       | 0.61 ± 0.92     | 0.08 ± 0.38    | <0.001  | 0.49 ± 0.90     | 0.18 ± 0.74    | 0.011   |
| SF       | 0.60 ± 0.91     | 0.15 ± 0.39    | <0.001  | 0.60 ± 0.99     | 0.23 ± 0.52    | 0.001   |
| SP       | 0.44 ± 0.73     | 0.22 ± 0.58    | 0.017   | 0.52 ± 0.65     | 0.15 ± 0.42    | <0.001  |
| TH       | 2.22 ± 2.48     | 0.74 ± 1.21    | <0.001  | 2.02 ± 2.78     | 0.68 ± 1.28    | <0.001  |

Table 6: GHQ scores: Age ≤ 24 years and > 24 years (Wilcoxon signed ranks test)

|          | Before Means±SD | After Means±SD | P value | Before Means±SD | After Means±SD | P value |
|----------|-----------------|----------------|---------|-----------------|----------------|---------|
|          | Y               | PE             |         | Y               | PE             |         |
| Age ≤ 24 years | SS        | 0.65 ± 0.93 | 0.43 ± 0.76 | 0.161 | 0.43 ± 0.76 | 0.14 ± 0.35 | 0.01 |
|          | Al              | 0.71 ± 0.96   | 0.10 ± 0.47 | <0.001 | 0.66 ± 0.99 | 0.30 ± 1.00 | 0.057 |
|          | SF              | 0.80 ± 0.98   | 0.18 ± 0.44 | <0.001 | 0.75 ± 1012 | 0.34 ± 0.64 | 0.019 |
|          | SP              | 0.45 ± 0.71   | 0.29 ± 0.68 | 0.185 | 0.64 ± 0.89 | 0.16 ± 0.43 | <0.001 |
|          | TH              | 2.61 ± 2.54   | 1.00 ± 1.44 | <0.001 | 2.48 ± 3.11 | 0.93 ± 1.53 | 0.001 |
| Age > 24 years | SS        | 0.47 ± 0.89 | 0.11 ± 0.39 | 0.004 | 0.40 ± 0.85 | 0.09 ± 0.29 | 0.044 |
|          | Al              | 0.47 ± 0.86   | 0.05 ± 0.23 | 0.002 | 0.33 ± 0.78 | 0.06 ± 0.26 | 0.047 |
|          | SF              | 0.34 ± 0.75   | 0.11 ± 0.31 | 0.071 | 0.44 ± 0.83 | 0.12 ± 0.32 | 0.017 |
|          | SP              | 0.42 ± 0.76   | 0.13 ± 0.41 | 0.047 | 0.40 ± 0.79 | 0.14 ± 0.41 | 0.013 |
|          | TH              | 1.71 ± 2.25   | 0.39 ± 1.00 | 0.001 | 1.56 ± 2.00 | 0.42 ± 0.00 | 0.003 |

SS: Somatic symptoms; AI: Anxiety and insomnia; SF: Social dysfunction; SP: Severe depression; TH: Total health

There is a significant decrease in Rajas which was not observed after Mahamantra. This difference could be because of the inclusion of Asanas and Pranayama to the Meditation technique in the integrated yoga program used in the present study as compared to the mahamantra which is mainly a form of meditation. In their study, Dasa et al. also showed a significant reduction in stress, anxiety and depression after mahamantra as measured by State Trait Anxiety Inventory (STAI) comparable to the results of GHQ in this study.

The behavior of a human being is an expression of a combination of different gunas. Tamas (meaning darkness) is the grossest aspect of our personality characterized by excessive sleep, innocence, laziness, depression, procrastination, a feeling of helplessness, impulsivity, anger and arrogance (packed up with vital energy). When we reduce Tamas through mastery over the mind, we become dynamic, sensitive and sharp to move towards Rajas (the shining one) characterized by intense activity, ambitiousness, competitiveness, high

(effect size 0.61) than in the PE group (effect size 0.45) (paired samples t test). The decrease in the Rajas scores was significantly higher in the PE than in the Y (P=0.005) (independent samples t-test) groups and this was seen in juniors and males. The GHQ revealed a significant improvement on all four domains and the overall health in both groups after the intervention (P ≤ 0.001) (Wilcoxon’s signed rank test). It can be seen from the GHQ scores that PE was more effective in reducing somatic symptoms (P = 0.018) (Mann Whitney test), severe depression (effect size for Y = 1.46, PE = 1.60) and anxiety and insomnia (effect size for Y = 0.98, PE = 1.93).

A similar study by Dasa[32] conducted by the use of mahamantra in a three-armed, randomized prospective, controlled study on 62 volunteers showed that the mahamantra group had increased Sattva and decreased Tamas with no significant change in Rajas scores on the VPI questionnaire after a month of chanting of mahamantra, 20 minutes daily for four weeks. In the present study, apart from an increase in Sattva and decrease in Tamas,
Table 7: Gender-based GHQ scores (Wilcoxon signed ranks test)

|          | Before Mean±SD | After Mean±SD | P value | Before Mean±SD | After Mean±SD | P value |
|----------|----------------|---------------|---------|----------------|---------------|---------|
|         | SS             | 0.50 ± 0.99   | 0.25 ± 0.58 | 0.115 | 0.40 ± 0.74 | 0.07 ± 0.27 | 0.018 |
| Females | Al             | 0.50 ± 0.85   | 0.02 ± 0.16 | 0.001 | 0.57 ± 0.98 | 0.30 ± 1.04 | 0.208 |
|         | SF             | 0.40 ± 0.81   | 0.10 ± 0.30 | 0.038 | 0.45 ± 0.81 | 0.15 ± 0.36 | 0.038 |
|         | SP             | 0.35 ± 0.62   | 0.28 ± 0.72 | 0.584 | 0.50 ± 0.85 | 0.10 ± 0.45 | 0.005 |
|         | TH             | 1.71 ± 2.35   | 0.65 ± 1.03 | 0.01 | 1.93 ± 2.60 | 0.70 ± 1.44 | 0.018 |
| Males   | SS             | 0.64 ± 0.85   | 0.32 ± 0.69 | 0.027 | 0.43 ± 0.85 | 0.15 ± 0.36 | 0.022 |
|         | Al             | 0.70 ± 0.98   | 0.13 ± 0.49 | <0.001 | 0.43 ± 0.83 | 0.08 ± 0.28 | 0.007 |
|         | SF             | 0.77 ± 0.96   | 0.19 ± 0.45 | <0.001 | 0.72 ± 1.12 | 0.30 ± 0.62 | 0.009 |
|         | SP             | 0.51 ± 0.80   | 0.17 ± 0.43 | 0.008 | 0.53 ± 0.86 | 0.13 ± 0.40 | <0.001 |
|         | TH             | 2.62 ± 2.53   | 0.81 ± 1.36 | <0.001 | 2.11 ± 2.78 | 0.66 ± 1.15 | <0.001 |

SS: Somatic symptoms; Al: Anxiety and insomnia; SF: Social dysfunction; SP: Severe depression; TH: Total health

Table 8: Comparison between our data (before and after) and standard VPI data

|          | n  | Observed range | Observed mean±SD | n  | Predicted range | Predicted mean±SD |
|----------|----|----------------|------------------|----|-----------------|------------------|
| Sattva   | 174| 3.04 - 6.17    | 4.90±0.53        | 247| 3.00 - 6.39     | 4.67±0.75        |
| Rajas    |    | 2.11 - 5.25    | 3.76±0.63        | 247| 2.46 - 5.96     | 4.07±1.08        |
| Tamas    |    | 1.47 - 5.38    | 3.19±0.60        | 247| 1.43 - 6.00     | 3.49±0.90        |

Observations by Atlantis et al. on the efficacy of physical exercise practised for eight weeks in a population of Australian employees showed that the intervention significantly improved the Quality of Life as compared to a waiting list control group (measured by SF-36). They have shown an improvement of 12.8% in physical functioning, 9.90% in general health, 44.50% in vitality and 15.90% in mental health scores. The significantly better reduction in SS in the Yoga group in our study may be due to deeper rest and relaxation obtained in Yoga.

Although in this study, Yoga has shown a better effect on the Sattva guna than PE with a better effect size, the main difference between Y and PE practices seems to be the effect on Rajas guna. The reduction in this guna was significantly higher after PE than after Y (this group difference was in males and juniors). The scores for Tamas also decreased significantly in seniors of both groups (females in Y and males in PE groups) with the effect size being higher in the PE than in the Y groups. Thus, significantly greater reductions in Rajas and Tamas were worthy of note with PE than with Y. This positive effect of PE in reducing Rajas and Tamas adds to the fund of knowledge about several psycho-physiological benefits of PE. Hence, it appears that physical practices are more effective in reducing the limitations of Rajas and Tamas such as lack of mastery over upsurges of emotions and impulsive behavior, while yoga improves the softer qualities of Sattva. The mechanism of how physical exercises may reduce Rajas and Tamas and how yoga may increase Sattva needs to be investigated by further studies. Thus, we may conclude that both physical activity (to reduce Rajas and Tamas) and Yoga (to improve Sattva) may be recommended for the harmonious promotion of personality.

The GHQ showed significant differences within groups in all domains in both groups. There was a significant difference in SS between the Y and PE groups (Mann Whitney Test).
The results of the study seem to point out clear differences between Y and PE on VPI whereas differences between Y and PE are not found in most domains of GHQ (except SS). Hence, although GHQ is a good measure of the various aspects of health and disease, VPI seems to be a better measure to differentiate the effects of Y and PE.

In summary, this randomized, prospective, single-blind, comparative study has shown the efficacy of both Y and PE in improving all components of general health. While physical exercise has reduced Rajas and Tamas, the yogic practice has increased Sattva. Hence, yoga which is more traditionally practised in India and cost-effective, can be recommended with additional benefits of promotion of the Sattva guna.

The strength of our design is a PE intervention matched with the integrated Y module. The study population was taken from different parts of Bangalore from different socioeconomic classes of the city. The improvement observed in both groups after eight weeks of intervention in all variables in both groups not only provides hitherto undemonstrated evidence of the efficacy of physical activity in a normal South Indian adult population but also shows that yoga could be an equally effective tool. This study also brings out the subtle differences in the efficacy of the two interventions (Y or PE). It also points out the utility of the VPI as a tool for measuring the subtle dimensions of guna described in traditional texts of yoga that can measure the steps of growth of an individual.

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REFERENCES

1. Dhirendra B. Yoga for life and living. Central Research Institute for Yoga: New Delhi; 1968.
2. Margareta Eriksson K, Westborg CJ, Eliasson MC. A randomized trial of lifestyle intervention in primary healthcare for the modification of cardiovascular risk factors. Scand J Public Health 2006;34:453-61.
3. Brukner PD, Brown WJ. Is exercise good for you? Med J Aust 2005;183:538-41.
4. Stamper M, Hu F, Manson J, Rimm E, Willett W. Primary prevention of coronary heart disease in women through diet and lifestyle. N Engl J Med 2000;343:16-22.
5. Courneya KS, Friedenreich CM. Physical exercise and quality of life following cancer diagnosis: A literature review. Ann Behav Med 1999;21:171-9.
6. Lamb KL, Brodie DA, Roberts K. Physical fitness and health-related fitness as indicators of a positive health state. Health Promotion Int 1988;3:171-82.
7. Dimeo F, Bauer M, Varahram I, Proest G, Halter U. Benefits from aerobic exercise in patients with major depression: A pilot study. Br J Sports Med 2001;35:114-7.
8. Bloomfield HH, Cain MP, Jaffe DT. ‘TM’-Discovering inner energy and overcoming stress. 8th ed. Delacorte Press: New York; 1975.
9. Brena SH. Yoga and Medicine. The Julian Press Inc: New York; 1975.
10. Pratindhi BF. The ten point way to health. DB Taraporevale Sons and Co. Pvt. Ltd: Mumbai; 1966.
11. Denniston D, Williams PM. ‘TM’ book. Veremonger Press: Michigan, USA; 1975.
12. Sarasvati, Swami. Yoga for vital beauty. B.I. Publications: Delhi; 1975.
13. Nirmala, G. Report No. KK/20, Pub. Vivekananda Kendra; 1978.
14. McCarthey R, Ruknui P, Hathakati U, Kasetsonboon P. The effects of yoga on hypertensive persons in Thailand. Holist Nurs Pract 2005;19:173-80.
15. Sabina AB, Williams AL, Wall HK, Bansal S, Chupp G, Katz DL. Yoga intervention for adults with mild-to-moderate asthma: A pilot study. Ann Allergy Asthma Immunol 2005;94:543-8.
16. Bijnani RL, Vempati RP, Yadav RK, Ray RB, Gupta V, Sharma R, et al. A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. J Altern Complement Med 2005;11:267-74.
17. Brown RP, Gerberg PL. Sadarshan Kriya yogic breathing in the treatment of stress, anxiety and depression: Part I-neurophysiologic model. J Altern Complement Med 2005;11:189-201.
18. Jorm AF, Christensen H, Griffiths KM, Rodgers B. Effectiveness of complementary and self-help treatments for depression. Med J Aust 2002;176:S84-96.
19. Goyandka J. Srimadbhagavad gita Tatavivecani, 15th ed. Govind Bhavan Karyalaya, Gita Press: Gorakhpur; 1999.
20. Das RC. Standardization of the Gita inventory of personality. J Indian Psychol 1991:9:47-54.
21. Wolf DB. The vedic personality inventory: A study of the Ganas. J Indian Psychol 1998;16:26-43.
22. Goldberg DP, Gater R, Sartorius, Ustan TB, Piccinelli M, Gujeje O, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. Psychol Med 1997;27:191-7.
23. Available from: http://www.randomisor.org AU:Incomplete reference.
24. Goldberg DP, Hillier VF. A scaled version of the general Health Questionnaire. Psychol Med 1979;9:139-45.
25. Nagarathna R, Nagendra HR. Integrated Approach of Yoga Therapy for Positive Health. 5th ed. SVYP: Bangalore; 2003.
26. Lokeshwarananda S. Taittiriya U. The Ramakrishna Mission Institute of Culture: Calcutta; 1996. p. 136-80.
27. Nagarathna R, Nagendra HR. Yoga, 2nd ed. SVYP: Bangalore; 2003.
28. Nagarathna R, Nagendra HR. Yoga for Arthritis. Swami Vivekananda Yoga Prakashana: Bangalore; 2001. p. 35-51.
29. Atlantis E, Chow CM, Kirby A, Singh MF. An effective exercise-based intervention for improving mental health and quality of life measures: A randomized controlled trial. Prev Med 2004;39:424-34.
30. Available from: http://www.uni-mannhein.de/gpower. AU:Incomplete reference.
31. Cohen J. Statistical power analysis for the behavioral sciences. Academic Press: New York; 1977.
32. Dasa DG. Effects of the Hare Krsna Maha mantra on stress, Depression and The Three Gunas. VNN Vaishnav News org Network VNN4267. 1999. Available from: http://www.vnn.org/usa/US9907/US10-4267.html.
33. Nagendra HR. The secret of action. 1st ed. SVYP: Bangalore; 2003.
34. Holt WR, Caruso JL, Riley JB. Transcendental Meditation vs pseudo-meditation on visual choice reaction time. Percept Motor Skills 1978;46:726.
35. Alexander CN, Robinson P, Rainforth M. Treating and preventing alcohol, nicotine and drug abuse through transcendental meditation: A review and statistical meta-analysis. Alcoholism Treatment Quarterly 1994;11:1-2, 13-87.
36. Abrams AI. Transcendental meditation and rehabilitation at Folsom prison: Response to a critique. Criminal Justice Behav 1979;6:13-21.
37. Dillbeck MC, Orme-Johnson DW. Physiological differences between transcendental meditation and rest. Am Psychol 1987;42:879-81.
38. Kember P. The Transcendental Meditation technique and postgraduate academic performance. Br J Educ Psychol 1985;55:164-6.