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ORIGINAL ARTICLE

Does Inspiratory Muscle Training Affect Respiratory Parameters? The Different Effects of Diaphragm Muscle-Focused Respiratory Exercise

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ABSTRACT

Background. Considering that breathing strategies are essential for athletic performance, insufficient scientific data exists to understand how they operate. **Objectives.** This study investigated the effect of conscious diaphragm muscle-based respiratory muscle exercise on respiratory muscle strength and function. **Methods.** For that, four groups (IMT-DF (inspiratory muscle training using diaphragm), IMT (inspiratory muscle training), IMT-SHAM (training without intensity), and control) were formed into which 24 healthy sedentary participants were randomly divided. Inspiratory muscle training was organized three days a week for 4 weeks, and respiratory muscle strength (measured with a pressure gauge) and function (measured with a spirometer) were obtained one day before and one day after the 4 weeks. In respiratory muscle strength parameters maximal inspiratory pressure and maximal expiratory pressure (MIP-MEP), significant differences were found in favor of IMT-DF and IMT groups. **Results.** Significance was found favoring IMT-DF in analyzing the difference between means and percentage change in comparing pre-post test data between groups. In the pulmonary function tests, a significant difference was found between the IMT-DF group and the IMT group in favor of the IMT-DF group in the forced expiratory volume in the first second (FEV1) parameter; a significant difference was found between the IMT-SHAM group and the IMT-DF group in favor of the IMT-SHAM group, and no significant difference was detected in respiratory functions ($p>0.05$). **Conclusion.** As a result, performing respiratory muscle training specific to the diaphragm muscle may improve respiratory muscle strength and function more positively than regular training.

KEYWORDS: ***Diaphragm, Respiratory, Exercise, Maximal Inspiratory Pressure, Maximal Expiratory Pressure, FEV1.***

INTRODUCTION

Every second of life requires respiration for every living creature to carry out its vital activities healthily. When a person breathes, oxygen, the primary element that cells need, reaches the cells, and the necessary need is met. Oxygen passes through various filtration processes, binds to hemoglobin in the blood, and is delivered to the appropriate organ, tissue, and cell (1, 2). Almost all people do not pay attention to all the physiological processes mentioned before, do not try to control them, and the process continues. Because it is known that this involves an autonomous process and that the respiration of the organism takes place smoothly and entirely according to its coding (3, 4), this is followed by several exercises and health practices aimed at improving the respiratory performance of individuals (5, 6). Here, the implementation of respiratory muscle-strengthening

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exercise programs for sedentary people and athletes comes to the fore; looking at the literature, it is possible to find many studies in which respiratory muscles were strengthened and contributed to the improvement of muscle strength and respiratory function (5, 7, 8). Sometimes, studies have been carried out on a group of patients to overcome the respiratory difficulties and difficulties caused by the disease, and sometimes, research has been designed to achieve better capacities both in everyday life (9, 10) and in sports performance (5), focusing on improving the existing healthy capacity to better levels. However, when the studies are carefully examined, little attention is paid to or a detailed explanation of how respiratory muscle training is done outside the protocol (8, 11-14).

Although many benefits are obtained from respiratory muscle training (6, 11), a detail is not emphasized (how to perform breathing exercises mechanically). When the respiratory muscle was trained, it was determined that the diaphragm muscle was involuntarily activated and loaded while inhaling and exhaling (15). People are only given an inspiratory muscle training device and told how the training protocol will be on it and how long the rest will be (16, 17). We designed that muscle-focused training should be prepared so that the diaphragm muscle can perform more robust and more effective training and the capacity of this muscle, which is mainly responsible for breathing, can be increased more effectively. Based on this information, respiratory muscle training was carried out in addition to a working process for consciously starting and maintaining breathing in the diaphragm area by activating the respiratory muscle (diaphragm). We hypothesize that conscious respiratory muscle training for the diaphragm muscle will positively affect respiratory function and muscle strength. The aim is to reach a conscious level in the use of the diaphragm and to achieve more and more effective results in respiratory muscle training. In this direction, our study is essential to eliminate such an essential deficiency in the literature and carry out training programs more consciously in future research on respiratory muscles.

MATERIALS AND METHODS

Experimental Design and Participants. Our study was designed as a randomized, controlled, pre-posttest experimental design. Participants visited the research site 2 times and underwent a 4-week training period. Three groups (IMT-SHAM, IMT, IMT-DF) performed respiratory muscle exercises to the accompaniment of researchers, 2 sets of 30 repetitions (1 min rest between repetitions) 3 days a week for each week during this 4-week training period. Participants were assigned to study groups according to the complete randomization. Prior to the 4-week training period (first visit), participants' respiratory muscle strength, maximal inspiratory pressure (MIP), and maximal expiratory pressure (MEP)parameters and respiratory functions were measured, and other anthropometric characteristics of the participants were recorded (Table 1). The intensity of the training sessions was based on 40% of the participants' MIP values. A-priori power analysis of the study was calculated using the G*Power 3.1.9.7 program. As a result of the calculation performed using the research data with a total sample size of 24 (The sample size was estimated based on data published by Kim, Park & Lee (18)), the effect size value of the research was found to be 0. With a 5% error rate (α=0.05), the power of the study (1-β) was calculated as 0.95. A total of 24 healthy sedentary males who did not have any respiratory disease, did not use medication, did not smoke or consume alcohol, and no leisure-time physical activity, with a mean age of 19.63±1.173 years, a mean height of 177.25±3.90 centimeters, mean weight of 74±4.59 kilograms and a mean body mass index of 23.6±0.68 kilograms/square meter, participated in our study. Inclusion criteria are not having any respiratory disease, not smoking or drinking alcohol, and not using any medication regularly. No participant withdrew from the study.

Table 1. Descriptive parameters of subjects (n=24)

	Minimum (n=24)	Maximum (n=24)	Mean±Std.Dev (n=24)
Age (Years)	18	21	19.63±1.173
Height (cm)	175	182	177.25±3.90
Weight (kg)	69	80	74±4.59
BMI (kg/m^2)	22.5	24.2	23.6±0.68

BMI: Body Mass Index.

Participants were divided into 4 groups, with 6 people in each group. In addition, the participants randomly assigned to the IMT-DF group (n=6) were shown breathing exercises focused on that area to perform conscious respiratory muscle training for the diaphragm muscle, and the participants were asked to perform the training by paying attention to the specified points. The other groups were asked to perform respiratory muscle training without any intervention (the control group (n=6) was not subjected to any training). IMT-SHAM application group (n=6) was trained without any exercise intensity (at %0 of MIP), and the IMT group (n=6) was only informed about the repetition and rest periods of the respiratory muscle training and performed the training for 4 weeks (19, 20). At the end of the 4-week training period, the participants' respiratory muscle strength and function were measured as the final test (Table 2; Table 3). The Gaziantep University Social and Human Sciences Ethics Committee permitted the study (Protocol number 361976).

Table 2. Descriptive Statistics of Pre-test and Post-test Respiratory Muscle Strength Values of Groups

Groups (n=24)		MIP (cmH_2O)		MEP (cmH_2O)	
		$\bar{x}$	SD	$\bar{x}$	SD
IMT-DF (n=6)	Pre	61.83	21.55	83.83	27.68
	Post	108.50	13.46	125.83	21.78
IMT (n=6)	Pre	87.17	18.51	118.83	29.61
	Post	100.33	22.97	131.67	27.12
IMT-SHAM (n=6)	Pre	76.00	14.21	103.33	25.34
	Post	79.67	13.94	110.33	28.44
Control (n=6)	Pre	81.33	12.97	127.83	11.0
	Post	114.33	22.04	132.50	22.46

MIP: Maximal Inspiratory Pressure; MEP: Maximal Expiratory Pressure; IMT-DF: diaphragm-focused inspiratory muscle training; IMT: Inspiratory Muscle Training; IMT-SHAM: Inspiratory Muscle Training-Sham; Control: Non-Inspiratory Muscle Training.

Table 3. Descriptive Statistics of Pre-test and Post-test Respiratory Function Values of the Groups

Groups (n=24)		FEV (lt)		FVC (lt)		MVV (lt/min)		VC (lt)		TV (lt)		IVC (lt)	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
IMT-DF (n=6)	Pre	3.23	0.98	4.19	1.29	112.98	34.45	4.48	2.02	0.60	0.19	2.61	1.09
	Post	3.87	0.68	4.89	0.80	135.58	23.73	6.09	0.77	0.87	0.51	2.94	0.50
IMT (n=6)	Pre	3.70	0.44	4.49	0.62	129.43	15.46	3.97	1.13	0.83	0.31	2.40	0.43
	Post	4.54	0.98	4.99	0.99	160.32	31.50	5.26	0.42	1.26	0.46	2.93	0.42
IMT-SHAM (n=6)	Pre	2.60	1.19	3.98	1.14	112.05	30.52	2.39	1.13	0.64	0.14	1.53	0.62
	Post	3.06	1.02	4.33	0.43	125.13	16.17	3.79	1.17	0.75	0.35	2.03	0.51
Control (n=6)	Pre	4.23	0.25	4.41	0.32	142.88	15.48	4.67	1.06	0.69	0.40	2.42	0.78
	Post	3.88	0.52	4.30	0.89	135.93	18.23	4.62	1.06	1.08	0.52	2.67	0.60

FEV: Forced Expiratory Volume; FVC: Forced Vital Capacity; MVV: Maximal Voluntary Ventilation; VC: Vital Capacity; TV: Tidal Volume; IVC: Inspiratory Vital Capacity.

Training Protocol and Data Measurement Tools. The groups performed the inspiratory muscle training program 3 days a week for a month. The participants breathed 30*2 times at 40% MIP (1-min rest between repetitions) using an inspiratory muscle training device. For the IMT-DF and IMT groups, MIP was measured on the first training day of every week. The same procedure was used in the control group; however, the intensity was at 0% MIP with IMT-SHAM (6). At every inspiratory muscle training session, pulse oximetry followed oxygen saturation to avoid a hypoxic condition in participants.

For the diaphragm-focused group, diaphragm-strengthening exercise methods were shown before the study to perform breathing more consciously. While doing respiratory training, the diaphragm muscle was made to contract consciously, and the training was carried out that way. Here, the conscious initiation of breathing through the diaphragm muscle, not the rib cage, was an essential factor.

MIP-MEP Measurement. The MIP and MEP were measured using an electronic pulmonary pressure meter (Pocket Spiro MPM-100, Medical Electronic Construction R&D, Brussels, Belgium) under the American Thoracic Society and European Pulmonary Society recommendations from 2002. Subjects did maximal expiration first, followed by maximal inspiration for 1-3 seconds. Subjects completed maximal inspiration for MEP measurement before being asked to execute maximal expiration for 1-3 seconds. The lab tests were retaken till the difference between the best two values reached 5 cmH2O, at which point the best result was noted in cmH2O (16).

Respiratory Function Measurement. The pulmonary function was measured using a spirometer (Pocket Spiro USB-100, Medical Electronic Construction R&D, Brussels, Belgium). Slow and forced vital capacity tests were selected and measured according to the 2002 American Thoracic Society and European Respiratory Society guidelines. Variables such as forced vital capacity (FVC), forced expiratory volume in one second (FEV1), maximal voluntary ventilation (MVV), vital capacity (VC), tidal volume (TV), inspiratory vital capacity (IVC) were recorded using pulmonary function test (20). Subjects performed all of the respiratory function measurements twice, and we recorded the measurements with higher data.

Statistical Analysis. SPSS 22.0 (SPSS Inc., Chicago, IL, USA) program was used for statistical analysis. Values were represented as minimum, maximum, mean, and standard deviation, and significance was set at 0.05. Shapiro–Wilk test was performed to assess normality, and One Way ANOVA and LSD significant test were performed for differences of pre-posttest (intergroup) and percentage differences between groups. Paired Sample T-test was used for pre and post-tests.

RESULTS

Table 4 analyses statistical changes in respiratory muscle strength in different breathing practice groups. The data obtained from the practice groups were compared before and after the 4-week training period. When the pre-post test data of each group were analyzed, a significant difference was found in favor of the post-test for the IMT-DF group ($t=-6.019$, $p=0.002$), IMT-SHAM group ($t=-4.825$, $p=0.005$) and MIP in the control group ($t=4.807$, $p=0.005$) ($p<0.05$). When a comparison was made for the MEP parameter of the same groups, a significant difference was found in favor of the post-test only in the IMT-DF group ($t=-4.376$, $p=0.007$, $p<0.05$). When the difference between the pre-test and post-test data was compared between the groups, a significant difference was found between the IMT-DF group and other groups for the MIP parameter ($F=4.242$, $p=0.018$, $p<0.05$). The significant difference was found to be in favor of the IMT-DF groups. A significant difference was detected in comparing the difference between groups of pre-post test data for MEP ($F=3.546$, $p=0.033$, $p<0.05$). This significant difference was found between the IMT-DF and IMT groups, which favored the IMT-DF groups. When the change between the pre and post-test data of the groups was analyzed in percentage, a significant difference was found in the MIP parameter ($F=4.180$, $p=0.019$, $p<0.05$). The significant difference was between the IMT-DF group, SHAM group, and control group, which resulted in favor of the IMT-DF group. When the percentage change between the pre-post test data was analyzed in the MEP parameter, a significant difference was found ($F=5.028$, $p=0.009$, $p<0.05$). The significant difference was between the IMT-DF group and IMT group, SHAM group, and control group, resulting in favor of the IMT-DF group.

In Table 5, statistical analysis of the changes in pulmonary function in different breathing treatment groups is demonstrated. When the data were examined, in the pre-post test results of the groups, a significant difference was found in the IMT group in favor of the post-test in the averages of FEV1 (lt) ($t=-2.790$, $p=0.038$), MVV (lt/min) ($t=-3.368$, $p=0.020$) and VC (lt) ($t=-3.183$, $p=0.024$) ($p<0.05$). In the IMT-SHAM group, a significant difference was found in the mean VC (lt) in favor of the post-test ($t=-3.261$, $p=0.022$, $p<0.05$). In the control group, a significant difference was found in the mean TV (lt) in favor of the post-test ($t=-4.094$, $p=0.009$, $p<0.05$). In the comparison of the difference between the pre-post test data in pulmonary function parameters between the groups, a significant difference was found between the IMT-DF group and the IMT group in favor of the IMT-DF group in the FEV1 parameter and between the IMT group and the control group in favor of the IMT group ($F=3.546$, $p=0.033$, $p<0.05$); When the change between the pre-test and post-test data of the groups was analyzed in percentage, no significant difference was detected in respiratory functions ($p>0.05$). The changes in other respiratory parameters for the groups are shown in Figure 1.

Table 4. Analysis of Changes in Respiratory Muscle Strength Parameters

		IMT-DF (n=6)	IMT (n=6)	IMT-SHAM (n=6)	Control (n=6)
MIP (cmH2O)	Pre-test	61.83±21.55	87.17±18.51	76.00±14.21	81.33±12.97
	Post-test	108.50±13.46 [a]	100.33±22.97	79.67±13.94 [a]	114.33±22.04 [a]
	Diff. (lt)	42.00±23.51 [b c d]	12.83±26.21	7.00±12.05	4.67±17.34
	Diff. (%)	98.28±88.76 [c d]	19.37±35.86	5.08±3.15	41.54±21.69
MEP (cmH2O)	Pre-test	83.83±27.68	118.83±29.61	103.33±25.34	127.83±11.00
	Post-test	125.83±21.78 [a]	131.67±27.12	110.33±28.44	132.50±22.46
	Diff. (lt)	0.64±0.68 [b]	0.84±0.74 [b]	0.46±0.72	-0.35±0.57
	Diff. (%)	61.50±50.78 [b c d]	13.78±24.61	6.78±11.93	3.51±13.16

a: significant difference between pre-post test; b: significant difference with IMT; c: Significant difference with IMT-SHAM; d: significant difference with a control group; MIP: maximal inspiratory pressure; MEP: maximal expiratory pressure; IMT-DF: intervention group 1 (a group that received inspiratory muscle training using diaphragm); IMT: intervention group 2 (a group that received chest-focused inspiratory muscle training); IMT-SHAM: intervention group 3 (a group that received without inspiratory muscle training); Control: control group 4 (a group without inspiratory muscle training).

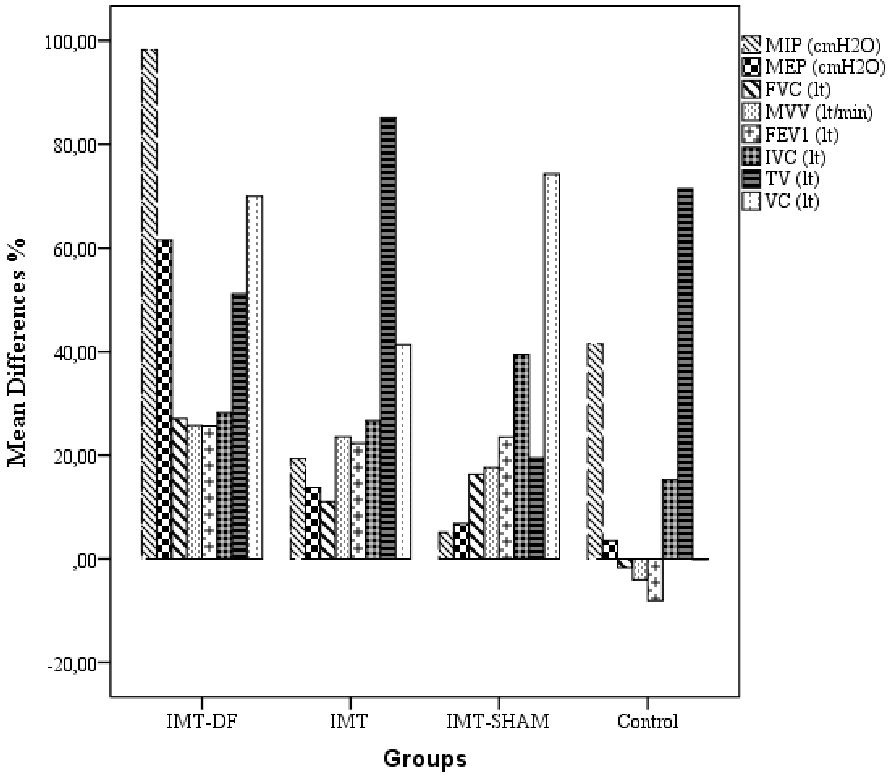

Figure 1. The Percentage Analysis of Change in Respiratory Parameters of Groups.

Table 5. Analysis of Changes in Respiratory Functions

		IMT-DF (n=6)	IMT (n=6)	IMT-SHAM (n=6)	Control (n=6)
FEV1 (lt)	Pre-test	3.23±0.98	3.70±0.44	2.60±1.19	4.23±0.25
	Post-test	3.87±0.68	4.54±0.98 [a]	3.06±1.02	3.88±0.52
	Diff. (lt)	0.64±0.68 [b]	0.84±0.74 [d]	0.46±0.72	-0.35±0.57
	Diff. (%)	25.66±29.11	22.35±20.45	23.55±31.29	-8.05±13.48
FVC (lt)	Pre-test	4.19±1.29	4.49±0.62	3.98±1.14	4.41±0.32
	Post-test	4.89±0.80	4.99±0.99	4.33±0.43	4.30±0.89
	Diff. (lt)	0.70±1.33	0.50±0.74	0.35±0.93	-0.11±1.01
	Diff. (%)	27.09±47.29	11.02±16.56	16.31±32.93	-1.70±22.43

MVV (lt/min)	Pre-test	112.98±34.45	129.43±15.46	112.05±30.52	142.88±15.48
	Post-test	135.58±23.73	160.32±31.50 [a]	125.13±16.17	135.93±18.23
	Diff. (lt)	22.60±23.79	30.88±22.46	13.08±27.60	-6.95±22.03
	Diff. (%)	25.76±29.18	23.58±17.66	17.64±34.72	-4.04±15.24
VC (lt)	Pre-test	4.48±2.02	3.97±1.13	2.39±1.13	4.67±1.06
	Post-test	6.09±0.77	5.26±0.42 [a]	3.79±1.17 [a]	4.62±1.06
	Diff. (lt)	1.61±1.64	1.29±1.00	1.40±0.84	-0.06±0.89
	Diff. (%)	69.99±93.49	41.37±39.83	74.29±66.19	-0.16±18.02
TV (lt)	Pre-test	0.60±0.19	0.83±0.31	0.64±0.14	0.69±0.40
	Post-test	0.88±0.51	1.26±0.46	0.75±0.35	1.08±0.52 [a]
	Diff. (lt)	0.28±0.42	0.43±0.68	0.11±0.32	0.40±0.30
	Diff. (%)	51.14±77.54	85.11±132.52	19.51±61.54	71.49±74.45
IVC (lt)	Pre-test	2.61±1.09	2.40±0.43	1.53±0.62	2.42±0.78
	Post-test	2.94±0.50	2.93±0.42	2.03±0.51	2.67±0.60
	Diff. (lt)	0.33±1.01	0.53±0.78	0.50±0.36	0.25±0.52
	Diff. (%)	28.29±50.49	26.69±31.57	39.42±31.91	15.28±29.91

a: significance between pre-post test; b: significant difference with IMT; c: Significant difference with IMT-SHAM; d: significant difference with control group FVC: forced vital capacity; FEV1: forced expiratory volume in 1 sec; MVV: maximal voluntary ventilation; VC: vital capacity; TV: tidal volume; IVC: inspiratory vital capacity; lt liters; sec seconds; min minutes. IMT-DF: the intervention group, where respiratory muscle training was performed using the diaphragm; IMT: the intervention group, respiratory muscle training focused on chest breathing. IMT-SHAM: intervention group, a group that received without inspiratory muscle training. Control: control group, a group without inspiratory muscle training.

DISCUSSION

This study investigated the effect of conscious diaphragm muscle-based respiratory muscle exercise on respiratory muscle strength and respiratory function. For this purpose, respiratory muscle training was applied differently with healthy sedentary individuals, and respiratory muscle strength and functions were tested. In our study, significant differences were found in the respiratory muscle strength data in favor of the post-test. Especially in the MIP parameter, there was a significant difference in the IMT-DF group, IMT group, and control group, while in the MEP parameter, a significant increase was achieved only in the IMT-DF group. One of the critical findings that draws attention here is the significant changes that occurred in the control group. When the control group's data was examined, it was determined that there was a significant difference in the respiratory muscle strength parameter (MIP) in favor of the post-test. Possible mechanisms for the significant difference obtained here can be explained as follows: The control group could not achieve a sufficient level of motivational test concentration during the pre-test. Thus, this may cause the pre-test data to be deficient compared to the data obtained in the post-test. Another mechanism can be that the individuals in the control group were physiologically more ready during the post-test measurement than the pre-test and felt better during the post-test. In terms of respiratory functions, the significant difference in TV (tidal volume) capacity in favor of the last test can be explained by this parallel. However, no significant change occurred in the control group when the change in the pre-and post-test was analyzed both as a percentage and as average values.

When the changes in respiratory muscle strength were examined in general, significant changes were realized in favor of the IMT-DF group in both the pre-posttest and the difference and percentage differences between the tests. In respiratory functions, along with the changes in some parameters in IMT-SHAM and control groups, a significant change was observed in FEV1 in favor of the post-test in the IMT group. Many studies have been conducted on respiratory functions and muscle strength, including strengthening and breathing exercises for respiratory muscles (6, 15-17, 21, 22). However, it has been observed that the respiratory muscle exercises performed by consciously focusing on the diaphragm muscle were either not mentioned, or it is thought that the studies were performed by ignoring that correct and effective breathing should be performed diaphragm centered (8, 11, 14, 15). There are studies in which significant changes in respiratory muscle strength and respiratory functions have been recorded, especially in the patient (e.g., COPD) and disabled (e.g., Down Syndrome) groups, where significant improvements have been recorded to alleviate the adverse outcomes of disability and disease (1, 23). Although the studies show that significant and significant changes have been made in these parameters, it has been observed that no attention has been drawn to diaphragm-focused conscious breathing. In our study, diaphragm-focused inspiratory muscle training positively affected respiratory muscle strength and function. It is known that this positive and significant change is due to the increase in the contraction and relaxation capacity of the respiratory muscles, especially the diaphragm muscle (24). In addition, the significant change in respiration can be explained by physiological changes such as improved nervous conduction in respiratory muscles, increased contraction capacity, and increased metabolic enzyme activity required during contraction (25-27). Healthy skeletal muscles contribute to the control of many vital functions during breathing. These contributions are significant because the input needed for life is provided chiefly by the airway and respiration (28). Muscle strength and functions will be positively affected as the performance increase provided consciously in respiratory muscles provides significant changes in the respiratory tract (29). When current studies are examined, it is shown that respiratory training or respiratory training significantly affects respiratory functions in patients, disabled, and healthy groups (17, 30-33). However, as mentioned before, it has not been reported that inspiratory muscle training was performed consciously with a focusing the diaphragm. Our study shows that conscious inspiratory muscle training focused on the diaphragm muscle significantly changes muscle strength and function. There are several limitations in this study. The first limitation of this study is that the sample does not consist of athletes. The second limitation is that the number of study group participants is insufficient. Therefore, in future studies, the application of the diaphragm-focused breathing exercise technique, especially in sports branches where respiratory muscle strength comes to the force (swimming, diving, underwater rugby, water polo), will play an essential role in further detailing this technique and making its application widespread.

CONCLUSION

In conclusion, as in our study, inspiratory muscle training can significantly affect respiratory function and muscle strength. The critical point to be emphasized in our study is that conscious respiratory muscle training focused on the diaphragm muscle can significantly affect respiratory muscle strength and function in healthy, sedentary individuals.

APPLICABLE REMARKS

- Although breathing plays a crucial part in sportive performance, insufficient scientific information exists to paint a complete and accurate picture of how it works.
- The study's findings imply that diaphragm-specific respiratory muscle exercise affects healthy individual's ability to use their respiratory muscles and their strength.
- These findings are essential in supporting the development and popularization of new training methods that can contribute to sports performance by integrating the diaphragm-focused technique into respiratory muscle training.

AUTHORS' CONTRIBUTIONS

Study concept and design: Mehmet Vural, Mustafa Ozdal. Acquisition of data: M. Berk Demiryol, C. Didem Eyipinar. Analysis and interpretation of data: Mehmet Vural, Mustafa Ozdal. Drafting the manuscript: Mehmet Vural, M. Berk Demiryol, C. Didem Eyipinar. Critical revision of the manuscript for important intellectual content: Mustafa Ozdal. Statistical analysis: Mehmet Vural, Mustafa Ozdal. Administrative, technical, and material support: Mustafa Ozdal. Study supervision: Mustafa Ozdal.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

ETHICAL CONSIDERATION

The study was conducted under the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) Gaziantep University Social and Human Sciences Ethics Committee (protocol code 361976/10 and date: 11.09.2023 of approval)."

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ROLE OF THE SPONSOR

The funding organizations are public institutions and had no role in the design and conduct of the study.

FINANCIAL DISCLOSURE

All authors declare that they have no financial interests related to the material in the manuscript.

ARTIFICIAL INTELLIGENCE (AI) USE

AI was not used to prepare or write any part of our manuscript.

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