**The Effect Of Anuloma Viloma Pranayama And Kapalbhati On Resting Pulse Rate And Stress Of School Going Children In Bhubaneswar**

Manoranjan Tripathy

Research Scholar, Department of Clinical Psychology, Dev Sanskriti University, Haridwar, India

manoranjanonly@gmail.com

**Abstract:** To determine the effect of Anuloma-viloma Pranayama and Kapalbhati on resting pulse rate and stress, one hundred fifty (N=150) randomly selected male student aged 15-17 years to participated in the study of DAV Public School, Bhubaneswar, Odisha, India. They were randomly assigned into three groups: A- Pranayama, B- Kapalbhati and C- Control. The subjects were subjected to the twelve weeks Pranayama and Kapalbhati training program. The between group differences was assessed using the post-hoc test. The level of p ≤ 0.05 was considered significant. The pulse rate and stress significant decrease in group A and B compared with the control group-c.

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**Key Words:** Anuloma-viloma Pranayama, Kapalbhati, Pulse Rate Stress

**Introduction**

In this contemporary fast growing world of science and technology, the human elements are treated as ever before. Its goals are distant and dissatisfying1. The mechanism of modern living, the force restriction of physical activity leading to a century life, an increased amount of leisure, time, all these factors have resulted in a tremendous increase of professional and public interest in physical activity and health2. People seem to be “*turning on*” to the idea that one looks and feels better and stays healthier by being physically more active. Today yoga, being a matter of varied interests, has gained worldwide popularity3. Recent research trends have shown that it can serve as an applied science in a number of fields such as physical education and sports, (Health and family welfare, psychology and medicine and one of the valuable means for the development of human resources for better performance and productivity). However, it has generally been believed that yoga is a spiritual science having emancipation as its goals and hence cannot be treated only as a therapy4. It is now being achieved in all parts of the globe that yoga is not only for better development of mind, socio-control (spiritual or moral) but a therapy. Yoga focuses on harmony between mind and body. Yoga derives its philosophy from Indian metaphysical beliefs5. The word yoga comes from the Sanskrit language and means union or merger. The ultimate aim of this philosophy is identical to strike a balance between body, mind and attain self-enlightenment. To achieve this, yoga uses movement, breath, relaxation, posture and meditation in order to create a lively, healthy and balanced approach to life6.

**Objective of the Study**

1. To find out the effect of Kapalbhati on resting pulse rate of school going children of Bhubaneswar.
2. To find out the effect of Anuloma-viloma Pranayama on resting pulse rate of school going children of Bhubaneswar.
3. To find out the effect of Kapalbhati on stress of school going children of Bhubaneswar.
4. To find out the effect of Anuloma-viloma Pranayama on stress of school going children of Bhubaneswar.

**Methodology**

**A. Method**

The researcher was followed the experimental research method in the study. There were three groups, one act as a Kapalbhati group and second act as a Pranayama group and no act control group.

* Group “A” - Kapalpalbhati
* Group “B” - Anuloma-Viloma Pranayama
* Group “C” - Control

The duration of experimental period was twelve weeks.

The pre-test conduct before the practice.

The post-test conduct after the practice.

**B. Size of Sample**

The size of the sample was 150 school boys.

* 75 students were selected from DAV Public School, Bhubaneswar, Odisha, India to Class 11 and 12 those who are interested in yoga.
* 75 students were selected from DAV Public School, Bhubaneswar, Odisha, India to Class 11 and 12 those who are interested in yoga.

**Variables**

* Resting Pulse Rate
* Stress

**Resting Pulse Rate**

Resting Pulse Rate was recorded as the number of Pulse per minute during the state of rest.

**Table 1: Descriptive statistics of the data measured in the post testing pulse rate**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Groups** | **Practices** | **N** | **Mean** | **Std. Deviation** |
| Group - A | Kapalbhati | 50 | 68.44 | 6.73 |
| Group – B | Anuloma-Viloma Pranayama | 50 | 71.38 | 5.72 |
| Group -C | Control | 50 | 74.20 | 5.13 |
| Total | 150 | 71.34 | 6.31 |

Table 1 indicates the values of descriptive statistics of the experimental Groups Kapalbhati Group, Anuloma-Viloma Pranayama Group & Control Group for physiological variable of pulse rate, which shows that the mean and S.D. values of Pranayama Group, Kapalbhati Group and the Control Group were found to be 68.44±6.73, 71.38±5.72 and 74.20±5.13respectively. Total the same was 71.34±6.31.

**Table 2: Descriptive statistics of the data measured in the post-testing after adjustment withthe initial difference pulse rate**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Groups** | **Practices** | **Mean** | **Std. Error** | **95% Confidence Interval** |
| **Lower Bound** | **Upper Bound** |
| Group - A | Kapalbhati | 69.263a  | .313 | 68.643  | 69.882 |
| Group – B | Anuloma-Viloma Pranayama | 71.646a | .312 | 71.029  | 72.263 |
| Group -C | Control | 73.111 a | .314 | 72.490  | 73.732 |

a Covariates appearing in the model were evaluated at the following values: pre pulse rate = 72.67

The mean and standard error of different post-testing Groups after adjustment have been shown in Table 2. Which were for Kapalbhati Group 69.263, Pranayama Group 71.646 & 0.312 & 0.313 and Control Group 73.111 & 0.314.

**Table 3: ANCOVA table for the post-test data on pulse rate**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **Sum of Squares** | **df** | **Mean Square** | **F Sig.**  | **(p-value)** |
| Pre-Pulse rate | 4401.134 | 1 | 4401.134 | 903.792 | .000 |
| Treatment Group | 370.271 | 2 | 185.135 | 38.018 | .000 |
| Error | 710.966 | 146 | 4.870 |  |  |
| Corrected Total | 5482.371 | 149 |  |  |  |

Table 3 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre-test values of physiological variable of pulse rate for the three selected Groups, as the value was found to be 903.792, which proves to be the base of Analysis of Co-Variance. Also, a significant difference was found between the post-test values of the experimental and Control Group as the value was found to be 38.018, which was significant at 0.05 level.

**Table 4: Post hoc comparison for the group means in post-measurement adjusted with the initial differences pulse rate**

|  |  |  |  |
| --- | --- | --- | --- |
| **(I) Different Groups** | **(J) Different Groups** | **Mean Difference (I-J)** | **SIG. a****(p-value)** |
| Pranayama | Kapalbhati | 2.384**\*** | .000 |
| Control | -1.465**\*** | .001 |
| Kapalbhati | Pranayama | -2.384**\*** | .000 |
| Control | -3.848**\*** | .000 |
| Control | Pranayama | 1.465**\*** | .001 |
| Kapalbhati | 3.848**\*** | .000 |

Based on estimated marginal means:

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

**\*** The mean difference is significant at the 0.05 level.

Table 4 indicates the values of post hoc test for the selected Groups for physiological variable of pulse rate, which shows that a significant difference was found between the post-test values of Pranayama Group and the Kapalbhati Group as the value was found to be 2.384 which was significant at 0.05 level, the post-test values of Pranayama Group and the Control Group as the value was found to be 1.465 which was significant at 0.05 level, Kapalbhati Group and the Control Group as the value was found to be 3.848 which was significant at 0.05 level.

**Table 5: Comparison among three groups, pre and post-test mean of pulse rate**

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Subject** | **Mean (Pre-Test)** | **Mean (Post-Test)** |
| Pranayama | 50 | 72.36 | 71.38 |
| Kapalbhati | 50 | 71.72 | 68.44 |
| Control | 50 | 73.92 | 74.20 |

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**Figure 1: Bar diagram showing the mean value of pulse rate among Pranayama group, Kapalbhati group and Control group**

**Table 6: Descriptive statistics of the data measured in the post testing stress**

|  |  |  |  |
| --- | --- | --- | --- |
| **Different Groups** | **N** | **Mean** | **Std. Deviation** |
| Pranayama | 50 | 12.280 | 3.923 |
| Kapalbhati | 50 | 13.980 | 3.772 |
| Control | 50 | 17.320 | 4.488 |
| Total | 150 | 14.527 | 4.558 |

Table 6 indicates the values of descriptive statistics of the experimental Groups (Pranayama Group, Kapalbhati Group) & Control Group for psychological variable of stress, which shows that the mean and S.D. values of Pranayama Group, Kapalbhati Group and the Control Group were found to be 12.280±3.923, 13.980±3.772, and 17.320±4.488 respectively. Total the same was 14.527±4.558.

**Table 7: Descriptive statistics of the data measured in the post-testing after adjustment with the initial difference stress**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Groups** | **Practices** | **Mean** | **Std. Error** | **95% Confidence Interval** |
| **Lower Bound** | **Upper Bound** |
| Group - A | Kapalbhati | 14.425a | .228 | 13.973 | 14.876 |
| Group – B | Anuloma-Viloma Pranayama | 12.835a | .229  | 12.382  | 13.287 |
| Group -C | Control | 16.321a | .231  | 15.865  | 16.777 |

a Covariates appearing in the model have evaluated at the following values: pre stress = 15.6867.

The mean and standard error of different post-testing Groups after adjustment have been shown in table 6. Which are for Kapalbhati Group 14.425, Pranayama Group 12.835 & 0.229 & 0.228 and Control Group 16.321 & 0.231.

**Table 8: ANCOVA table for the post-test data of stress**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **Sum of Squares** | **df** | **Mean Square** | **F Sig.**  | **(p-value)** |
| Pre-Stress | 2058.638 | 1 | 2058.638 | 792.406 | .000 |
| Treatment Group | 295.559 | 2 | 147.779 | 56.883 | .000 |
| Error | 379.302 | 146 | 2.598 |  |  |
| Corrected Total | 3095.393 | 149 |  |  |  |

Table 8 indicates the values test of difference between the subject effects, which shows that there were a significant difference in pre-test values of psychological variable of stress for the three selected Groups, as the value has found to be 792.406, which proves to be the base of Analysis of Co-Variance. Also, a significant difference is found between the post-test values of the experimental and Control Group as the value has found to be 56.883, which was significant at 0.05 level.

**Table 9: Post hoc comparison for the group means in post-measurement adjusted with the initial differences stress**

|  |  |  |  |
| --- | --- | --- | --- |
| **(I) Different Groups** | **(J) Different Groups** | **Mean Difference (I-J)** | **SIG. a****(p-value)** |
| Pranayama | Kapalbhati | -1.590**\*** | .000 |
| Control | -3.486**\*** | .000 |
| Kapalbhati | Pranayama | 1.590**\*** | .000 |
| Control | -1.896**\*** | .000 |
| Control | Pranayama | 3.486**\*** | .000 |
| Kapalbhati | 1.896**\*** | .000 |

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

**\*** The mean difference is significant at the 0.05 level.

Table 9 indicates the values of post hoc test for the selected Groups for psychological variable of stress, which shows that a significant difference has found between the posttest values of Pranayama Group and the Kapalbhati Group as the value has found to be 1.590\* which was significant at 0.05 level, the post-test values of Pranayama Group and the Control Group as the value has found to be 3.486\* which was significant at 0.05 level, Kapalbhati Group and the Control Group as the value has found to be 1.896\* which was significant at 0.05 level.

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**Figure 2: Bar diagram showing the mean value of stress among Pranayama group, Kapalbhati group and Control group**

**Table 10. Comparison among three groups, pre and post-test mean of Stress**

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Subject** | **Mean (Pre-Test)** | **Mean (Post-Test)** |
| Pranayama | 50 | 15.65 | 12.20 |
| Kapalbhati | 50 | 15.70 | 14.01 |
| Control | 50 | 16.30 | 16.70 |

**Discussion and Findings**

We observed no significant difference in the baseline parameters of the three groups and therefore, they can be examined comparable for the study. After 12 weeks of the study period, researcher observed a significant decrease in resting pulse rate in both (Anuloma-viloma Pranayama and Kapalbhati) groups with no change in control group (Group C). But the Kapalbhati group is more effective then comparison of Anuloma-viloma Pranayama group.

The researcher observed a significant decrease in stress in both (Anuloma-viloma Pranayama and Kapalbhati) groups with no change in control group (Group C). But the Anuloma-viloma Pranayama group is more effective than comparison of Kapalbhati group.

To summarize, our study demonstrates that Anuloma-viloma Pranayama and Kapalbhati were effective in reducing perceived resting pulse rate and stress. Kapalbhati was more suitable for subjects with stable resting pulse rate and Pranayama was more suitable for subjects with stable stress. On post-test analysis, sample size (150 students) was found adequate for the present study.

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