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Immediate Effect of Manual Diaphragmatic Release Technique Versus Diaphragmatic Stretch Technique on Peak Expiratory Flow Rate in College Going Students

Mishruti Sheladiya [1], Dr. Aniket Solanki [2], Dr. Bosky Mehta [3]

[1] MPT Student, Department of Physiotherapy, Apollo Institute of Physiotherapy, Gujarat University, Ahmedabad, Gujarat, India.

[2] HOD & Associate Professor, Department of Physiotherapy, Apollo Institute of Physiotherapy, Gujarat University, Ahmedabad, Gujarat, India.

[3] Associate Professor, Shri M M Shah Physiotherapy College, Sardar Patel University, Mehemdavad, Gujarat, India.

Abstract

Introduction: Lifestyle factors and environmental pollution are known to negatively impact respiratory function. The Manual Diaphragm Release Technique (MDRT) aims to enhance chest wall mobility by stretching diaphragmatic muscle fibers, while the Diaphragmatic Stretch Technique (DST) promotes diaphragm relaxation to optimize its contraction–relaxation efficiency and thoracoabdominal pressure dynamics. Peak Expiratory Flow Rate (PEFR) serves as a rapid, reliable measure reflecting overall pulmonary function. This study compared the immediate effects of MDRT and DST on PEFR in healthy college going students.

Methods: This comparative, randomized study included 40 college students from Ahmedabad, conveniently sampled and randomly divided into two groups (n=20 each). Group A received MDRT (supine position, involving upward–lateral traction during inspiration and deep inward pressure during expiration). Group B received DST (sitting position, involving gentle upward traction under the subcostal margin during inspiration). Both interventions were performed for 2 sets of 5 breaths with a 1-minute rest. PEFR was recorded in standing using a Mini Wright Peak Flow Meter pre- and post-intervention.

Results: The data was analyzed using SPSS Version 27.0 after confirming normal distribution through the Shapiro–Wilk test. Since all variables met normality assumptions, parametric tests were applied. The Paired t-test showed a statistically significant improvement in PEFR within both the MDRT group ($p < 0.001$) and the DST group ($p < 0.001$). However, the Independent t-test comparing the post-intervention PEFR values between the two groups showed no statistically significant difference ($p = 0.661$). This indicates that both therapeutic techniques produced comparable immediate effects on expiratory flow.

Conclusion: MDRT and DST both produced immediate improvements in PEFR among college-going students, but neither technique proved superior. Both interventions can be safely applied to enhance respiratory performance.

Keywords: Diaphragmatic Stretch Technique, Manual Diaphragmatic Release Technique, Peak Expiratory Flow Rate

1. Introduction

The diaphragm, which is the main inspiratory muscle, generates a craniocaudal movement of its dome during contraction.[1] Diaphragm is flat which splits the thoracoabdominal hollows in the human body. Thoracoabdominal mechanics, as well as strength of respiratory muscle, determine intra-abdominal pressure.[2]

The Manual Diaphragm Release Technique (MDRT) is an intervention intended to directly stretch the diaphragmatic muscle fibres thereby increasing the chest wall mobility.[3,4] Evidence supports the beneficial effect on diaphragmatic mobility and it can be hypothesised that there is traction of the lower rib cage in a cranial direction and manual compression of the tissues in the area of insertion of the anterior costal diaphragm fibres brought about by the manual action on the under side of the last four costal cartilages which allows lengthening the diaphragm in its insertional zone.[5]

The Diaphragmatic Stretch Technique (DST) or doming of diaphragm technique is designed to relax the resting state of the diaphragm, enhancing its contraction and relaxation functions, thereby creating a greater pressure gradient between the thorax and abdomen.[6]

Peak expiratory flow (PEF) is a frequently used pulmonary function measure that is defined as the greatest flow attained during forced expiration after a maximal inhalation. [7,8] Peak expiratory flow is a non-invasive, non-voluntary effort test that takes into account voluntary effort, cooperation, expiratory muscular strength, airway resistance, and alveolar pressure. It is measured with portable, simple, reliable, and low-cost equipment that can measure flows between 100 and 850 L/min and is also used to evaluate a person's ability to exhale through the bronchi. It indicates the degree of airway blockage.[9,10]

Previous studies have investigated the effects of MDRT and DST in conditions such as Chronic Obstructive Pulmonary Disease (COPD), sedentary women, gastroesophageal reflux disease, healthy individuals, and patients with cerebral palsy.[1-6] However, there is limited evidence comparing the immediate effects of MDRT and DST on Peak Expiratory Flow Rate (PEFR) in college-going students.

Hence, The aim of the study is to find out the Immediate Effect of Manual Diaphragmatic release Technique versus Diaphragmatic stretch Technique on Peak Expiratory Flow Rate in College going Students.

2. Materials and Methodology

This comparative study was conducted to investigate the effect of the Manual Diaphragm Release Technique (MDRT) and Diaphragmatic Stretch Technique (DST) on Peak Expiratory Flow Rate (PEFR) among college students in Ahmedabad. A total of 40 participants, comprising 19 males and 21 females, were selected using convenient sampling and randomly divided into two groups of 20 each. Group A received MDRT, while Group B received DST. Oral consent was obtained from all participants after explaining the purpose and nature of the study, and demographic data including age, gender, height, weight, and BMI were recorded.

The inclusion criteria were participants aged 18–25 years, both male and female, and willing to participate in the study. The exclusion criteria included participants with any cardiopulmonary, neurological, or musculoskeletal conditions, a history of surgical procedures in the past three months, and smokers.

2.1 Intervention

Group A : Manual Diaphragm Release Technique[1]

Manual Diaphragm Release Technique. The participant was asked to lie supine with relaxed limbs. Positioned at the head of the patient, the therapist made manual contact with the hypothenar region and last three fingers bilaterally to the underside of the seventh to tenth rib costal cartilages. The therapist's forearms were aligned towards the participant's shoulders. In the inspiratory phase, the therapist was gently pulling the points of contact with both hands in the direction of the head and slightly laterally, accompanied by the elevation of the ribs. During exhalation, the therapist's contact was deepened towards the inner costal margin, maintaining resistance. In the subsequent respiratory cycles, the therapist deepened the contact inside the costal margin.

Group B : Diaphragmatic Stretch Technique[1]

Diaphragmatic Stretch Technique. The participant was asked to sit erect for the intervention. The therapist standing behind the subject pass their hands around the thoracic cage, introducing fingers in the subcostal margins. The participant's trunk was rounded slightly to relax the rectus abdominis. As the participant exhaled, the therapist easing their hands caudally grasped the lower ribs at the subcostal margin. This firm, but gentle, traction was maintained as the patient inhales.

2.2 Outcome

- **Peak Expiratory Flow Rate (PEFR)[11]**

Subjects were asked to stand in an upright position with the Mini Wright's peak flow meter held horizontally in front of their mouth, they were then allowed to inhale deeply and close the lips firmly around the mouthpiece and with the nose clipped shut, to ensure that there were no air leaks around the lips. They were then told to exhale as hard as possible, and the number indicated by the cursor was noted. The procedure was repeated twice more, thereby obtaining three readings at an interval of two minutes. The maximum of the three values was taken as the PEFR.

2.3 Statistical analysis

Statistical analysis was done by Statistical Package for Social Sciences (SPSS)Version 27.0 and Microsoft Excel 2021.The data was screened for normal distribution using Shapiro - Wilk test. As all the baseline data were normally distributed, so parametric tests were applied for outcome measure's analysis. Paired t – test was used for within group analysis. Independent t – test used for between group analysis. Statistical significance was kept at ≤ 0.05.

3. Result

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF MDRT GROUP AND DST GROUP

	MDRT (Mean ± SD) n = 20	**DST (Mean ± SD) n = 20**
Age (Years)	20.65 ± 1.69	20.25 ± 2.05
Height (cm)	165.35 ± 8.91	162.25 ± 12.43
Weight (kg)	60.15 ± 12.41	54.15 ± 11.39
BMI (kg/m^2)	22.04 ± 4.45	20.63 ± 4.04

*SD = Standard deviation
*cm = Centimeter
*BMI = Body Mass Index
*kg/m² = Kilogram per meter square

TABLE 2: WITHIN GROUP ANALYSIS OF PEFR

		PRE	POST	t Value	p Value
PEFR	MDRT GROUP (Mean ± SD)	422.85 ± 120.15	421.30 ± 115.58	0.265	<0.001
	DST GROUP (Mean ± SD)	428.45 ±133.17	438.80 ± 134.06	-1.709	<0.001

* SD = Standard deviation
* Significance level p<0.05

TABLE 3: BETWEEN GROUP COMPARISON OF PEFR

	MDRT GROUP (Mean ± SD)	DST GROUP (Mean ± SD)	t Value	p Value
PEFR	421.30 ± 115.58	438.80 ± 134.06	-0.442	0.661

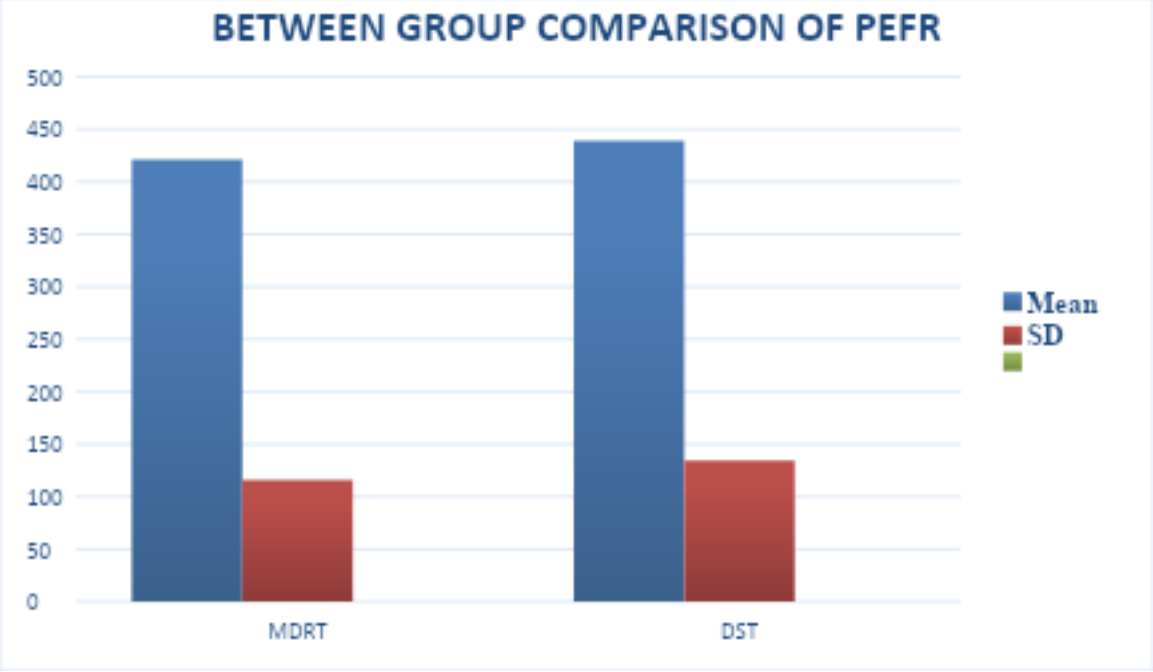

Figure 1: between group comparison of pefr

4. Discussion

The main purpose of the study was to compare the immediate effect of Manual Diaphragmatic release Technique vs Diaphragmatic stretch Technique on Peak Expiratory Flow Rate in College going Students. The results revealed a crucial finding both interventions independently achieved a statistically significant improvement in PEFR (MDRT = $p < 0.001$, DST = $p < 0.001$), supporting the utility of manual diaphragm techniques for immediately enhancing pulmonary mechanics, even in an asymptomatic population. However, the comparative analysis showed no statistically significant difference between the post-intervention PEFR values of the two groups ($p = 0.661$).

The mechanisms underlying the improvements are distinct MDRT primarily exerts a mechanical effect by using traction to release myofascial restrictions at the costal insertions, thereby optimizing the diaphragm's length-tension relationship for a stronger contraction, which aligns with previous reports, such as those by Rocha et al. and Martínez-Hurtado et al., suggesting improved inspiratory muscle strength and pressure dynamics.[4,5] In contrast, DST operates through both neurophysiological and mechanical pathways,

promoting relaxation and optimal doming of the diaphragm via passive stretching, potentially inducing reflex inhibition and modulating autonomic activity to optimize lung mechanics and ribcage excursion, as previously demonstrated by González-Álvarez et al.[3]

The comparable outcome suggests that for a rapid, effort-dependent measure like PEFR, both mechanical optimization and neuro-muscular relaxation approaches are equally effective in enhancing the patient's maximal expiratory effort. Therefore, clinicians can safely and flexibly choose either MDRT or DST based on patient comfort and specific underlying functional limitations (e.g., stiffness versus hypertonicity).

While the present study clearly establishes the immediate efficacy of both MDRT and DST, it is constrained by two key limitations that warrant future investigation. First, the relatively small sample size (N=40) restricts the generalizability of the findings, particularly in detecting subtle differences that may exist between the two interventions. Second, the study design focused only on the immediate post-intervention effect. Therefore, future research is strongly recommended to employ a larger cohort and incorporate a longitudinal design (e.g., follow-up at 4 and 8 weeks) to determine the persistence and long-term comparative effectiveness of MDRT versus DST on respiratory function measures in this population.

5. Conclusion

MDRT and DST both produced immediate improvements in PEFR among college-going students, but neither technique proved superior. Both interventions can be safely applied to enhance respiratory performance.

6. Clinical implication

- The findings of this study suggest that the Manual Diaphragmatic Release and Diaphragmatic Stretch Technique can significantly improve PEFR in college going students.
- This has important clinical implications for the use of breathing techniques as a complementary therapy for improving cardiovascular function and aerobic capacity in runners and COPD patients.

7. Future recommendation

- Larger sample size can be taken.
- This study may done for a Longer Duration.

8. References

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