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Effectiveness of Strelnikova Breathing Exercises on Respiratory Parameters Among School-Age Children with Lower Respiratory Tract Infections

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Abstract

This quasi-experimental study assessed the effectiveness of Strelnikova breathing exercises on respiratory parameters among school-age children (6–12 years) with lower respiratory tract infections (LRTIs) in selected hospitals of Tenkasi District. Sixty children were selected using purposive sampling and divided equally into experimental and control groups. The experimental group received Strelnikova breathing exercises twice daily for five days, while the control group received routine care. Respiratory parameters were assessed using a peak flow meter and pulse oximeter. Results revealed significant improvement in oxygen saturation and peak flow zones in the experimental group compared to the control group ($t=25.42$, $p<0.05$ for peak flow; $t=6.35$, $p<0.05$ for oxygen saturation). Findings demonstrated that Strelnikova breathing exercises are effective, economical, and non-pharmacological interventions that enhance recovery among children with LRTIs.

Introduction

Children are the ones who are very vital for deciding how the world is going to be after some years. So, if one can do some good in the life of a child then there can be change, at least a slightest change, in the world to come **(Mohammad Sanaulla, 2008).**

School age children, between the ages of 6 to 12 years, are experiencing a time of slow progressive physical growth, while their social and developmental growth accelerates and increases in complexity **(Kristian Kroschel, 2020).**

Lower respiratory tract infection (**LRI**) is a term often used as a synonym for

pneumonia but can also be applied to other types of infection including **lung abscess** and **acute bronchitis**. Symptoms include shortness of breath, weakness, fever, coughing and fatigue **(Antibiotic Expert Group, 2014).**

Lower respiratory tract infections (LRI) are any infections in the lungs or below the voice box. These include pneumonia, bronchitis and tuberculosis. Symptoms of lower respiratory tract infection can vary depending upon severity. A lower respiratory tract infection can affect the airways, such as with bronchitis, or the air sacs at the end of the airways, as in the case of pneumonia. Infections in the lower respiratory tract are primarily the result of viruses, bacteria, fungus or mycoplasma. In some cases, substances from the environment can irritate or cause inflammation in the airways or lungs, which can lead to an infection **(Jenna Flectcher, 2019).**

Globally, respiratory tract infections cause the death of approximately 4.5 million children each year, primarily in developing countries. Respiratory infections occur more frequently than any other illness **(Gupta P., 2004)**.

In India, a child under eight years of age dies every seven seconds due to lower respiratory tract infections, mostly pneumonia. Each year, approximately 4.5 million children die from such infections, accounting for 30% of all childhood deaths **(Stephen B., 2007)**.

In Tamil Nadu, the overall prevalence of asthma among urban and rural children was 18%, with diagnosed asthma at 5%. Breathing difficulties were reported by 22% of urban and 9% of rural children aged 6–12 years **(Chakravarthy S. et al., 2002)**.

In Chennai, respiratory illnesses have risen significantly in recent years. Between March 2010 and March 2011, cases of pneumonia in children

doubled. In just one hospital, 296 children were diagnosed with pneumonia within a year, with at least three to five admissions weekly **(Karthikeyan H. et al., 2011)**.

Approximately 10.8 million children die each year for various reasons, many of which are related to economic and environmental conditions. One of the major causes is lower respiratory infection **(Black, Morris, & Bryce, 2003)**.

. In India, children frequently suffer from pneumonia, bronchiolitis, and asthma, conditions often worsened by poor environmental and socio-economic factors. Non-pharmacological interventions such as breathing exercises are gaining recognition as supportive therapies for respiratory illnesses. Strelnikova breathing exercises, a paradoxical technique emphasizing short nasal inhalations with rhythmic body movements, have been shown to improve lung function and oxygenation. This study aimed to evaluate the effectiveness of Strelnikova breathing exercises on respiratory parameters among children with LRTIs.

Statement of the problem

A study to assess the effectiveness of strelnikova breathing exercise on respiratory parameters among school age children with lower respiratory tract infection (LRTI) in selected hospitals, Tenkasi.

Objectives of the study

1. To assess and compare the pre-test and post-test score on respiratory parameters among school age children with Lower respiratory tract infections (LRI) in the experimental group and control group.
2. To evaluate the effectiveness of strelnikova breathing exercise on respiratory parameters among school zage children with Lower respiratory tract infections (LRI).
3. To find out the association between the pre-test score on respiratory

parameters with their selected demographic variables among school age children with Lower respiratory tract infections (LRI) in experimental group & control group.

Hypothesis

H_1 – There will be a significant difference between pretest and post-test score on respiratory parameters among school age children with Lower respiratory tract infections (LRI) in the experimental and control group.

H_2 – There will be a significant association between pre-test score on respiratory parameters among school age children with Lower respiratory tract infections (LRI) and their selected demographic variable in experimental and control group.

Research Methodology

A quasi-experimental, pre-test post-test control group design was adopted for this study. Purposive sampling technique was used to select 30 samples for experimental group & 30 samples for control group. Pre test was conducted using peak flow meter & pulse oximeter. Only experimental group received the strelnikova breathing exercise along with routine treatment while control group received the routine treatment alone. Parents supervised the sessions, supported by instructional videos. Post test was conducted for both the experimental and control group on the 5th day using the same peak flow meter & pulse oxi-meter.

Discussion and Results

Frequency and percentage distribution of school age children according to the demographic variables in experimental and control group

The study findings of the demographic variables shows that, Regarding the age, majority 15 (50%) of them were between the age group of 6-8 years, 8(26.67%) of them were between the age group of 9-10 years and 7(23.33%) of them were between the age group of 11-12 years in experimental and in control group,

majority 19 (63.33%) of them were between the age group of 6-8 years, 9(30%) of them were between the age group of 9-10 years and 2(6.67%) of them were between the age group of 11-12 years. According to gender, majority 16(53.33%) were male, 14(46.67%) were female in experimental group, whereas 18(60%) were male, 12(40%) were female in control group. Regarding area of residence, majority 17(56.67%) were from urban area, 13(43.33%) were from rural area in experimental group, whereas 19(63.33%) were from urban area, 11(36.67%) were from rural area in control group.

Regarding religion, majority 16(53.33%) were Hindus, 10(33.33%) were Christian, 4(13.33%) were Muslim in experimental group, whereas 22(73.33%) were Hindus, 6(20%) were Christian, 2(6.67%) were Muslim in control group. Considering the order of birth, majority 15(50%) were first born child, 8(26.67%) were middle born child, 7 (23.33%) were last born child in experimental group and in control group majority, 18(60%) were first born child, 9(30 %) were last born child, 3 (10%) were middle born child. With regards to the family history of respiratory infections, majority 24 (80%) were not having family history of respiratory infections, 6(20%) were having family history of respiratory infections in the experimental group. Whereas in the control group, 27 (90%) were not having family history of respiratory infections, 3(10%) were having family history of respiratory infections.

Regarding pet animals in house, majority 17(56.67%) were not having pets, 13(43.33%) were having pets in the experimental group. Whereas in the control group, majority 19(63.33%) were not having pets, 11(36.67%) were having pets. Considering the history of allergy, majority 18(60%) were not having the history of allergy, 12(40%) were having the history of allergy in experimental group and in control group, majority 21(70%) were not having

the history of allergy, 9(30%) were having the history of allergy.

According to duration of illness, majority 15(50%) of them had less than one year of illness, 8(26.67%) of them had one year to three years of illness, 4(13.33%) of them had three years to five years of illness and 3(10%) of them had more than five years of illness in the experimental group. Whereas in the control group, majority 12(40%) of them had less than one year of illness, 8(26.67%) of them had one year to three years of illness, 6(20%) of them had three years to five years of illness and 4(13.33%) of them had more than five years of illness.

The first objective of the study was to compare the pre-test and post-test score on respiratory parameters among school age children with Lower respiratory tract infections (LRI) in the experimental group and control group.

- **Peak Flow Zones:** In the experimental group, mean post-test score (71.3) was significantly higher than pre-test (50.7) ($t=25.42$, $p<0.05$). Control group improvement was minimal (mean difference = 2.3).

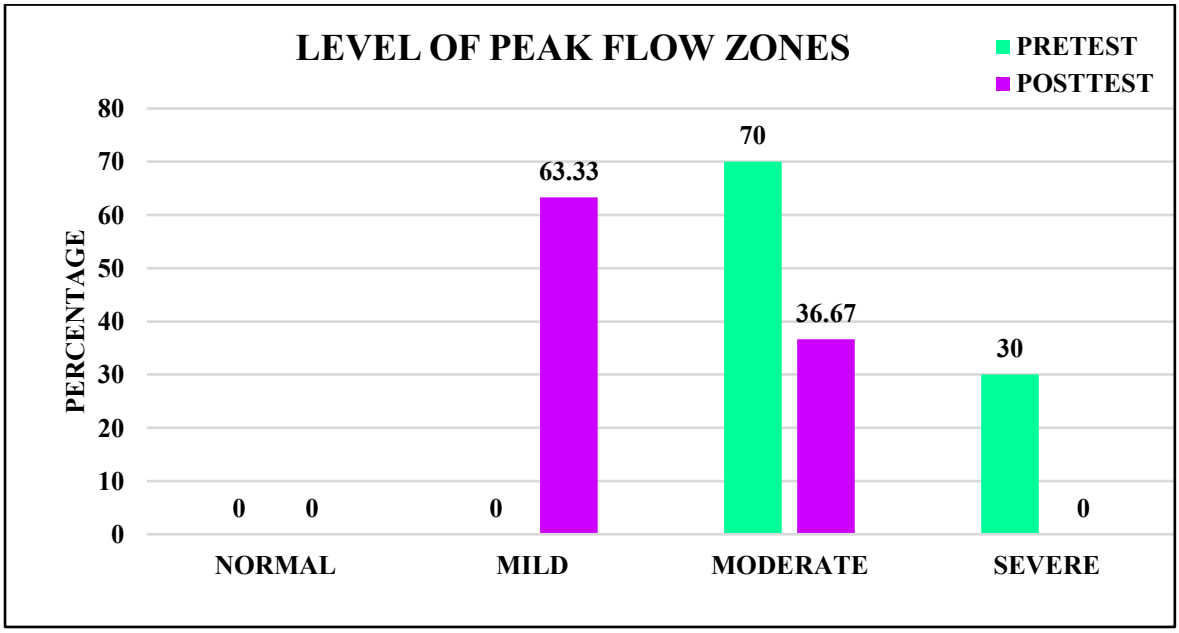

FIGURE 1.1 Frequency and percentage distribution of pretest and post-test level of level of Respiratory parameters- Peak flow zones among school age children in the experimental group

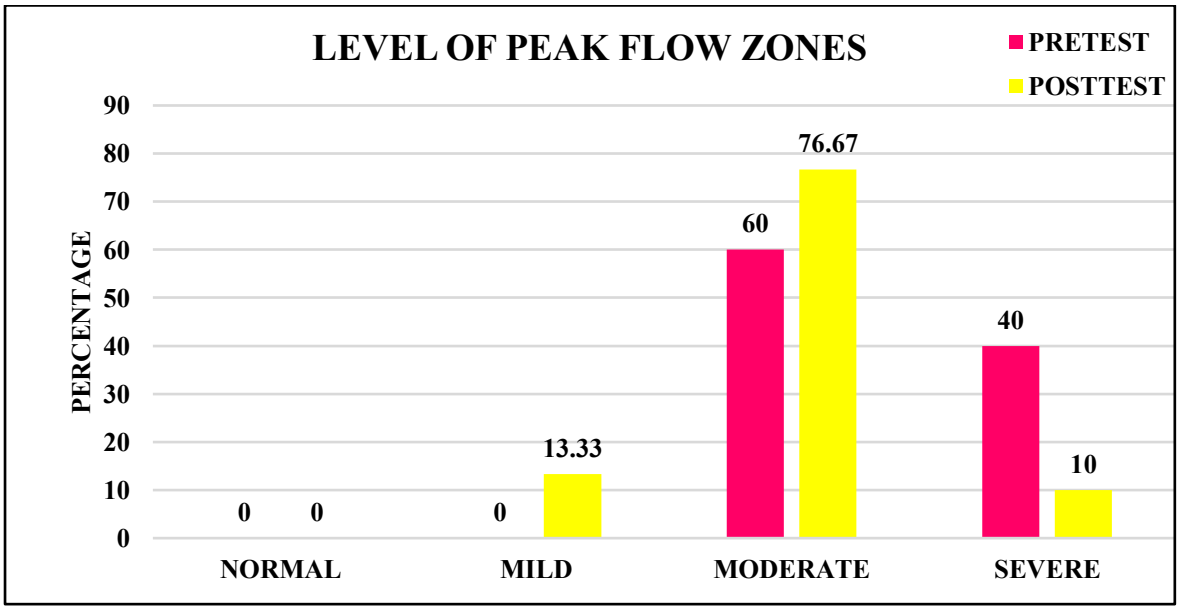

FIGURE 1.2 Frequency and percentage distribution of pretest and post-test level of Respiratory parameters- Peak flow zones among school age children in the control group.

- **Oxygen Saturation:** In the experimental group, mean post-test SpO_2 was 97.06 compared to 93.8 in pre-test ($t=6.35$, $p<0.05$). Control group showed only mild improvement (94.86 vs. 94.16)

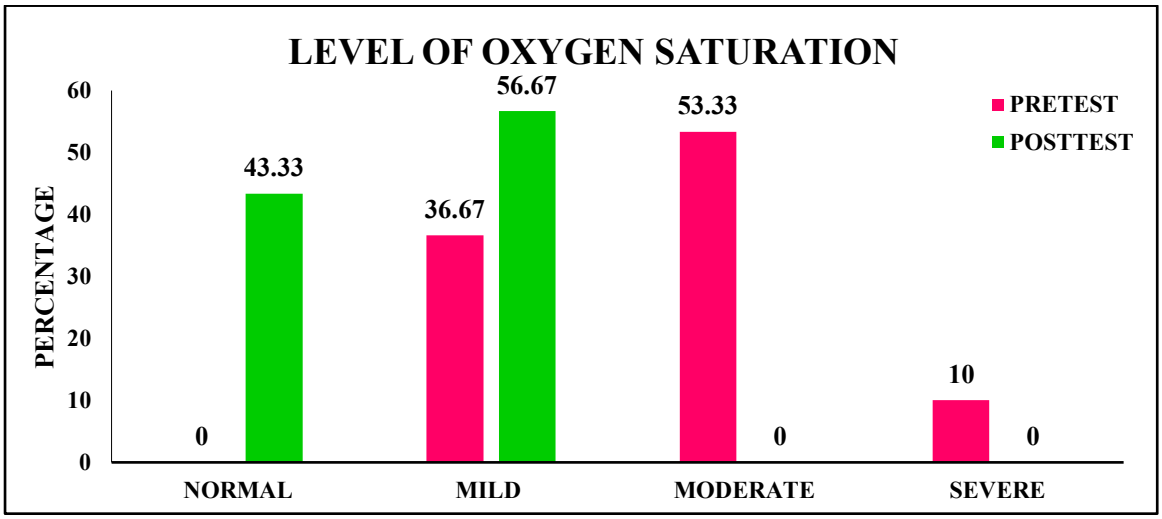

FIGURE 1.3 Frequency and percentage distribution of pretest and post-test level of Respiratory parameters- Oxygen saturation among school age children in the experimental group

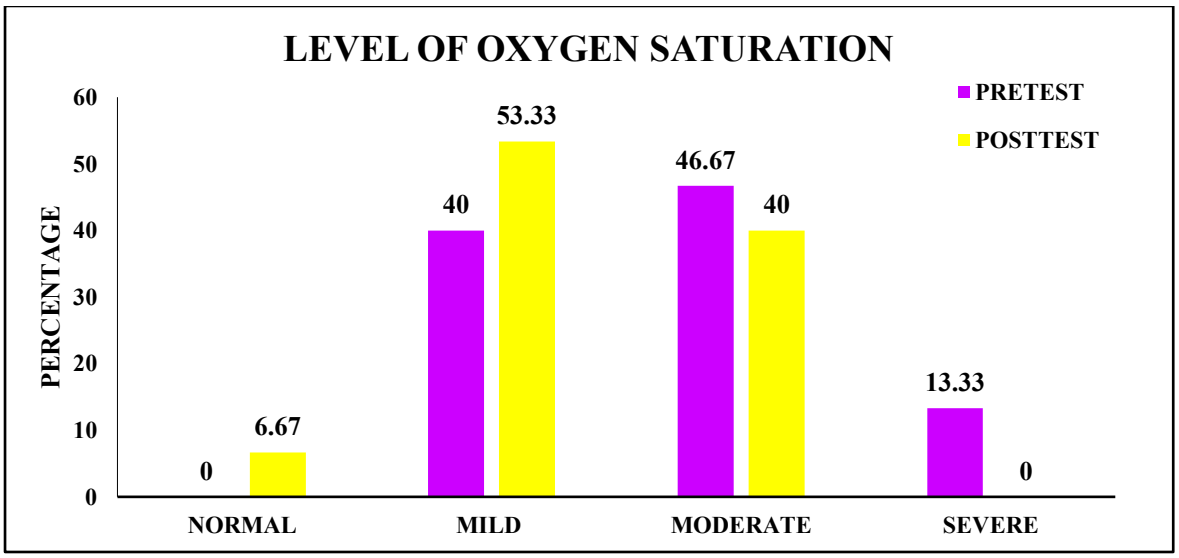

FIGURE 1.4 Frequency and percentage distribution of pretest and post-test level of Respiratory parameters- Oxygen saturation among school age children in the control group

A similar study was conducted by **Padmaja (2020)** conducted a study to assess the Effectiveness of Breathing Exercises on Lower Respiratory Tract Infections among School Children at Tertiary Hospitals, Guntur District, Andhra Pradesh. Non-Equivalent Control Group design was adopted, Children in the age group of 6-12 years with lower respiratory tract infections with a sample size of 60 were selected. Data collected using structured questionnaire and checklist on respiratory tract parameters in the pretest. Sterlinkova Exercises three times every day for 5 days with routine care and conducted posttest on 5th day in the experimental group. In the control group, conducted pretest and no intervention given, only routine care for 5 days and posttest on 5th day. Result shows that the severity of lower respiratory tract infection in the experimental group, majority of respondents had mild lower respiratory tract infection 28(93.3%) and few respondents had moderate lower respiratory tract infections 2(6.7%) in the pretest. In posttest majority of respondents had mild lower respiratory tract infection 30(100%) and none had moderate lower respiratory tract infection. In the control group, most respondents had mild lower respiratory tract infection 28(93.3%) in pretest and posttest. Few respondents 2(6.7%) had moderate lower respiratory tract infections in both pretest and posttest. The findings revealed that sterlinkova exercises improved the respiratory parameters among children (6-12 years) with lower respiratory tract infection.

The second objective of the study was to evaluate the effectiveness of strelnikova breathing exercise on respiratory parameters among school age children with Lower respiratory tract infections (LRI) in experimental group.

Table 1.1 Comparison of Mean, Standard deviation and paired 't' test value on pretest and post-test level of Respiratory parameters- Peak flow zones among school age children in experimental and control group. **(N=60)**

S. No	Group		Mean	Standard deviation	Mean difference	Paired 't' Value
1	**Experimental group (n=30)**	Pre-test	50.7	6.55	20.6	25.42 * S
		Post-test	71.3	7.84		
2	**Control group (n=30)**	Pre-test	52.3	7.73	2.3	4.12 * S
		Post-test	54.6	7.57		

Table 1.1 summarizes that in the mean post-test level of Peak flow zones 71.3 which was greater than the mean pre-test level 50.7 in the experimental group. The obtained "t" value 25.42 * was highly significant at $p< 0.05$ level. The mean difference was 20.6 is a true difference and has occurred by chance.

Table 1.2 Comparison of Mean, Standard deviation and paired 't' test value on pretest and post-test level of Respiratory parameters- Oxygen saturation among School age children in experimental and control group.

(N=60)

S. No	Group		Mean	Standard deviation	Mean difference	Paired 't' Value
1	**Experimental group (n=30)**	Pre-test	93.8	2.93	3.26	6.35 * S
		Post-test	97.06	1.12		
2	**Control group (n=30)**	Pre-test	94.16	2.60	0.7	2.24 * S
		Post-test	94.86	2.14		

- **Significant at*p≤0.05, **p≤0.01, ***p≤0.001**

Table 1.2 summarizes that in the mean post-test level of Oxygen saturation 97.06 which was greater than the mean pre-test level 93.8 in the experimental group. The obtained "t" value 6.35 * was highly significant at p< 0.05 level. The mean difference was 3.26 is a true difference and has occurred by chance.

The third objective of the study was to find out the association between the pre-test score on respiratory parameters with their selected demographic variables among school age children with Lower respiratory tract infections (LRI) in experimental group & control group.

Table 1.3 Association on Pre-test level of Respiratory parameters- Peak flow zones among school age children with their selected demographic variables in experimental group.

(N=30)

S. No	Demographic Variables	Experimental group				
		Level of Peak flow zone				
		Moderate	Severe	X^2	df	P value
1	**Age** a) 6-8 Years b) 9-10 Years c) 11-12 Years	9 6 6	6 2 1	1.63	2	5.99 # NS
2	**Gender** a) Male b) Female	12 9	4 5	0.41	1	3.84 # NS
3	**Area of residence** a) Rural area b) Urban area	10 11	3 6	0.52	1	3.84 # NS
4	**Religion** a) Hindu b) Christian c) Muslim d) Others	10 8 3 0	6 2 1 0	0.95	2	5.99 # NS
5	**Order of birth** a) First born b) Middle child c) Last born	9 7 5	6 1 2	1.88	2	5.99 # NS
6	**Family history of Respiratory infections** a) Yes b) No	2 19	4 5	4.80	1	3.84 * S
7	**Pet animals in house** a) Yes b) No	6 15	7 2	6.21	1	3.84 * S

8	**History of allergy** a) Yes b) No	5 16	7 2	7.64	1	3.84 * S
9	**Duration of illness** a) < 1 year b) 1 – 3 years c) 3 – 5 years d) > 5 years	10 6 4 1	5 2 0 2	3.81	3	7.81 # NS

To find out the association between pre-test level of Respiratory parameters- oxygen saturation among school age children with their selected demographic variables, the null hypothesis was stated as follows.

H_2: There will be a significant association between pre-test level of Respiratory parameters- oxygen saturation among school age children with their selected demographic variables.

The above table predicts that the demographic variables have statistically significant association with oxygen saturation like gender, family history of respiratory infections and Pet animals in house. The above findings partially support the research hypothesis.

TABLE 1.4 Association on Pre-test level of oxygen saturation among School age children with their selected demographic variables in control group.

(N=30)

S. No	**Demographic Variables**	**Control group**					
		Level of Oxygen saturation					
		Mild	**Moderate**	**Severe**	**X^2**	**df**	**P value**
1	**Age** a) 6-8 Years	9	7	3			9.48

	b) 9-10 Years	2	6	1			#
	c) 11-12 Years	1	1	0	2.57	4	NS
2	**Gender**						
	a) Male	9	6	3	3.21	2	5.99
	b) Female	3	8	1			#
							NS
3	**Area of residence**						5.99
	a) Rural area	5	4	2			#
	b) Urban area	7	10	2	0.83	2	NS
4	**Religion**						
	a) Hindu	9	10	3			12.59
	b) Christian	2	3	1			#
	c) Muslim	1	1	0	0.95	6	NS
	d) Others	0	0	0			
5	**Order of birth**						
	a) First born	7	8	3			9.48
	b) Middle child	1	2	0	0.95		#
	c) Last born	4	4	1		4	NS
6	**Family history of Respiratory infections**						5.99
	a) Yes	1	2	0			#
	b) No	11	12	4	0.76	2	NS
7	**Pet animals in house**						5.99
	a) Yes	9	2	0			*
	b) No	3	12	4	12.92	2	S
8	**History of allergy**						5.99
	a) Yes	2	4	3			#
	b) No	10	10	1	4.88	2	NS
9	**Duration of illness**						
	a) < 1 year	6	4	2			

	b) 1 – 3 years c) 3 – 5 years d) > 5 years	5 0 1	2 6 2	1 0 1	10.17	6	12.59 # NS

To find out the association between pre-test level of Respiratory parameters- oxygen saturation among school age children with their selected demographic variables, the null hypothesis was stated as follows.

$H_{2:}$ There will be a significant association between pre-test level of Respiratory parameters- oxygen saturation among school age children with their selected demographic variables.

The above table predicts that the demographic variables have statistically significant association with oxygen saturation like Pet animals in house. The above findings partially support the research hypothesis.

Discussion

- The study demonstrates that Strelnikova breathing exercises significantly improve respiratory parameters among children with LRTIs. These findings align with previous research showing improved lung function and reduced respiratory distress following structured breathing interventions
- Unlike pharmacological therapies, this approach is non-invasive, cost-effective, and feasible for use in hospital and community settings.

Recommendations

1. Conduct similar studies in rural and urban settings with larger sample sizes.

2. Compare Strelnikova exercises with other non-pharmacological techniques.
3. Train nurses in complementary therapies for pediatric respiratory care.

Limitations

- The Sample size is 60.
- The data collection period is only 4 weeks.
- The study will be limited to children (6-12 years) with lower respiratory tract infection.

Conclusion

Strelnikova breathing exercises are effective in improving oxygen saturation and peak expiratory flow among children with LRTIs. Integrating these exercises into pediatric nursing practice may accelerate recovery, reduce complications, and minimize hospital stay duration.

Implications for Nursing

- **Practice:** Nurses can use Strelnikova exercises as an adjunct to medical therapy to enhance recovery.
- **Education:** Incorporating non-pharmacological methods like breathing exercises into nursing curricula will strengthen holistic care approaches.
- **Administration:** Nurse administrators should organize workshops, training programs, and policies integrating breathing exercises in pediatric care.
- **Research:** Replication with larger samples and diverse settings is recommended.

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