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## Effect of Suryanamaskar on resting heart rate of school girls

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### Abstract

The objectives of the study were to determine the main effect of training durations (within-groups), the main effect of groups (between-groups) and interaction effect (combined effect of training durations and groups) on resting heart rate due to practices of Suryanamaskar. Mixed design was used for the study. Three groups were created (pace 1, pace 2 and pace 4 groups). Ten girls were in each group in the range of 15 – 17 years. First experimental group performed one round of Suryanamaskar in 1 minute, second experimental group in 2 minutes and third experimental group in 4 minutes. Total treatment duration was six weeks. Resting heart rate was measured by stop watch and recorded in beats per minute before (pretest), after 3 weeks and after 6 weeks of all three groups. 3 x 3 mixed factorial ANOVA was used and level of significance was set at 0.05. The findings of the study revealed that practice of Suryanamaskar for 3 weeks and 6 weeks are not sufficient to bring out significant improvement on resting heart rate (main effect of training duration). There was no interaction effect as in all three groups. There was no significant difference found among three groups (main effect of groups) on resting heart rate at pretest, after 3 weeks and after 6 weeks.

**Keywords:** Suryanamaskar, Pace, Resting Heart Rate and Mixed ANOVA.

### 1. Introduction

Suryanamaskar is a graceful combined sequence of twelve postures along with regulated breathing and relaxation. It is an effective way of loosening up, stretching, massaging and toning all the joints, muscles and internal organs of the body. It relieves stiffness, revitalizes the body, refreshes the mind and purifies subtle energy channels. (Choudhary, 2010)

Activities such as aerobic dance, distance running, brisk walking, swimming, bicycling and cross country run are associated with cardiovascular fitness. The most important aspect of an exercises program is cardiovascular conditioning. There are many benefits of cardiovascular workout like increase physical work capacity at all ages, control blood pressure, control all the problems associated with obesity, decrease the risk of coronary artery disease and stroke, decrease risk of diabetes, improve resting heart rate and many more.

There is a positive high correlation between resting heart rate and fitness of an individual. If an individual has good fitness than naturally his/her resting heart rate would be low. The key method for improvement of resting heart rate is aerobic workout. There are plenty of studies have been done and found that regular practices of asanas with moderate pace, benefited as a aerobic activity. Suryanamaskar is itself combination of six asanas. (Shankar and Pancholi, 2011). Going through many research papers this query has been raised that change in the pace of Suryanamaskar will effect on resting heart rate (Bhavanani, 2011).

The objectives of the study were following:

- To determine the effect of different paces (between-groups) of Suryanamaskar on resting heart rate.
- To determine the effect different training durations (within-groups) on different paces of Suryanamaskar on resting heart rate.
- To investigate whether there is interaction effect (combined effect of groups and training durations) on resting heart rate due to practice of Suryanamaskar.

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**2. Methods**

**1. Subjects:** The subjects for this study were selected from the KIDDY’S CORNER SCHOOL, Gwalior. Thirty six girls in the range of 15 – 17 years from class 11<sup>th</sup> and 12<sup>th</sup> were selected for this study. Only thirty girls were able to complete 6 weeks Suryanamaskar practices.

**2. Variables:** Suryanamaskar was considered as independent variable and resting heart rate was considered as dependent variable.

**3. Test for Resting Heart Rate:** The resting heart rate of the subject was measured under complete resting condition. The resting heart rate was collected after giving thirty minutes of Savasana. The subject was requested to remain in lying position and the scholar placing the two middle fingers of his right hand on the thumb side of the subject left wrist, and measured heart rate simultaneously. Final score was recorded as number of pulse beats per minute.

**4. Experimental Design:** Mixed-Model design (between-within group design) was used for the study. The experimental treatment was assigned randomly into three groups. Ten girls were in each group. The data was collected from all the three groups before the training (pre-test), after 3 weeks and after 6 weeks training of Suryanamaskar. First experimental group performed one round of Suryanamaskar in 1 minute pace, second experimental group performed in 2 minutes pace, third experimental group performed in 4 minutes. Total treatment duration was six weeks. All participants were briefed introduced about general objectives and requirement of Suryanamaskar. Suryanamaskar

training was carried for a period of six weeks, five days per week. The scheduled time of practice was during their physical education period for 40-45 minutes. Suryanamaskar practice was demonstrated to the group by the scholar and most important points were reviewed several times. The pace of Suryanamaskar was control by watch. To determine the effect different paces of Suryanamaskar on resting heart rate on school girls 3 x 3 between-within factorial ANOVA was applied and level of significant was set at 0.05.

**3. Results**

**Table 1:** Descriptive Statistics of Resting Heart Rate of different groups and training durations of Suryanamaskar

|         | Groups | Mean  | Std. Deviation | N  |
|---------|--------|-------|----------------|----|
| Pretest | pace1  | 71.40 | 2.67           | 10 |
|         | pace2  | 70.70 | 2.66           | 10 |
|         | pace4  | 72.50 | 1.90           | 10 |
|         | Total  | 71.53 | 2.47           | 30 |
| 3 weeks | pace1  | 70.50 | 2.59           | 10 |
|         | pace2  | 70.10 | 4.09           | 10 |
|         | pace4  | 71.80 | 1.87           | 10 |
|         | Total  | 70.80 | 2.98           | 30 |
| 6 weeks | pace1  | 69.40 | 1.83           | 10 |
|         | pace2  | 69.80 | 1.13           | 10 |
|         | pace4  | 71.70 | 2.86           | 10 |
|         | Total  | 70.30 | 2.24           | 30 |

In table 2 Mauchly’s test was applied to check the assumption of sphericity. The p-value is 0.29 which is more than 0.05, so we found that the assumption of sphericity was fulfilled.

**Table 2:** Mauchly's Test of Sphericity for Training Duration of Systolic Blood Pressure

| Within Subjects Effect | Mauchly's W |       | df | p-value | Epsilon <sup>b</sup> |             |             |
|------------------------|-------------|-------|----|---------|----------------------|-------------|-------------|
|                        |             |       |    |         | Greenhouse-Geisser   | Huynh-Feldt | Lower-bound |
| Durations              | 0.91        | 2.414 | 2  | .299    | .919                 | 1.00        | 0.50        |

**Table 3:** F- Table for Training Durations (Within-Subjects Effects) and Interaction of Resting Heart Rate

| Source           | Type III Sum of Squares | Df     | Mean Square | F     | p-value |       |
|------------------|-------------------------|--------|-------------|-------|---------|-------|
| Duration         | Sphericity Assumed      | 23.08  | 2           | 11.54 | 2.42    | 0.098 |
| Durations*groups | Sphericity Assumed      | 4.97   | 4           | 1.24  | 0.26    | 0.902 |
| Error(duration)  | Sphericity Assumed      | 257.26 | 54          | 4.76  |         |       |

Above table shows that there was no significant main effect of training durations on resting heart rate as the p-value was 0.09 which is greater than 0.05. It also shows that there was no

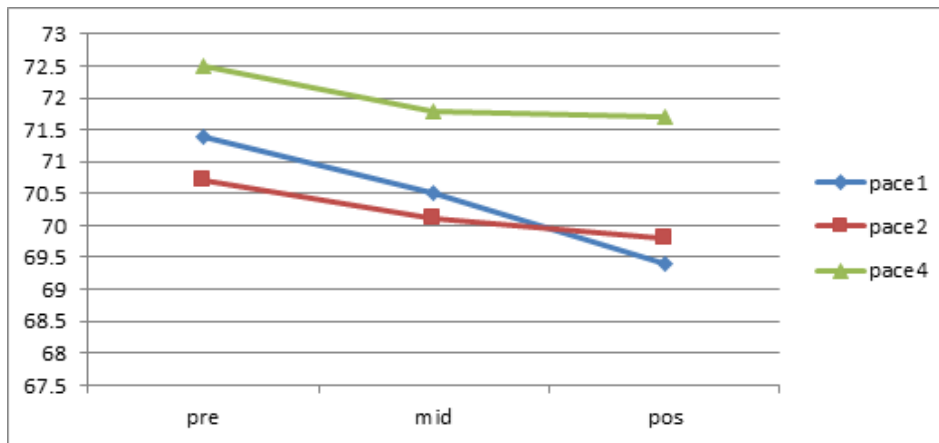
significant interaction effect between groups and training durations as the p-value was 0.90 which is greater than 0.05.

**Table 4:** F- Table for Groups (Between-Subjects Effects) of Resting Heart Rate

| Source | Type III Sum of Squares | Df | Mean Square | F    | p-value |
|--------|-------------------------|----|-------------|------|---------|
| Groups | 57.48                   | 2  | 28.74       | 2.95 | 0.069   |
| Error  | 262.83                  | 27 | 9.73        |      |         |

Above table shows that there was no significant main effect of groups (pace 1, pace2 and pace 4) on resting heart rate due to

Suryanamaskar practice as the p-value was 0.069 which is greater than 0.05.



**Fig 1:** Graphical representation of different groups with time intervals of Resting Heart Rate

On the basis of above tables we concluded that practice of Suryanamaskar for 6 weeks are not sufficient to bring out significant effect on resting heart rate.

#### 4. Discussion

The objectives of the study were to determine the main effect of training durations (within-groups), the main effect of groups (between-groups) and interaction effect (training durations x groups) on resting heart rate due to practices of Suryanamaskar. The finding of the study revealed that practice of Suryanamaskar for 3 weeks and 6 weeks are not sufficient to bring out significant improvement on resting heart rate (main effect of training duration). There is no significant difference found among three groups (main effect of groups) on resting heart rate, after 3 weeks and after 6 weeks. There is no significant interaction effect found between training duration and groups due to practice of Suryanamaskar. Study concluded that Suryanamaskar practice for six weeks with different paces (pace 1, pace 2 and pace 4) is not sufficient to bring significant change on resting heart rate of school girls.

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