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EFFECT OF SHORT TERM HATH YOGA ON LUNG FUNCTION, AEROBIC CAPACITY AND QUALITY OF LIFE IN HEALTHY YOUNG INDIVIDUALS

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ABSTRACT

Introduction: Yoga is one of the most common methods used as mind body therapy. Hath yoga, one of the many forms or paths of yoga, focuses on overall fitness through pranayama, asana, and meditation. Anxiety and stress are the major problems of the modern world particularly of youth and college going students. There are very few studies on effect of hath yoga on lung function and aerobic capacity of healthy young individuals and there is paucity of data on effect of yoga on quality of life in the same group.

Objective: The objectives of the study were to see the effect of short term hath yoga on lung function, aerobic capacity and quality of life in healthy young individuals.

Methodology: Study design: experimental study Sample size: 60 volunteers A: experimental group & B: control group. Study setting: students of the college of physiotherapy. Method Hath yoga for 4 weeks,5 days in a week for 60 minutes; including 5 minutes of relaxation-savasana & makarasana, 5 minutes of pranayam, 5-10 minutes warm up, 25-30 minutes asanas (Ardh Paschimotasana, Paschimotasana, Yogamudra, Ardhmatsy endrasana, Uttitakumarasana, Tadasana) 5-10 min savasana, cool down period. Subjects of control group were in waiting list. After 4 weeks control group was taught same hath yoga poses. Peak expiratory flow rate, 12 min walk distance, SF-36 scores were taken as pre and post data.

Result: The result shows that there is statistically significant improvement in PEFR, 12 MWD, and component of SF-36 after 4 week of hath yoga practice in healthy young individuals compared to a control group at 5% significance level.

Conclusion: The conclusion of the study is that Short term Hath yoga improves lung functions, aerobic capacity and quality of life in healthy young individuals compared to control group.

Keywords: hath yoga, lung function, aerobic capacity, quality of life

INTRODUCTION

Complementary and alternative medicine (CAM) is a group of diverse medical and health care systems, therapies and products.[1] The American public´s use of complementary and alternative medicine increased substantially during the 1990s.[2]Complementary and alternative medicine includes techniques such as aromatherapy, massage, yoga, etc.

Yoga is one of the most common methods used as mind body therapy. Yoga is a Sanskrit word which means "the unity of body and mind." Yoga is an ancient Indian practice; first described in Vedic scriptures around 2500 B.C. which utilizes mental and physical exercises to attain "Samadhi", or "the union of the individual self with the infinite".[3] Yoga is cessation of thought waves in mind.

Hath yoga, one of the many paths of yoga, focuses on overall fitness through breath control exercises (pranayama), yoga poses (asana), and meditation. Practitioners of yoga therapy integrate yoga concepts with western medical and psychological knowledge for example, by using body awareness and breathing activities, physical posture and meditation with an understanding of pathological condition such as back pain or depression[4] whereas traditional yoga practice is primarily concerned with personal enlightment of people without understanding of pathology.

Yoga since long has been used to reduce the physical symptoms of chronic pain, improves fitness and for meditation. Yoga also may help individuals deal with the emotional aspects of chronic pain, reducing anxiety and depression. Although yoga is historically a spiritual discipline, it has been used clinically for therapeutic intervention. The number of publications on its clinical application has greatly increased over the past 3 decades [5]. In literature there are many articles of use of yoga in variety of condition such as multiple sclerosis, rheumatoid arthritis, breast cancer, low back pain, migraine, epilepsy.[6-10] Even though there have been numerous studies on yoga and disease, there have been few on healthy subjects. Several studies have been conducted in the geriatric population to see improvement in balance and fitness, but very few on healthy young subjects.[11]

Anxiety and stress are the major problems of the modern world particularly of youth and college going students. Stresses have very negative effects on fitness and health. Poor health negative feelings lead to various physical and psychological problems. Stressful life can lead to poor quality of life and fitness. There are studies on yoga and disease related stress, anxiety and effect on well being but very few on healthy young individuals' fitness aspect.

Some studies found improved lung function in condition such as asthma, Bronchiecstasis etc.[12-13] there are very few studies on effect of hath yoga on lung function and aerobic capacity of healthy young individuals and there is paucity of data on effect of yoga on quality of life in the same group.

Hence the need of this study to determine whether yoga practice over a short duration of 4 weeks would result in a change in lung function, aerobic capacity and quality of life in healthy young individuals.

MATERIAL AND METHADOLOGY

Study design

A randomized controlled trial

Study setting

The study was conducted at the College of physiotherapy.

Duration of study

The total duration of the study was 6 months.

Sample size and design

60 healthy volunteers were randomly divided in to 2 groups

1) Experimental group (yoga group)-30 individuals
2) Control group-30 individuals

Inclusion criteria

Gender- male and female

Age-18 to 25 years

BMI within normal limits

Having full range of motion of all joints

Exclusion criteria

Those who were doing regular exercises previously

Having any history of acute or chronic diseases

History of Smoking and drinking

Data collection and procedure

Material

Consent form.

Data collection sheet

Yoga mats

Paper, pencil, pen

Apparatus

Stop watch
Peak flow meter
Weighing machine
Measure tape

Outcome measure

Peak expiratory flow rate[14]
12 min walk distance[15]
SF-36 questionnaire[16]

Procedure

68 volunteers, 18-25 years of age were recruited from the undergraduate students of the college of physiotherapy. According to inclusion exclusion criteria 60 volunteers were included in the study. All subjects were explained the study and written consent informed form was taken. Then they are randomly divided in to 2 group's .group A: experimental group and group B: control group. General characteristics (age, sex, height, and weight and body mass index) were collected. On the first day of study, both groups came to training room and their pre intervention data were collected: 12 min walk distance, peak expiratory flow rate and SF-36 score. Experimental group performed hath yoga for 4 weeks, 5 days in a week. Some important guidelines and precautions for practice of asanas were explained such as

Take light snacks 1 hour before yoga class.
Evacuate bowel and bladder.
Dress should be loose and comfortable.
Ladies should not do asana during menstruation.
Breathing should be done through nose only.
Avoid jerky movements while doing asanas.
Exhale during all forward bending movements in which the chest and abdomen are being compressed, and inhale during all movement in which the chest and abdomen is being expanded.
Do not force your body to achieve final pose.

Each yoga session was taken between 7.30 to 8.30 a.m. for 60 minutes; including 5 minutes of relaxation with savasana and makarasana, 5minutes of pranayam consisting of alternative nostril breathing while maintaining of half lotus pose (ardh padmasana).(Photograph 1)

Then 5-10 minutes of warm up focused on slow dynamic muscle movements with dynamic lunges, shoulder/arm circling, and neck rolling.

This was followed by 25-30 minutes of asanas consisting of following poses:

ArdhPaschimotasana (photograph 2)
Paschimotasana (toe touching in long sitting) (photograph 2)
Yoga mudra ArdhPaschimotasana (photograph 3)
Ardh matsyendrasana (sitting and twisting pose) (photograph 4)
Uttita kumarasana (cat and camel pose) (photograph 5)
Tadasana (toe standing with arm elevated) (photograph 6)

Session was ended with 5 min of relaxation with savasana and cool down period.

At the end of 4 weeks post exercises data were collected. Statistical tests were used to compare the data of both groups. Level of significance was kept at 5%. Subjects of control group were in waiting list. After 4 weeks control group was thought same hath yoga poses.

RESULT

The present study comprised of two groups of 30 subjects in each group. Group A was experiental group and Group B was Control group. Group A was given Hath yoga training, while Group B was kept in waiting. All selected subjects completed the study satisfactorily. Subjects were evaluated at end of four weeks. The results of the 60 subjects were analyzed by using Graph pad Prism-5.

Graph 1, 2 shows the mean age, body mass index values having no statistical difference.

Here paired t test was used for statistical analysis of within group A & B peak expiratory flow rate & 12 MWD

Group A showed statistically significant difference in PEFR (table 1 & 2) and 12 MWD (table 4 & 5) at the end of 4 weeks of Hath yoga practice at 5 % level of significance compared to group B (control group)

For comparing the difference in mean PEFR score and 12 MWD Score between Groups A & B, Mann-Whitney U test was performed and found statistically significant (table 3 & 6)

In this study subjects were healthy individuals who had no complain of pain and hence pain subscale of physical component was not evaluated.

Group A showed statistically significant difference in SF 36 score at the end of 4 weeks of Hath yoga practice $p<0.0001$ at 5 % level of significance compared to group B ($p>0.05$) in physical functioning, general health, role-physical, vitality, social functioning, role-emotional, and mental health (table 7 – 9)

DISCUSSION

The result shows those 4 weeks of hath yoga practice in healthy individuals can significantly benefit in improving lung function, aerobic capacity and quality of life compared to a control group.

This is similar to findings by Yadav RK et al., in a study on 60 healthy young females; where a significant increase was demonstrated in forced vital capacity, forced expiratory volume in 1 second and peak expiratory flow rate.[17]

Mandanmohan et al. also demonstrated that short-term Yoga practice increased skeletal muscle strength and lung volumes in children.[18]

Joshi LN et al. found that short term pranayam practice increased respiratory sensation, maximum expiratory pressure and flow rate.[19]

Respiratory function depends on many factors including nervous system, respiratory muscle strength, and lung dimension.

Yoga recognises three methods of breathing: Diaphragmatic, Intercostal, Clavicular [20]

According to Chitlow, of these three, diaphragmatic breathing is the most efficient as it uses the least energy and enables the most absorption of oxygen. This is because the surface area of the lungs is greater in the lower lobes resulting in higher quantities of oxygen circulating around the body.[21]

Yoga stabilizes autonomic equilibrium with a tendency towards parasympathetic dominance rather than stress-induced sympathetic dominance.

According to Ernst, Yoga therapy readjusts the autonomic imbalance, controls the rate of breathing and relaxes the voluntary inspiratory and expiratory muscles, which results in decreased sympathetic reactivity.[22, 23] Thus; Yoga increases respiratory efficiency, balances activity of opposing muscle groups and slows dynamic and static movements.

Pranayama may have psycho physiological benefits by increasing the patient's sense of control over stress and thus aids in reducing their autonomic arousal factors.

Five positions of Hath-Yoga used in this study have been reported to predominantly affect prime mover and accessory respiratory muscle such as external and internal intercostal muscle, pectoral, latisimusdorsi, erector spine, rectus abdominals, serratus anterior and diaphragm.[24]

Halvorson stated that performing Yoga stretching and balancing movement can lead to improvements of muscle strength and flexibility of all these muscles.[25] and thus improve PEFR as seen in present study.

The result of this study, showed statistically significant difference in 12 min walk distance at the end of 4 weeks of Hath yoga practice in group A

Similarly Balasubramanian and Pansare also reported significant increases in cardio-respiratory endurance after 6 weeks of regular yoga practice. However, the authors had estimated VO_2max using the Astrand- Rhyming Step Test.[26]

In contrast Blumenthal et al. and Raju et al. directly measured VO_2max by the analysis of expired gases and reported no significant changes resulting from yoga practice[27] .However, the sample population in these two studies consisted of healthy older individuals (ages 60–83) and elite athletes, respectively.

Cardiac function in normal young volunteers has been studied in a randomized controlled trial in 24 school children, which was designed to determine whether pranayama had any effect on ventricular performance by measuring systolic time intervals and cardiac autonomic function tests. After 3 months training, parasympathetic activity was seen to be increased and sympathetic activity decreased .[28]

A study by Bhattacharya on 30 healthy young men also demonstrated improvement in oxidative status and the antioxidant pathological processes following yoga practice leading to an increase in aerobic capacity which could justify the changes seen in present study. [29]

The result also suggests improvement in subjective well being and score of SF 36 scale. In this study subjects were healthy individuals who had no complain of pain and hence pain subscale of physical component was not evaluated.

As shown in this study, Group A showed statistically significant difference in SF 36 score at the end of 4 weeks of Hath yoga practice.

According to Madanmohan, Savasana, the relaxation part of yoga practices, has shown to enhance the ability to withstand stress[30]

Kamei T et al studied changes in brain waves and blood serum cortisol during yoga exercise and increase in alpha waves and decrease in cortisol level have been reported.[31] In vivo evidence has been provided for regulation of conscious states at a synaptic level by yoga nidra [32] .

Harinath K et al. studied on the effects after 3 months of hath yoga practice on cardio-respiratory performance, psychological profile and melatonin secretion. They showed improvement in these profiles and increase in plasma melatonin, indicating that yoga could be used as a psycho physiologic stimulus to increase endogenous secretion of melatonin, which in turn might be responsible for improved sense of well-being[33].

Prasad concluded the state of the mind and that of the body are intimately related. If the mind is relaxed the muscles in the body will also be relaxed. Stress produces a state of physical and mental tension. Yoga physical postures and breathing exercises improve muscle strength, flexibility, blood circulation and oxygen uptake, as well as hormone function, In addition the relaxation helps to stabilize the autonomic nervous system with a tendency towards parasympathetic dominance. The physiological benefits which follow help the yoga practitioner become more resilient to stressful conditions[34].

The limitations of the study were Predominant female individuals were included as participants. Direct estimation of aerobic capacity was not performed.

Future Research can be conducted on healthy young individuals to measure relation between quality of life and stress and also can be done in geriatric population to see effect on fitness and quality of life

CONCLUSION

The conclusion of the study is that Short term Hath yoga improves lung functions, aerobic capacity and quality of life in healthy young individuals compared to control group

So, clinically it can be implicated to be used to improve physical & psychological fitness in healthy individuals.

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TABLE-1: MEAN DIFFERENCE IN PEFR SCORE WITHIN GROUP-A

PRE		POST		t-value	p-value
MEAN (l/min)	SD	MEAN (l/min)	SD	9.74	<0.0001
380	56	415	49		

Here, Paired t test was performed for analysis, p<0.0001 was found to be statistically significant as shown in table 4 and graph 6.

TABLE-2: MEAN DIFFERENCE IN PEFR SCORE WITHIN GROUP-B

PRE		POST		t -value	p-value
MEAN (l/min)	SD	MEAN (l/min)	SD	0.32	0.72
378	30	379	39		

Here, Paired t test was performed for analysis, p>0.05 was found to be statistically not significant as shown in table 5 and graph 6.

TABLE-3: MEAN DIFFERENCE IN PEFR SCORE BETWEEN GROUP A & B

	MEAN (l/min)	SD	U -VALUE	p-VALUE
GROUP A	32.65	21.22	63	<0.0001
GROUP B	0.29	6.26		

For comparing the difference in mean PEFR score between Groups A & B, Mann-Whitney U test was performed. Mann- Whitney U=63 at p<0.0001 was found to be statistically significant as shown in table 6 and graph 7

TABLE 4: MEAN DIFFERENCE IN 12 MWD SCORE WITHIN GROUP-A

PRE		POST		t -value	p-value
MEAN (m)	SD	MEAN (m)	SD	9.7	<0.0001
1110	191.3	1317	128		

Here, Paired t test was performed for analysis, p<0.0001 was found to be statistically significant as shown in table 6 and graph 4.

TABLE-5: MEAN DIFFERENCE IN 12 MWD SCORE WITHIN GROUP-B

PRE		POST		t -value	p-value
MEAN (m)	SD	MEAN (m)	SD	0.30	0.76
1134	146.3	1138	122		

Here, Paired t test was performed for analysis, p >0.05 was found to be statistically not significant as shown in table 7 and graph 4.

TABLE-6: MEAN DIFFERENCE IN 12 MWD SCORE BETWEEN GROUP A & B

	MEAN(m)	SD	U- VALUE	p- VALUE
GROUP A	207.3	115.5	30	<0.0001
GROUP B	4.43	61		

For comparing the difference in mean 12 MWD score between Groups A & B, Mann-Whitney U test was performed. Mann-Whitney U=30 at p<0.0001 was found to be statistically significant as shown in table 9 and graph 5

TABLE-7: MEAN DIFFERENCE IN SF-36 SCORE WITHIN GROUP-A

SF 36	PRE		POST		t-VALUE	p-VALUE
	MEAN	SD	MEAN	SD		
PHYSICAL FUNCTIONING	75.83	10.18	95.5	6.06	19.3	<0.0001
GENERAL HEALTH	65.83	7.9	84.5	6.06	17.02	<0.0001
ROLE-PHYSICAL	77.5	18.9	95	10.17	5.88	<0.0001
VITALITY	71.17	7.15	88	7.02	14.81	<0.0001
SOCIAL FUNCTIONING	72.42	10.18	88	10.12	8.31	<0.0001
ROLE-EMOTIONAL	72.19	27.8	91.15	15.02	6.15	<0.0001
MENTAL HEALTH	73.07	9.56	91.47	7.02	11.50	<0.0001

Here paired t test was performed for analysis, p<0.001 were found to be statistically significant as shown in table 8 and graph 8 to 14

TABLE-8: MEAN DIFFERENCE IN SF-36 SCORE WITHIN GROUP-B

SF 36	PRE		POST		t -VALUE	p-VALUE
	MEAN	SD	MEAN	SD		
PHYSICAL FUNCTIONING	75.5	8.4	76.8	10.3	1.66	0.10
GENERAL HEALTH	66.5	8.4	66.75	8.6	1.2	0.23
ROLE-PHYSICAL	75	21	76.6	21.7	1.0	0.32
VITALITY	68.4	7.3	69.8	6.49	1.21	0.23
SOCIAL FUNCTIONING	67.4	1.45	67.7	1.36	0.21	0.83
ROLE-EMOTIONAL	81.09	0.16	79.96	16.6	1.0	0.32
MENTAL HEALTH	70	7.5	72.5	7.23	2.03	0.04

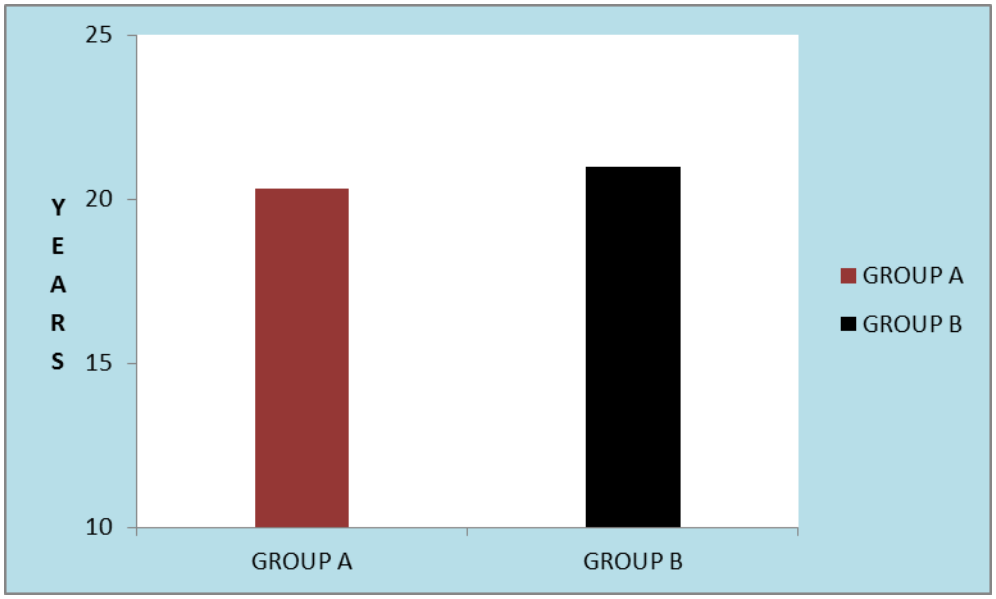
Here paired t test was performed for analysis, p>0.05 were found to be statistically significant as shown in table 9 and graph 8 to 14.

TABLE 9: MEAN DIFFERENCE IN SF-36 SCORE BETWEEN GROUP A & B

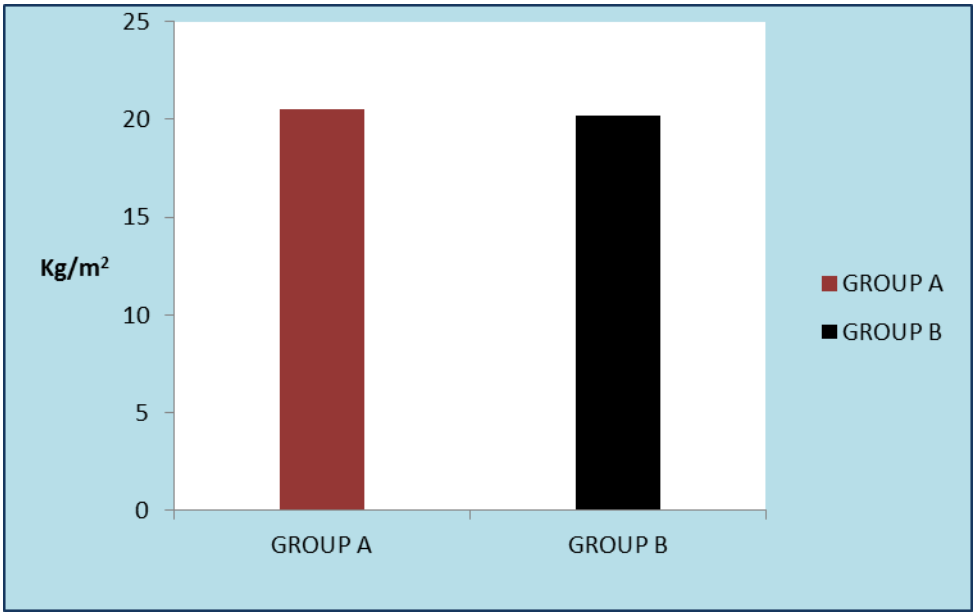
SF- 36	MEAN		SD		U-value	p-value
	group A	group B	group A	group B		
PHYSICAL FUNCTIONING	19.67	1.76	5.56	5.34	23.5	<0.0001
GENERAL HEALTH	16.97	0.06	7.90	5.60	230	<0.0001
ROLE-PHYSICAL	16.94	1.66	16.31	9.12	174	<0.0001
VITALITY	16.83	1.03	6.22	6.17	36	<0.0001
SOCIAL FUNCTIONING	15.58	0.55	10.27	7.67	54	<0.0001
ROLE-EMOTIONAL	19.55	1.11	16.72	6.09	122	<0.0001
MENTAL HEALTH	18.40	1.88	8.76	5.50	60	<0.0001

For comparing the difference in mean SF-36 score between Groups A & B, Mann-Whitney U test was found to be statistically significant as shown in table 12 and graph 15 to 17.

GRAPH 1: AGE DISTRIBUTION



GRAPH 2: MEAN OF BODY MASS INDEX GROUP A&B



Photograph 1

SAVASANA

MAKARASANA

PRANAYAMA

Photograph 2

ARDH PASCHIMOTASANA

PASCHIMOTASANA

Photograph 3

YOGMUDRA

Photograph 4

ARDH MATSYENDRASAN

Photograph 5

UTTITA KUMARASANA (CAT AND CAMEL POSE)

Photograph 6

TADASANA (TOE STANDING WITH ARM ELEVATED)