

# Correlation Between Peak Expiratory Flow Rate (P.E.F.R.) And Abdominal Muscles Strength Among Voice Over and Dubbing Artists: A Correlational Study

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DOI: <https://doi.org/10.52403/ijhsr.20240755>

## ABSTRACT

**Introduction:** Voice over & dubbing artists are professionals who use their voice to portray characters or provide information to an audience to entertain them. These artists use abdominal breathing rather than thoracic breathing. Respiratory function has correlation with voice production and quality. Pulmonary function tests can be used to assess the voice of a person. There is less literature support for nature of abdominal muscle activation among professional voice users. In this study the correlation between Peak Expiratory Flow Rate (P.E.F.R.) and abdominal muscle strength will be assessed

**Method:** 50 Voice over and dubbing artist with experience of at least 6 months in voice industry among which 17 were females and 33 were male artists within age group of 18-25 years were approached and consented for the assessment. Peak Expiratory Flow Rate (P.E.F.R.) were assessed using Peak Flow Meter and strength of abdominal muscles were assessed using pressure biofeedback unit. The statistical data was then analyzed for the result.

**Results:** Linear regression test was performed to find the correlation between the Peak Expiratory Flow Rate (P.E.F.R.) and abdominal muscles. The statistical analysis of P.E.F.R. and abdominal muscles strength was calculated to be significant. The test showed significant results with p value <0.0001. Correlation coefficient (r) is 0.1959.

**Conclusion:** it was concluded that there is correlation between Peak Expiratory Flow Rate (P.E.F.R.) and Abdominal Muscles Strength among voice over and dubbing artists.

**Keywords:** Voice over artists, dubbing artist, P.E.F.R., abdominal muscles, pulmonary function tests

## INTRODUCTION

Voice-over and dubbing artists are the professionals who use their voice to portray characters or provide information to the audience via radio, movies, audiobooks, or television commercials to entertain their audience.<sup>1</sup> Dubbing involves replacing the original soundtrack containing the actors'

dialogue either with the same language (lip-match dubbing) or in another languages (multilingual dubbing), ensuring that the actor's dialogue is synchronized with the actor's lip movements in such a way that the target viewers are led to believe that the actors on screen are actually speaking their language.<sup>1</sup> Voiceover is the voice of an

unseen narrator expressing unspoken thoughts.<sup>2</sup> Voice-over artists narrate the story and provide information to portray characters. In Pune, over 2000 commercial voice-over and dubbing artists are working till date. The voiceover and dubbing artists require the recording of the voiceover and dubbing of a scene while standing in front of a microphone in a soundproof recording room. Strong breathing control is one of the most important tools for voice projection and ultimately for performance, as voice manipulation is key for voiceover and dubbing artists.<sup>3</sup> Voice work begins with a focus on breathing.<sup>4</sup>

Vocal function is significantly influenced by respiratory function.<sup>5</sup> During inspiration, the costovertebral joint moves superiorly and posteriorly. This causes an elevation of the first rib. In the upper ribs, i.e. rib 2 through 7, most of the movement occurs at the anterior aspect of the rib. The costocartilage rotates upward and becomes more horizontal with inspiration. The sternum is pushed ventrally and superiorly due to the movement of the ribs. The effect of motion of the upper ribs and sternum is an increase in anteroposterior (A-P) diameter, which is also known as pump handle motion. Lower ribs, i.e. rib 8 through 10, allow motion at the lateral aspect of the rib cage, which increases the transverse diameter of the lower thorax. This is known as bucket handle movement. During expiration, abdominal muscles act as accessory muscles of expiration.<sup>6</sup> Expiration is controlled, and there is active contraction of the rectus abdominis, external oblique muscles, and internal oblique muscles, which push the diaphragm upwards. In this way, air gets expelled at a controlled rate of flow through the laryngeal aperture.<sup>7</sup> Peak expiratory flow rate (P.E.F.R.) is the maximal expiratory flow rate sustained by the subject for at least 10 milliseconds, which is expressed in Liters / min. It is used as a measurement of ventilatory lung function.<sup>8</sup> The external, internal, and rectus abdominis contracts during expiration during dramatic vocalization.<sup>7</sup> The anterior wall of the core muscles includes the abdominal muscles.

Abdominal muscles include the transverse abdominis, rectus abdominis, internal oblique, and external oblique.<sup>9</sup>

## **MATERIALS & METHODS**

### **METHODS**

This study was a correlational study conducted on 50 Voice over and dubbing artists in and around Pune by convenient sampling method within 6 months. Artists selected were having experience of at least 6 months in voice industry among which 17 were females and 33 were male artists within age group of 18-25 years and Normal P.E.F.R. values according to age group and gender. Artists having Active lung infection, diagnosed cases of COPD, Restrictive lung diseases, Recent abdominal surgery, Pregnant females and obesity class I, II, III were excluded from the study.

### **PROCEDURE**

The project was started with the presentation of synopsis and the ethical clearance from the ethical committee.

Participants fulfilling the inclusion and exclusion criteria were selected and written consent was taken. The participants were assessed for P.E.F.R. and Abdominal muscles strength on the basis of a convenient sampling method.

Voice over and dubbing artist having work experience of at least 6 months or more than 6 months were included in study. The participants were assessed for P.E.F.R. value with Peak flow meter. Abdominal muscle strength value was assessed with Stabilizer's pressure biofeedback test.

### **P.E.F.R. Assessment with Peak flow meter**

- The purpose and methodology of the test were explained. Subject positioning will be sitting position with back supported on chair. The position of the therapist is besides the patient. Each subject was explained for the test procedure. The test subjects were closely monitored to make sure that there was no air leakage between the mouthpiece and the lips. Each participant had three attempts, and the

mean P.E.F.R. value was taken into consideration.

**Hygiene of Peak Flow Meter-** Peak Flow Meter was immersed in warm water and washing-up liquid for 2 – 3 minutes rinsed in clean water and shake gently to remove any excess water after single use.

**Abdominal muscle strength assessment with stabilizer’s pressure biofeedback unit (PBU)-**

**Starting position-** Prone position

**Procedure-** PBU placed under the abdomen of patient, with the navel at the center and the pad's distal border was aligned with the anterior superior iliac spines on the left and right. PBU will be then inflated up to 70 mmHg.

It is then allowed to stabilize so that variations in pressure caused by breathing may be detected. These variations can be as little as 2 mmHg for each inhale and expiration.

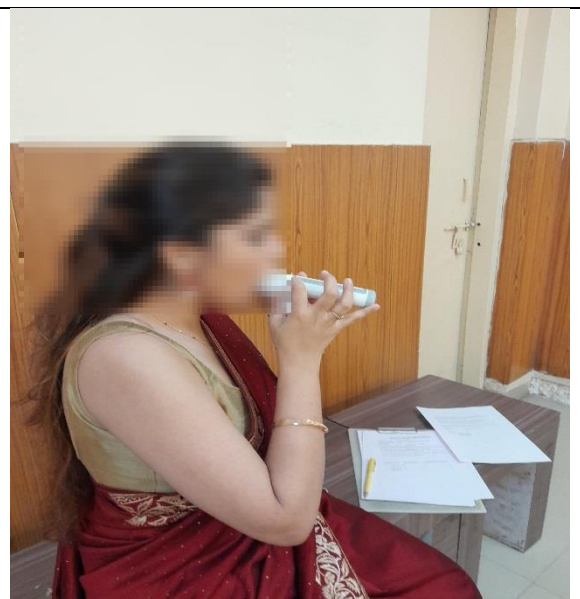
The subjects were directed to execute the indrawing maneuver, or abdominal contraction.

Each participant had three attempts, and the mean mmHg value was taken into consideration.

**Interpretation-** A normal reading would decrease by 6 to 10 mmHg during the abdominal contraction. The objective data of the test will show the activation of core stability muscles. The numerical readings that the Pressure Biofeedback Unit (PBU) produces will be employed in statistical analysis.



Abdominal Muscles Strength Assessment Stabilizer’s Pressure Biofeedback Unit



P.E.F.R. Assessment with Peak Flow with Meter

## RESULT

In this study 50 voice over and dubbing artists were assessed for P.E.F.R. and abdominal muscles strength out of which 17 were female artists and 33 were male voice over and dubbing artists, between the age group of 18 years to 30 years. 6 participants were between age group 18-20 years and 44 participants were between age group 21-30 years. Among which 30 participants have normal Body mass index (B.M.I.), 18

subjects were overweight and 2 were underweight.

The Peak Flow Meter was used for assessment of P.E.F.R. (Peak Expiratory Flow Rate). All Participants showed normal value of P.E.F.R. according to their age group and gender.

Stabilizer’s Pressure Biofeedback unit (PBU) was used for assessment of Abdominal Muscles Strength. This showed that Maximum subjects i.e. 16 subjects

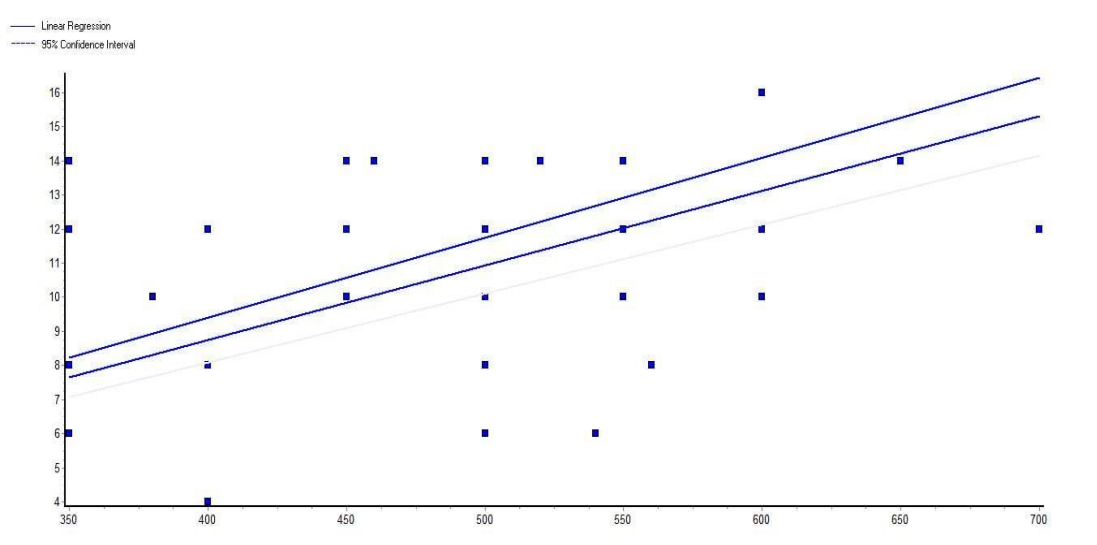
showed 12mmHg abdominal muscles strength, 12 subjects showed 14mmHg, 3 individuals showed 6mmHg, 5 subjects showed 8mmHg, 12 individuals showed 10 mmHg, 1 subject showed 16mmHg and 1 subject showed 4mmHg abdominal muscles strength.

Linear regression test was performed using Instat and GraphPad prism software to find correlation between P.E.F.R. and abdominal

muscles strength. The statistical analysis of P.E.F.R. and abdominal muscles strength was calculated to be significant. Correlation coefficient (r) is 0.1959.

This proves the alternative hypothesis ( $H_1$ ) i.e. there is a correlation between peak expiratory flow rate (P.E.F.R.) and abdominal muscles strength among voice over and dubbing artist.

### Correlation between P.E.F.R and Abdominal muscles strength:



**INTERPRITATION:** X -Axis represents P.E.F.R. (L/Mins) and Y-Axis represents Abdominal muscles strength (mmHg). The graph represents correlation between P.E.F.R. and Abdominal muscles strength.

### DISCUSSION

The current study was conducted to find correlation between P.E.F.R. and abdominal muscles strength among voice over and dubbing artists. Voice over & dubbing artists are professionals who uses their voice to portray characters or provide information to an audience via Radio, Movies, Audiobooks, Television commercials to entertain their audience<sup>1</sup>. This study focuses on voice over and dubbing artists, since they use their voices to portray characters or provide information to audiences in various media.<sup>1</sup> According to William Thorpe et.al. 2001, breathing control is required for effective

voice projection. Vocal function is influenced by respiratory function.<sup>10</sup> As it is stated in D Garfield Davies et.al. 2<sup>nd</sup> edition, Care Of Professional Voice, these artists use abdominal breathing rather than thoracic breathing as thoracic breathing technique is less effective and more effortful.<sup>7</sup>

These artists demand consistent vocal capabilities during repeated voice performance such as harsh voice behaviors. Voice projection and resonance which affects the range, volume and speed of our voice to be as effortless as possible.<sup>8</sup> Strong breathing control is one of the most important tools for the voice projection and ultimately for the performance as voice manipulation is key for voice over and dubbing artist.<sup>3</sup>

Vocal function is influenced by respiratory function, with upper ribs and sternum moving in Pump handle motion, and lower



ribs allowing bucket handle movement. During expiration, abdominal muscles act as accessory muscles, controlling exhalation by pushing the diaphragm upwards and exchanging air at a controlled rate through the laryngeal aperture.

There are previous researches done about voice quality, voice projection, role of abdominal muscles in other voice professionals such as stage actors, singers which include Jane Y. Tong et.al in 2020, review concluded that respiratory function has significant contribution to voice.<sup>5</sup> Also reveals that few studies have explored the role for airflow measures in clarifying this relationship. Robert Lewis et.al. in 2019 Stage actors need breath control for voice projection and resonance. However, little is known about the abdominal muscle activation during vocalizations of different sounds and different lung volumes. Peter J. Watson et.al. in 1988 who concluded that brief decrements in lateral abdominal activity often occurred in association with the onset of the inspiratory side of the breathing cycle. Findings support the concept that the abdomen plays an important role in the posturing of the chest wall for singing.

Traditionally, these artists are trained with various vocal training techniques, vocal hygiene and control over posture to improve efficiency of their voice. Graham Williamson et.al.2014, states that diaphragmatic breathing technique, easy onset of vibration on vocal cord during voice production and effortless voice projection without strain are required for effective voice projection. According to Williamson, Graham et.al.2017, relaxation of head, shoulder and neck muscles, Varying the loudness using vowel sounds, repeating different vowel sounds, Varying the loudness using numbers, sustaining and projecting the voice by intoning words and phrases are exercises for effective voice projection.

Previous studies have concluded that breathing control is required for good quality of voice control and effective voice projection but role of abdominal muscle strength is under-reported in previous

literature so this study may add strength to the underreported literature. The impact of training on muscle activation is likewise under-reported in the literature. There is less literature support for correlation of lung function and abdominal muscles strength thus this study would help to know the correlation.

In this study 50 voice over and dubbing artists were assessed for P.E.F.R. and abdominal muscles strength out of which 17 were female artists and 33 were male voice over and dubbing artists between the age group of 18 years to 30 years. 6 participants were between age group 18-20 years and 44 participants were between age group 21-30 years. Among which 30 participants have normal Body mass index (B.M.I), 18 subjects were overweight and 2 were underweight. The Peak Flow Meter was used for assessment of P.E.F.R. (Peak Expiratory Flow Rate) Artists were assessed for P.E.F.R. with Peak flow meter and Abdominal muscles strength with stabilizer's pressure biofeedback unit.

The statistical analysis showed that there is significant correlation between P.E.F.R. and abdominal muscles strength among voice over and dubbing artists. The present study provides promising results and showed that there is correlation between Peak expiratory flow rate (P.E.F.R. L/min) and Abdominal muscles strength (mmHg) among voice over and dubbing artists.

This proves the alternative hypothesis ( $H_1$ ) i.e. there is a correlation between peak expiratory flow rate (P.E.F.R.) and abdominal muscles strength among voice over and dubbing artist.

The limitation of this study is that this study considered age group only between 18 years to 30 years. Hence the nature of this correlation among other age groups could not be studied.

The study considered only normal values of abdominal muscles strength and not the grades of abdominal strength testing. This study only considered strength as a parameter was assessed to understand role of abdominal muscles during dramatic vocalization.

Further researches can be done on abdominal strength training program could be incorporated to improve voice projection. The study can consider other age groups to understand the nature of this correlation in other age groups. Grading of abdominal muscles strength can be considered to know the effect of abdominal muscles strength on voice projection. Other parameters such as endurance of abdominal muscles can be considered.

## CONCLUSION

Based on this study, it was concluded that there is correlation between Peak Expiratory Flow Rate (P.E.F.R.) and Abdominal Muscles Strength among voice over and dubbing artists.

Hence, we accept our alternate hypothesis ( $H_1$ ) which stated that “There is a correlation between peak expiratory flow rate (P.E.F.R.) and abdominal muscles strength among voice over and dubbing artists.”

## Declaration by Authors

**Ethical Approval:** Approved

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

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How to cite this article: Siddhima Hardikar, Manali Deshpande. Correlation between peak expiratory flow rate (P.E.F.R.) and abdominal muscles strength among voice over and dubbing artists: a correlational study. *Int J Health Sci Res.* 2024; 14(7):424-429. DOI: <https://doi.org/10.52403/ijhsr.20240755>

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