

The Effect of Pilates Exercise with Sage Herbal Consumption on Respiratory Functions for Soccer Players

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Abstract Sage herbal is an evergreen subshrub that is native to the Mediterranean region. Recent studies have demonstrated that *Salvia* consumption may improve symptoms associated with lung and sinus disorders. The effect of Sage consumption on respiratory parameters in healthy athletic populations is not clear. **Purpose:** The purpose of the study was to assess the effects of Pilates training conjugated with the drinking of Sage herbal on the respiratory function of young soccer players. **Method:** The analysis is based on baseline measurements of 40 healthy soccer players were (age $17.48 \pm 0.82y$, mass 64.19 ± 6.44 Kg, BMI 22.8 ± 2.54 , Kg/M², height 174.4 ± 3.91 cm and competitive experience 6.81 ± 1.24 y). The experimental group was 21 players. In contrast, the control group was 19 players. The experimental group participants consumed 60-70 ML of cold *Salvia* after boiling twice a day with aerobic exercises for 6-weeks. Dependent measures were taken immediately before (pretest) and after (posttest) the 6-week period and included vital capacity (VC), inspiratory vital capacity (IVC), peak expiratory flow (PEF), forced vital capacity (FVC), forced expiratory volume (FEV₁). **Results:** There were differences between pre-test and post-test values for the experimental group in all measures ($p < 0.05$) except FEV₁/FVC and FEV₁/VC ($p < 0.53$). For example, VC post-test values were 15% greater than pre-test values (4.88 ± 1.15 vs 5.62 ± 0.72) and IVC post-test values were 14% greater than pre-test values (4.45 ± 1.18 vs 5.06 ± 0.64). A similar observation was made for FVC, PEF, and FEV₁ values. In Addition to, there were differences between post-tests of the experimental group and control group ($p < 0.53$) in VC, IVC, FVC, FEV₁ PEF and MEF₅₀. **Conclusion:** There are limited studies over the effect of Sage on respiratory function in athletes. The results indicate that healthy athletic soccer players who consume herbal Sage for 6-weeks improve respiratory functions as evidenced by greater VC, IVC, and FVC values during posttest than pretest. Moreover, these results are encouraging and suggest drinking the *salvia officinalis* may help in long aerobic activities.

Keywords: *sage herbal, salvia officinalis, respiratory function, pilates exercise*

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1. Introduction

Sage herbal or *Salvia Officinalis* is an evergreen subshrub that is native to the Mediterranean region. Recent studies have demonstrated that sage consumption may improve symptoms associated with lung and sinus disorders.

Salvia officinalis is a traditional treatment for lung disorders as well as sinusitis, sore, throats and coughs which are used in traditional medicine in European countries [1]. In addition, the essential oil and infusion of *Salvia officinalis* leaves have been widely applied in traditional medicine since ancient times and nowadays subjected to extensive research of their antibacterial, antiviral and cytotoxic properties [2]. While, *Salvia* is one

of the most popular plants among herbal clients. People prefer plants like Sage herbal, *Juniperus drupacea*, *Rumex crispus*, and *Sideritis perfoliata* as medication for coughing, digestive disorders, and urological and gynecological diseases, while the customers of herb shops use them in treatments relating to respiratory and digestive systems [3]. Regardless of the popularity of *Salvia*, the rationale for using *salvia* is its content in thujone and camphor, and because the biological properties of the sage oil are mainly attributable to camphor, 1, 8-cineole and α - and β -thujone. Furthermore, the essential oils of Albanian sage possess a significant anti-inflammatory effect and improve lung function [4]. There is a growing debate regarding the use of *Salvia* as a natural medicine for lung problems and respiratory function. This research handled the role of *salvia* in the activity of the respiratory system. The effects of Sage herbal with Pilates training on

pulmonary function are poorly understood unless one study represented the benefits of drinking salvia officinalis with aerobic exercises on the respiratory function [5].

Several medical approaches have been recommended to improve respiratory function. Human lungs are vital organs that delivers oxygen to the red blood cells, remove carbon dioxide and expel it into the environment [6,7,8]. The effect of Sage consumption on respiratory parameters in healthy athletic populations is not clear. So current study will focus on respiratory function because it's heavily impact on the vital functions during physical exertion, especially on the cardiovascular system. Additionally, the best measurements for the respiratory function which have been used before with Pilates training in several researches was Forced vital capacity (FVC) and Forced expiratory volume (FEV) [9,10]. Moreover, Vital capacity (VC), Peak Expiratory Flow (PEF) and the Maximum expiratory flow (MEF) [11,12] consequently, the recent research will base on these measurements.

Several studies have demonstrated the effect of Pilates training on pulmonary function. Pilates exercises seem to be idoneous stimuli for improving the respiratory function. [13]. Some studies reported The improvement in respiratory muscle and lung function, after evaluating the effects of different Pilates exercise protocols on patients with cystic fibrosis [14], in healthy subjects [15], healthy women [16], and in athletes [17]. In Pilates method, several muscles are activated, including the muscles involved in breathing, especially to improve the expiratory function, which remains contracted during the inspiratory and expiratory phase [9,12].

Soccer is an aerobic sport characterized by different types of effort. Indeed, elite soccer players need healthy lung functions to run approximately 10-12 km throughout the 90-minute duration of the game [18]. As such this

research aims to assess the effects of Pilates training conjugated with the drinking of Sage herbal on the respiratory function of young soccer players.

2. Method

2.1. Design

This study used experimental research design. The participants were assigned randomly to two groups. The experimental group performed two tasks. First is drinking cold Sage herbal after boiling twice a day. The second task is practicing the Pilates exercises program. On the other hand, the control group did the Pilates exercises only.

2.2. Subjects

After receiving ethics committee approval from Damietta University and Department of sports health sciences. 40 subjects (21 experimental group and 19 control group) gave written consent to involve in this study. All subjects received form contained the benefits of Salvia herb and the Pilates program. Moreover, they didn't mind to cooperate in this study and stated that they hadn't any lung diseases or breathing disorders. The analysis is based on baseline measurements of 40 healthy elite soccer players were asked to participate in this study, aged 16-18 (mean age $17.48 \pm 0.82y$, Mass 64.19 ± 6.44 Kg, BMI 22.8 ± 2.54 , Kg/M², Height 174.4 ± 3.91 cm and training experience 6.81 ± 1.24 y). They collected from two clubs. The measurement had been collected through each of the participants separately. The age, training age status of each interview were recorded.

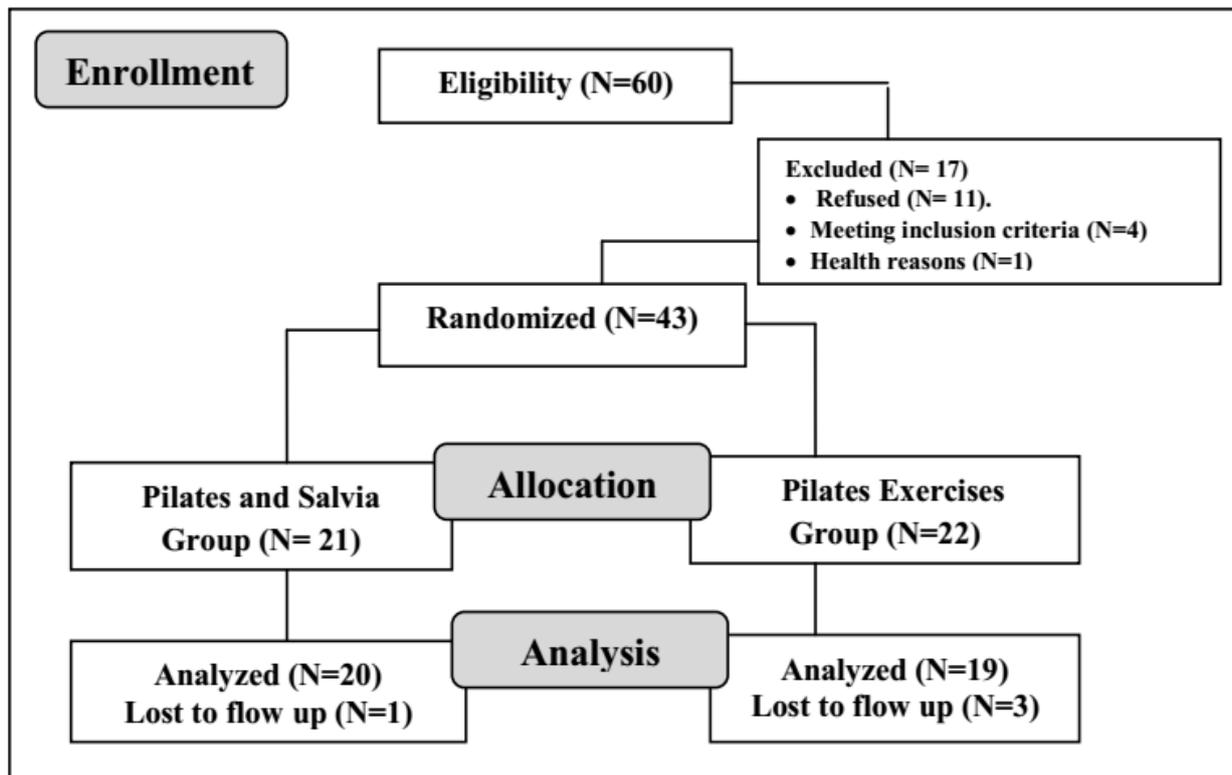


Figure 1. The subjects design

2.3. Pilates Training Program

The exercise consisted of progressive isotonic Pilates training and kinetic Pilates training. The Pilates program has been spent (6) Weeks, at a rate of (4) units per week for 35-40 minutes in each unit. After having completed a 5–10 min warm up one specific warm-up was performed for each exercise followed by 2–3 sets of static stretching for specific muscle groups. Furthermore, training intensity was set at 70-90% of 1RM. The first 2 weeks of the training intervention required participants to complete all sessions and exercises at 70% 1RM for 4 sets of 10 repetitions. The following 2 weeks of the intervention were completed at an intensity of 80% 1RM for 4 sets of 8 repetitions. The last 2 weeks of the intervention were completed at an intensity of 90% 1RM for 6 sets of 6 repetitions.

2.4. Drinking Sage Herbal

The 21 participants in the experimental group consumed 60-70 ML cold Sage herb after it was boiled. The Sage has been boiled by the researchers and has been drunk twice a day and 4 times each week on each training day of the Pilates exercises for 6-weeks. The first time 2 hours before practicing the Pilates program and the second time 30 minutes after finishing the training. The researches chose this times design for drinking to ensured that consumption of *Salvia* occurred under the supervision and flowed the rules of the study.

2.5. Statistical Analysis

The paired t-test was used to determine whether the differences between the samples were significant at the $p < 0.05$ level. All the analyses were performed by using SPSS 21 software. Using 2×1 repeated measures Analysis of Variance (ANOVA).

2.6. Measurements

All measurements in post and pre-tests had been taken by Geratherm Respiratory GmbH. The measurements in this research were Vital capacity (VC): the volume change of the lung between a full inspiration and a maximal expiration. Inspiratory Vital Capacity (IVC) The volume change of the lung between a maximal expiration to residual volume and a full inspiration to total lung capacity. The inspiratory vital capacity is assessed during an inspiratory maneuver, which is not performed forcefully. Peak Expiratory Flow (PEF) it measures how

much air you can exhale when you try your hardest. Forced vital capacity (FVC) measures the amount of air you can exhale with force after you inhale as deeply as possible. Forced expiratory volume (FEV1). measures the amount of air exhaled with force in one breath at 1st second. Maximum expiratory flow (MEF) 25%, 50% and 75% measures the air flow halfway through an exhale. (FEV1/VC %) measures the volume exhaled during the first second of a forced expiratory maneuver started from the level of total lung capacity.

3. Results

Table 1 represents that there were differences between the posttests of the experimental group and the control group in some measures of respiratory function in VC, IVC, FCV, FEV1 and PEF. In contrast, there were differences in FEV1/FVC, FEV1/VC, MEF75 and MEF25 ($p < 0.05$) For instance, VC post-test values of experimental group were 5.3% greater than post-test values of control group (5.62 ± 0.72 vs 5.32 ± 0.63), IVC post-test values of experimental group were 2.7% greater than post-test values of control group (5.06 ± 0.46 vs 4.93 ± 0.55), FVC post-test values of experimental group were 6% greater than post-test values of control group (4.96 ± 0.52 vs 4.66 ± 0.42), FEV1 post-test values of experimental group were 7.5% greater than post-test values of control group (3.98 ± 0.52 vs 3.68 ± 0.45), PEF post-test values of experimental group were 5.4% greater than post-test values of control group (5.75 ± 2.02 vs 5.44 ± 1.87) and MEF50 post-test values of experimental group were 4% greater than post-test values of control group (4.61 ± 1.21 vs 4.45 ± 1.13). Likewise, there were significant differences between the pretests and post-testes ($p < 0.05$) of the experimental group in all of the measurements except FEV1/FVC and FEV1/VC ($p < 0.05$). Moreover, VC 5.62 ± 0.72 advance, 15.2 %, IVC 5.06 ± 0.64 advanced 13,7 %, FEV1 3.98 ± 0.56 24.8% advance, FVC 4.96 ± 0.52 advanced 14.55%, PEF 5.75 ± 2.02 advance, 23.7%, MEF25 2.76 ± 0.71 advance, 24.9%, MEF50 4.61 ± 1.21 with advance 21.6%, and MEF75 5.11 ± 2.09 with advance 23.7 %. Addition, there weren't statistically significant differences between the pretests and post-testes ($p < 0.05$) of the control group for the measurements FVC, FEV1, FEV1/VC, FEV1/VC, MEF25. However, there were significant difference in VC advance 10.6 %, IVC advance 11,3 %, PEF advance 16.5%, MEF50 advance 23.6% and MEF 75 is 21.2 %.

Table 1. Measurements of respiratory function for the experimental and control groups

Variables	Unit	experimental group (N=21)			Control group (N=19)		
		Pre- Test	Post- Test	Advance	Pre- Test	Post- Test	Advance
VC	L	4.88± 1.15	5.62± 0.72	15.2 %	4.81 ±1.19	5.32 ±0.63	10.6 %
IVC	L	4.45 ±1.18	5.06± 0.64	13.7%	4.43 ±1.18	4.93 ±0.55	11.3 %
FVC	L	4.33± 1.14	4.96 ±0.52	14.54 %	4.39 ±1.12	4.66 ±0.42	6.2 %
FEV1	L	3.19± 0.94	3.98 ±0.56	24.8 %	3.17 ±0.91	3.68 ±0.45	16.1 %
FEV1/FVC	%	73.5 ±12.5	81.6 ±10.5	9.7 %	72.2 ±12.1	79 ±9.75	9.4 %
FEV1/VC	%	65.6 ±12.23	71.2 ±10.8	7 %	65.9 ±11.7	69.2± 9.58	5.01 %
PEF	L/S	4.65± 2.02	5.75 ±2.02	23.7%	4.67 ±2.15	5.44 ±1.87	16.5 %
MEF75	L/S	4.02± 2.07	5.11 ±2.09	22.64 %	4.11 ±2.1	5± 2.14 ±	21.2 %
MEF50	L/S	3.8± 1.38	4.61 ±1.21	21.3 %	3.6 ±1.42	4.45± 1.13	23.6 %
MEF25	L/S	2.21± 0.84	2.76 ±0.71	24.9 %	2.23 ±0.79	2.6± 0.66	%

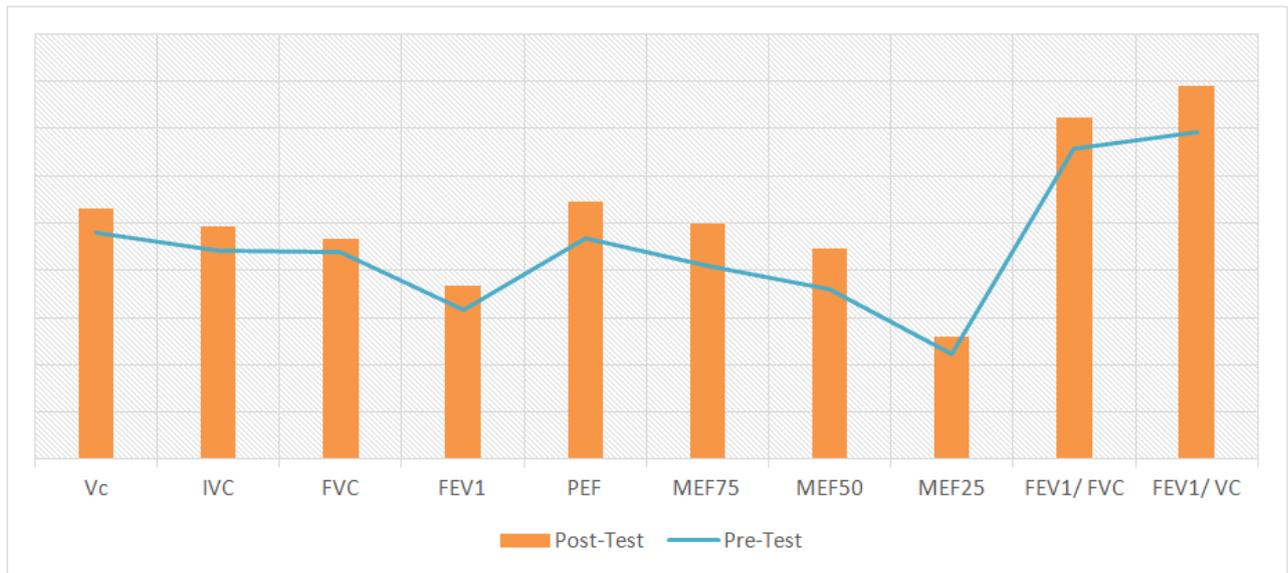


Figure 2. The advanced of respiratory function for the control group

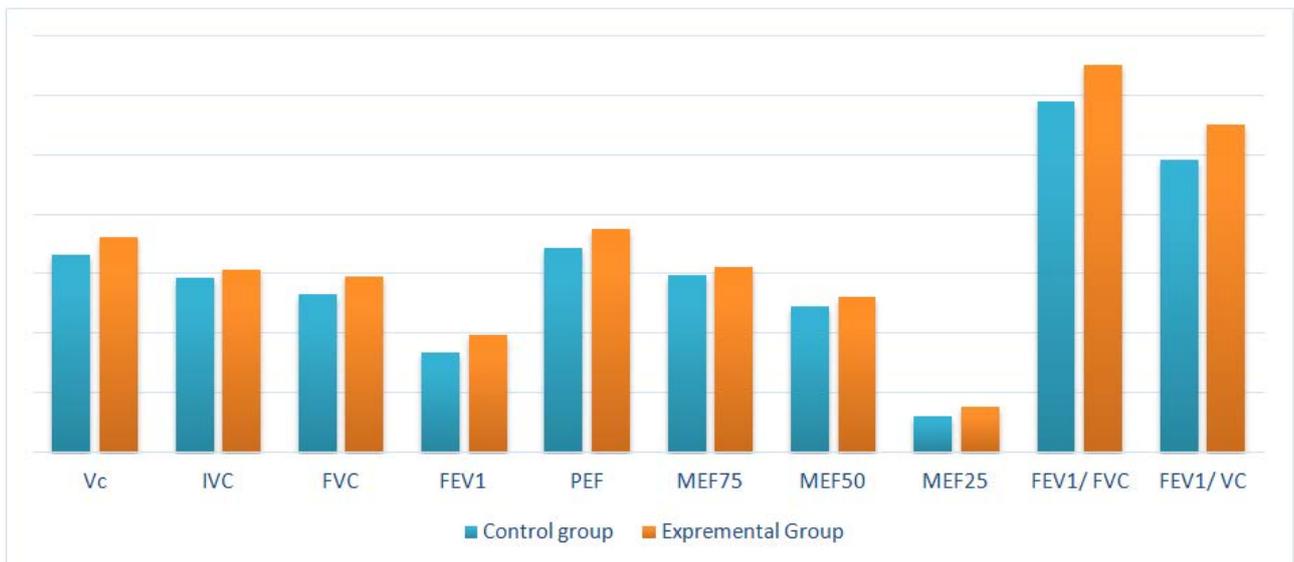


Figure 3. different between experimental and control groups in the post-tests

4. Discussion

The Figure 2 and Table 1 reflect the advances in respiratory system function for the experimental and control group which participated a Pilates training only. This explains that Pilates exercises have effects in lung function and breathing, through using many approaches, emphasizing the improvement of both lung function and muscles while breathing [13,19]. Pilates can be effective for improving chest capacity, expansion, and lung volume [20]. Several studies have investigated the role of Pilates exercises to improve the respiratory function, abdominal muscles and respiratory muscles [9,21,22]. According to previous results, there isn't a big effect of Pilates exercises on the FVC and FEV. Additionally, increased normally in some lung function such as FVC, FEV, FEV1/FVC and FEV1/VC [9,10]. Another study demonstrated that the increase in PEF is a response to the Pilates training [23]. On the other hand, some studies reported that lung function does not change during respiratory muscle training [24].

The present study found a big increase in some amusements for the respiratory system VC, IVC, FVC, PEF, and MEF. By contrast, there are results that confirmed the role of Pilates exercise in encashment the VC and PEF [11]. Our results demonstrated a greater increase, in the respiratory function than was observed in similar studies, perhaps due to our protocol, which included a higher number of exercises than other studies. Furthermore, the intensity of the exercises was between 70-90% 1RM. The increase in lung function during respiratory muscles training would occur only with high training loads (80% MIP) [25]. Up to the present moment, there are not many reports of an improvement in respiratory function due to drinking salvia with exercises except one study handled the effect of drinking salvia officinalis with aerobic exercises and verified that cardiovascular function was improved expressed by VO2 max enhancement and improvement of respiratory system function [5]. The Present study presents the benefits of drinking salvia with Pilates exercises for athletics and the improvement of respiratory function as well as the

performance of elites' soccer player. Whereas, the Sage herbal had a great effect on Systolic blood pressure, diastolic blood pressure, respiratory function, and salivary cortisol [26]. Additionally, The Figure 3 and Table 1 represent the differences between the experimental and control groups in the post-tests. We can see the measurements of the experimental group it better than the control group which in all of the respiratory function. That illustrates the benefits of Salvia Officinalis. Whereas, the rich aromatic properties arising from Salvia's volatile oils contain several respiratory stimuli. and contains (cis-thujone, camphor, trans-thujone, 1,8-cineole, b-pinene, camphene, borneol, and bornyl acetate) Addition all of this stimulis have been used in the medical drugs for the respiratory disorders [27,28]. Previous in vitro studies compared herbal medicine including Panax ginseng and Salvia with a conventional treatment (Ambroxol tablet) and reported no difference between the groups [29]. The rationale for the use of Salvia is believing that it's oil contains the volatile compounds seemed to be more effective than rosmarinic acid. 1,8-Cineole, borneol, camphor, and α - β -thujone chiefly contribute to the anti-inflammatory activity and enhancement the respiratory function [30].

Sage herbal essential oil caused significant growth inhibition in both cell lines, compared with respective controls. Salvia officinalis could represent an important source of substances with antiproliferative activity and could improve the lung function and the treatment of lung cancer disease [31].

5. Conclusion

In conclusion, there are limited studies on the effect of Sage herbal on respiratory function in athletes. The results indicate that healthy athletic soccer players who consume herbal Sage for 6-weeks improve respiratory parameters as evidenced by greater VC, IVC, and FVC values during posttest than pretest. Moreover, these results are encouraging and suggest drinking the Sage herbal may help in long aerobic activities and reduce the inflammation of lung after high-intensity training. Addition to, this paper explains that Pilates exercises has a big effect on the lung function and breathing. Generally, the effects of Pilates exercises in lung function recommended in athletes training.

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