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EFFECTS OF BREATHING TECHNIQUES ON PROFESSIONAL SINGERS AND PATIENTS WITH RESPIRATORY DISEASES

NEFES TEKNİKLERİNİN PROFESYONEL ŞARKICILAR VE SOLUNUM YOLU HASTALARI ÜZERİNDEKİ ETKİLERİ

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Absract

Respiratory system is the main section of vocal production and singing. Breathing as an involuntary muscle movement is the most essential factor of life. Its mechanism is dependent on air moving in and out of the lungs in response to pressure differences between the lungs and the atmosphere. If the air pressure within the alveolar spaces falls below atmospheric pressure, inspiration occurs with the air entering the lungs. If the air pressure within the alveoli exceeds atmospheric pressure, expiration occurs with air blown out of the lungs. During normal breathing, inspiration occurs as the diaphragm muscle contracts downward, increasing the thoracic cavity. The external intercostal muscles contract, too, expanding the rib cage. Normal breathing expiration occurs passively, while diaphragm and intercostal muscles relax. Forced breathing can occur during exercise or during actions which need active manipulation of breathing, such as singing. In forced breathing, both inspiration and expiration are done actively via contraction of the breathing muscles. In general, breathing patterns may change according to the physical activity, emotional conditions as well as health situation. In this paper, respiratory system and breathing mechanisms are explained, and studies involving the relationship between breath and singing are investigated and analyzed. According to the results, efficient larynx productivity via phonation requires a correct posture and efficient breathing. These factors also reduce tension in the vocal tract and help to provide good resonance. The singer needs to control the sounds she/he produces as well as a qualified breath support. The coordination of the singing muscles should be applied with the guidance of a good singing teacher or a professional of breathing techniques. Singing therapies had good results on patients with respiratory diseases. They developed better breathing control mechanisms and physical functioning via singing exercises. The professionals may provide different imageries according to the age and the condition of the singer/patient. During breath management teaching, constant flow of air concept may be suggested instead of using the support concept in order to decrease the tension and stress on the muscles. Further studies are recommended with longer periods of breathing and singing lessons at private sessions for better evaluations.

Keywords: Breath, Respiration, Lung, Singing, Respiratory Diseases

Öz

Solunum sistemi ses üretimi ve şan tekniğinin temel sistemidir. İstemsiz bir kas hareketi olarak solunum hayatın en önemli unsurudur. Mekanizması, akciğerler ve atmosfer arasındaki basınç farkından dolayı havanın akciğerlere girişi ve çıkışına bağlıdır. Alveollerdeki hava basıncı atmosfer basıncının altına düşerse, akciğerlere hava girişiyle nefes alınır. Eğer alveollerdeki hava basıncı atmosferik basınçtan fazla olursa, akciğerlerden hava çıkışıyla birlikte nefes verilir. Normal/istirahat solunumu sırasında, nefes alma işlemi diyafram kasının aşağı doğru kasılmasıyla ve göğüs boşluğunu arttırmasıyla gerçekleşir. Dış interkostal kaslar da kasılarak göğüs kafesini genişletir. Normal solunumda nefes verme işlemi pasif olarak gerçekleşir, bu sırada diyafram ve interkostal kaslar gevşer. Konuşma ve şarkı solunumu spor yaparken ya da solunumun aktif olarak gerçekleştirilmesini gerektiren durumlarda oluşur. Bu solunum sırasında hem nefes alma hem de nefes verme işlemi solunum kasların kasılmasıyla gerçekleşir. Genel olarak solunum düzeni fiziksel aktiviteye, duygusal duruma ya da sağlık durumuna göre değişebilir. Bu makalede, solunum sistemi ve nefesin mekanizması açıklanıp, solunum ve şarkı söylemenin ilişkisini araştıran makaleler incelenmiş ve analiz edilmiştir. Bulgulara göre, etkili bir larenks fonskiyonu ve fonasyon doğru bir vücut duruşunu ve iyi bir solunumu gerektirir. Bu faktörler, aynı zamanda ses yolundaki gerilimi azaltır ve iyi bir rezonans sağlar. Şarkıcı ürettiği sesleri kontrol ederken etkili bir nefes desteğine ihtiyaç duyar. Şarkı söyleme kaslarının birbiriyle uyumunu sağlayabilmek için iyi bir şan eğitmeni ya da nefes teknikleri uzmanıyla çalışılmalıdır. Şarkı söyleme terapisi sayesinde solunum rahatsızlıkları olan hastalarda başarılı sonuçlar elde edilmiştir. Şan egzersizleri ile hastalarda daha iyi solunum kontrol mekanizmaları ve fiziksel iyileşme gözlenmiştir. Uzmanlar şarkıcının/hastanın yaşına ve durumuna göre çeşitli imgelemler geliştirebilirler. Solunum mekanizması öğretimi sırasında, kaslar üzerindeki gerginliği ve stresi azaltmak amacıyla destekleme konsepti yerine sürekli akış halindeki hava konsepti tavsiye edilebilir. Daha iyi değerlendirmeler yapabilmek adına, daha uzun süreli nefes ve şan dersleri ile gerçekleştirilen bire bir çalışmalar önerilir.

Anahtar Kelimeler: *Nefes, Solunum, Akciğer, Şan, Solunum Hastalıkları*

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INTRODUCTION

Respiratory system is a central section of voice production (Traser, *et al*., 2017: 69-77). Breathing is an involuntary muscle movement that the brain controls in order to supply oxygen throughout the body for life. Emotionally charged conditions, illness or physical activity may change the breathing patterns. A severe change in breathing may cause drastic pain, anxiety or discomfort in the individual. For individuals with compromised airways, breathing becomes a particular challenge (Wade, 2017: 7-8).

During phonation, the respiratory, pronator and resonator regions of the voice organ can interact. In this interaction, physiological action in one subsystem affects another one directly. Vocal tract adjustments may affect the voice source's behavior through nonlinear source-tract interactions. Moreover, the degree and type of vocal fold adduction controls the expiratory airflow rate. In addition to that, the tracheal pull, that the respiratory system causes, influences the vertical larynx position as well as the vocal tract resonances. Therefore, even in the presence of a clearly defined and isolated physiological target, functional voice building concerned with a specific voice subsystem may provide benefits or provoke side effects on other subsystems (Herbst, 2017: 13-19).

In much of the singing voice literature, breathing and support strategies are variable and non-specific. (Gordon and Reed, 2020: 243-249). There are almost as many methods and ideas about the right way of breathing for singing as there are voice teachers. These methods may vary from 'not thinking about breathing at all' to the most complicated understanding of the involved musculature and breath support. Manipulation of the muscles for proper breath support includes the use of intercostal muscles and pelvic muscles, expansion of the rib cage and raising the chest (Petersen, 2014). All these facts describe what happens when the singing is correct; not what one does to sing right. According to Stephen, the more one simply thinks about breathing, the better she/he will do it. For the right way of singing, the vocals must be clear, creating an intense muscular vibration. In order to balance that intensity, the breath flow must be free and continuous. One must not focus on the physiology of breathing excessively in order to sing properly (Stephen, 2007).

THE MECHANICS OF BREATHING

The breathing mechanism is dependent on air moving in and out of the lungs in response to pressure differences. Inspiration occurs with the air entering the lungs, when the air pressure within the alveolar spaces falls below atmospheric pressure. Expiration is blowing air from the lungs, in the case of air pressure within the alveoli exceeding atmospheric pressure. The rapidness or slowness of air flow depends on the magnitude of the pressure difference. Since the atmospheric pressure is relatively constant, the flow is decided by how much below or above atmospheric pressure the pressure within the lungs falls or rises. Figure 1 (Encyclopedia Britannica, 2006) shows the breathing mechanism; the chest expands with the ribs and the diaphragm contracts while breathing in air. In contradiction, during breathing out, the chest and the diaphragm relaxes (Encyclopedia Britannica, 2020).

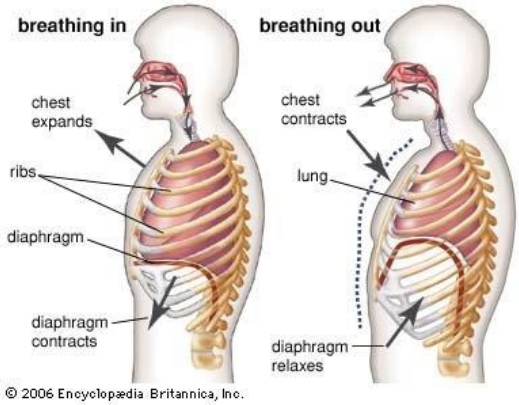

Figure 1: Breathing Mechanism (Encyclopedia Britannica, 2006).

The breathing mechanism is divided into two parts called the upper and lower respiratory systems. The upper system includes mouth, nose, pharynx, larynx and trachea, and the lower system includes bronchi and lungs (Wade, 2017: 7-8). Figure 2 shows these major respiratory structures,

functioning primarily to provide oxygen to body tissues for cellular respiration, to remove carbon dioxide as the waste product, and provide to maintain the acid-base balance. Some parts of the respiratory system involve in speech production, odor sensations straining and coughing (Boston College, 2020). Via the usage of expiratory and inspiratory neurons, breathing is controlled by the medulla oblongata. In the case of an inhalation need, inspiratory muscles such as diaphragm, scalene, external intercostals, sternomastoid and parasternal take a signal, causing the muscles to contract and move. Thus the lungs fill in with the air. In the case of resting, the neurons relax and the exhalation occurs. If there is a physical activity involvement, a signal is fired by the expiratory neurons in order to provide the body to take a deeper breath and trigger the expiratory muscles, such as internal and external obliques, internal intercostals, transverse abdominis and rectus abdominis. In order to alert the muscles to breathe, the brain is cued by the peripheral chemoreceptors in the aortic arch and carotid arteries. The brain is stimulated by these chemoreceptors to increase the volume or the rate of the breath. The central chemoreceptor is found near the brain and is able to sense carbon dioxide. Therefore, it can alert the brain in order to increase the frequency of breathing for the removal of carbon dioxide (Wade, 2017: 7-8).

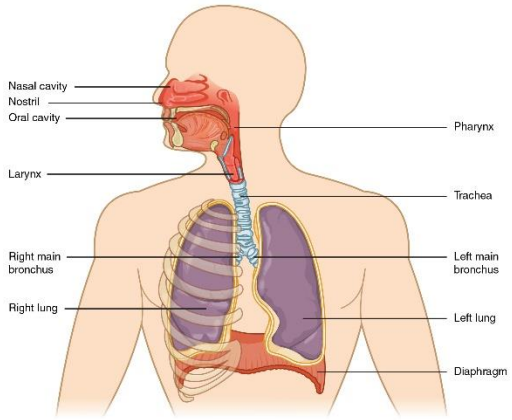

Figure 2: Major Respiratory Structures (Boston College, 2020).

ROLE OF THE BREATHING MUSCLES

The respiratory muscles add muscular contraction to displace the equilibrium of elastic forces in the chest and lung in one direction or the other. In the case of inspiration, in order to increase the traction on the lung required for its additional stretch, muscle contraction is included to the outward elastic force of the chest. The additional retraction of the lungs returns the system to the equilibrium position when the muscles relax. The abdominal muscle contraction adds an increased abdominal pressure to the retraction of the lungs, and thus displaces the equilibrium in the opposite direction. This condition raises the diaphragm and causes forceful expiration. During relaxation, the additional muscular force is removed and the original lung volume is restored. Ordinary or normal breathing involves muscular contraction only during respiration; elastic recoil of the lung provides expiration to be achieved 'passively' (Encyclopedia Britannica, 2006).

In other words, during normal breathing, muscular contraction is seen only in respiration. The diaphragm and the external intercostal muscles contract. A bigger breath causes additional muscles to be used. The contraction of the diaphragm means that it moves downward. Thus a larger thoracic cavity and more space are created for the lungs. The contraction of the external intercostal muscles moves the ribs downward and upward. Thus the rib cage expands, and the thoracic cavity volume increases. When the volume increases, intra-alveolar pressure decreases, meaning that atmospheric pressure is higher than the pressure inside the lungs. As a result, air is pulled into the lungs. Expiration in normal breathing occurs passively. It means that energy is not needed to push air out of the lungs. Diaphragm and intercostal muscles relax. The volume of the lungs and the thoracic cavity are decreased. This condition causes the interpulmonary pressure to rise above atmospheric pressure, thus the air leaves the lungs (ER Services, 2020).

Forced breathing can occur during actions requiring active manipulation of breathing, such as singing, or during exercise. In this case, both inspiration and expiration occur with contraction of the muscles. In addition to the diaphragm's and the intercostal muscles' contraction, other necessary muscles add to the total contraction. During forced inspiration, muscles of the neck, such as scalenes, contract and

lift the thoracic wall, thus increasing the volume of the lungs. Forced expiration, accessary muscles of the abdomen, such as the obliques, contract and force the abdominal organs pushing upward against the diaphragm muscle. Thus the diaphragm pushes up into the thorax, letting more air leave the lungs. Accessory muscles, mainly the internal intercostal muscles, compress the rib cage, reducing the volume of the thoracic cavity (ER Services, 2020).

LUNG DEVELOPMENT

Fetal lung development begins after four weeks of pregnancy. The last organs that complete the development are the lungs. Prematurely born infants may not have a surfactant to help their lungs' transition from working in the wet environment of the amniotic fluid to breathing oxygen in the dry environment outside the mother's womb. The surfactant provides that the lungs do not collapse and stick together. If the development in the womb is not provided enough, the infant suffers the negative impacts on long-term lung function (Burri, 2006: 313-322). Figure 3 shows a comparison of normal and collapsed alveolar tissues in the underdeveloped lung of premature infants due to the lack of surfactant. Deficiency of lung surfactant in premature newborns results with respiratory disease syndrome, which is also a leading cause of perinatal mortality (University of Hawaii at Manoa, 2009).

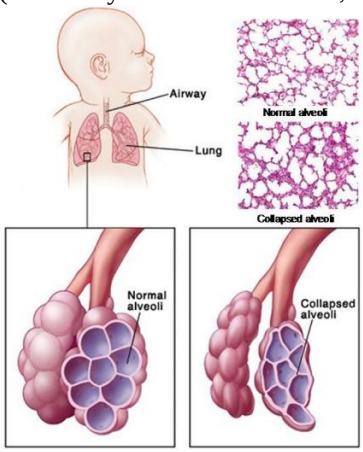

Figure 3: Lack of Surfactant in Premature Newborns (University of Hawaii at Manoa, 2009).

After birth, lung development proceeds. Small air sacs called alveoli actually make up the lungs, and the infants are not born with all of them improved. An increase in alveoli multiplying the gas exchange surface of the lungs up to twenty times is called alveolarization. The septa inside the alveoli has a double capillary network for allowing the expansion and development of new alveoli between the ages of six months to three years. Until the stage of adulthood, alveolar development continues. In the early stages of a possible damage, the lungs can regenerate with the help of the alveoli (Burri, 2006: 313-322). By the age of 22, the end of lung development is signaled by the maximum lung volume being reached and the single capillary network being formed (Stocks, *et al.*, 2013: 728-742).

LUNG INJURIES

During different stages of life, lung injury may occur in a variety of ways. The problems may occur in the utero, causing the development of the lungs be disrupted. Bronchitis, pneumonia or infection are some of the illnesses that can damage the lungs by causing scars (GOLD, 2015). During the development of the lungs in children, the function of the lungs may be damaged due to illness. Multiple and early exposures to lower respiratory tract infections may cause asthma (Harding and Maritz, 2012: 67-72). If the lung infections pneumonia and bronchitis repeat, they may lead scar tissue formation and long-term damage of the lungs. Later in life, the childhood exposures to these kind of infections may cause Chronic Obstructive Pulmonary Disease (Soriano, *et al*., 2009: 721-732).

Particulates such as dust may cause permanent problems of lung functioning (GOLD, 2015). Other particulates made up of liquids and solids are droplets, nitrates, sulfates, haze and smoke. There may be particulates that are smaller than 2.5 micrometers, being very dangerous due to the fact that they can be inhaled deeper in the body (EPA, 2015).

Smoking causes long-term damage in the lungs, as well as breathing difficulties (Wade, 2017: 9). Exposure to smoking may be varied such as exhaust from cars, second-hand smoke, forest fires, and indoor wood burning stoves for cooking (EPA, 2015). Smoking causes 9 out of 10 cases of chronic obstructive pulmonary disease (Wade, 2017: 9). Smoking is responsible from the paralysis and death of cilia in the lungs, as well as the reduction of the alveoli flexibility. Present in the lungs and the respiratory tract, cilia are small organelles moving in a sweeping mode in order to push the pollutants out of the lungs. They work in coordination with the mucous which traps the damaging material, as well as it reduces the disease or infection. The alveoli, which move oxygen into the bloodstream, are changed by smoking structurally. They cannot recoil back to their original size and the walls of the sacs are thinned. Thus, the distance between alveoli expand, oxygen exchange is disrupted and all these cause shortness of breath (American Lung Association, 2020).

METHOD

This study is a qualitative work, and involves literature review about respiratory system, singing and its relation to breath support. In a qualitative research, social facts are analyzed in their context to form theories. (Yıldırım, 2010). Literature review focuses on a specific topic by explaining the current knowledge about it, as well as surveying the literature and analyzing it critically (McCombes, 2019). The effects of breathing techniques, singing exercises and breath support on singers as well as patients with respiratory diseases were investigated.

RESULTS

In general, breathing generates the support to oral vocalization and communication. The speaker or the singer constantly tries to control their produced sounds and the breath support. In overall, speech and singing have the same pattern of a shorter inhalation followed by a longer exhalation with vocalization (Paroni, *et al*., 2019). During the development of singing voice, training of the breath use is one of the most important components. The coordination of the singing muscles is managed through the support of the singing teacher, who is also responsible from imagery creation related to breath. The imagery changes according to the age and training of the singing students. The throat muscles' tension should be minimalized via proper breath control (White, 1988: 26-29).

Speech problems which may be caused by different reasons harm patients psychologically and sociologically. The exercises which are used for breath and voice development can also be applied to cure voice problems (Çakan and Gülnihal, 2018: 50-63). In a study, voice training methods were applied to patients with vocal disorders by experts of the field. The patients had similar backgrounds such as using their voices often during their professional jobs excessively and usually with a wrong method. The results showed that vocal disorders such as vocal cord nodule and mutational falsetto can be treated with voice training exercises. The therapies should be at least 2-3 months in a regular basis in order to get more satisfactory results (Evren, 2006). In a similar study by Uğurtay, 23 patients with benign vocal fold lesions and 4 patients with bilateral vocal fold paralysis were applied with voice therapy for 3 months. The patients with vocal fold paralysis had their therapy after the cordotomy surgery. A significant improvement was observed at the patients with benign vocal fold lesions. The results pointed out that dysphonia can be treated effectively with an appropriate breath and voice treatment protocol (Uğurtay, 2006).

Voice pedagogues and voice scientists debate about how to teach breath management, especially about support concept (Kim, 2019). The Italian term *appoggio*, which is used to explain the idea of support, is the key concept of singers' breathing methods. It ensures maximal potentials of inhalation and exhalation, thus producing the optimal phonation (Han, 2018). The term 'support' is strongly objected by Smith, who suggests that the word promotes increased air pressure use. He uses an alternative instruction concept of constant flow of air rather than conventional singing instruction using the word support (Smith, 2007). Kim and her colleagues measured subglottal pressure, airflow rate and sound pressure level of 49 healthy participants who were given three instructions in randomized order. The first instruction as baseline was to sing the way as they usually do. The second was to allow their breaths to flow steadily with the clear 'a' vowels. The third was to keep the tone well supported with the clear 'a' vowels. The singing phrase included seven intonations of the syllable 'pa' to the tune of the song 'Somewhere Over the Rainbow'. The participants were asked to fill out a questionnaire asking them how they applied the second and the third instructions to their singing. According to the results, there were

significant differences in both subglottal pressure and sound pressure level between the second and the third instructions. In the second instruction, subglottal pressure and sound pressure level were lower than those of the third instruction. The participants wrote that the second instruction was 'free', 'easier', 'legato' and 'natural' compared to the third instruction. Thus it can be concluded that allowing the breath to flow steadily may help students' efficient singing without additional stress and tension (Kim, 2019).

Efficient larynx productivity is essential for singers. The correct posture and efficient breathing can reduce tension in the vocal tract and improve resonance. In a study, an integrated mind-body program designed to improve mental and physical fitness for musicians was determined if it has effects on the posture, efficacy, tension and respiratory function of singers. The fitness program included physical and yogic therapy, improvisation and mental exercises. In the study, 11 singers who took a college course over five semesters in five years participated. Muscle strength/flexibility, postural structure and an aerobic endurance test measurements were taken before and after the study. Other tests were done to measure physical and musical efficacy, mental fitness and improvisation, health-pain injury and motion recordings to analyze torso volume. According to the results of singers' physical examination, there was a significant improvement in the deep neck flexor strength test. 'Comfort in vocal technique' and 'composite body awareness' as physical and musical efficacy indicators showed positive changes. According to mental fitness and improvisation tests, significant changes were observed in 'satisfaction with environment while improvising', 'imagery in favorite music' and 'time spent in emptying the mind'. According to motion analysis, there was a shift from the chest to abdominal breathing, and breathing volume increased (Lopez, *et al.*, 2020: 111-125).

According to another study, five professional opera singers' rib cage and abdominal motions were recorded, and acoustic output was measured. The singers performed an aria recorded with two levels of voice projection. In the case of greater projection, it was observed that there was a significant increase in the acoustic power in the frequency band 2-4 kHz, relative to the power in the 0-2 kHz band. Moreover, the mean expiratory flow decreased, pointing out that there was a move to more efficient vocalization with a greater projection. The greater projection condition had a larger rib cage result, especially in the lateral dimension, with only a small decrease in the abdominal lateral dimension. It showed that the greater abdominal support needed for a larger projection is acquired by increased activation of abdominal muscles in the medial direction (Thorpe, *et al.*, 2001: 86-104).

In order to fully understand the mechanism of normal breathing or underlying functional relations between rib cage and diaphragm compared to singing, respiratory dynamics in breathing and phonation were compared vie dynamic MRI of the lung in a study by Traser and his colleagues. 6 professional singers' images were captured during vital capacity breathing, and maximal length of sustained phonation at three different pitches and volumes. Distances between characteristic anatomical landmarks of the lungs were measured. In normal breathing exhalation, the rib cage and the diaphragm moves synchronously in order to reduce the lung volume. However, different functional units were identified during phonation, supporting it by facilitating the control of subglottic pressure. In short, it was found out that breathing and phonation have different kinematic behaviors, and singers tend to contract their lung muscles more efficiently during phonation compared to exhalation (Traser, *et al.*, 2017: 69-77).

Suggestion of exercises for the development of correct breathing in singing is very crucial especially in the case of children. Davidova and her colleagues tried to come up with information about the coordination between musical hearing and vocal apparatus of 6-8 year-old children during the process of singing. They formulated the development of children's breathing for singing in three areas: breath support, formation of the sensation of inhalation and exhalation, and breath energy (Davidova, *et al.*, 2017: 111-121). In this case, teachers' usage of imagery plays an important role since children learn better via making a story out of a functional mechanism.

In the case of musculature support, many studies look at musculature utilized in respiration, breath support and subglottal pressure generation. Pelvic floor was not mentioned or mentioned little in many studies. According to the physical medicine literature, pelvic floor musculature has an essential role in respiration. Being a primary expiratory muscle, it plays a key role in the intra-abdominal pressure generation. Gordon and Reed suggests that cooperation studies between physical medicine and voice literature should be done in order to search for the importance of pelvic floor in singing (Gordon and Reed, 2020: 243-249).

Singing can be used as an add-on-therapy for respiratory diseases. Best results can be procured after long-term studies. The singing teacher and the patients' strong relationship as well as group lessons

providing for the social interaction need and support, facilitates treatment. After a series of singing lessons, positive physical outcomes and quality of life were observed at people suffering from respiratory health problems such as asthma, chronic obstructive pulmonary disease, Parkinson disease, multiple sclerosis, cancer, cystic fibrosis and quadriplegia. Some studies show that overall breathing technique and maximum expiratory pressure improve after singing lessons. Many participants expressed that singing was an effective therapy improving their mood and giving them joy, as well as teaching them breathing and its control. Singing lessons were good exercises for their lungs, and helped their physical functioning (Goldenberg, 2018: 85-94) According to another study, the value of singing for breathing, especially for patients with chronic obstructive pulmonary disease was investigated. Three controlled trials showed that the patients enjoyed singing and reported that their health status improved. However, exercise capability and lung function did not have a significant improvement (Clift and Gilbert, 2016).

There are other studies focusing on singing which provides additional advantages to respiratory and voice therapies. They have a greater emphasis on the respiratory muscle control system in the progresses of patients with Parkinson's disease (PD). A study examined the effects of singing on voice, quality of life and respiratory pressure at 27 participants with PD. Participants were assigned to a high or low dosage group of meeting twice or once weekly, respectively. Before and after an 8-week singing intervention, the measures of voice, respiratory pressure and quality of life were recorded. Sessions led by music therapists consisted of a series of group singing, and vocal and articulation exercises. According to the results, both groups showed significant improvements in phonation time, maximum inspiratory and expiratory pressures as well as quality of voice and life. As a conclusion, singing is an engaging and helpful treatment choice for the improvement and maintaining of respiratory pressure and vocal function at patients with PD (Stegemöller, *et al*., 2017: 594-600).

CONCLUSION AND DISCUSSION

Respiratory system is the one of the most essential systems in the body, providing the oxygen-carbon dioxide exchange in the lungs. The relationship between the lungs and the atmospheric pressure regulates the inspiration and expiration mechanism. Breathing is crucial for vocalization and communication processes. The singer or the speaker need to control the sounds produced via breath support. During speech and singing, a short inhalation is followed by a longer period of exhalation with vocalization. Singing voice development needs a good training of breath support. The coordination of the breathing muscles should be improved via the help of the professionals. In this paper, the effects of breathing and singing techniques and breathing support on singers as well as patients with respiratory diseases were searched. Many investigations were done in order to evaluate the effect of breathing on singing or singing on breath mechanism. In short, both affect the development of each other. For a healthy larynx productivity, one needs to have a correct posture and well breathing technique. Thus, the vocal tract tension is decreased and a good sound of resonance is provided. Patients with respiratory diseases had better breathing control and physical conditions via singing lesson therapies. During breath management teaching, constant flow of air concept may be suggested instead of using the support concept in order to decrease the tension and stress on the muscles. Further research is suggested to be done via applying different techniques of breathing exercises with private lessons as well as group lessons, in order to evaluate their effect on healthy lungs or lungs with diseases. Longer periods of studies are recommended to get more efficient results.

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