



## AN INTEGRATED APPROACH TOWARDS IMPROVING LUNG FUNCTIONS BY LAUGHTER YOGA

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**ABSTRACT** **Objective:** Laughter is the best simplest natural cheapest preventive medicine bearing today's lifestyle as well as cost of living. The purpose of this study is to evaluate the impact of simulated laughter (laughter yoga) by performing simple spirometry (lung function tests) before and after laughter yoga session, to analyze potential benefits perceived by participants on physical well-being and impact of group dynamics on perceiving regular exercise schedules.

**Method-**The subjects participated in pre and post laughter yoga assessed by doing simple spirometry & compared the values of FEV1, FEV1%,(Forced expiratory volume in 1 sec)FVC, .FVC%(Forced vital capacity) , & PEFR(Peak expiratory flow rate) pre & post laughter yoga. Simultaneously participants were monitored for vital parameters related changes and group climate score survey was also conducted.

**Conclusion:-**There is significant post laughter yoga improvement in values of FVC, .FVC%, FEV1, FEV1% & PEFR.Also there are multifactorial benefits of laughter yoga on preservation and boosting functional capacity of lung. Hence accepting laughter yoga as a medical science must be proposed. Key words:- laughter yoga, simulated laughter, Lung function tests, FEV 1, FEV1%,(Forced expiratory volume in 1 second,)FVC, FVC%,(Forced vital capacity) , PEFR, (Peak expiratory flow rate)group cohesion

**Abbreviations:-**Laughter yoga - LY, Semplespirometry -Pulmonary function tests by flow volume loope, PEFR – Peak Expiratory Flow Rate, BP- Blood pressure

## KEYWORDS :

## INTRODUCTION

Laughter comes naturally to all human beings.Smiling is observed first followed by laughter during the 4th month of gestation and all structures needed for laughter are present and functional at birth.(1) Laughter is also observed in congenitally deaf and blind people proving that laughter is not acquired but innate and necessary like any other emotion or body phenomenon. Laughter begins with a forced exhalation starting at any point of respiratory cycle and when continued there are phases of inhalation followed by burst of forceful exhalation which may or may not be associated with phonation, movements of facial muscles and limbs.( 1 ).The importance of laughter has been known to humans since long and was first described scientifically by Darwin in 1872 p. 199)as a sound produced by a deep inspiration followed by short, interrupted, spasmodic contraction of the chest, and especially of the diaphragm.

Laughter has been divided in to five types (1) genuine or spontaneous laughter, (2) simulated laughter, (3) stimulated laughter. eg. Tickling process, (4) induced laughter eg. By drugs and (5) pathological laughter eg. Neurological diseases. (2). Although it has been understood that spontaneous or genuine laughter has equally genuine effects on various organs of human body, never the less simulated laughter (laughter yoga) can be used to our benefit by targeted approach. Laughter Yoga is a type of simulated laughter which involves 4 steps:( 1st step);-childlike playfulness behavior to dissolve inhibition, (2nd step); - use of various actions to bring out emotional wellbeing, (3rd step); - physical work out by involving limb action, stretching exercise, deep breathing, and performance of yoga and (4th step);-utilizing special techniques like dancing, singing, conversation, group games, etc.. (2)

As noted by Charles Dickens' there is nothing more contagious than laughter and humor.Likewise simulated laughter can initiate spontaneous laughter and spread to involve all group members and bring about all the essential benefits of genuine laughter. Hence when clubbed with controlled exercises and techniques, added and desirable benefits can be obtained. Aim of our study was to evaluate the impact of (simulated laughter) laughter yoga by performing lung function

tests (simple spirometry) before and after laughter yoga session, to analyze potential benefits perceived by participants on physical well-being and to elucidate recommendations for further research.

## Materials and Methods

## Setting and participants:-

The present study was conducted on field at different laughter yoga clubs. The participants involved were regularly attending laughter yoga sessions for more than 3 months either daily or more than 3 times per week during morning hours (between 6.30 am to 8.30 am) of 30-40 minute durations. Participants were invited to take part in the study and following exclusion criteria were applied during selection: participants not able to perform lung function tests and those with known contraindication to perform lung function tests e.g. uncontrolled hypertension, IHD, recent MI , stroke, surgery, hemoptysis, pneumothorax or history of pulmonary embolism and individuals with active acute or chronic infection which included but not limited to upper and lower respiratory tract infection and other systemic infections.

## Procedure:-

Individual were asked to perform lung function maneuver over a portable spirometer and best one out of three flow volume loops was recorded and simultaneously peak expiratory flow rate (PEFR)was recorded over a peak flowmeter. Vitals i.e. blood pressure, pulse rate, respiratory rate, Oxygen saturation and respiratory system auscultation findings were noted. A 25 minute laughter yoga session was conducted which included the following 3 steps.

Step 1: Warming up exercise : first 5 minutes of breathing and stretching exercises: deep inhalation, prolonged exhalation, quiet respiration, passive mild to moderate stretching of upper and lower limbs, neck,west, and back muscles and joints.

Step 2:Laughter yoga session : Individuals performed laughter techniques for next 15 minutes which included different laughter exercises starting with clapping & using different phonetics of "Ho-Ho,Ha,Ha, Ha" along with eye contact with each other and limb

movements. The laughter yoga exercises included greeting laughter, hand shaking laughter, swinging laughter, milk shake laughter, sipping tea laughter, lion laughter, chili laughter, monkey laughter and catch the ball laughter etc. The individuals were made to have active eye contact while performing different laughter exercises and childlike playfulness. Individuals were asked to do twice deep breathing after each laughter exercise

Step 3:Relaxation & Pranayama: last 5 minutes included body relaxation techniques, deep & fast breathing,, Anulom vilome Pranayam, Kapal bhati, Bhramari etc. and chanting of 'om'.

After 5 minute rest vitals were noted and pulmonary function tests were performed. Participants were requested to complete a questionnaire including life satisfaction index, 11 item short form version of questionnaire, measures of general life satisfaction and group climate questionnaire scale (3).

**Observation & Statistical analysis:-**

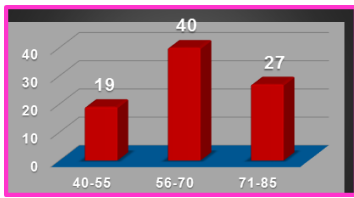
**3.1.1 General study structure:-**

A total of 86 participants,39 males(45.34%) and 47 females (54.34%) with an age range of 40 to 83 years (64.80233 mean,+9.689072 SD)were included(Table no.1 and 2)and (graph no.1 and 2).Participants were diagnosed cases of (14) DM, (28) HT,(8) COPD and (8)arthritis and all were on regular treatment(Table no 3 ). None were suffering from any disease specific exacerbation or infectious etiology especially upper or lower respiratory tract infections at the time of study

**Table no.1 Age wise Distribution of Participants**

Age group	No. of Cases	Percentage
40-55	19	22.09%
56-70	40	46.51%
71-85	27	31.40%
Total	86	100.00%

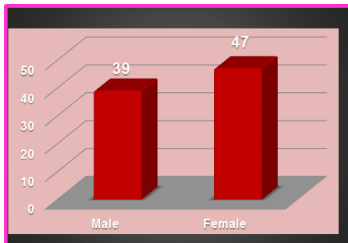
**Graph No.1:Age wise Distribution of Participants**



**Table no.2 Sex wise Distribution of Participants**

Sex	No. of Cases	Percentage
Male	39	45.35%
Female	47	54.65%
Total	86	100.00%

**Graph No. 2:Sex wise Distribution of Participants**



**Table no.3 Co-morbidities in participants**

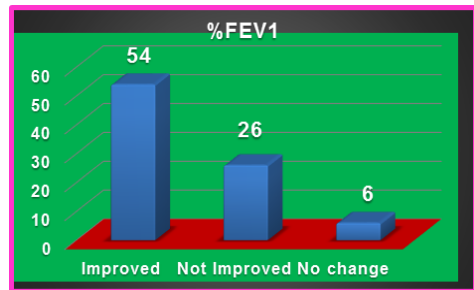
Normal	DM	HT	COPD	ARTHRITIS	TOTAL
18	14	28	8	8	86

**3.1.2 PFT changes:-**

a) FEV1(L) and FEV1 %:- Pre and post laughter yoga session FEV1(L) and FEV1% values of 86 subjects showed a significant change (p=0.034,p=0.016 respectively) with 54 (62.79%) subjects having an improvement, 6 (6.98%) subjects having no change and 26(30.23%) subjects having no improvement in FEV1% post LY session (Table no.4,5 and Graph no.3, & 4).6 out of 54 subjects had both 12% and 200ml increase in FEV1that means showing good

reversibility and only 2 out of the 26 subjects had a significant drop of >10%. Although p value (>0.05) showed no significant correlation between age and FEV1%, 9 subjects had not improved, 11 had improved and 4 had no change in FEV1% values between the age group 40-60 years. However out of 67 subjects more than 56yrs, 20 had not improved, 47 had improved And participants of age more than 56 yrs. showed good improvement in FEV1 value. (Table no. 5). Out of 17 subjects who had a FEV1/FVC ratio of <0.70, 10 showed a post LY session improvement in FEV1% and 7 had a drop in FEV1% values.

**Graph No.5:Observation of post laughter yoga FEV1% in 86 subjects**



**Table no 4.Association between sex and changes in post Laughter yoga FEV1%**

Sex	FEV1		Total
	Improved	Not Improved+ No change	
Male	29	10	39
Female	25	22	47
Total	54	32	86

Chi-Square Tests			
	Value	do	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.087	1	0.043
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.51.			

P value =0.043 < 0.05 implies significant Association between Sex of patients and changes in FEV1 post Laughter yoga

**Table no5. Association between Age and changes in post laughter yoga FEV1%**

Age group	FEV1		Total
	Improved	Not Improved+ No change	
40-55	7	12	19
56-70	28	12	40
71-85	19	8	27
Total	54	32	86

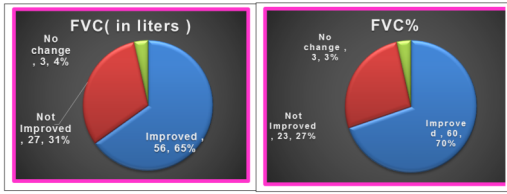
Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.029	2	0.030
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.07.			

P value =0.030 < 0.05 implies significant Association between age group of patients and changes in FEV1post laughter yoga

b) FVC[L] and FVC%:- Pre and post laughter yoga session FVC (L) and FVC % values of 86 subjects also showed the significant change (p=0.045, p=0.015 respectively) with 56 (65%)subjects showed good improvement ,27(31%) subjects did not show improvement while 3 (4%) showed no changes at all in FVC (L) values in post Ly session , while 60(69.77%) subjects showed improvement, 3 (3.49%) subjects having no change and 23(26.74%) subjects did not show improvement in FVC% values in post LY session FVC%.(Graph no.6 and 7).

**Graph No 6 & 7**

**Observation of FVC (L) & (FVC%) in 86 subjects post LY session**  
**Graph No.6 & 7:**

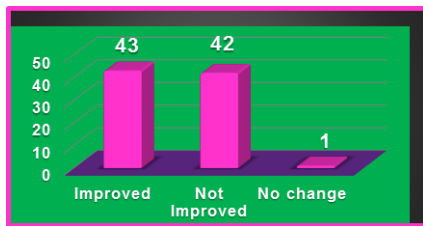


**FEV1/FVC ratio:-** Out of 86 participants 43 individuals showed an improvement in their FEV1/FVC ratio. 42 individual showed no improvement & 1 individual showed no change at all. Thus FEV1/FVC ratio in post laughter yoga didn't showed significant changes. (Table no. 6 & Graph no.7)

**Table no.6: Observation of FEV1/FVC ratio post laughter yoga in 86 subjects**

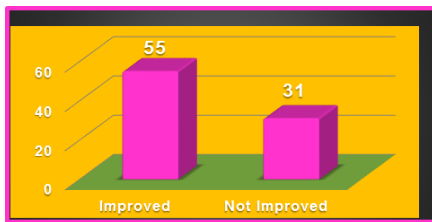
IMPROVED	NOT IMPROVED	No change	TOTAL
43(50%)	42(48.84%)	1(1.16%)	86

**Graph No.7: Observation of FEV1/FVC ratio post laughter yoga in 86 subjects.**



D) PEFR change: - Pre and post laughter yoga session PEFR values of 86 subjects showed significant change (p=0.018) however 55 (63.95%) subjects showed an improvement and 31(36.05%) subjects had a drop post LY session. (Graph no.8)

**Graph no 8. Showing PEFR changes post LY session**



E) FEF 25-75%:- Pre and post laughter yoga session FEF 25-75 % values of 86 subjects did not show a significant change (p=0.436) however 54 (62.79%) subjects had an improved, 2 (2.33%) subjects had no change and 30 (34.88%) subjects had a not improved in post LY session. 1 subject showed a significant change of >35% post LY session.

**Table no.7:-Spirometric parameters & vital parameters post laughter yoga session**

Variable	Improved (Increased)		Not Improved (Decreased)		No change		Total
	No. of Cases	%	No. of Cases	%	No. of Cases	%	
FEV1%	54	62.79%	26	30.23%	6	6.98%	86
FEV1 ( in liters )	54	62.79%	26	30.23%	6	6.98%	86
FVC%	60	69.77%	23	26.74%	3	3.49%	86
FVC ( in liters )	56	65.12%	27	31.40%	3	3.49%	86
FEV1/FVC	43	50.00%	42	48.84%	1	1.16%	86
PEFR	55	63.95%	31	36.05%	0	0.00%	86

FEF 25-75%	54	62.79%	30	34.88%	2	2.33%	86
BP Systolic	19	22.09%	55	63.95%	12	13.95%	86
BP Diastolic	30	34.88%	29	33.72%	27	31.40%	86
So2	64	74.42%	12	13.95%	10	11.63%	86

**Table no.8 Comparison of Spirometric values between pre & post Laughter Yoga & their significance with P Value**

**\*(paired t test applied between improved & not improved pattern of pre & post LY)**

Pair no.	Paired Variable	Pre Yoga	Post Yoga	P value	significance
Pair 1	FEV1%	62.04	63.67	0.016	significant
Pair 2	FEV1	1.4	1.43	0.034	significant
Pair 3	FVC	1.83	1.86	0.045	significant
Pair 4	FVC%	64.85	66.42	0.15	significant
Pair 5	FEV1/FVC	77.07	77.04	0.94	Not significant
Pair 6	PEFR	3.56	3.81	0.018	significant
Pair 7	FEF 25-75	54.81	55.85	0.436	Not significant
Pair 8	BP systolic	144.85	139.23	0.01	significant
Pair 9	BP diastolic	80.26	80.5	0.8	Not significant
Pair 10	So2	96.59	97.2	0.019	significant

**3.1.3 Vital parameters changes:-**

Pre and post laughter yoga session systolic blood pressure showed a significant change (p=0.01) and diastolic blood pressure values of 86 subjects did not show change (p =0.80). 19(22.09%) subjects had an increase, 55(63.95%) had decrease and 12(13.95%) had no change in systolic blood pressure values. Similarly 30(34.88%) had an increase, 29(33.72%) had a decrease and 27(31.40%) had no change in diastolic blood pressure values. While O2 saturation (So2) in post laughter yoga session was increased in 64 (74.42%), and decreased in 12(13.95%)& 10(11.63%) had no change.

**3.1.4 Physical parameters:-**

Same individuals were assessed by questionnaire format about the individual perceived joint pain scale and tiredness by using Global binary fatigue scale for physical & psychological fatigue was below 3.( 9) There was an overall decrease in scale parameter from average score of 0 to 2 post laughter yoga sessions and adherence to the routine exercise schedules showed a better daily activity performance.

**3.1.5 Group cohesion study:-**

Group climate questionnaire contain 12 items rated on a 7 points likert scale indicating extent of agreement ranging from "not at all" (0) to extremely(6) & it consists Engagement, Avoidance, and conflict factors. (9). In our study we got average 30 to 35 score for Engagement factor and 6 to 8 score for avoidance factor while not at all for conflict factor.

**3.2 Interpretation:-**

The study showed a significant increase in FEV1 and FVC values post laughter yoga session. The change as observed were more prominent in subjects more than 60 years of age (74.13% subjects showed an increase in FEV1%). 6 subjects showed good reversibility (12% and 200ml) in FEV1. It is believed that laughter induces bronchospasm (10). However this study showed that subjects having obstructive pattern had an improvement after the laughter yoga session as we have taken controlled COPD participants. Although subjects having higher grades of obstruction in PFT either did not show an improvement or had a mild drop in FEV1 values post LY session. Thus patients suffering from severe or very severe grade of obstruction (COPD, chronic bronchial asthma, etc) need to take caution before performing laughter yoga. However they may benefit from other simpler exercises and relaxation techniques included in LY. The earliest change observed in lung functions is seen at the level of small airways and this study

showed an improvement in FEF25-75% values amongst 62.79% of subjects with 1 individual having good reversibility (>35%) post LY session. Also there was significant change in PEFV values post laughter yoga session.

Post LY session 63.95% and 13.95% subjects had a favorable (decrease and no change) in systolic BP and 33.72% & 31.40% subjects had a favorable (decrease and no change) in diastolic blood pressure values respectively. Subjects having uncontrolled or untreated hypertension should practice caution while performing simulated laughter techniques.

#### 4. DISCUSSION

Lungs are the centre of all systems providing the jewel of life – oxygen to all cells of body. Simple natural aging or accelerated aging of lung in disease states like COPD causes such changes that affect the lung functioning. This in turn has its effect over other body organs resulting in accelerated deterioration of their functioning capacities. Aging is a natural process of human body. Like wrinkling of skin, lungs also lose their capacity to function optimally. Osteoporotic changes in the bones cause change in shape of ribcage and stiffening of chest wall, muscles of respiration including diaphragm become weak resulting in inadequate gas exchange mechanism. Bronchial muscles lose their strength and collapse of airways take place easily. Walls of air sacs become weak and cause emphysematous changes that is start of aging process. In our study we have observed most participants were of geriatric age group and there was a significant post laughter yoga improvement in PFT.

During smiling and laughing expiration is prolonged compared to inspiration. Laughing consists of a mostly passive maneuver including low-level rhythmic contractions of abdominal muscles, relaxation of the diaphragm, prolonged expiration, produce significantly increased ventilation or oxygen consumption. Furthermore this could be achieved anywhere and at any time at no costs and with no drug-induced side effects. (4) In laughter yoga the technique of graded laughter is performed where one starts by lightly stretching the lips, then smiling broadly by stretching then clapping and stretching out the hands followed by down grading these steps in reverse order.

Laughter yoga can be satisfactorily and safely applied to patients suffering from COPD and other chronic respiratory diseases and is not limited only to postpone the aging changes.

Our knowledge and understanding of human physiology and pathophysiology has grown. We now appreciate the complex nature of functioning of human body and its relation to multitude of diseases. Repeatedly through various large and small studies we have become more aware about the interrelationship between disease stage and need for rehabilitation. During disease state body loses its rhythmic pace on life and hastens the aging changes. Rehabilitation helps bring to track the deranged mechanics and thus the adoption of a healthy lifestyle to reduce the impact of the disease. Deep inhalation, pursed lip expiration, diaphragmatic breathing, breathing by optimizing respiratory muscles are well accepted techniques of respiratory physiotherapy which are incorporated in laughter yoga.

Race, gender, and age of participants do not affect their perception of group cohesion and brings about better engagement in their activities. (6) Laughter yoga can be performed by an individual in front of a mirror or in groups in open spaces like garden, beach, community halls, etc. Our participants were involved in laughter yoga activity in groups. They aggregated in open spaces. The group climate questionnaire gave a positive working group atmosphere. Thus indicating better chances of regular exercise schedule thus bringing about desired changes in physio-pathological dynamics. (7)

Bonding in a group does not only boost the emotional wellbeing but it encourages individuals to exercise. Movements of both upper and lower limbs are involved while performing the art of laughter yoga. Individuals were asked about their joint mobility perceptions before and after the exercise in addition to the group climate questionnaire. Some perceived immediate benefit in terms of more comfortable joint mobility as opposed to days they fail to attend the laughter yoga sessions. Chronic lung diseases are notorious in emotional behaving an individual. The systemic inflammatory changes associated with chronic lung diseases as well and hypoxic damage to the muscles debilitates a patient towards exercise. A community-based group

program may be a feasible alternative approach to rehabilitation due to easy accessibility and cost effectiveness. (6). It is recommended to consider laughter yoga as a preventive approach towards secondary disabilities for persons living with chronic conditions.

#### Limitations

The study design included a small population size and looked up at immediate effects of the program. Larger study group and long term effects need to be assessed in details to establish the validity of this study.

#### CONCLUSION:-

There is a significant post laughter yoga improvement in lung functions (PFT). Also this study proves multifactorial benefits of laughter yoga on preserving and boosting the functional capacity of the lung. The study also assesses the benefits of group dynamics associated with laughter yoga. An integrated approach of laughter yoga sessions in improving lung functions can be considered significant and steps towards accepting this art as a medical science must be proposed. Future study is required to assess the efficacy and cost-effectiveness of the program.

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