Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 November; 6 (10s): 1781-1792

Effect Of Kapalbhati In Different Time Durations On Selected Physiological Variables Among School Girls

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Abstract

The objective of the study was to investigate the effect of Kapalbhati with different time duration on physiological variables among school girls. Another objective of the study was to improve physiological variables in school girls. **Method:-** To achieve the objective of this study 60 girls aged 15-18 years were randomly selected from Mount Carmel School, Muradnagar, Ghaziabad (UP). After that all the subjects were divided equally into four groups (three experimental groups and one control group). Subjects of three experimental groups were given Kapalabhati training program at different times for a period of 8 weeks and the control group was not given any kind of training. The selected variables to be compared were vital capacity, peak flow rate, breath holding capacity (positive & negative) and blood pressure (systolic & diastolic). To measure Vital Capacity among deferent groups, Dry-Spirometer was used, To measure Peak Flow Rate among deferent groups, Peak Flow Meter was used, To measure Breath Holding Capacity among deferent groups, Manually was used and To measure Blood Pressure among deferent groups, Sphygmomanometer was used.
Statistical Techniques:- ANCOVA was used to find out the effect of Kapalabhati with differernt time duration on physiological variables among school girls. The level of significance was set at 0.05 to test the hypothesis.
Results And Discussion:- The results revealed that there were significant (p>.05) differences in the effect of Kapalabhati on all physiological variables except systolic blood pressure in school girls.

Keywords:- Kapalbhati, Vital Capacity, Peak Flow Rate, Breath Holding Capacity And Blood Pressure.

INTRODUCTION

Yoga is not an ancient myth buried in oblivion. It is the most valuable inheritance of the present. It is the essential need of today and the culture of tomorrow.
-Swami Satyananda Saraswati
The word Yoga means ‘unity’ or ‘oneness’ and is derived from the Sanskrit word *yuj*, which means ‘to join’. This unity or joining is described in spiritual terms as the union of the individual consciousness with the universal consciousness. The definition of yoga in “Bhagavad Gita” which says, “*smatvameva yoga uchyate*” that is equanimity is called yoga. It means that yoga remains equipose in success and failure, gain or loss, victory and defeat etc. The term ‘samatva’ may also be translated as equilibrium, which leads to harmonious development of the physical, mental, spiritual aspects of the human personality. Equanimity and equilibrium are thus the essential trades of yoga. They help in skillful performance of action.

Yoga is a science practiced in India over the thousands of years. Yoga practices mainly consist of Asana (posture- a particular position of the body which contributes to steadiness of body and mind), Pranayama (to control the breathing in a superior and extra-ordinary way to get maximum benefits.) and meditation. It produces consistent physiological changes and has sound and have sound scientific basis. In recent times, medical fraternity is much attracted towards beneficial effects of Yoga. We are well aware of the fact that any sort of exercise done regularly, is beneficial to the body. Yoga is considered to be a very good exercise for maintaining proper health and also has a profound effect on the lung functions of an individual. It is claimed that yogic practices help in prevention, control and rehabilitation of many respiratory diseases. In view of this, the present study was undertaken to see whether yoga has any effect on ventilator lung functions, which depend on compliance of lungs and thorax, airway resistance and strength of respiratory muscles.
Kapalabhati is an important part of Shatkarma the yogic system of body cleansing techniques. The word kapalbhati is made up of two words: kapal meaning 'skull' (here skull includes all the organs under the skull too) and bhati meaning 'shining, illuminating'. Due to the process, the organs under the skull mainly the brain and the small brain are influenced in a good manner. Kapalbhati pranayama helps to detoxify lungs and respiratory tracts, boosts the supply of oxygen and purifies blood and helps to tone up the abdominal muscles. It is also helpful in reducing abdominal fat, improvises concentration span. Pulmonary function tests (PFTs) provide important clinical information to identify and quantify the

defects and abnormalities in the functioning of the respiratory system. Spirometry is the basic and useful method available for evaluating these pulmonary function parameters.
It is a simple expression of complex process, which measures airflow during inspiration and expiration and has a central role in early diagnosis and management of common respiratory diseases. In view of the above background the present study was conducted to study the effect of 6 weeks of Kapalabhati pranayama training on pulmonary function.

Shatkarma, the yogic system of bodily purification procedures, includes kapalabhati as a key component. The word kapalbhati is made up of the words kapal, which means "skull," including all of the organs located beneath the skull, and bhati, which means "shining, illuminating." The process has a positive impact on the under-the-skull organs, particularly the brain and the tiny brain. The kapalbhati pranayama improves blood purity, increases oxygenation, and tones the abdominal muscles in addition to aiding in the detoxification of the lungs and respiratory systems. Additionally, it helps with belly fat loss and improves attention span. PFTs, or pulmonary function tests, offer crucial clinical data that can be used to locate and measure flaws and irregularities in the way the respiratory system functions. The spirometer is the pulmonary function parameters can be evaluated using a simple and practical procedure.

It is a straightforward representation of a sophisticated procedure that monitors airflow during inspiration and expiration and plays a crucial part in the early detection and treatment of common respiratory illnesses. The purpose of the current study was to determine the impact of an 8-week Kapalabhati pranayama training program on pulmonary function in light of the aforementioned background.

METHODOLOGY

The subjects for the study were randomly selected from Mount Carmel School, Muradnagar, Ghaziabad (UP). The total number of subjects for the study was 60 girls. After that all the subjects were divided equally into four groups (three experimental groups and one control group). The age of the subjects were ranged between 15-18 years. Necessary data collected for vital capacity, peak flow rate, breath holding capacity (positive & negative) and blood pressure (systolic & diastolic). To measure Vital Capacity among deferent groups, Dry-Spirometer was used, To measure Peak Flow Rate among deferent groups, Peak Flow Meter was used, To measure Breath Holding Capacity among deferent groups, Manually was used and To measure Blood Pressure among deferent groups, Sphygmomanometer was used.The results revealed that there were significant (p>.05) differences in the effect of Kapalabhati on all physiological variables except systolic blood pressure in school girls. For the testing of hypothesis, The level of significance was set at 0.05.

TRAINING PROTOCOL

The process of kapalbhati was taught and the practice session were conducted and supervised by the researcher himself. For teaching purpose, procedure were explained and demonstrated before and subjects performed the same after work. Necessary corrections were made. The rest of the instruction that were given in between succeeding programmed was as follows:-

TRAINING SCHEDULE

OVERVIEW OF TRAINING SCHEDULE

	Group 1	Group 2	Group 3	Group 4
Total Time duration	30-40 minutes	30-40 minutes	30-40 minutes	Control Group
Time duration for 1 round	1 minutes	2 minutes	4 minutes	Control Group
Training Variation	Kapalbhati (1 round for 1 minute)	Kapalbhati (1 round for 2 minute)	Kapalbhati (1 round for 4 minute)	Control Group
Total Rounds	16	8	4	Control Group
Rounds***-Rest****	1 – **0.5** – 1	1 – **1** – 1	1 – **2** – 1	Control Group
Starting Prayer	1 minutes	1 minutes	1 minutes	Control Group
General Stretching	2 minutes	2 minutes	2 minutes	Control Group
Relaxation Posture & Closing Prayer	5 minutes	5 minutes	5 minutes	Control Group
Strokes of Kapalbhati per minute	80-90	80-90	80-90	Control Group

***Round in numbers** ****Rest in minutes**

Training Schedule of 1st Week

	Group 1	Group 2	Group 3	Group 4
Training Variation	Kapalbhati	Kapalbhati	Kapalbhati	Control Group
Training duration	15-25 minutes	15-25 minutes	15-25 minutes	Control Group
Kapalbhati rounds	8	4	2	Control Group
Rounds*-Rest**	1 – **0.5** – 1	1 – **1** – 1	1 – **2** – 1	Control Group
Starting Prayer	1 minutes	1 minutes	1 minutes	Control Group
General Stretching	2 minutes	2 minutes	2 minutes	Control Group
Relaxation Posture & Closing Prayer	5 minutes	5 minutes	5 minutes	Control Group

***Round in numbers** ****Rest in minutes**

Training Schedule of 2nd Week

	Group 1	Group 2	Group 3	Group 4
Training Variation	Kapalbhati	Kapalbhati	Kapalbhati	Control Group
Training duration	25-35 minutes	25-35 minutes	25-35 minutes	Control Group
Kapalbhati rounds	12	6	3	Control Group
Rounds*-Rest**	1 – **0.5** – 1	1 – **1** – 1	1 – **2** – 1	Control Group
Starting Prayer	1 minutes	1 minutes	1 minutes	Control Group
General Stretching	2 minutes	2 minutes	2 minutes	Control Group
Relaxation Posture & Closing Prayer	5 minutes	5 minutes	5 minutes	Control Group

***Round in numbers** ****Rest in minutes**

Training Schedule of 3rd Week to 8th Week

	Group 1	Group 2	Group 3	Group 4
Training Variation	Kapalbhati	Kapalbhati	Kapalbhati	Control Group
Training duration	35-45 minutes	35-45 minutes	35-45 minutes	Control Group
Kapalbhati rounds	16	8	4	Control Group
Rounds*-Rest**	1 – **0.5** – 1	1 – **1** – 1	1 – **2** – 1	Control Group
Starting Prayer	1 minutes	1 minutes	1 minutes	Control Group
General Stretching	2 minutes	2 minutes	2 minutes	Control Group
Relaxation Posture & Closing Prayer	5 minutes	5 minutes	5 minutes	Control Group

***Round in numbers** ****Rest in minutes**

RESULT OF THE STUDY

To find out effect of kapalbhati with different time durations on vital capacity among different groups of school girls, analysis of co-variance was used and presented in table-1.

TABLE-1 Analysis of co-variance table of among groups effects on vital capacity

Source of Variance	**Df**	**SS**	**MSS**	**F-ratio**
Between Group	3	11.658	3.886	42.781*
Within Error	55	4.996	.091	

*Significant at .05 level

F-Value required to be significant at .05 (3, 55) = 2.78

Table no. 1 indicates the values test of difference among the subjects effects, which shows that there are a significant difference in pre and post test values of vital capacity for the four selected Groups, as the f-value has found to be 42.781. Further the mean difference among the group-1, group-2, group-3 and control group subjects in relation to their vital capacity level through post hoc test were computed which are presented in the table no. 2 and also are represented by figure I.

TABLE-2 Post hoc test for the differences between the adjusted post tests paired means on vital capacity

Group-1	Group-2	Group-3	Control Group	M.D	C.D
2.677	2.997			-.32	.22
2.677		3.314		-.637	
2.677			2.112	.565	
	2.997	3.314		-.317	
	2.997		2.112	.885	
		3.314	2.112	1.202	

*Significant at .05 level

The post hock test is to compare the vital capacity among group-1, group-2, group-3 and control group. It has clearly revealed the significant difference between the group-1 and group-2 where the calculated mean difference found (-.32), group-1 and group-3 where the calculated mean difference found (-.637), group-1 and control group where the calculated mean difference found (.565), group-2 and group-3 where the calculated mean difference found (-.317), group-2 and control group where the calculated mean difference found (.885) and group-3 and control group where the calculated mean difference found (1.202) was higher than the required value .22.
The scores are also illustrated in the figure-I

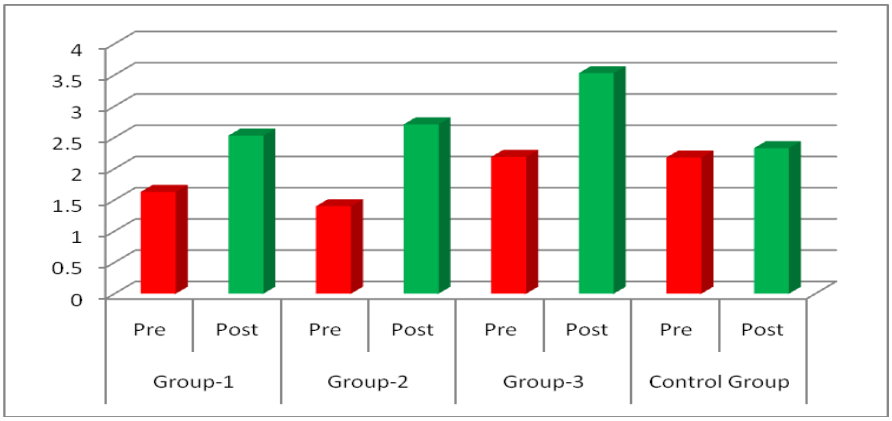

Figure I: Graphical representation on vital capacity of school girls

To find out effect of kapalbhati with different time durations on peak flow rate among different groups of school girls, analysis of co-variance was used and presented in table-3.

TABLE-3 Analysis of co-variance table of among groups effects on peak flow rate

Source of Variance	df	SS	MSS	F-ratio
Between Group	3	9.129	3.043	77.505*
Within Error	55	2.159	.039	

*Significant at .05 level

F-Value required to be significant at .05 (3, 55) = 2.78

Table no. 3 indicates the values test of difference among the subjects effects, which shows that there are a significant difference in pre and post test values of peak flow rate for the four selected Groups, as the f-value has found to be 77.505. Further the mean difference among the group-1, group-2, group-3 and control group subjects in relation to their peak flow rate level through post hoc test were computed which are presented in the table no. 4 and also are represented by figure II.

TABLE-4 Post hoc test for the differences between the adjusted post tests paired means on peak flow rate

Group-1	Group-2	Group-3	Control Group	M.D	C.D
3.362	3.925			-.563	.072*
3.362		4.034		-.672	
3.362			2.979	.383	
	3.925	4.034		-.109	
	3.925		2.979	.946	
		4.034	2.979	1.055	

*Significant at .05 level

The post hock test is to compare the peak flow rate among group-1, group-2, group-3 and control group. It has clearly revealed the significant difference between the group-1 and group-2 where the calculated mean difference found (-,563), group-1 and group-3 where the calculated mean difference found (-.672), group-1 and control group where the calculated mean difference found (.383), group-2 and group-3 where the calculated mean difference found (-.109), group-2 and control group where the calculated mean difference found (.946) and group-3 and control group where the calculated mean difference found (1.055) was higher than the required value .072.
The scores are also illustrated in the figure-II

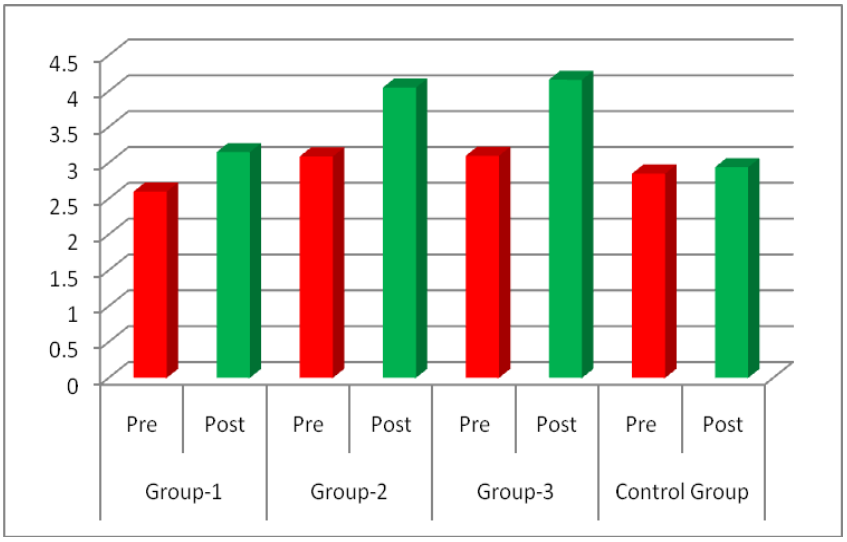

Figure II: Graphical representation on Peak Flow Rate of school girls

To find out effect of kapalbhati with different time durations on peak positive breath holding capacity among different groups of school girls, analysis of co-variance was used and presented in table-5.

TABLE-5 Analysis of co-variance table of among groups effects on positive breath holding capacity

Source of Variance	Df	SS	MSS	F-ratio
Between Group	3	192.847	64.282	14.929*
Within Error	55	236.821	4.306	

*Significant at .05 level

F-Value required to be significant at .05 (3, 55) = 2.78

Table no. 5 indicates the values test of difference among the subjects effects, which shows that there are a significant difference in pre and post test values of positive breath holding capacity for the four selected Groups, as the f-value has found to be 14.929. Further the mean difference among the group-1, group-2, group-3 and control group subjects in relation to their positive breath holding capacity level through post hoc test were computed which are presented in the table no. 6 and also are represented by figure III.

TABLE-6 Post hoc test for the differences between the adjusted post tests paired means on positive breath holding capacity

Group-1	Group-2	Group-3	Control Group	M.D	C.D
24.413	20.849			3.564	
24.413		21.725		2.688	
24.413			17.147	7.266	1.515*
	20.849	21.725		-.876	
	20.849		17.147	3.702	
		21.725	17.147	4.578	

*Significant at .05 level

The post hock test is to compare the positive breath holding capacity among group-1, group-2, group-3 and control group. It has clearly revealed the significant difference between the group-1 and group-2 where the calculated mean difference found (3.564), group-1 and group-3 where the calculated mean difference found (2.688), group-1 and control

group where the calculated mean difference found (7.266), group-2 and group-3 where the calculated mean difference found (3.702) and group-3 and control group where the calculated mean difference found (4.578) was higher than the required value 1.515.
The scores are also illustrated in the figure-III

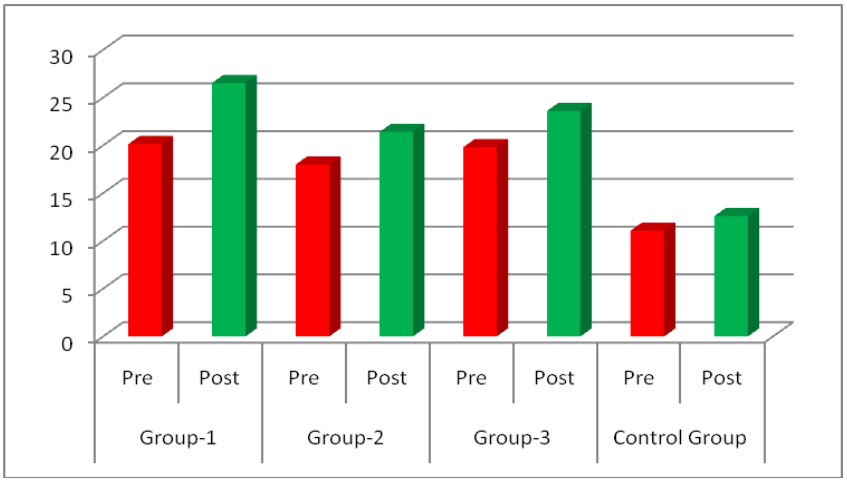

Figure III: Graphical representation on Breath holding capacity (+ve) of school girls

To find out effect of kapalbhati with different time durations on negative breath holding capacity among different groups of school girls, analysis of co-variance was used and presented in table-7.

TABLE-7 Analysis of co-variance table of among groups effects on negative breath holding capacity

Source of Variance	Df	SS	MSS	F-ratio
Between Group	3	241.484	80.495	47.837*
Within Error	55	92.549	1.683	

*Significant at .05 level
F-Value required to be significant at .05 (3, 55) = 2.78

Table no. 7 indicates the values test of difference among the subjects effects, which shows that there are a significant difference in pre and post test values of negative breath holding capacity for the four selected Groups, as the f-value has found to be 14.929. Further the mean difference among the group-1, group-2, group-3 and control group subjects in relation to their negative breath holding capacity level through post hoc test were computed which are presented in the table no. 8 and also are represented by figure IV.

TABLE-8 Post hoc test for the differences between the adjusted post tests paired means on negative breath holding capacity

Group-1	Group-2	Group-3	Control Group	M.D	C.D
14.663	16.19			-1.527	.947
14.663		17.208		-2.545	
14.663			11.740	2.923	
	16.19	17.208		-1.018	
	16.19		11.740	4.45	
		17.208	11.740	5.468	

*Significant at .05 level

The post hock test is to compare the negative breath holding capacity among group-1, group-2, group-3 and control group. It has clearly revealed the significant difference between the group-1 and group-2 where the calculated mean difference found (-1.527), group-1 and group-3 where the calculated mean difference found (-2.545), group-1 and group-3 where the calculated mean difference found (2.923), group-2 and group-3 where the calculated mean difference found (-1.018), group-2 and control group where the calculated mean difference found (4.45) and group-3 and control group where the calculated mean difference found (5.468) was higher than the required value .947.
The scores are also illustrated in the figure-IV

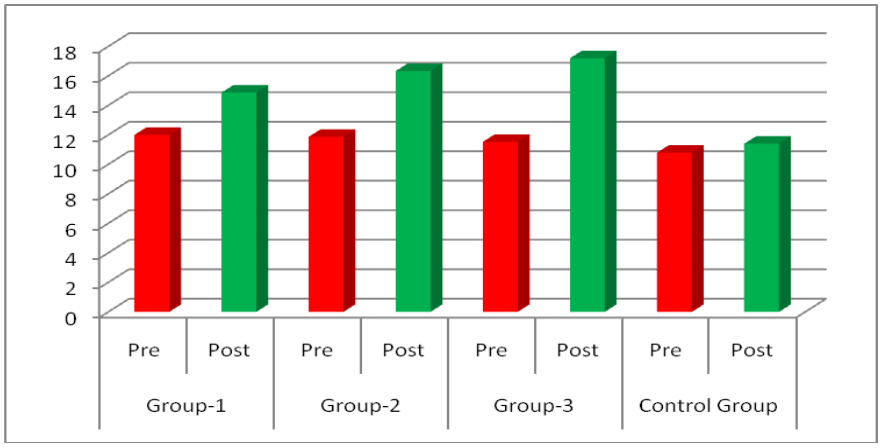

Figure IV: Graphical Representation on Breath Holding Capacity (-ve) of school girls

To find out effect of kapalbhati with different time durations on negative systolic blood pressure among different groups of school girls, analysis of co-variance was used and presented in table-9.

TABLE-9 Analysis of co-variance table of among groups effects on systolic blood pressure

Source of Variance	Df	SS	MSS	F-ratio
Between Group	3	4.274	1.425	.318
Within Error	55	246.406	4.480	

*Significant at .05 level

F-Value required to be significant at .05 (3, 55) = 2.78

Table no. 9 indicates the values test of difference among the subjects effects, which shows that there are a insignificant difference in pre and post test values of systolic blood pressure for the four selected Groups, as the f-value has found to be .318 and also are represented by figure V.

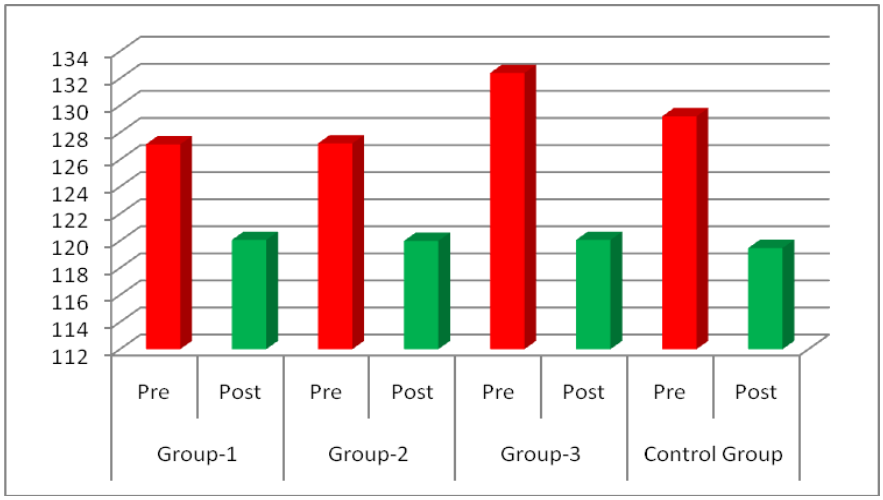

Figure V: Graphical Representation on Systolic blood pressure of school girls

To find out effect of kapalbhati with different time durations on diastolic blood pressure among different groups of school girls, analysis of co-variance was used and presented in table-10.

TABLE-10 Analysis of co-variance table of among groups effects on diastolic blood pressure

Source of Variance	Df	SS	MSS	F-ratio
Between Group	3	135.514	45.171	5.157*
Within Error	55	481.774	8.76	

*Significant at .05 level

F-Value required to be significant at .05 (3, 55) = 2.78

Table no. 10 indicates the values test of difference among the subjects effects, which shows that there are a significant difference in pre and post test values of diastolic blood pressure for the four selected Groups, as the f-value has found to be 5.157. Further the mean difference among the group-1, group-2, group-3 and control group subjects in relation to their diastolic blood pressure level through post hoc test were computed which are presented in the table no. 11 and also are represented by figure VI.

TABLE-11 Post hoc test for the differences between the adjusted post tests paired means on diastolic blood pressure

Group-1	Group-2	Group-3	Control Group	M.D	C.D
80.85	81.66			-.81	2.161*
80.85		77.74		3.11	
80.85			80.89	-.04	
	81.66	77.74		3.92	
	81.66		80.89	.77	
		77.74	80.89	-3.15	

*Significant at .05 level

The post hock test is to compare the diastolic blood pressure among group-1, group-2, group-3 and control group. It has clearly revealed the significant difference between the group-1 and group-3 where the calculated mean difference found (3.11), group-2 and group-3 where the calculated mean difference found (3.92), group-3 and control group where the calculated mean difference found (-3.15) was higher than the required value 2.161.
The scores are also illustrated in the figure-IV

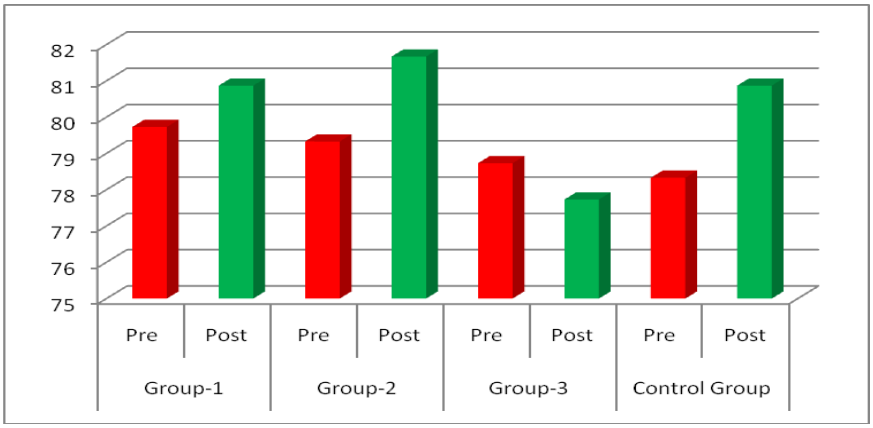

Figure VI: Graphical Representation on Diastolic blood pressure of school girls

DISCUSSION OF THE RESULT

The present investigation was designed to know the effect of Kapalbhati with different time durations on selected physiological variables among school girls. The purpose of this study was to find a better role of kapalbhati effects on pulmonary functions in different time durations on selected physiological variables. Although the research scholar did not interfere with the personal lifestyle of the subjects, some facts may be inaccessible. Which time Kapalbhati will be more beneficial in looking at the lifestyle of school girls and making their lifestyle more effective, it has been seen in this study. In order to achieve the objectives, various physiological variables of school girls were collected from various scientific aspects and after that the school girls were divided into four groups i.e. one control and three experimental group for the study. After which these groups were trained deferent time in a day, after that data were obtained from all these groups again. Before going to the conclusion of the study, it must be understood that the progress of any country depends on its school girls. His positive contribution definitely helps any society or country to move in the right direction.

The result of the study revealed significant difference among the mean scores of Kapalbhati effect on pre and post physiological variables (Forced vital capacity, Peak expiratory flow, Breath holding capacity and Blood pressure) of school girls in the experimental group. The mean score of Kapalbhati training girls group were found higher than the control group school girls, but mean score of systolic blood pressure Kapalbhati training school girls group was found lower. We cannot deny the fact that Kapalbhati training has more effect on physiological variables (Forced vital capacity, Peak expiratory flow, Breath holding capacity and Blood pressure) on school girls. The results of this study

also point to the same. The result of present study is also on the line of the studies conducted by **Nagesh.J,reena .P (2017)** The study undertaken was entitled as "The Effect of Pranayama and Kapalbhati on Selected Psychological and Physiological variables of school going children in Jaipur". The results of the study were to (i) Find out the effect of Kapalbhati on selected physiological variables of school going children of Jaipur. (ii) Find out the effect of Kapalbhati on selected psychological variables of school going children of Jaipur. (iii) Find out the effect of Pranayama on selected physiological variables of school going children of Jaipur. (iv) Find out the effect of Pranayama on selected psychological variables of school going children of Jaipur. **Kanhaiya l. (2018)** conducts a study on topic "Effect of kapalbhati on mental health and respiratory parameters". Kapalabhati is the rhythmic breathing done by the belly with the speed of approximate 90 breathings per minute. Beginners (especially with not trained diaphragm breathing) should do about 60 breathings per minute, and then increase this rhythm. The main mistake in doing Kapalabhati is to use pectoral muscles, which can lead to break-ups of heartbeat and cause pain in the diaphragm. Physically Kapalabhati is an intracranial hydraulic massage of the brain, done by pressure difference made by the belly. A Kapalabhati works the same way as Pranayama, but because of reducing the permeability of the air in inhaling, the hydraulic wave is twice stronger, that s why the effect is greater. Another mechanism of action has to with the altering stimulation of Ida and Pingala, widening the spectrum of ANS states. **Santosh k., Rajesh K. & Kshitiz U. (2017)** conduct a study on topic "Effect of Kapalbhati on Blood Pressure in Naïve". Results: As in usual exercises, SBP and DBP increases significantly immediately after Kapalbhati session when compared with the value before exercises. The basal (pre-Kapalbhati) mean SBP and DBP were 125.76 ± 7.36 and 82.92 ± 5.75 which increases up to 143.60 ± 11.18 and 90.33 ± 7.90 respectively immediately after exercises and fall after 3 minutes of exercises value being 127.05 ± 10.93 and 81.38 ± 5.38 respectively. Conclusion: There is significant rise between Pre-value and post-value (immediate) of all parameters and significant fall of all parameters if compared between post-value and after 3 minute. **Nimai C. (2019)** conduct a study on topic "Effect of Kapalbhati and selected Pranayama techniques on physiological parameters of middle aged sedentary women". To compare between the mean scores of pre and post-test of the both groups Independent Sample t-test was applied. From the findings of the study it may be concluded that resting respiratory rate, vital capacity, peak expiratory flow rate and systolic blood pressure were significantly improved as compared to that of control group. Insignificant between the group differences were noted in resting heart rate, diastolic blood pressure and body fat percent. From the findings of this study we concluded that Pranayama techniques may be recommended to improve the selected physiological characteristics of middle age sedentary women for their economic and productive life style. **Kamakhya K. (2016)** conduct a study on topic "Significance of Nadi Sodhan and Kapalbhati on forced ventilation capacity (FVC), maximum voluntary ventilation (MVV) and picks expiratory flow rate (PEFR)". Results show that FVC $t=5.4$, $p<0.05$, for MVV $t=6.4$, $p<0.05$ and for PEFR $t=8.4$, $p<0.05$. The study adds: Yogic interventions proving itself as an effective tool as CAM to improve the respiratory functions.

The result of the study insignificant difference among the mean scores of school girls who wear systolic blood pressure. The results of this study also point to the same. The result of present study is also on the line of the past studies conducted by **GokhaleV., Shetty V., Rani V. & et al (2018)** conduct a study on topic **"**Influence of kapalabhati pranayama on oxygen saturation and blood pressure". There was no significant change observed in these parameters among the control group. [Systolic BP (p=0.089), Diastolic BP (p=.069), SpO2(p=0.097), pulse rate(p=0.87)] Interpretation & Conclusion: Practice of kapalabhati pranayama increases diastolic BP and Oxygen saturation immediately in novices. Thus the practice exercises the diaphragm vigorously and enhances the better oxygenation. Further studies are required to understand the physiological changes followed by the practice of kapalbhati pranayama among Hypertensive patients.

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