Journal of STEPS for Humanities and Social Sciences

Volume 1 | Issue 3 Article 95

The Effect of a Threshold Loading Device on Respiratory Muscle Function for football Referees

Ryad Salam
University of Babylon, Iraq

Ammar Hamza Hadi
University of Babylon, Iraq, ammarhadi_1976@yahoo.com

Recommended Citation

Salam, Ryad and Hadi, Ammar Hamza (2022) "The Effect of a Threshold Loading Device on Respiratory Muscle Function for football Referees," *Journal of STEPS for Humanities and Social Sciences*: Vol. 1 : Iss. 3 , Article 95. Available at: https://doi.org/10.55384/2790-4237.1159

The Effect of a Threshold Loading Device on Respiratory Muscle Function for football Referees

Ryad Salam, Faculty of Physical Education and Sports Science, University of Babylon, Iraq. Email: ammarhadi_1976@yahoo.com

Ammar Hamza Hadi, Prof. Dr, Faculty of Physical Education and Sports Science, University of Babylon, Iraq.

Received: 08/08/2022 Accepted:26/08/2022

Abstract

Football referees feel tired shortly after training or during match because the respiratory muscles of them are weakness in the work during the high physical effort; this weakness varies during different long-term periods. The research aims to know the effect of a threshold loading device on respiratory muscle function in football referees. The researchers used the experimental approach by designing one group for the research sample including (5) referees from Babylon clubs.. After the pre-tests, the group followed the training units by using the threshold loading device for training respiratory muscle function, within a period that lasted (8) weeks; three training units per a week, so the total number of units reached (24) units with(30) minutes for each unit. After completing the training units, the post-tests were conducted on the group. The researchers concluded that the threshold loading device has an effect on the respiratory muscles function.

Keywords: Threshold loading device, respiratory muscles function, football referees.

1. Introduction:

Our modern world is observing a series of nonstop developments in all fields, including the sports field, and we frequently discover new developments that appear from time to time, all of which focus on helping the training process and succeeding its aim which is to bring about alteration and enhancement in the level of training.

It is recognized that respiratory muscles function undergo adaptation in response to overload stimuli during exercise training in football referees, thus resulting in significant increase of respiratory muscle function working as well as the physical improvements. The respiratory muscles weakness have significant clinical consequences for football referees and this reason may partially explain the appearance of common symptoms like reduced tolerance to physical exercise.

At present, there are numerous devices in the market which can be used to train the pulmonary muscles for football referees. Pulmonary devices fall into two main classifications: devices that enforce an incentive for endurance training and those that enforce an incentive for resistance training. Even though previous studies have attempted to describe all respiratory muscle training devices, some devices that have proven effective were not included (Menzes KKP *et al*., 2018).

Muscles of the respiratory are unique among the muscles of the skeletal, so that they must work without permanent rest, so far the weakness of the respiratory muscles decreases in muscle contraction, which leads to the inability of the respiratory muscles to produce normal levels of air flow and pressure during expiration and inspiration, this weakness can affect the football referee exercise performance (Andrea A. 2016), and then the application of training which has the ability to rise the endurance of the respiratory muscles, represented by the use of threshold loading training device, consequently improving functional ability and exercise performance are acceptable because conditioning is one of the most important reasons that can help muscles to perform high training loads at high levels and for long periods.

The nature of football stadium distances results in more effort from referees to continue with players for two matches which is more than one hour and half, so most researchers try to discover a new method to improve physiological and physical abilities of referees.

Through following up the football game and the matches by the researchers, they found that there is a weakness in the endurance of the referees in the end of the matches, so that they feel tired within a short period. This motived the researchers to use electronic respiratory muscles device to training the respiratory muscles of the referees and then improve their endurance level.

The study aims to use a threshold loading device for training the function of the respiratory muscles for football referees, and to recognize the effect of the device on some physiological variables of football referees.

2. procedures:

2.1. **Methodology**:

We used an experimental method by designing the two equivalent groups of pre and post-test.

2.2. **Participant:**

The number of participants required for this study was calculated to be (10) referees based on the original research community in Babylon-Iraq. participants randomized into two groups (control and experimental). Each group consists of (5) referees, table (1) shows the sample specifications.

Table (1) shows the equivalence of the research sample in the research variables

Variables	Median	Vernal Deviation	Kruskal-Wallis value	freedom degree	error ratio	statistical significance
FEV1%	82.70	1.04	2.30	8	0.125	insignificant
FVC%	91.22	1.24	2.12	8	0.232	insignificant
FVC / FEV1%	92.13	1.10	2.23	8	0.245	insignificant
PEFR%	51.60	1.01	1.65	8	0.084	insignificant

Table (1) shows that the participants are equivalent in terms of the above variables, because the values of the error rate are greater than the level of statistical significance (0.05). We conclude that there are no significant differences between the research groups in the searched variables.

2.3. Measurements:

2.3.1. Pulmonary Function Measurement:

- Forced expiratory volume at the first second (FEV1)
- Forced vital capacity (FVC)
- Ratio (FEV1 / FVC)
- Peak of expiratory flow rate (PEFR)

Table (2) Pulmonary Function Test

No	Variables	test
1	Forced expiratory volume in the first second FEV1	Spirometer
2	Forced Vital Capacity FVC	
3	FEV1 / FVC ratio	
4	PEFR	

2.3.2. Measuring FEV1, FVC, (FEV1 / FVC), and PEFR (Redlich *et al*., 2014):

Arrangements before test: the players have not to eat or drink (tea and coffee), no physical effort, and have to maintain their psychological state very well on the morning of the test day, because it results to shortness of breath.

The used devices: Spirometer is one of the basic devices in examining the pulmonary function, it is approved in many specialized clinical laboratories and its results are of high accuracy depending on the effort exerted by the tester and the tested in the measurement stage, a lot of resources emphasizes the importance of measuring expiratory volume in the first second (%) (FEV1), forced vital capacity (FVC) and the ratio (FVC / FEV1) and maximum rate of expiratory flow (PEFR) as these parameters were measured with the aforementioned device, to find out the extent to which the respiratory muscles perform their main function without delay for all players.

Test Method: Player sits on a chair at a height of (40 cm), where the feet are touching the ground and the back is straight and resting on the back of the chair. Technique of the test was taught by the researchers, where players take a deep inhale and then forcefully and quickly expel the air from the chest (exhale) until the lungs empty or until the device makes a sound and the nose is closed with an airtight stopper to ensure that the inhalation is taken out from the mouth only.

Recorder method: The players must continue exhaled the air completely, and it must be at least (6) seconds and may last up to 12 seconds or more, and the test was performed on three attempts for each player with one minute rest among tests recording the best performance.

2.4. Pre-Tests:

We achieved the pre-tests on Monday 13/12/2021at ten mornings (FEV1, FVC, FEV1/FVC, and PEFR) tests were carried out simultaneously in the physiological laboratory of the University of Babil - College of Physical Education and Sports Sciences.

2.5 Main Experience:

The application of the training curriculum vocabulary began with the threshold loading training device on Tuesday 14/12/2021. The players attended the outdoor field of the College of Physical Education & Sports Sciences to complete the program.

During the 10-week program, players participated in 35 to 45-min sessions three times a week. The sessions focused on regulating the breathing rhythm, increasing the expiratory time, stimulating diaphragmatic and nasal breathing, and slowing the respiratory flow. By using Threshold Loading device (Powerbreathe, HaB International, Southam, UK), the players have to breath the air through the mouth and close the nose by a clip and they were encouraged to breathe out "the entire air contents of the lungs". The intensity of each breath was 50–70% of maximal inspiratory pressure (PImax). the players were instructed to maintain a low breathing frequency to avoid hyperventilation and they were instructed to periodically increase the resistive load such that the completion of 40 breaths approximated the limit of inspiratory muscle tolerance. To ensure that players followed to the training requirements of the respective training interventions, they attend to the laboratory on a monthly to do their tests.

2.6 post-Tests

We achieved the pre-tests on Tuesday 1/3/2022 at ten morning (FEV1, FVC, FEV1/FVC, and PEFR) tests were carried out simultaneously in the physiological laboratory of the University of Babil - College of Physical Education and Sports Sciences.

2.7 Statistical Analysis:

The researchers used (SPSS) version (24) for the purpose of extracting the statistical results.

3. Results and Discussion

3.1 Differences between the pre and post-tests of the experimental group in functional variables.

Table (3) shows the median, spring deviation, and Wilcoxon value between the pre and post-tests of the experimental group

Variables	Unit of measurement	pre-test		post-test		Wilcoxon	error ratio	statistical indication
		M	SD	M	SD			
FEV1	%	85.50	1.30	95.00	1.10	2.050	0.043	Significant
FVC	%	88.20	1.10	92.15	1.12	2.120	0.035	Significant
FVC/FEV1	%	86.30	1.21	89.30	1.06	2.090	0.037	Significant
PEFR	%	62.20	1.11	65.10	1.14	2.130	0.038	Significant

3.2 Differences between the pre and post-tests of the control group in functional variables.

Table (4) shows the median, spring deviation, and Wilcoxon value between the pre and post-tests of the control group

Variables	Unit of measurement	pre-test		post-test		Wilcoxon	error ratio	statistical indication
		Median	Spring Deflection	Median	Standard Deviation			
FEV1	%	84.40	1.15	87.00	1.30	2.14	0.03	Significant
FVC	%	89.10	1.10	90.15	1.50	2.15	0.02	Significant
FVC/ FEV1	%	85.20	1.13	87.10	1.66	2.14	0.04	Significant
PEFR	%	63.50	1.17	65.20	1.72	2.15	0.03	Significant

3.3Discussion:

Tables (3,4) show a significant differences between the pre and post-tests in the functional variables for both groups. However, the results of the present study show a real effect on improving the speed of breathing, the strength and endurance of the respiratory muscles, and the amount of air entering and leaving during inhalation and exhalation.

Earlier studies found that resistance training devices such as respiratory muscle training devices need a period of at least 6 weeks to gain a positive results; Paltiel *et al*., (2003) concluded that a period of 5 weeks of respiratory muscle training equipment is an insufficient to reduce pressure on the diaphragm during breathing and improve the endurance, speed, and strength of the respiratory muscles and then improve the physical aspect of the athletes. Moreover, *Geddes et al*., (2005) found that a period of 5 weeks of training by respiratory muscles devices are insufficient to gain significant results.

Respiratory muscle strength, endurance, vital capacity, and lung volume measurement are essential for referee from the physiological point of view, because the results of the previous studies and scientific research confirmed that tidal volume during mechanical ventilation in athletes is 6.6 mL/kg for males and 6.5 mL/kg for females compared to 6 mL/kg as suggested by the ARDS Network (Pavlos M & George B, 2013). However, ideal vital capacity for men between the age of 25-35 years is 3500cm^3 and the percentage of the prediction was equal to 150%, moreover, the scientists confirmed that the percentage is good if it is between 100-120% and they agreed based on the observed value and in terms of height and age (Muhammad & Khalid. 2013).

While the lung volumes and capacities vary according to the different positions of the body, so breathing during physical activity for referees is connected to the situations of the body, and the breathing are compatible with the body movements through the incorporation of capacities, volumes, and pulmonary ventilation, in addition, the effectiveness of breathing and the compatibility of breathing are increased with the sports performing (Yusef LK.& Salih B. 2009).

Our study confirmed that power of the differences between pre and post-tests for experimental group because of used the threshold loading training device which it contributed to make a clear and real development and expansion in the strength and endurance of the respiratory muscles.

4-Conclusion

We conclude there is a positive and moral effect for the threshold loading training device on respiratory system for football referees and there is a very slight improvement in respiratory system for control group. Moreover, the experimental group outperforms the control group in the post tests.

References

Andrea A. (2016). The respiratory muscles during exercise. Breathe (Sheff). 12(2): 165–168.

Filomena M & Alessandro L. (2019). RESPIRATORY RESPONSES TO EXERCISE IN SPORT. Sport Science. 12 (1): 49-52

Geddes EL, *et al*., (2005). Inspiratory muscle training in adults with chronic obstructive pulmonary disease: A systematic review. Respir Med, 99: 1440-1458.

Glenn McGovern *et al*., (2019). Guidance Document for Sports Field Development, Sport New Zealand. 4-37.

Goldstein R, Rosie J De, Long S T, Dolmage, Avendano M A. (1989). Applicability of a threshold loading device for inspiratory muscle testing and training in patients with COPD. Chest.96(3):564-71.

Menzes KKP, Nascimento LR, Avelino PR, Polese JC and Salmela LFT. (2018). A Review on Respiratory Muscle Training Devices. J Pulm Respir Med, 8:2: 1-7.

Muhammad NR. & Khalid BH. (2013). Physiological Measurements in the Sport Field, 1st Edition, Cairo, Book Center for Publishing, 110-120.

Paltiel W, *et al*., (2003). Specific Expiratory Muscle Training in COPD, CHEST, 124: 468-473.

Pavlos M & George B. (2013). A Higher Tidal Volume May Be Used for Athletes according to Measured FVC. Scientific World Journal. 52-61.

Redlich CA, Tarlo SM, Hankinson JL, *et al*. (2014). Official American Thoracic Society technical standards: spirometry in the occupational setting. Am J Respir Crit Care Med. 983-993.

Redlich CA, Tarlo SM, Hankinson JL, *et al*. (2014). Official American Thoracic Society technical standards: spirometry in the occupational setting. Am J Respir Crit Care Med. 983-993.

Yusef LK & Salih BK. (2009). Physiology of Physiology in the Sports Field, Jordan, Amman, Zahran House, 154-166.