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INDIVIDUAL AND COMBINED EFFECTS OF SURYANAMASKAR AND PRANAYAMA PRACTICES ON RESTING PULSE RATE OF SCHOOL BOYS

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ABSTRACT

The purpose of study was to find out the individual and combined effects of suryanamaskar and pranayama practices on resting pulse rate of school boys. To achieve this purpose of the study, forty school boy's students from Alagappa Physical Fitness Academy, Karaikudi, were randomly selected as subjects. The age of the subjects ranged between 11 and 13 years. The study was formulated as pre and post-test random group design, in which forty subjects were divided into four equal groups. The experimental group-1 (n=10, SNP) underwent suryanamaskar practices, the experimental group-2 (n=10, PP) underwent pranayama practices, the experimental group-3 (n=10, SNP+PP) underwent combined practice of suryanamaskar and pranayama and group 4 served as control group (n=10, CG) did not undergo any specific training. In this study, three training programme were adopted as independent variable, i.e., suryanamaskar practices, pranayama practices and combined practice of suryanamaskar and pranayama. The Resting pulse rate, was selected as dependent variables and the measurement was recorded in numbers. The selected three treatments were performed five days in a week for the period of six weeks, as per the stipulated training program. The resting pulse rate was collected before and after the training period. The collected pre and post data was critically analysed with apt statistical tool of one-way analysis of co-variance, for observed the significant adjusted post-test mean difference of three groups. The Scheffe's post hoc test was used to find out pair-wise comparisons between groups. To test the hypothesis 0.05 level of significant was fixed in this study.

Key words: 1). Suryanamaskar practice, 2). Pranayama practice, 3). resting pulse rate, 4). School boys, 5). ANCOVA

INTRODUCTION

Yoga is a realistic way of life, not a faith, and needs no loyalty to some exacting scheme of faith. The remark "yoga" arrives from the Sanskrit word "yuj", meaning to join yoe or unite. This is traditional Indian philosophy so as to engage the mixing of the spiritual and physical to attain an intellect of wellbeing. By this the body and mind lead to a better correlation to person's awareness. Surrounded by perform of yoga, the body is connected to the movement of breath, mind to carry about a feeling of relaxation, harmony and balance. Man is taught to awaken all his cells and his soul. (Francoise. et. al, 2005) Yoga is a practical philosophy, not a religion and requires no allegiance to any particular system of belief. The word "yoga" comes from the Sanskrit word "Yug", meaning to join yoke or unite. It is a traditional Indian Philosophy that involves the integration on the physical and spiritual in order to achieve a sense of wellbeing. This synthesis and inseparability of the body and mind leads to a greater connection to one's consciousness. In the practice of yoga, the body is linked to the movement, mind and breath to bring about a feeling of balance, relaxation and harmony.

The practitioner uses the physical self to refine the mind. Through this thorough training of the body and thought, one is taught to awaken every cell of one's self and one's soul. The practice of physical postures (asanas) improves a variety of ailments, strengthens and tones muscle and develops flexibility. Various movements in the postures result in blood saturating, nourishing and cleansing the remotest parts of the body. Psychologically, yoga increases concentration, stills the mind and promotes a feeling of balance, tranquility and contentment. There is difference between yoga and other physical exercises. Yoga asanas are psycho-physiological, while physical jerks are purely external. Asanas develop body awareness, muscles and flexibility, as well as generating internal awareness and stabilizing the mind. In physical exercises, body movements may be done with external precision, whereas in yoga, together with the precision, a deeper awareness is awakened, which brings about balance in body and spirit. (Barbira et.al. 2006) Suryanamaskar, or sun salutation, is of ancient origin and serves as the cornerstone upon which the science of yoga rests according to a well-known teacher of yoga, Shri K. Pattabhi Jois. Through the unique combination of asana, pranayama and meditation, suryamanaskar can be considered to be the ideal way to practice yoga, as it helps to develop the strength of the body and mind on the one hand and to aid in the attainment of spiritual focus on the other. Without bringing the mind to a state in which it can push the body through the various stages of yoga practice, say the texts, students cannot be certain of avoiding injury and of making due progress. The classical yogic practices of pranayama have been known in India for over 4,000 years. In the Bhagavad Gita, a text dated to the Mahabharata period, the reference to pranayama (4:29) indicates that the practices were as commonly known during that period as was yajna, fire sacrifice. Many Upanishads written in the pre-Buddhist period also refer to techniques of pranayama (to attain higher states of consciousness). However, it is in the hatha yoga texts such as Hatha Yoga Pradipika, Gheranda Samhita and Hatharatnavali, written between the sixth and fifteenth centuries AD, that we find a detailed description of the practices. It would seem that a need was felt at that time to revive and codify the practices that were until then handed down through the oral tradition. The vedic culture had declined with the advent of Buddhism and many yogic practices were being lost or misapplied by their practitioners. Thus the authors of the texts sought to restore the purity and authenticity of the practices. A need is felt yet again in the twenty-first century to reinstate the original intent and experience of the practices. The yogic renaissance witnessed in the last few decades has made asana and pranayama into household terms, but the essence and depth of the practices remain unexplored for most practitioners. (Swami Niranjanananda Saraswati, 2009)

METHODOLOGY

The experimental group-1 underwent suryanamaskar practices, the experimental group-2 underwent pranayama practices, the experimental group-3 underwent combined practice of suryanamaskar and pranayama and group-4 serve as control group did not undergo any specific training. The training period was delimited to six weeks for five days. The details training performance as follows

TRAINING APPROACHES

ADMINISTRATION OF TRAINING PROGRAMMES

1 Suryanamaskar Practices (12 counts)

Activity : Suryanamaskar practice (12 count)			
Weeks	**1-2 weeks**	**3-4 weeks**	**5-6 weeks**
Rep	2	4	5
Rec.in Between set	3 min	3 min	3 min
Set	3	3	3

2. Pranayama Practice

Nadi shodhana pranayama: Inhalation and exhalationfor1 minute.

Activity: Nadi shodhana pranayama			
Weeks	**1-2 weeks**	**3-4 weeks**	**5-6 weeks**
Rep	5	7	10
Rec.in Between set	1 min	1 min	1 min
Set	5	5	5

3. Combined practice of suryanamskar and pranayama practices

Nadi shodhana pranayama: Inhalation and exhalationfor1 minute.

Weeks	**1-2 weeks**		**3-4 weeks**		**5-6 weeks**	
Activity	Suryanamaskar practice (12 counts)	Nadi shodhana pranayama	Suryanamaskar practice (12 counts)	Nadi shodhana pranayama	Suryanamaskar practice (12 counts)	Nadi shodhana pranayama
Rep	2	5	4	7	5	10
Rec.in Bet. set	3 min	1 min	3 min	1 min	3 min	1 min
Set	3	5	3	5	3	5

TABLE - I

THE RESULTS OF ANALYSIS OF COVARIANCE ON RESTING PULSE RATE OF DIFFERENT GROUPS (Scores in Numbers)

Test Conditions		**Ex-1 SNP**	**Ex-2 PP**	**Ex-3 SNP+PP**	**Gr-4 CG**	**SV**	**SS**	**Df**	**MS**	**'F' ratio**
Pre test	**M**	71.80	71.60	71.70	71.70	B	.200	3	0.06	0.09
	S.D.	0.78	0.84	0.82	0.82	W	24.200	36	0.67	
Post test	**M**	69.90	69.10	68.90	71.40	B	38.675	3	12.89	15.94 *
	S.D.	0.99	0.87	0.87	0.84	W	29.100	36	0.81	
Adjusted Post test	**M**	69.87	69.12	68.90	71.40	B	38.20	3	12.73	16.49 *
						W	27.01	35	0.77	

* Significant at .05 level of confidence. The required tables value for test the significance was 2.87 and 2.87 with the df of 3 and 36, 3 and 35.

RESULTS OF RESTING PULSE RATE

The pre-test mean and standard deviation on resting pulse rate scores G1, G2, G3 and G4 were 71.80±0.78, 71.60±0.84, 71.70+ 0.82 and 71.70±0.82 respectively.The obtained pre-test F value of 0.09was lesser than the required table F value 2.87. Hence the pre-test means value of suryanamaskar practices, pranayama practices, combined practice of suryanamaskar and pranayama and control group on resting pulse rate before start of the respective treatments were found to be insignificant at 0.05 level of confidence for the degrees of freedom 3 and 36. Thus this analysis confirmed that the random assignment of subjects into four groups were successful. The post-test means and standard deviation on resting pulse rate of G1, G2, G3 and G4 were 69.90±0.99, 69.10±0.87, 68.90±0.87 and 71.40±0.84 respectively. The obtained post-test F value of 15.94 was higher than the required table F value of 2.87. Hence the post-test means value of suryanamaskar practices, pranayama practices and combined practice of suryanamaskar and pranayama on resting pulse rate were found to be significant at 0.05 level of confidence for the degrees of freedom 3 and 36. The results proved that the selected three training interventions suryanamaskar practices, pranayama practices, combined practice of suryanamaskar and pranayama was produced significant improvement rather than the control group of the sample populations. The adjusted post-test means on resting pulse rate scores of G1, G2, G3 and G4 were 69.87, 69.12, 68.90 and 71.40 respectively. The obtained adjusted post-test F value of 16.49 was higher than the required table F value of 2.87. Hence the adjusted post-test means value suryanamaskar practices, pranayama practices and combined practice of suryanamaskar and pranayama on resting pulse rate were found to be significant at 0.05 level of confidence for the degrees of freedom 3 and 35. The results confirm that the selected three training interventions namely suryanamaskar practices, pranayama practices and combined practice of suryanamaskar and pranayama on resting pulse rate were produced significant difference among the groups.

In order to find out the superiority effects among the treatment and control groups the Scheffe's post hoc test were administered. The outcomes of the same are presented in the table I.

TABLE - I

THE RESULTS OF SCHEFFE'S POST HOC TEST MEAN DIFFERENCES ON RESTING PULSE RATE AMONG THE GROUPS

(Scores in Numbers)

Ex-1 SNP	Ex-2 PP	Ex-3 SNP+PP	Gr-4 CG	Mean Differences	CI Value
69.87	69.12	-----	-----	0.74	0.02
69.87	-----	68.90	-----	0.97	
69.87	-----	-----	71.40	1.53*	
-----	69.12	68.90	-----	0.22	
-----	69.12	-----	71.40	2.27*	
-----	-----	68.90	71.40	2.5*	

* Significant at .05 level of confidence.

Result of Scheffe's Post Hoc test on resting pulse rate

Table I shows the paired mean differences of suryanamaskar practices, pranayama practices and combined practice of suryanamaskar and pranayama and control group on resting pulse rate. The pair wise comparisons result as follows.

Significant comparisons: The comparison between suryanamaskar practices and control group, pranayama practices and control group, combined practice of suryanamaskar and pranayama and control group shows significant different effect on resting pulse rate. Insignificant comparisons :The comparison between suryanamaskar practices and pranayama practices, suryanamaskar practices and combined practice of suryanamaskar and pranayama, pranayama practices and combined practice of suryanamaskar and pranayama shows insignificant. It shows above comparisons shows similar effect on resting pulse rate.

The adjusted post-test mean deference of experimental and control group value graphically represented in the figure 1.

FIGURE 1

THE ADJUSTED POST TEST MEAN VALUES OF EXPERIMENTAL AND CONTROL GROUPS ON RESTING PULSE RATE

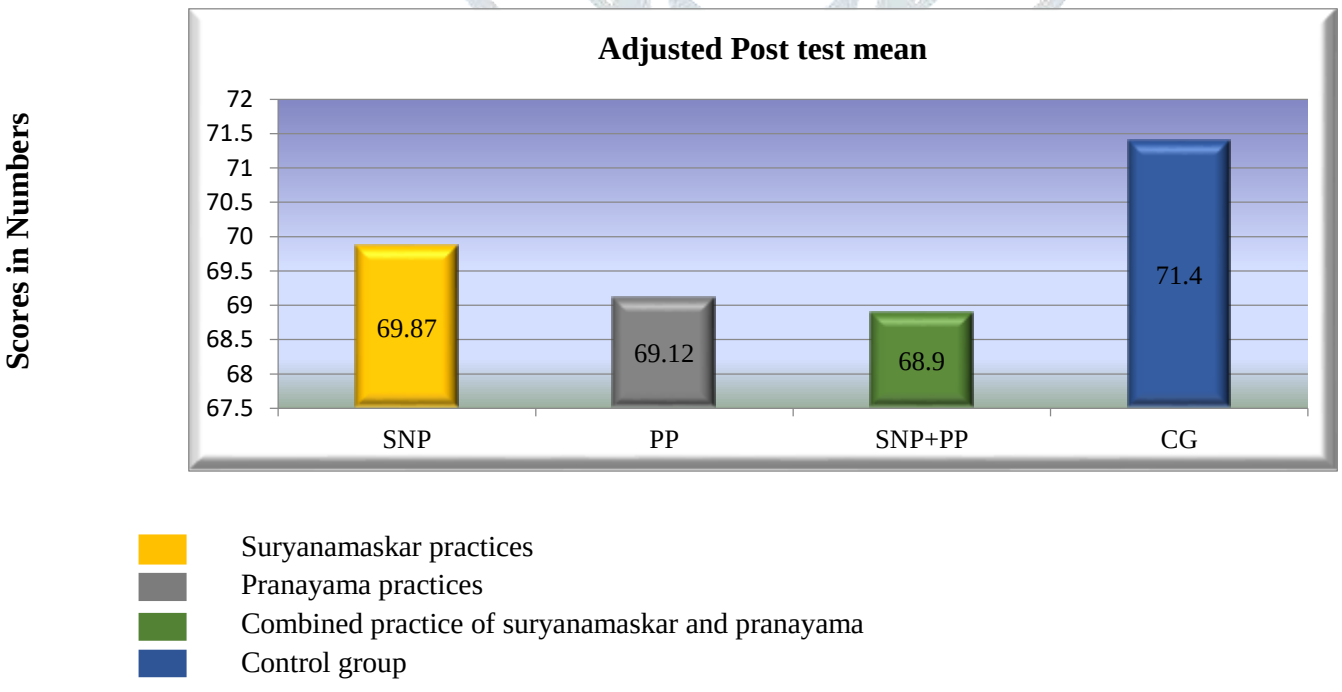
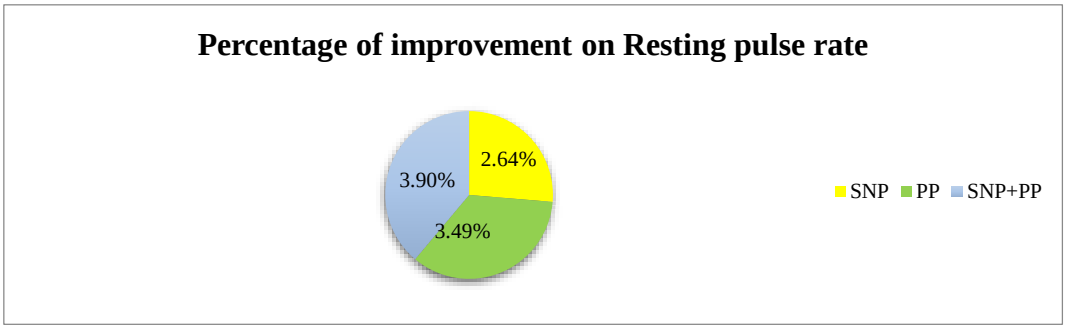


FIGURE-2

PERCENTAGE OF IMPROVEMENT OF EXPERIMENTAL GROUPS ON RESTING PULSE RATE



After analyzing the statistical end results the researcher found that the selected training groups have significantly altered resting pulse rate from the base line to post interventions. The pre to post intervention was present as follows. The suryanamaskar practices(SNP) group from pre (71.80±0.78), to post (69.90±0.99), pranayama practices (PP) pre (71.60±0.84), to post (69.10±0.87), combined practice of suryanamaskar and pranayama (SNP+PP) pre (71.70+ 0.82), to post (68.90±0.87) has significantly changed the pre to post results. The present study demonstrates an alteration in resting pulse rate of 2.64 %, 3.49% and 3.9% for suryanamaskar practices (SNP), pranayama practices (PP), combined practice of suryanamaskar and pranayama (SNP+PP) group respectively. The result of this study prove that the resting pulse rate altered significantly over the six weeks training period for suryanamaskar practices(SNP), pranayama practices (PP), combined practice of suryanamaskar and pranayama (SNP+PP) when comparing control group. However, the three training groups namely suryanamaskar practices (SNP), pranayama practices (PP) and combined practice of suryanamaskar and pranayama (SNP+PP) have produced similar effect on resting pulse rate. The control group did not show any significant changes on resting pulse rate. The percentage of improvement of experimental groups on resting pulse rate is shown in figure.

Tyagi and Cohen (2016), they concluded that yoga practices including postures, breathing techniques, and meditation may enhance autonomic regulation and vagal tone, as indicated by improvements in heart rate variability (HRV). However, they emphasized the need for more rigorous, high-quality, and standardized studies to confirm these effects and better understand the mechanisms involved. Posadzki et al. (2015), they found no significant evidence that yoga improves heart rate variability (HRV) compared to usual care, with high variability across studies. Methodological weaknesses and heterogeneity highlight the need for more rigorous research to clarify yoga's impact on autonomic function. Markil et al. (2012) found that both Yoga Nidra (YR) and relaxation (R) conditions significantly improved heart rate and heart rate variability (HRV) measures, indicating enhanced parasympathetic activity. These results suggest that Yoga Nidra, with or without preceding Hatha yoga, promotes a favorable shift toward parasympathetic dominance in autonomic balance.

Yunati MS, Deshp VK, Yuwanate AH (2013), their present study demonstrated that Sahaja yoga meditation can help counteract the age-related decline in heart rate variability (HRV) in healthy adults over 40. They recommend daily practice of Sahaja yoga meditation to reduce the risk of cardiac autonomic dysfunction associated with aging. Madanmohan et al. (2004) they found that significant improvements in spectral measures of short-term HRV, indicating enhanced parasympathetic activity and improved autonomic balance following regular practice of Shavasan. Sharpe et al. (2021), their study identified that all five interventions significantly increased RMSSD ($p < .01$), indicating enhanced parasympathetic activity. Externally paced breathing and Sheetali/Sheetkari pranayama produced greater improvements than self-paced breathing or quiet sitting, highlighting the potential of pranayama techniques to positively influence autonomic regulation. Singh S, Gaurav V, and Parkash V (2011), Results showed that a 6-week pranayama training program significantly improved heart rate, vital capacity, and blood pressure. They concluded that regular pranayama practice can enhance physiological efficiency, making it beneficial for athletes and as part of lifestyle interventions for maintaining physical and mental well-being. R.Selvakumar & G.Vigneshwaran (2020), their study concluded that the experimental group demonstrated a significant improvement in resting pulse rate compared to the control group, indicating the effectiveness of the intervention in lowering resting heart rate. Maniazhagu (2013), his study demonstrated that the resting pulse rate was significantly improved due to asana, pranayama, and meditation practice and regular practice can enhance autonomic balance and promote overall heart health. Maniazhagu, Nelliyan, (2013), their study proved that the resting pulse rate significantly improved (reduction) due to the combined Asana, Pranayama practice and SAQ training and This suggests that blending yogic practices with athletic training can effectively enhance overall physiological fitness in young athletes. Maniazhagu Dharuman (2021), the result of his study showed the 12 weeks of isolated (individual) and combined training of aerobic dancing and resistance training have produced significant positive alteration on body composition. P. Rajeswari, Sajja Madhuri, Rajani R (2024), their findings demonstrate that even a single brief yoga session can induce clinically meaningful improvements in heart rate and blood pressure, likely through autonomic nervous system modulation. Future research should focus on optimizing yoga protocols for specific population subgroups and investigating strategies to enhance long-term adherence, thereby maximizing the potential public health impact of this ancient practice.

S Senthil Kumaran, K Ooraniyan and N Kodeeswaran (2023), Their result clearly proved that the vital capacity and resting pulse rate better improvement on hearing impairment school students through brisk walking with pranayama. X. Christy, S. Dhanara (2019), they revealed that a significant reduction in resting pulse rate among participants who practiced pranayama. The difference between the experimental and control groups highlights the positive effect of pranayama on cardiovascular function. Alaguraja, K., & Yoga, P. (2019), the study effectively highlights the positive impact of yogic practices on resting pulse rate. However, future research could expand the sample size, include diverse age groups, and explore long-term effects to strengthen the generalizability of the findings. Alaguraja, K., Yoga, P., Balamuralikrishnan, R., & Selvakumar, K. (2019), their study clearly demonstrates that the yogic package had a positive impact on resting pulse rate. The significant difference between the experimental and control groups suggest that yogic practices can effectively regulate autonomic functions and promote better cardiovascular efficiency. Nitai Biswas, Dilip Kumar Dureha (2024), their study concluded that Pranayama and mindfulness meditation significantly improve resting respiratory and pulse rates among visually impaired students. These findings underscore the potential of these practices to enhance the physiological wellbeing of this population, advocating for their inclusion in health and educational programs. Raghavendra B et al. (2013), they observed a heart rate reduction of 19.6 bpm in the first trial and 22.2 bpm in the second trial with breath regulation. The results suggest that the strategy used had little effect on altering the overall outcome. Nimesh Kumar D Chaudhari, Kamlesh Kumar P. Patel (2021), their results showed in Long distance runners have better resting pulse rate when compared to sprinters, jumpers and throwers. Pranita, A et al. (2012), their study demonstrated that even short-term yoga practice of three months reduces anxiety and resting heart rate. This reflects enhanced parasympathetic dominance alongside reduced sympathetic activity in young individuals. Sawane MV, Gupta SS (2015) their findings suggest that regular yoga practice leads to significant improvement in autonomic functions, as evidenced by enhanced resting heart rate variability (HRV) and Yoga promotes parasympathetic dominance, thereby improving cardiovascular health and stress regulation. Telles et al. (2004), their study demonstrated that yoga practice helps individuals consciously regulate and reduce heart rate. These findings highlight yoga's therapeutic potential in promoting relaxation and cardiovascular health. Barka Bhardwaj and M.A. Bassan (2015), their study concluded that three months of daily Anuloma Viloma pranayama reduced resting heart rate in females, with the highest 5.05% decrease in the 26-30 years group. This reflects improved parasympathetic activity and cardiovascular efficiency. The practice holds clinical value as a supportive therapy for hypertension management. Gunjan Y. Trivedi and Banshi Saboo (2021) their study investigated hat Bhramari Pranayama can be a beneficial lifestyle practice to improve lung function, autonomic balance, immunity, and sleep quality.

CONCLUSION

The present study demonstrates that, an alteration in resting pulse rate of 2.64 %, 3.49% and 3.9% for suryanamaskar practices (SNP), pranayama practices (PP), combined practice of suryanamaskar and pranayama (SNP+PP) group respectively. The three training groups suryanamaskar practices (SNP), pranayama practices (PP) and combined practice of suryanamaskar and pranayama (SNP+PP) have produced similar effect on resting pulse rate. The control group did not show any significant changes on resting pulse rate.

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