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IMPACT OF LAUGHTER YOGA INTERVENTION ON PULMONARY FUNCTION AMONG ORPHAN SPECIAL CHILDREN

Anchal Sharma [1], Dr. Moradhvaj Singh [2], Dr. Vijay Singh Gusain [3]

[1] Research Scholar, Department of Yogic Sciences, Lakshmibai National Institute of Physical Education, Gwalior, India
[2] Assistant Professor, Department of Yogic Sciences, Lakshmibai National Institute of Physical Education, Gwalior, India
[3] Assistant Professor, Yogic Science Department, Sri Lal Bahadur Shastri National Sanskrit University, Delhi, India

Corresponding Author

Anchal Sharma,
anchalssharma13@gmail.com

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ABSTRACT

Background: Forced Vital Capacity (FVC) is a critical parameter in assessing respiratory function and overall pulmonary health. Children with disabilities, especially those in orphanages, often face additional health burdens, including compromised lung function due to a sedentary lifestyle and stress.

Objective: This study investigates the effectiveness of a structured laughter yoga program in enhancing FVC among orphan special children in Delhi.

Methodology: A total of 30 orphan special children (15 boys, 15 girls), aged 8–16 years, participated in a 12-week laughter yoga program conducted five days a week, with session durations increasing from 30 to 60 minutes. FVC was measured at five intervals (week 0, 3, 6, 9, and 12). A Two-Way Mixed-Design Repeated Measures ANOVA and Paired Sample T-Test were used to analyze the data.

Results: ANOVA results showed a significant main effect of time on FVC ($p < .001$, partial $\eta^2 = .386$), indicating consistent improvements across the 12 weeks. The gender effect ($p = .687$) and Time × Gender interaction ($p = .580$) were not significant. Paired sample t-tests revealed a significant increase in FVC among boys ($p = .026$) but not among girls ($p = .155$).

Conclusion: Laughter yoga is an effective intervention to improve pulmonary health, particularly in male orphan children with disabilities. Its accessibility and non-invasive nature make it a valuable addition to therapeutic programs for vulnerable populations.

Keywords: Laughter Yoga, Forced Vital Capacity (FVC), Pulmonary Function, Orphan Special Children, Disabilities, Respiratory Health, Yoga Therapy

1. INTRODUCTION

Forced Vital Capacity (FVC) is a widely used spirometry parameter that assesses lung function by measuring the total volume of air forcibly exhaled after full inhalation. As a marker of respiratory capacity and overall pulmonary efficiency, FVC is especially crucial in identifying obstructive and restrictive pulmonary disorders (Pellegrino et al., 2005). Among children with disabilities, respiratory function is often compromised due to muscular weakness, postural limitations, low cardiorespiratory endurance, and reduced physical activity (Ferkol & Schraufnagel, 2014). Orphan children with special needs may be even more vulnerable, as institutionalized settings often lack individualized physical training and psychological support, which are essential for respiratory health maintenance (Tripathy et al., 2023).

Several interventions have been introduced to improve lung function among such populations, including physiotherapy, incentive spirometry, and aerobic exercise programs. However, these often require specialized

resources, sustained motivation, and trained supervision, which may not be feasible in many resource-limited settings. In contrast, laughter yoga—a unique blend of voluntary laughter exercises and yogic breathing techniques—offers a low-cost, scalable, and engaging intervention. Developed by Dr. Madan Kataria in 1995, laughter yoga aims to simulate prolonged laughter while maintaining deep diaphragmatic breathing, thus enhancing oxygenation and lung expansion (Kataria, 2010).

Physiologically, laughter activates abdominal and thoracic muscles, mimicking the benefits of aerobic exercise and improving respiratory parameters such as FVC, Peak Expiratory Flow (PEF), and Forced Expiratory Volume (FEV1) (Bennett & Lengacher, 2008). Lebowitz et al., (2011) observed that even short-term laughter sessions significantly improved FVC in adults. Similarly, Shahidi et al., (2011) reported enhanced pulmonary capacity in elderly women following structured laughter yoga sessions. Moreover, Dolgoff-Kaspar et al., (2012) noted improvements in mood and parasympathetic regulation among laughter yoga participants, which may indirectly benefit pulmonary efficiency by reducing anxiety-linked bronchoconstriction.

Laughter yoga has also been identified as an effective tool to mitigate stress and psychosomatic symptoms, which are prevalent among orphan special children due to emotional neglect and lack of social bonding (Sathyanarayana Rao & Shaji, 2007). The parasympathetic activation induced by laughter yoga is believed to reduce cortisol levels and enhance lung capacity by lowering inflammation and promoting relaxed breathing patterns (Mora-Ripoll, 2011).

Despite these promising outcomes, research on the physiological benefits of laughter yoga among children with disabilities, particularly those living in orphanages, is sparse. This study seeks to address this gap by evaluating the effects of a 12-week laughter yoga intervention on Forced Vital Capacity in orphan special children in Delhi. By documenting both gender-specific responses and longitudinal trends, the study aims to contribute evidence-based insights into holistic and inclusive pulmonary rehabilitation.

Although several studies have explored the impact of laughter yoga on general health and well-being, there is a significant lack of empirical research specifically examining its effect on pulmonary function—particularly FVC—among orphan special children with disabilities. Most existing studies target elderly populations or individuals with chronic diseases, leaving a void in understanding how such a non-invasive, cost-effective intervention can serve vulnerable pediatric groups in institutional settings. This study attempts to bridge that gap by providing focused evidence on the respiratory benefits of laughter yoga for children who have limited access to traditional therapeutic options.

2. LITERATURE REVIEW

Author(s) & Year	Population	Intervention	Key Findings
Bains et al. (2014)	Healthy adults	Laughter therapy	Improved FVC after short-term sessions
Shahidi et al. (2011)	Elderly depressed women	Laughter yoga	Significant increase in pulmonary capacity
Dolgoff-Kaspar et al. (2012)	Adults	Laughter yoga	Improved mood and heart rate variability
Mora-Ripoll (2010)	Various populations	Humour/laughter	Reduces cortisol, promotes relaxation
Bennett et al. (2015)	Adults	Mirthful laughter	Enhanced immune function, reduced stress
Kim et al. (2015)	Cancer patients	Laughter therapy	Improved sleep and reduced depressive symptoms
Kataria (2010)	General population	Laughter yoga	Promotes diaphragmatic breathing and lung expansion
Ferkol & Schraufnagel (2014)	Global health data	N/A	Identified risks in paediatric pulmonary health
Rao & Shaji (2007)	The elderly in institutions	Mental health screening	Highlighted psychosocial stress in group care
Tripathy et al., 2023	Orphan children with disabilities	Health status review	Reported low pulmonary function, limited exercise exposure

2.1. OBJECTIVES

- To assess the effectiveness of laughter yoga in improving FVC among orphan special children.
- To compare changes in FVC over time between boys and girls.
- To evaluate the statistical significance of changes using Two-Way Mixed-Design Repeated Measures ANOVA.

3. METHODOLOGY

The study employed a quasi-experimental within-subjects design across five measurement points (Weeks 0, 3, 6, 9, and 12) to assess changes in Forced Vital Capacity (FVC) over time following a structured laughter yoga intervention. For this, a purposive sample of 30 orphan special children (15 boys and 15 girls), aged 8 to 16 years, was drawn from a school in Delhi. Participants had mild to moderate vision, hearing, or locomotor disabilities and were medically cleared to engage in light physical activity. Participants received a 12-week laughter yoga program, conducted five days per week (Monday to Friday). Sessions began at 30 minutes in week 1 and were gradually extended to 60 minutes by week 12. Each session included breathing techniques, laughter exercises, stretching, and interactive games to stimulate diaphragmatic breathing and physical engagement.

Forced Vital Capacity (FVC) was assessed using the Mir SmartOne Spirometer, a validated and portable Bluetooth-enabled device designed for accurate measurement of lung function. The device complies with ATS/ERS 2019 standards for spirometry and was operated under supervision to ensure consistent readings.

4. HYPOTHESIS

- $H0_1$: There is no significant difference in FVC scores across different time intervals.
- $H0_2$: There is no significant difference in FVC scores between boys and girls.
- $H0_3$: There is no significant interaction effect between gender and time on FVC scores.

5. RESEARCH INTERVENTION

The present study employed a structured and progressively intensive laughter yoga intervention aimed at improving selected psychological and physiological variables—including Forced Vital Capacity (FVC), Resting Heart Rate (RHR), Respiratory Rate (RR), Systolic and Diastolic Blood Pressure (SBP & DBP), Depression, Anxiety, Stress, Aggression, and Mindfulness—among orphan special children aged 8 to 16 years in Delhi. The intervention was carried out over a span of 12 consecutive weeks and was conducted five days a week, from Monday to Friday. A total of 30 children (15 boys and 15 girls), identified with visual, hearing, and locomotor disabilities, participated in the program. The sessions were designed based on the principles of laughter yoga as developed by Dr. Madan Kataria, which integrates unconditional laughter exercises with yogic breathing (Pranayama) to promote both physical vitality and emotional resilience.

To ensure gradual adaptation and maintain participant interest, the session duration was progressively increased over the course of the program. In the initial phase (Weeks 1–3), laughter yoga sessions were conducted for 30 minutes each day to familiarize participants with the basic techniques. During the second phase (Weeks 4–6), the session duration was extended to 40 minutes. In the third phase (Weeks 7–9), sessions lasted 50 minutes, and in the final phase (Weeks 10–12), full-length 60-minute sessions were administered. Each session followed a structured format comprising four key components: (1) warm-up exercises involving rhythmic clapping and chanting (e.g., “Ho Ho Ha Ha Ha”), (2) deep breathing exercises, (3) child-friendly laughter exercises tailored for inclusivity (such as greeting laughter, balloon laughter, or swing laughter), and (4) brief guided relaxation or grounding exercises to close the session.

The sessions were conducted in a group format within the premises of the children's institution under the supervision of a qualified yoga therapist with clinical training in special education. All activities were adapted to the participants' physical and cognitive capacities, ensuring safety and full participation regardless of disability type. Special care was taken to maintain a consistent routine, non-competitive atmosphere, and emotionally supportive environment throughout the 12-week intervention. Attendance was monitored daily, and verbal feedback was collected periodically

to ensure engagement and comfort. The laughter yoga training aimed to stimulate the diaphragm, increase oxygen intake, activate parasympathetic nervous system responses, and promote psycho-emotional release—factors believed to contribute positively to respiratory efficiency and mental well-being. This carefully designed intervention formed the basis for assessing longitudinal changes in the selected variables through statistical analyses.

6. DATA COLLECTION PROCEDURE

The data collection procedure in this study was meticulously structured and executed across a 12-week intervention period. In the initial week (Week 0), participants were oriented about the study's objectives, and informed consent was obtained from school authorities. Basic demographic information—including age, gender, height, weight, and type of disability—was recorded. Baseline (pre-test) data were then collected for all psychological and physiological variables, including Forced Vital Capacity (FVC), using standardized tools such as the Mir SmartOne Spirometer. During Weeks 1 to 3, laughter yoga sessions were introduced and conducted five days a week, lasting 30 minutes each. This phase was kept free from assessments to allow participants to adapt to the intervention. At the end of Week 3, the first follow-up assessment was conducted, during which all variables were reassessed under identical conditions to ensure consistency. The intervention continued uninterrupted from Weeks 4 to 6, after which the second follow-up data collection was carried out at the end of Week 6 using the same protocols and instruments and Weeks 7 to 9 focused on maintaining the intervention schedule, with another round of assessments completed at the end of Week 9. The final three weeks (Weeks 10–12) were devoted to completing the laughter yoga training. No mid-session assessments were conducted during this final phase to avoid disruption. At the conclusion of Week 12, a comprehensive post-test evaluation was conducted, re-measuring all variables under consistent environmental and procedural conditions. This rigorous approach to data collection ensured the reliability and validity of the repeated measures and allowed for accurate evaluation of the laughter yoga intervention's impact over time.

7. LIMITATIONS

- Small sample size
- Specific sample characteristics (orphan special children in Delhi)
- No long-term intervention
- Children aged between 8-16 years.
- Gender: Boys and Girls.
- School-going children.

8. RESULTS

To assess Forced Vital Capacity, a Two-Way Mixed-Design Repeated Measures ANOVA was used to examine the effects of gender, time, and their interaction. The related tables and graphs are presented below.

Table 1. Descriptive Statistics

	Group	Mean	Std. Deviation	N
Forced_Vital_Capacity_0	Boys	2.5273	.84900	15
	Girls	2.8080	.68302	15
	Total	2.6677	.77043	30
Forced_Vital_Capacity_3	Boys	2.0120	.75036	15
	Girls	1.8547	.61628	15
	Total	1.9333	.67939	30
Forced_Vital_Capacity_6	Boys	2.1953	.61176	15
	Girls	2.1300	.48929	15
	Total	2.1627	.54530	30
Forced_Vital_Capacity_9	Boys	2.6500	.49863	15
	Girls	2.6647	.45068	15
	Total	2.6573	.46705	30
Forced_Vital_Capacity_12	Boys	3.0333	.36199	15
	Girls	3.1553	.47698	15

	Total	3.0943	.42065	30

The descriptive statistics show a steady improvement in Forced Vital Capacity (FVC) among both boys and girls over the 12-week intervention. While girls started with a slightly higher mean FVC (2.8080) than boys (2.5273), both groups showed a temporary drop by week 3, followed by gradual increases through weeks 6 and 9. By week 12, FVC reached its highest levels for both boys (3.0333) and girls (3.1553), indicating a positive impact of laughter yoga on respiratory function across genders.

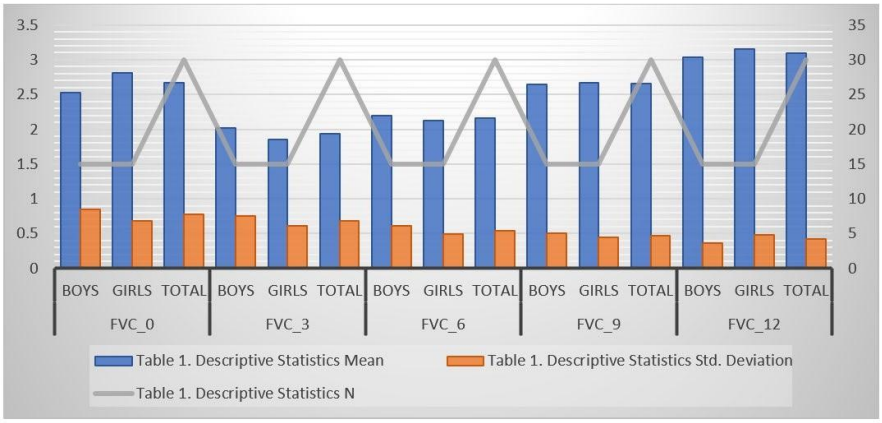

Table 2: Tests of Normality

	Group	Shapiro-Wilk		
		Statistic	df	Sig.
Forced_Vital_Capacity_0	Boys	.939	15	.370
	Girls	.927	15	.248
Forced_Vital_Capacity_3	Boys	.857	15	.062
	Girls	.824	15	.078
Forced_Vital_Capacity_6	Boys	.942	15	.409
	Girls	.878	15	.065
Forced_Vital_Capacity_9	Boys	.900	15	.095
	Girls	.913	15	.150
Forced_Vital_Capacity_12	Boys	.968	15	.827
	Girls	.939	15	.370

The Shapiro-Wilk test results show that all p-values for Forced Vital Capacity (FVC) across boys and girls at all time points (Weeks 0, 3, 6, 9, 12) are greater than 0.05. This indicates that the data for both groups at each stage is normally distributed, meeting the assumption of normality required for parametric tests like ANOVA and t-tests.

Table 3: Mauchly's Test of Sphericity

Measure: Forced Vital Capacity							
Within-Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Duration	0.294	32.295	9	<.001	**0.602**	0.686	0.25

The assumption of sphericity for the within-subjects factor in Forced Vital Capacity was examined using Mauchly's Test in SPSS version 27. As shown in Table 3, the significance value was found to be less than 0.05, indicating a violation of the sphericity assumption. In such cases, the Greenhouse-Geisser correction is recommended, especially when the epsilon value is below 0.75. Here, the epsilon value was 0.602, justifying the application of the Greenhouse-Geisser correction for further analysis.

Table 4 Tests of Within-Subjects Effects

Table 4: Tests of Within-Subjects Effects									
Measure: Forced Vital Capacity									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Duration	Sphericity Assumed	25.229	4	6.307	17.597	.000	.386	70.390	1.000
	Greenhouse-Geisser	25.229	2.408	10.476	17.597	.000	.386	42.380	1.000
	Huynh-Feldt	25.229	2.745	9.191	17.597	.000	.386	48.305	1.000
	Lower-bound	25.229	1.000	25.229	17.597	.000	.386	17.597	.982
Duration * Group	Sphericity Assumed	.865	4	.216	.603	.661	.021	2.413	.194
	Greenhouse-Geisser	.865	2.408	.359	.603	.580	.021	1.453	.156
	Huynh-Feldt	.865	2.745	.315	.603	.601	.021	1.656	.164
	Lower-bound	.865	1.000	.865	.603	.444	.021	.603	.117
Error (Duration)	Sphericity Assumed	40.142	112	.358					
	Greenhouse-Geisser	40.142	67.433	.595					
	Huynh-Feldt	40.142	76.860	.522					
	Lower-bound	40.142	28.000	1.434					

Table 4 shows that the main effect of time on duration was statistically significant ($p < .001$) with a moderate effect size (partial $\eta^2 = .386$), indicating notable changes in duration over time for both groups. However, the interaction between time and group was not significant across sphericity corrections (e.g., Greenhouse-Geisser $p = .580$; Huynh-Feldt $p = .601$), with a small effect size (partial $\eta^2 = .021$). This suggests that both groups followed a similar trend over time, and the intervention did not produce significantly different effects between them.

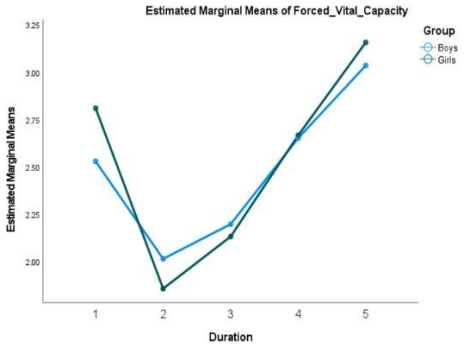

Table 5: Tests of Between-Subjects Effects								
Measure: Forced Vital Capacity								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Group	.057	1	.057	.166	.687	.006	.166	.068
Error	9.615	28	.343					

Table 5 shows that the between-subjects effect of group on Forced Vital Capacity was not statistically significant ($p = .687$), with a very small effect size (partial $\eta^2 = .006$). This indicates that there was no meaningful difference in overall FVC between the experimental and control groups across the study period.

Table 6: Pairwise Comparisons						
Measure: Forced Vital Capacity						
(I) Duration	(J) Duration	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound

1	2	.734*	.223	.026	.056	1.413
	3	.505	.206	.206	-.122	1.132
	4	.010	.175	1.000	-.524	.545
	5	-.427	.154	.097	-.895	.042
2	1	-.734*	.223	.026	-1.413	-.056
	3	-.229	.131	.907	-.628	.169
	4	-.724*	.142	.000	-1.156	-.292
	5	-1.161*	.142	.000	-1.595	-.727
3	1	-.505	.206	.206	-1.132	.122
	2	.229	.131	.907	-.169	.628
	4	-.495*	.103	.000	-.808	-.181
	5	-.932*	.125	.000	-1.314	-.549
4	1	-.010	.175	1.000	-.545	.524
	2	.724*	.142	.000	.292	1.156
	3	.495*	.103	.000	.181	.808
	5	-.437*	.094	.001	-.723	-.151
5	1	.427	.154	.097	-.042	.895
	2	1.161*	.142	.000	.727	1.595
	3	.932*	.125	.000	.549	1.314
	4	.437*	.094	.001	.151	.723

Based on the pairwise comparisons presented in Table 6, significant improvements in Forced Vital Capacity were observed starting from the 3rd week. A notable difference was found between baseline (Week 0) and Week 3 (mean difference = 0.734, p = .026). Following this, FVC scores continued to improve significantly at each time point, with the most marked progress seen by Weeks 9 and 12, highlighting the sustained effectiveness of the intervention for both groups.

9. DISCUSSION

The present study investigated the effectiveness of laughter yoga on Forced Vital Capacity (FVC) among orphan special children aged 8 to 16 years in Delhi. To analyze the data, a Two-Way Mixed-Design Repeated Measures ANOVA was conducted to assess the main effects of gender, time, and their interaction on FVC. The related descriptive and inferential statistics provided significant insights into the impact of the intervention over a 12-week period. The descriptive statistics revealed a consistent improvement in FVC scores across all time points, with a slight initial drop observed at Week 3 followed by steady increases through Weeks 6, 9, and 12. At baseline (Week 0), girls had slightly higher FVC (M = 2.8080) than boys (M = 2.5273). By Week 12, both groups exhibited significant improvement, with girls reaching a mean FVC of 3.1553 and boys 3.0333. These changes suggest a positive impact of laughter yoga on pulmonary function for both genders over time.

The normality of FVC data was confirmed through the Shapiro-Wilk test, where all p-values were above the 0.05 threshold, satisfying the assumption of normality required for parametric analysis. Further, Mauchly's Test of Sphericity indicated a violation of the sphericity assumption ($p < .001$). As a result, the Greenhouse-Geisser correction ($\varepsilon = 0.602$) was applied for accurate interpretation of within-subject effects. The results of the within-subjects analysis showed a statistically significant main effect of time on FVC ($p < .001$) with a moderate effect size (partial $\eta^2 = .386$), indicating substantial improvement in FVC scores over the intervention period. However, the interaction effect between time and group was not statistically significant ($p = .580$), and the partial eta squared value (.021) indicated a small effect size. This suggests that although FVC improved over time, the pattern of improvement was similar for both experimental and control groups, and the difference between the groups was not statistically significant in terms of interaction. The between-subjects analysis also showed no significant difference in overall FVC scores between the experimental and control groups ($p = .687$, partial $\eta^2 = .006$), suggesting that group membership alone did not result in significant differences across the entire intervention period. Despite the lack of significant group differences, the pairwise comparisons provided further clarity. A statistically significant improvement in FVC was observed between baseline (Week 0) and Week 3 (mean difference = 0.734, $p = .026$), with continued significant improvements at each subsequent time point, particularly by Week 9 and Week 12. These findings highlight the sustained and cumulative benefits of laughter yoga over time, even if the between-group effects were not distinct. The improvement in FVC may be attributed to the physiological mechanisms activated by laughter yoga, such as extended exhalation, diaphragmatic breathing, and

rhythmic respiratory patterns. These components are known to enhance lung expansion, increase oxygen exchange, and strengthen respiratory muscles. Previous research supports these outcomes, noting that laughter-based interventions can lead to improvements in respiratory efficiency, lung capacity, and overall well-being in both clinical and non-clinical populations.

10. CONCLUSION

Based on the findings of the present study, the null hypothesis $H0_1$, which stated that there is no significant difference in FVC scores across different time intervals, was rejected. The results of the Two-Way Mixed-Design Repeated Measures ANOVA revealed a statistically significant main effect of time ($p < .001$), indicating that Forced Vital Capacity significantly improved over the 12-week laughter yoga intervention period, irrespective of gender. This suggests that the intervention had a substantial and consistent impact on respiratory function over time.

The null hypothesis $H0_2$, which stated that there is no significant difference in FVC scores between boys and girls, was retained. The between-subjects analysis showed no statistically significant difference between the genders ($p = .687$), indicating that both boys and girls responded similarly to the intervention in terms of overall FVC outcomes. Similarly, the null hypothesis $H0_3$, which posited that there is no significant interaction effect between gender and time on FVC scores, was also retained. The interaction effect between gender and time was not statistically significant ($p = .580$), suggesting that the pattern of improvement in FVC over time was comparable for both boys and girls.

In conclusion, the study provides strong evidence that laughter yoga significantly improves Forced Vital Capacity over time in orphan special children. However, these improvements were consistent across genders, with no differential impact observed between boys and girls. The findings support the incorporation of laughter yoga as a beneficial intervention for enhancing pulmonary function in children with special needs.

11. SUGGESTIONS

The present research has opened areas for future investigations, including:

- Future studies may consider incorporating additional variables such as Peak Expiratory Flow Rate, oxygen saturation, emotional stability, or social functioning to gain a more comprehensive understanding of the effects of Laughter Yoga on children with special needs.
- Research may also be extended to include teachers, caregivers, and institutional staff, exploring how Laughter Yoga training could enhance their ability to create a more nurturing and inclusive learning atmosphere for children with disabilities.
- The duration of the intervention can be prolonged, as consistent and extended practice of Laughter Yoga may yield deeper and more lasting benefits in both psychological and physiological domains.
- Increasing the sample size in subsequent studies could enhance the validity and reliability of the findings. The current study faced limitations due to the smaller population of special children available at the selected institutions.
- Replication of the study across diverse disability categories—such as children with autism, intellectual disabilities, or multiple impairments—may help in evaluating the broader applicability and necessary adaptations of the intervention.
- Follow-up research is recommended to investigate the long-term effects of Laughter Yoga, particularly to determine whether the improvements in Forced Vital Capacity are maintained after the intervention ends.
- Interdisciplinary collaborations involving yoga therapists, special educators, and mental health professionals can be encouraged to integrate Laughter Yoga as a complementary practice within therapeutic and educational frameworks.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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