Research Article

The effect of Sudarshan Kriya Yoga (SKY) on cardiovascular and respiratory parameters

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Abstract

Background: The ancient practice of breath is called pranayama meaning both "control of energy" and "expansion of energy." Sudarshan Kriya Yoga is a comprehensive breathing technique, which harmonize the body, mind, and emotions.

Objective: To assess the effects of long-term practice of Sudarshan Kriya Yoga (SKY) on cardiorespiratory physiology.

Materials and Methods: It was carried out on 100 healthy volunteers in the age group of 20–40 years. SKY group consisted of 50 individuals who were practicing SKY since more than 1 year and control group consisted of 50 individuals who are not following any type of yoga. Both groups were compared for cardiovascular and respiratory parameters using unpaired *t*-test.

Result: It was found that statically significant (p-value <0.05) lower values of cardiovascular parameters (pulse rate, systolic, and diastolic BP) and higher values of respiratory parameters (FVC, FEV1, PEFR, breath holding time) in SKY group as compared to control group.

Conclusion: Hence, on conclusion SKY has beneficial effects on cardiorespiratory physiology so it can be used as adjuvant therapy for management of lifestyle diseases such as hypertension, diabetes mellitus, and psychiatric disorders.

KEY WORDS: SKY, cardiovascular and respiratory parameters

Introduction

In the modern era, human beings are facing much stress in day-to-day life which leads to lifestyle diseases such as hypertension, diabetes mellitus, and psychiatric disorders. Yoga is one of the promotive, preventive as well as curative means for many such stress-related diseases. The word, "Yoga," originates from the Sanskrit word, "Yuj" meaning "to unite," "to yoke," or "to control."[1] Yoga helps in balancing and harmonizing the body, mind, and emotions.[2] Sudarshan Kriya Yoga (SKY) came into being in 1982 by Shri Shri Ravishankar, the spiritual guru of "Art of Living" Foundation.[3] Sudarshan – Su stands for "proper" and darshan means "Vision" and Kriya means a yogic practice, meant to purify the body. SKY incorporates specific natural rhythms of the breath which helps in eliminating the stress, fatigue, and negative emotions such as anger, frustration, and depression, leaving the individual calm, yet energized, focused, and relaxed.[4]

The comparative study of the effect of regular practice of SKY yoga on cardiorespiratory functions is important to better understand, its effects on healthy individuals and to provide the basis for the possible use of SKY yoga as supportive therapy for lifestyle diseases such as hypertension. Hence this study was planned to assess the effect of SKY on cardiorespiratory parameters.

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Materials and Methods

The study was approved by ethics committee of the institute. It was conducted at tertiary health-care teaching hospital. Two groups were made each consist of 50 individuals. The SKY group comprised of 50 subjects (including males and females) who have been regularly practicing SKY since more than 1 year. The subjects in this group were active volunteers of "Art of Living" Foundation who were doing SKY on regular basis.

The other group comprised of 50 subjects (including males and females) those who were not practicing SKY or any other form of yoga and not following any regime of exercise regularly. 40 min session of SKY includes Ujjayi breathing, Bhastrika pranayam, Om chanting, and Sudarshan Kriya followed by 10 min mediation.

Inclusion Criteria

1. Normal healthy individuals without any major illness.
2. Subjects between age group of 20–40 years of either gender.
3. For SKY group: Individuals those who were exclusively practicing SKY only since more than 1 year.
4. For control group: Individuals who were not practicing either SKY or any other form of physical exercise regularly.

Exclusion Criteria

1. Individuals with hypertension and diabetes mellitus or any heart diseases.
2. Individuals with chronic respiratory diseases such as asthma and COPD.
3. Individuals with any other chronic illnesses (chronic renal diseases, chronic liver diseases, etc.).
4. Smokers and alcoholics.
6. Pregnant women.

Parameters

1. Cardiovascular parameters – Pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP).
2. Respiratory parameters – Forced vital capacity (FVC), forced expiratory volume at one second (FEV1), breath holding time (BHT), and peak expiratory flow rate (PEFR).

Written informed consent was taken from each subject. After thorough clinical examination and screening for inclusion and exclusion criteria, anthropometric measurement of every subject was taken. Then he/she was made to relax physically and mentally for 15 min. All the recordings were done in morning hours in between 10 and 12 am in a quiet room. SBP and DBP were recorded by mercury sphygmomanometer in supine position by auscultatory method. Pulse rate was recorded for 1 min by standard three finger method. Three readings were taken at an interval of 5 min and the mean value was taken as final reading.

For Spirometry, computerized spirometer was used. Test was done in sitting position. Detail instructions were given to the subject before and while doing the test. A nasal clip was used to close the nose to prevent the breathing through the nostrils. The subject was instructed to seal his/her lips around the mouthpiece, breathe in fully and blow out forcefully into the mouth piece of the spirometer. He/she was instructed to do the same 2–3 times for better expiration. Three consecutive readings were recorded for every subject and the best of three was selected for reproducibility and validity of the recorded test. Recorded respiratory parameter were forced vital capacity (FVC), forced expiratory volume at one second (FEV1), and peak expiratory flow rate (PEFR). Spirometer was calibrated regularly by a 3 L calibration syringe for accurate readings. For breath holding time, subject was asked to hold the breath after normal expiration and time has been noted on stopwatch till the breaking point.

Statistical Analysis

The data were expressed as mean ± standard deviation and were analyzed using Graphpad prism software version 2. Unpaired *t*-test was used to compare the parameters between case and control group. *p*-Value of <0.05 indicated as significant difference.

Result

The subjects in two groups (SKY group and control) were comparable with regard to their age, socioeconomic status (all were from mid to upper socioeconomic class) and anthropometric parameters. As per Tables 3 and 4, comparison of the difference between the means of parameters using unpaired '*t*' test shows that there are significantly lower levels of cardiovascular parameters (PR, SBP, and DBP) in the case group as compared to the control group. (*p*-value < 0.05). As per Tables 5 and 6, comparison of the difference between means of parameters using unpaired *t*-test shows that there are significantly higher levels of respiratory parameters (FVC, FEV1, PEFR, BHT) in the case group as compared to the control group (*p*-value < 0.05).

Discussion

In our study, we found significantly lower levels of cardiovascular parameters (e.g., pulse rate, SDP, and DBP) and significantly higher levels of respiratory parameters (e.g., FVC, FEV1, PEFR, and BHT) in the case group as compared to control group. Therefore, it is showing that long-term practice of SKY has beneficial effects on one's cardiorespiratory physiology.

The regular practice of SKY is directly related to an increase in parasympathetic dominance via vagal stimulation from vagal somatosensory afferents[5] and also leads to a corresponding decrease in sympathetic activity.[6,7] Decrease in sympathetic activity will decrease the secretion of catecholamines, which allows vasodilatation and hence improves peripheral circulation in the body. The practice of Yogic breathing has been shown to decrease resting oxygen consumption,[8] which may be the reason for the decrease in heart rate in the SKY group. Decrease in heart rate will decrease work of heart and ultimately decreases SBP. The practice of yoga alters hypothalamic discharges,[7] resulting in a decrease in sympathetic tone and peripheral resistance; both physiological responses lead to a decrease in DBP. SKY decreases chemoreflex sensitivity, increases arterial baroreceptor sensitivity, oxygenation, and exercises tolerance.[5]

Practicing SKY on regular basis improves many bodily functions. Lung function is also improved. Our results are consistent with the earlier studies.[10,13,14] They had noticed increase in values of pulmonary function tests. In our study,

Table 1: Anthropometric measurements (21–30 years age group)

Parameters	Males		Females	
	SKY group (*n* = 10)	Control (*n* = 10)	SKY group (*n* = 16)	Control (*n* = 15)
Age (years)	25.9 ± 3.21	25.1 ± 3.14	26 ± 2.94	25.74 ± 2.11
Height (cms)	166.7 ± 5.01	165.25 ± 5.76	159.65 ± 4.22	159.6 ± 4.50
Weight (kg)	62.9 ± 4.01	61.9 ± 3.67	53.18 ± 3.58	55.07 ± 4.48

Table 2: Anthropometric measurements (31–40 years age group)

Parameters	Males		Females	
	SKY group (*n* = 10)	Control (*n* = 10)	SKY group (*n* = 16)	Control (*n* = 15)
Age (years)	36.82 ± 2.12	36.75 ± 1.87	35.35 ± 2.81	34.84 ± 2.82
Height (cms)	165.55 ± 5.39	162.91 ± 5.40	160.25 ± 4.73	159.46 ± 5.60
Weight (kg)	66.72 ± 6.52	67.08 ± 6.31	63 ± 5.31	63.38 ± 4.08

Table 3: Cardiovascular Parameters (21–30 years age group)

Parameters	Males			Females		
	SKY group (*n* = 10)	Control (*n* = 10)	*p*-Value	SKY group (*n* = 16)	Control (*n* = 15)	*p*-Value
Pulse rate (beats per min)	72.8 ± 5.09	79.6 ± 8.58	0.04	73.88 ± 5.68	78.53 ± 6.52	0.04
Systolic blood pressure (mmHg)	111.6 ± 7.82	119 ± 7.26	0.04	112 ± 9.30	118.53 ± 8.02	0.04
Diastolic blood pressure (mmHg)	66.80 ± 4.83	73.2 ± 7.84	0.04	67.75 ± 5.70	73.33 ± 8.16	0.03

Table 4: Cardiovascular parameters (31–40 years age group)

Parameters	Males			Females		
	SKY group (*n* = 11)	Control (*n* = 12)	*p*-Value	SKY group (*n* = 14)	Control (*n* = 13)	*n*-Value
Pulse Rate (beats per min)	72.18 ± 5.62	78.17 ± 6.63	0.03	72.86 ± 4.62	77.38 ± 6.08	0.03
Systolic blood pressure (mmHg)	111.82 ± 9.47	121.33 ± 7.45	0.01	112.57 ± 7.42	119.08 ± 7.86	0.03
Diastolic blood pressure (mmHg)	68 ± 6.45	74.17 ± 6.29	0.03	68 ± 6.13	73.85 ± 8.02	0.04

Table 5: Respiratory parameters (21–30 years age group)

Parameters	Males			Females		
	SKY group (*n* = 10)	Control (*n* = 10)	*p*-Value	SKY group (*n* = 16)	Control (*n* = 15)	*p*-Value
FVC (Liters)	4.28 ± 0.54	3.62 ± 0.62	0.02	4.08 ± 0.61	3.57 ± 0.65	0.03
FEV1 (Liters)	3.69 ± 0.62	3.08 ± 0.56	0.03	3.33 ± 0.53	2.89 ± 0.56	0.03
PEFR (Liters per min)	466.91 ± 97.77	386.03 ± 66.62	0.04	406.28 ± 78.34	338.4 ± 56.61	0.01
BHT (seconds)	44.6 ± 8.73	36.8 ± 7.25	0.04	40.38 ± 8.40	34.87 ± 6.10	0.04

Table 6: Respiratory parameters (31–40 years age group)

Parameters	Males			Females		
	SKY group (*n* = 11)	Control (*n* = 12)	*p*-Value	SKY group (*n* = 14)	Control (*n* = 13)	*p*-Value
FVC (Liters)	4.06 ± 0.53	3.41 ± 0.58	0.01	3.67 ± 0.47	3.18 ± 0.45	0.01
FEV1 (Liters)	3.54 ± 0.56	2.91 ± 0.52	0.01	3.26 ± 0.43	2.79 ± 0.45	0.01
PEFR (Liters per min)	415 ± 66.57	341.15 ± 77.08	0.02	371.29 ± 48.54	318.14 ± 61.76	0.01
BHT (seconds)	41.18 ± 8.70	33.83 ±7.43	0.04	37.21 ± 5.82	32 ± 5.39	0.02

all the Spirometric Lung Function Tests (viz. FVC, FEV1, and PEFR) were found at significantly higher levels in the case group as compared to control group. Although clear cut evidence is lacking, the mechanisms by which changes in respiratory functions occur are greater relaxation of respiratory muscles induced by supraspinal mechanisms which increases expiratory reserve volume, contributing to a rise in vital capacity.[11] Lung inflation to near total lung capacity is a major physiological stimulus for release of surfactant and prostaglandins into the alveolar spaces. This causes increase in lung compliance and decrease in bronchiolar smooth muscle tone.[11]

SKY has been shown to strengthen the respiratory muscles, thus increasing the excursions of the diaphragm and lungs along with increased thoracic compliance.[6,7] Airway resistance is also decreased by yogic breathing.[12] All these factors help to increase PEFR. It has been reported that long-term practice of yoga leads to a greater control of respiratory musculature and the ability to consciously override the normal physiological stimuli of respiratory centers.[11] This may be the reason for higher values of breath holding time in the case group.

Limitations of the Study

The better results of SKY can be seen in same individual before and after doing of SKY. Hence, it is proposed that further prospective studies with a larger sample size are recommended for applying these results to the population, in general.

Conclusion

It can be concluded here, that, long-term regular practice of SKY improves health and well-being of an individual, by increasing parasympathetic dominance and ultimately reducing the stress. Thus, regular SKY practice not only prevent but can be used as adjuvant in management of lifestyle-associated disorders such as essential hypertension and COPD.

Abbreviations: SKY, Sudarshan Kriya Yoga; FVC, forced vital capacity; FEV 1, forced expiratory volume at 1 s; PEFR, peak expiratory flow rate; BP, blood pressure.

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