T.C.

YEDITEPE UNIVERSITY

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DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION

THE EFFECTS OF CORE STABILIZATION EXERCISES ON RESPIRATORY FUNCTIONS, TRUNK MUSCLE ENDURANCE AND POSTURAL STABILIZATION IN INDIVIDUALS TAKING BASIC ACTING EDUCATION

MASTER THESIS

HELIN DICLE CELIK, PT

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ADVISER

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This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated 28/01/2021 and numbered 2021-01-53.

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Director of Institute of Health Science

DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

Helin Dicle ÇELİK

DEDICATION

I would like to dedicate my thesis to my beloved parents…

ACKNOWLEDGEMENT

I would like to express my sincere appreciation to all those who provided me the opportunity to complete this report. A special gratitude I give to my advisor, Asst. Prof. Şule BADILLI DEMİRBAŞ who has contributed to this project with her guidance and encouraged me with her support whenever I need.

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LIST OF SYMBOLS/ABBREVIATIONS

ANT: Anterior

ATS: American Thoracic Society

BMI: Body Mass Index

CG: Control Group

CKC: Closed Kinetic Chain

CNS: Central Nervous System

CSE: Core Stabilization Exercises

EG: Exercise Group

EXT: External

ERS: European Respiratory Society

FBT: Flamingo Balance Test

FEV1: Forced Expiratory Volume at 1st Second

FTET: Fleksor Trunk Endurance Test

FVC: Forced Vital Capacity

IAB: Intra-Abdominal Pressure

IAP: Internal Abdominal Pressure

INT: Internal

MD: Mean Difference

OKC: Open Kinetic Chain

PEF: Peak Expiratory Flow Rate

PM: Posteromedial

PL: Posterolateral

RFT: Respiratory Function Test

SEBT: Star Excursion Balance Test

SIAS: Spina Iliaca Anterior Superior

SD: Standart Deviation

SPSS: Statistical Package for Social Science

TrA: Transversus Abdominis

YBT: Y Balance Test

Δ : Post Variables minus Pre Variables

° : degree

m : meter

maks : maksimum

mg : miligram

min : minimum

p : the level of significance

x: mean

ABSTRACT

Çelik, H. (2020). The Effects of Core Stabilization Exercises on Respiratory Functions, Trunk Muscle Endurance and Postural Stabilization in Individuals Taking Basic Acting Education, Yeditepe University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, Master Thesis. Istanbul.

The aim of the study is to investigate the effects of a 8-week, core stabilization exercise program on respiratory functions, muscle trunk endurance and postural stabilization in individuals taking basic acting education. The study included 31 volunteer healthy actor candidate (18F, 13M; 27.17±6.02 years) who are taking basic acting education at DC Kozmos Art Academy between June 2020 - October 2020. The respiratory functions were assessed by the spirometer. Trunk muscle endurance was assessed by Fleksor Trunk Endurance Test (FTET), Biering Sorenson Test (BST) and Lateral Bridge Test (LBT). Postural stabilization was evaluated by Flamingo Balance Test (FBT) and Y Balance Test (YBT). The participants were randomly divided into two groups as Exercise Group (EG) (n=15) and Control Group (CG) (n=16). Both people in EG and CG were taken diaphragmatic training program according to BAE. The core stabilization exercise program was administered for EG, twice a week, 45 minutes a day and for a 8-week duration while CG was only evaluated in the begginning and at the end of the study. According to the main results of this study comparing two groups, EG and CG showed greater improvement in FEV1, FVC and PEF parameters, ($p<0.05$ for both EG and CG). EG showed statistically difference in FTET, BST and LBT while CG had improvement in only LBT($P<0.05$). In FBT and YBT, EG had significant improvement while CG had only enhancement in right anterior and posteromedial side in YBT. Consistent with the hypothesis, our findings suggest that the core stabilization exercises were effective to improve respiratory functions, trunk muscle endurance and postural stabilization in individuals taking basic acting education.

Key Words: core stabilization exercise, basic acting education, respiratory functions, trunk muscle endurance, postural stabilization.

ÖZET

Çelik, H. (2020). Temel Oyunculuk Eğitimi Alan Bireylerde Kor Stabilizasyon Egzersizlerinin Solunum Fonksiyonlarına, Gövde Kas Enduransına ve Postural Stabilizasyona Etkisi, Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Yüksek Lisans Tezi. İstanbul.

Bu çalışmanın amacı, temel oyunculuk eğitimi alan bireylerde 8 haftalık kor stabilizasyon egzersizlerinin solunum fonksiyonları, gövde kas enduransı ve postural stabilizasyon üzerine etkilerini araştırmaktır. Çalışmaya DC Kozmos Sanat Akademisi'nde temel oyunculuk eğitimi alan 31 gönüllü, sağlıklı oyuncu adayı (18K, 13E; 27.17±6.02 yıl) randomize olarak Haziran 2020 - Ekim 2020'de dahil edilmiştir. Solunum fonksiyonları spirometre ile değerlendirilmiştir. Gövde kas enduransı; Fleksor Gövde Endurans Testi (FTET), Biering Sorenson Testi (BST) ve Lateral Köprü Testi (LBT) ile değerlendirilmştir. Postüral stabilizasyon; Flamingo Denge Testi (FBT) ve Y Denge Testi (YBT) ile değerlendirilmiştir. Katılımcılar randomize olarak Egzersiz Grubu (EG) (n = 15) ve Kontrol Grubu (CG) (n = 16) olarak ikiye ayrılmıştır. Hem EG hem de CG'daki katılımcılar temel oyunculuk eğitimi kapsamında diyafram eğitim programı almıştır. Kor stabilizasyon egzersiz programı, EG için haftada iki kez, günde 45 dakika ve 8 hafta süreyle uygulanmış, CG yalnızca çalışmanın başında ve sonunda değerlendirilmiştir. İki grubun karşılaştırıldığı bu çalışmanın ana sonuçlarına göre, EG ve CG, FEV1, FVC ve PEF parametrelerinde anlamlı gelişmeler göstermiştir (hem EG hem CG için $p < 0.05$). EG; FTET, BST, LBT, FBT ve YBT'de istatistiksel olarak anlamlı gelişme gösterirken CG, yalnızca YBT'de sadece sağ anterior ve posteromedial tarafta artışa sahip olmuştur. Hipotezlerle tutarlı olarak bulgularımız, temel oyunculuk eğitimi alan bireylerde core stabilizasyon egzersizlerinin solunum fonksiyonları, gövde kas enduransı ve postural stabilizasyon üzerinde etkili olduğunu göstermektedir.

Anahtar Kelimeler: core stabilizasyon egzersizleri, temel oyunculuk eğitimi, solunum fonksiyonları, gövde kas enduransı, postural stabilizasyo

1. INTRODUCTION AND PURPOSE

Acting is a phenomenon that has been going on since the day human existed. The stage where he lives constitutes for the people who communicate through imitation in the primitive society, the stage where he lives constitutes. In later years, acting has emerged as an art branch with the importance of theater. The actor, acting on the stage with his knowledge, interpretation and technique in the theater and cinema (1).

On the basis of acting art exhibits the intertwined formation with almost all other branches of art like music, painting, sculpture and dance. Acting existences with these formations. In addition to these branches of art, there are also structures that form the backbone of acting. The trio of sound, body and emotion referred to as the main factors of acting in the lessons given both in educational institutions and private acting schools.

Two stages are required for natural voice development in acting training. The first one of these is improving body awareness. It is internalizing of natural breathing to relieve the body from tension and relax. The body and mind must work as a whole for this internalization. Feelings and thoughts must act together as the way voice and breath are. In the second stage, voice liberated in the first stage should bring a new face and a new body to the player (2).

Integrity between voice and breath in the voice studies given in acting training is tried to be established. It is necessary the body domination, control of the diaphragm muscle and natural breathing so that an actor can play his role freely and naturally on the stage.

Diaphragm has an important function in acting and actors should know how to make it functional. Diaphragm is pushed down by breathing, decreases the volume of the abdominal cavity and it reorganizes the other organs in that area and applies a kind of massage while exhaling. The breathe we take into the lung carries oxygen only to the upper part of the lung if we do not use the diaphragm functionally. But with the help of diaphragm, the oxygen also reaches the bloody area at the bottom of the lung. Thus, the capillaries also benefit from this oxygen entering. In addition, the diaphragm also benefits the tone areas in the chest. This region is not a complete resonant in the formation of your voice but it provides support for the timbre. When the diaphragm is used correctly, it provides a certain amount of energy that the body needs (3).

The most important thing in vocal education on our body is focusing the spine. Sound has very important connections with the spine. For example, if there is a problem in the lower back of the spine, the body has to be loaded on the abdominal muscles and this causes the sound to be negatively affected. Another part is neck. Any discomfort in the neck part of the person prevents sufficient and correct breathing so the sound will not be good enough (2).

Breath supported by the muscles in the center of the body gives strength to sound. There is a need that muscle strength and support according to the strength of the sound and the duration of use. Little voices should also be supported but less muscle power is needed for this (4).

Sitting or standing posture, positioning of the head, neck, spine, the laxity of the face and the relaxation of the other organs on the face determines the balance of sound. Speaking, using the right voice, resonance, body comfort are all intertwined with each other and work together in harmony. If any of these processes break the harmony then the sound is interrupted. Therefore the correct posture of the body and the correct position is crucial for correct sound (2).

The goal of core stabilization exercises is to train the core region more effectively by using activation effect on deep muscles with effective breathing Transversus abdominis (TrA) activation is very important in this tutorial. TrA is activated before sudden spinal loads or limb movements in the musculoskeletal system with by the mechanism of further notification of neuromuscular control and provides postural adaptation. Thus, effectively using of TrA contributes to postural control and distal mobility by increasing trunk stability (5).

In line with all these links, it is predicted that with core stabilization exercises affect respiratory functions, trunk muscle endurance and postural stabilization in individuals taking basic acting education and the importance of core stabilization in acting training can be understood and increased with this study.

Purpose of the study;

The aim of this study is to evaluate the effects of core stabilization exercises on respiratory functions, trunk muscle endurance and postural stabilization in individuals taking basic acting education.

Hypotheses regarding this study are as follows;

H1: Core stabilization exercises affects respiratory functions in individuals taking basic acting education.

H2: Core stabilization exercises affects trunk muscle endureance in individuals taking basic acting education.

H3: Core stabilization exercises affects postural stabilization in individuals taking basic acting education

2. LITERATURE REVIEW

2.1.Basic Acting Education

Art which is a phenomenon that exists in every period of human history has emotional and intellectual influence. Performing art is a field providing the artist with rich expression opportunities with voice, word, and movement. The main function of the stage artist to re-exist an interpretation of the truth in line with in this process and must have full control over his body and mind (6).

Body is the communication tool to express emotions in their most natural form so body language education is a method that can help to actor to have experience and uncover the possibilities body has (7). The starting point of body language education is movement training. Movement forms the basis of this branch that uses bodily expression and is the most basic element that provide communication in daily life and on the stage. Examining and analyzing the mechanical anatomical, areal and dynamic contents of movement is the key of body language technique (6).

When it comes to acting education, three issues come to minds in terms of art lessons. Acting lessons which are stage works are voice lessons, speaking lessons and movement lessons. Acting education cannot be done without these three basic issues. If one of these issues fails, it has an immediate impact on other issues, thereby educational integrity is damaged.

The acting lesson is a study with a specific text on the hand. Apart from this, there are improvisations which strengthen the creative power and the imagination strengthening without relying on a particular text the actress candidates. These studies are as important as the studies made with the text in the development and development of a candidate for the actress. These works are as important as the studies made with the text in the development and progression of a candidate of actress.

Voice and speaking lessons which are the studies that improve the technique of sound and breath should be given importance by the actor. A performer who cannot use his/her voice and breath cannot be a performer with sufficient qualifications. Speech is the basis of acting art. An actor can convey what the author means to the audience with good and correct speech (8).

2.1.1. The Role of Diaphragma in Acting Education

In acting education, actors need a diaphragm breathing to use sound correctly and effectively. Therefore, it is necessary to define the diaphragm breathing and to know how it is applied. It is necessary to send the the air that we take to the lungs towards the diaphragm muscle at the lower part. The diaphragm breath has the feature of be able to hold for a long time. Of course, only the breath to be taken to that area is not enough to hold this breath. It is necessary to learn how to control the breath by spending less energy with less breathing by working in breathing exercises and to be able to use the voice on stage more understandable and clearly and with longer usage (9).

2.1.2. The Importance of Core Stabilization in Acting Education

Body movement is the subject of the actor's physical expression, physical agility and strength, physical aesthetics and various physical movements (10). New lessons that make body more flexible should also be added in to the acting arts major programs. For example, not only just fencing and dance, but also acrobatics and balance lessons shoul be added (11). Knowing the features, structures and functions of the body dominate his body provides the opportunity to actor. Since passive learning continues during the exercise, success increases by itself each time (12).

One of the important elements in body exercises is the awareness which is the first step of change and development of the body. Awarenes can occur in various sizes such as mental, physical, sensory (seeing, hearing, smell, taste, touch) emotional and proprioceptive (sensing the body with the inner eye). Exercises that is done for create body awareness provides development of expression. It increases control, strength and naturalness of actor to create role in physical and spiritual way (6).

2.2. Core Stabilization

2.2.1. Definition of Core

The word core means center, in English (13). In Turkish, there is no word covering that anatomical region, although the term trunk (trunk stabilization) is used instead, the word trunk refers to a wider anatomical structure (14). In many of the books published in English, the concept of core exercise expresses the trunk exercises that train the tissues of the central point of the body. In certain parts of some physiology and training sciences books, the word core was expressed as basic exercises, it was used to indicate the exercises that are usually applied at the beginning of the training and are essential for that training unit (15, 16). However, in the sports science literature, it can be said that the expressions of core exercises, core stabilization, core strength, core endurance refer to the properties of the core muscles of the trunk and the exercises in which these muscles are exercised. This region, referred to as the central part of the body, is the point at which stabilization of the abdominal, paraspinal and gluteal muscles, consisting of the muscles, nerves, skeletal and other connective tissues that make up the spine, pelvis, abdominal cavity and superstructures, is critical for optimal performance (17, 18). It is also defined as the lumbopelvic region. It has been accepted as the motor and powerhouse of all limb movements because it is the center of the functional kinetic chain, stabilization of the central point in limb movements and the transition point of power transmission (19-23). In summary core muscles (10);

- Whether the limbs are movable or not, it works like a corset that stabilizes the trunk and spinal column.

- The trunk as the area where the big muscles meet and cover each other It forms the center of the kinetic chain by supporting the stabilization and functional movements. Provides proximal stability for distal mobility (22, 24).

- It is accepted as the power house of the body due to its functions of forming the origin of all movements and transmitting power to the limbs.

Along with the definition of the core region, the core region should be recognized anatomically and functionally in order to make an appropriate exercise planning for the core muscles (13).

2.2.2. Anatomy and Physiology of Core

Core region, to name the area consisting of 29 different muscles covering the waist-pelvis-hip-abdominal parts, including the center of gravity of the human body is used. Behm et al. (2010), anatomically, the core is the skeletal system (rib cage, spine, pelvis, shoulder girdle), soft tissues (cartilage and connective tissues), ensuring the stability of the body or taking part in active movements area is the body of muscles (13).

Core musculature consists of the diaphragm (Fig 2.1) at the top, pelvic floor (Fig. 2.2) and pelvic girdle below, abdominals (Fig 2.3) as anterior wall and paraspinals and gluteal muscle group (Fig. 2.4) as posterior wall. The core region muscles have pelvic floor muscles at the other end of the trunk component. Synergistic activation patterns consist of transversus abdominus (TrA) (Fig 2.5), abdominals, multifidi (Fig 2.6) and pelvic floor. They provide a support base to whole trunk and spinal muscles. The hip, pelvis and associated structures are the support basis for structures in the core region and are required for force generation and energy transfer to the distal extremities.

Figure 2. 1. Diaphragm Muscle(25)

Figure 2. 2. Pelvic Floor Muscle(25)

Figure 2. 3. Rectus Abdominis Muscle(25) Figure 2. 4. Gluteal muscles(25)

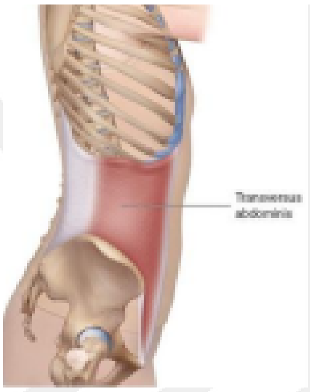


Figure 2. 5. Transversus Abdominis Muscle(25) Figure 2. 6. Multifidus Muscle(25)

Contraction of the diaphragm; the roof of the core muscle structures increases intra-abdominal pressure, thus contributing to spine stability. Pelvic floor muscular system becomes coactive with the contraction of transversus abdominus (22, 26, 27). Simultaneous contraction of diaphragm, pelvic floor muscles and the abdominal muscles are necessary to increase intra-abdominal pressure, provide a stiffer roller for trunk support, reduce the load on the spinal muscles and increase trunk stability.Diaphragm contributes to the intra-abdominal pressure before the begginnings of leg movements so it helps the spine / trunk stability. This activation happens independently of respiratory actions (27).

Considering the facet joints between the vertebrae, in each plane (sagittal, anterior and transverse) about 1 to 2 degrees of movement, passive resistance from ligaments without (tightening of ligaments that restrict further movement) is possible with the use of intervertebral discs. This range of non-resistance movement is called neutral zone (28). Protection of spinal stability under various loads and postures largely depends on keeping the lumbar spine in the neutral zone. When the lumbar spine is at rest, the muscles effectively provide the majority of stabilizing support. Conversely, when the lumbar spine is in a bent stance (outside the neutral zone), spinal extensor muscles are inhibited from neurologically developed tension; Therefore, passive tissues (cartilage, ligaments, facet joints), provides the majority of stabilizing support and this greatly increases the risk of injury to these structures (28).

Core muscles function is different than limb muscles'. They stabilize the movement of spinal segments more while the stopping than the beginning of motion (29). Anatomically, the core region is the center of gravity.place and most movement starts from there (30).

Muscle coactivation in the upper and lower extremities is integrated into the facial system called the serape effect. (Fig. 2.7) Anterior and middle layers of thoraco-lumbar fascia surround the quadratus lumborum and erector spinae muscle group. The back layer connects tension to both global and local muscles and is in an ideal position to transfer tension. This layer creates a complex crossover pattern from the latissimus dorsi on one side to gluteus maximus on the contralateral side. This anatomical ligament creates a functional relationship of gluteus maximus between the core region and the lower extremity thanks to its attachment to the clinging part of fascial system of the iliotibial band (29). Core region moves with thoracolumbar fascia. The thoracolumbar fascia also functions as a proprioceptor and provides feedback about trunk positioning with the narrowing of the contents of the muscle (22). Trunk and pelvic girdle muscles function to maintain balance of pelvic and the spine which is critical for transferring energy from the core to distal body parts (31).

Figure 2. 7. Serape effect and crossover pattern(32)

The contraction of TrA increases intra-abdominal pressure and stretches the thoracolumbar fascia.The TrA muscle has been shown to be critical in stabilizing the lumbar spine. Abdominal muscle contractions help to create a rigid roller that increases the stability of the lumbar spine. Rectus abdominus and oblique abdominals which are activated in patterns specific to that direction provides postural support before extremity movements. It has been clinically shown that a very small increase in activation of multifidi and abdominal muscles is required to stabilize the spinal segments (5% of the maximum voluntary contraction for daily life activities and 10% of maximum voluntary contraction for demanding activities) (27).

Muscles provides the necessary torque for causing movement (e.g. concentric muscle movements), controlling movement (e.g. eccentric muscle movements) or preventing movement (e.g. isometric muscle movements). In addition to the abdominal muscles, several other muscles are also considered to be part of the core region and provides stabilizing rigidity and dynamic motion functions. There is no one single core muscle that fulfills these functions in all static postures and movement scenarios (28).

Key muscles that work are the multifidus, transversus abdominus, internal oblique, paraspinal muscles, and pelvic floor muscle groups .The most important muscle groups that need to be strengthened with various exercises are the multifidus and transversus abdominis. Particular attention should be paid to the multifidus muscle group in studies performed to provide stabilization in the lumbopelvic region. Multifidus is a very important muscle tissue for stabilization and lumbar extension (33). While the superficial fibers protect the lumbar lordosis during mobility in the spine, the deep fibers are responsible for providing lumbar stabilization. Stabilization of the spine occurs with the external oblique muscle and internal oblique muscles via the transversus abdominus, thoracolumberfacia. The purpose of core training is to strengthen the muscles that play a key role and to create a muscle corset in the lumbo-pelvic area to transfer force from the upper extremity to the lower extremity. Because the weight transfer provided by the strengthened trunk muscles, continues during activities such as sitting, walking, standing, trunk mobility and weight transfer (34). All of these muscles ensure the balance of the body during movements. They work in coordination for the efficient delivery of the force generated during movement from the leg to the trunk or from the trunk to the leg is achieved by improving the strength of these muscles that work together (35).

2.2.3. Core Stabilization

Although there is no clear definition of the term 'core stabilization' in the literature many definitions have been made so far (29, 36). Core stabilization term dates back to 50 years before and it was defined to treat neurological and spinal cord injuries in the USA in the 1960s (26). Core stabilization is a dynamic process which requires optimal muscle capacity and neuromuscular control (muscles, joints and nerve involving receptors in their pathways) to integrate sensory information quickly and to initiate necessary responses according to internal and external information capacity (strength and endurance) (37). Core stabilization is the basis for movements. Deep muscles of the trunk are activated just before planned movements and suitable conditions are created in the form of a stable posture (38).

Definition of "Core stabilization" by Kibler et al. is “is the ability to control position and movement of the trunk on the pelvis and legs for ensure production, transfer and control the optimum effect of force and motion to the terminal segment in integrated kinetic chain activities.” (38, 39). Core stabilization of the body transfers the force generated in the lower extremities from the body to the upper extremity and this provides a more effective movement (40).

Core region-extremity relationship defined as "proximal stability" for distal mobility of extremities (31). Position and movement asymmetry does not allow the core region to be stable. A good core zone maintains the natural length-tension relationship of the agonist and antagonistic muscles. This results in accurate kinematics in functional motor chain movements of the waist, hip and thigh complex joints and maximizes stability for lower body movements (40).

Core stabilization which is similar to balance strategies is a mechanism involving the neuromuscular system to stabilize or regain optimal body configuration. This includes feedback from the sensory system (i.e. receptors in joints and muscles, includes position sensing, velocity and strength) to the CNS; thus it activates the appropriate muscles (agonists and antagonists) in the appropriate amount for the appropriate time, through reflex responses at the right time (41). Core stabilization depends on both muscle capacity (endurance) and neuromuscular control. Core stabilization is increased by co-contraction of antagonist muscle groups that only need level low activation to adequately stabilize the spine (29).

Core stabilization exercises activate specific motor patterns of the trunk muscles by forcing spine stability and trunk postural control (38). Mild muscle activity (5-25% of maximal voluntary contraction) is sufficient to provide sufficiently stiff and stable joints [33]. Therefore, muscle strength is a rarely limiting factor for core stability in daily life tasks in healthy individuals (42).

2.2.4. The Elements of Core Stabilization

Core stabilization approach was proposed first by Panjabi in 1992; this model was later expanded to explain the movement (43). Core stabilization is based on control of coactivation, coordination and sensorimotor of trunk muscles. According to Panjabi's core stabilization model, stabilization is provided by the result of the interaction of active structures (muscles and tendons), passive structures (ligaments) and neural structures (Fig. 8). In other words, the stability of the spine does not depend solely on muscle strength, it also depends on sensory input providing continuous feedback and allowing movement to be improved, informing the central nervous system about the interaction between the body and the environment (22).

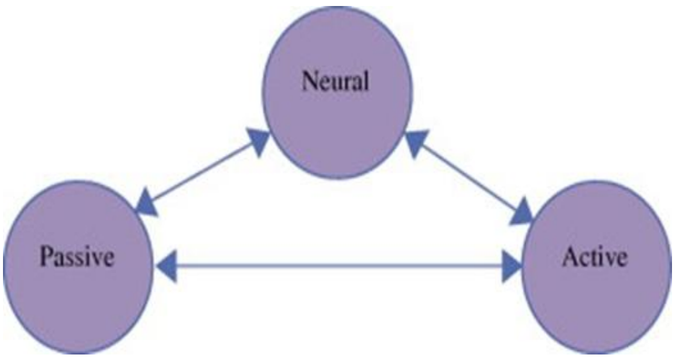


Figure 2. 8 Panjabi Core Stabilization Control Model(22)

Passive Subsystem : The passive subsystem does not produce spinal movements but it is dynamically active in supporting the spine position. Some of the structures in passive subsystem (facet joint capsules and ligaments of the vertebral column) contains a large amount of mechanoreceptors transmitting sensory information to the central nervous system (CNS) regarding spine position and movement (29). Passive elements consist of ligaments, bones, cartilage, fascia and other noncontractile structures. Although passive elements provide the structure of the core region they need support from the surrounding musculature and active structures (44).

Active Subsystem : The muscles and tendons of the active subsystem are structures where forces are generated to protect the stability of the spine. The magnitude of muscle strength generation is monitored by proprioceptors in tendons (Golgi tendon organs) and muscles (muscle spindles) so the muscular system is connected to the neural control subsystem (29).

Neuromuscular Control : Neural control subsystem receives information from special mechanoreceptors in both passive and active sub the systems. CNS controls movement and balance through motor control mechanisms with feedback and feedforward. The feedback about elongation of a ligament or joint capsule and muscle tension to the CNS mediates the adjustment of muscle activation patterns to maintain spine stability. The CNS also activates muscles as expected in the preparatory stage of movement of spine or external load application (transversus abdominus activation before starting movement) (29).

Overall stability of the spinal system will be affected if any of these three subsystems are not working optimally (29).

Hoffman and Gabel; expressed the interaction of active, passive and neural structures in a more complex way for stability and mobility (43, 45). According to the newly described model, this complex of stability and mobility systems working in harmony in the structure is the determinant of a quality function. Although these systems are defined separately, thanks to the synergistic relationship of neuromuscular structure,it works under neural control in an integrated way. Any problem in stability or mobility systems negatively affect all other subsystems and thus the movement efficiency (45). (Fig.9)

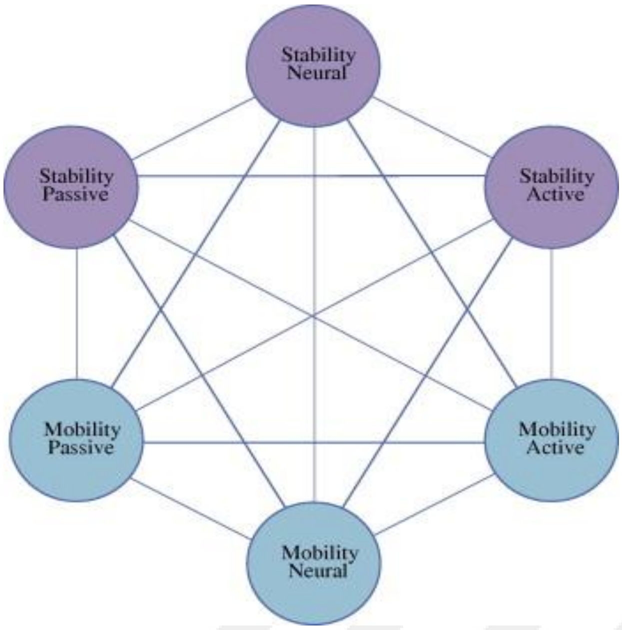


Figure 2. 9. Hoffman and Gabel's expanding core stability model(45)

Bergmark classified muscles relatively to their location in the vertebral column as global (generating trunk movement) or local (providing segmental stability) (29, 46). The core musculature consists of local and global stabilization systems (47).

Global (superficial) muscles: The global stabilization musculature mainly consists of large, superficial, rapidly twitch muscle fibers that revealing primary motion and providing multisegmental rigidity in wide range of motion during dynamic activities (29, 44, 48). Quadratus lumborum capable of generating strong and fast torque with erector spina, external oblique, psoas major, rectus abdominus, global stabilization are examples of muscles in this system (44, 47). Global muscles has the ability to generate greater forces thanks to its long moment arms and more mass (29). These muscles are the main carrier for trunk or hip flexion, extension, and rotation (26).

Local (deep) muscles: These muscles in the local stabilization system are smaller, deeper and shorter moment arms and sutiable for controling inter-zonal movement, responding to changes in posture and external loads (22, 29). These muscles are deeply located and associated with segmental stability of the spine (26). This system consists of deep and slow twitch muscles such as TrA, multifidi, internal oblique, medial fibers of the external obliques, deep transversospinalis, diaphragm, pelvic floor muscles, iliocostalis and logissimus (lumbar parts) (22, 44, 47, 48). It is believed that local muscles support the unprotected spine structures so that the superficial global muscles are allowed to perform movements such as walking and lifting (49).

2.2.5. Effectiveness of Core Stabilization

The core region has 3 important functions:

i. the postural control of axial skeleton
ii. postural control generated in response to proximal limb movements
iii. respiration

The respiratory component changes the shape and volume of the trunk, causing small angular displacements along the trunk and lower extremities in upright posture. Sensory-motor activity, constantly activates the postural reflex mechanism for the correct adjustment of posture with breathing. A healthy breathing pattern is basically provided by lateral expansion of the lower rib cage. This type of breathing contributes to postural control and stabilization system. Core zone contributes to the axial postural control by providing coactivation of the flexor and extensor muscles of trunk and proper intraabdominal pressure (50).

2.3. Respiratory System

Respiration is a gas exchange between indoor and outdoor for living creatures to survive. It is essential in this cycle to maintain balance of the internal organism (51).

Various systems take charge to ensure homeostasis. One of them is the respiratory system and its most important organs are the lungs.

Lungs expand and contract in two ways:

(1) The diaphragm moves up and down to lengthen and shorten the chest cavity

(2) With the up and down movement of the ribs, the anteroposterior diameter of the chest cavity is enlarged and downsized (52).

Normal calm breathing is almost exclusively performed with diaphragmatic movement. During inspiration (breathing) this muscle contracts and pulls the lower faces of lungs down. As the alveoli expand, negative pressure is created inside them and atmospheric air fills in. On expiration (exhalation), the lungs return to their former state due to their relaxation and flexible structure and expansion of diaphragm. The alveolar spaces become narrow and they expel the air that enters during inspiration (52).

Inspiration muscles are engaged in addition to contraction of the diaphragm during deep inspiration. These muscles expand the rib cage by raising the ribs and sternum. In this way, a greater negative pressure is created within the alveoli by drawing the lungs to not only down but in all directions and more air is allowed to enter.

For deep expiration, the expiratory muscles should pull down the ribs and narrow the chest cavity and in the meantime the abdominal organs must be pushed up (53).

2.3.1. Respiratory Muscles

Inspiration is an active process performed by the respiratory muscles. (Fig.10.) The most important muscle is the diaphragm during inspiration. Diaphragm performs 2/3 of pump duty during breathing (54).

A. Inspiration muscles:

1. External intercostal muscles: They lift all ribs upwards.

2. Sternocleidomastoid muscles: They lift the sternum.

3. Anterior serratus muscles: They lift most of the ribs.

4. Scalene muscles: They lift the first two ribs (55).

In addition to these, during maximal studies, it is considered that m.trapezius is taking part in inspiration as a result of the contraction of the neck and extensors of the back muscles (56).

B. Expiration muscles:

It is expressed that all the muscles that pull the rib cage down are the expiration muscles (57). However, expiration does not have a primary muscle because it is a passive procedure and there is no muscle contraction on expiration. Actual transaction happens by relaxing the inspiration muscles. But during expiration, diaphragmatic muscle does not relax completely and continues a little longer, especially in the horizontal position. Therefore the transition from expiration to inspiration is slow (58).

1. Rectus abdominus muscles: They pull down the lower ribs and press the diaphragm by pushing the abdominal organs up with other abdominal muscles.

2.Internal intercostal muscles: They pull the ribs down (55).

Auxiliary muscles: Contraction of the internal intercostal muscles such as mm. intercostales externi, mm. intercostales interni, m. serratus (posterior, inferior), m. quadratus lumbarum, m. transversus thorasis, mm. subcostales pull the rib cage in. As a result, thoracic volume is reduced as much as possible (57).

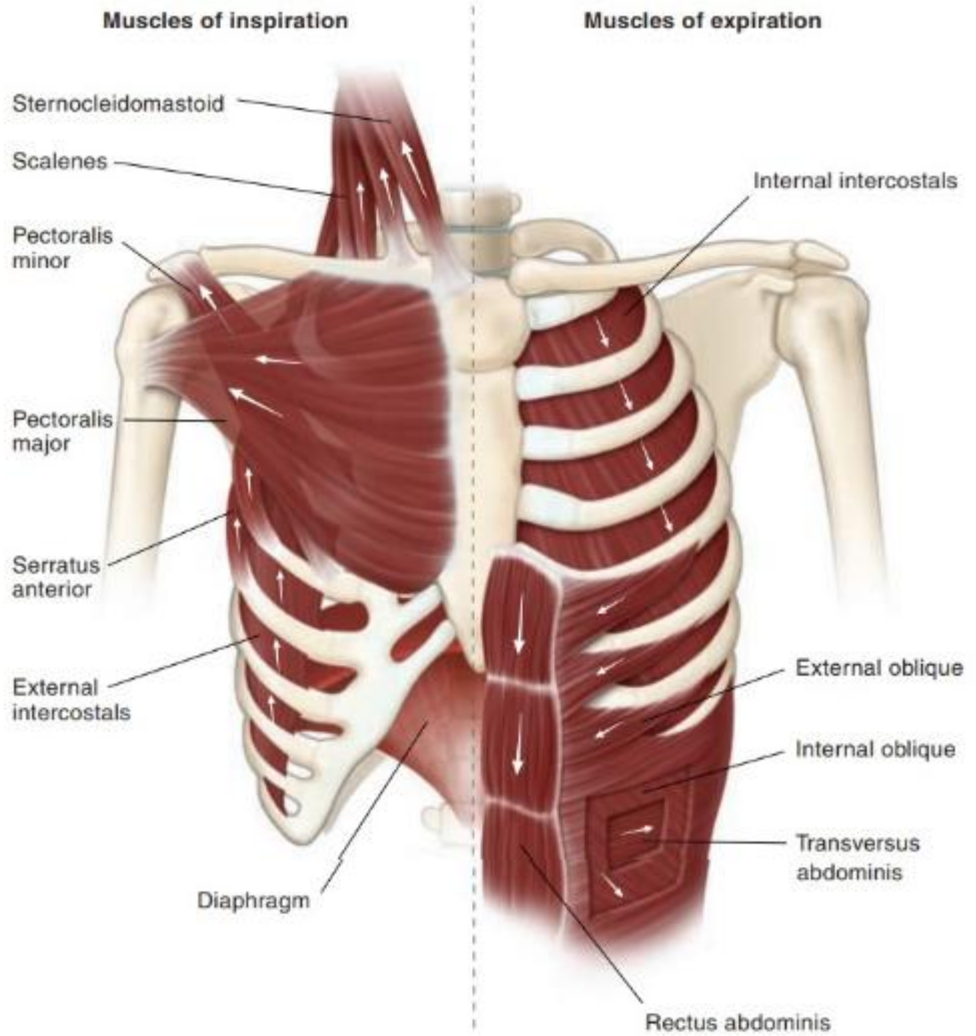


Figure 2. 10. Respiratory Muscles(59)

2.3.1.1. Diaphragm

M. diaphragma muscle fulfills the 75% of the breathing process and recess by expanding with inspiration to the lungs. When exhaling, the diaphragm goes upwards and compresses the lungs and provides exhalation (60). Different muscles should work coordinated and in harmony to keep breathing in all situations. The most important muscle that provides breathing is the diaphragm (61, 62).

Most of the process is provided by the diaphragmatic muscles during normal breathing. Other respiratory muscles are activated only when the depth of ventilation increases. Therefore, the diaphragm continues to work rhythmically and the diaphragm fibers have a structure resistant to fatigue for the continuation of this continuity (63).

Because of the diaphragm structure, the dome-shaped striated muscle group separate the chest cavity and the abdominal cavity from each other (54). The muscle fibers of the diaphragm which have equal proportions of slow and fast fibers are constantly active (63). The structural and functional properties of the respiratory muscle fibers increase their size in response to the momentary situations they encounter and they can change and adapt to different functional tasks of breathing (64).

Diaphragmatic muscle fibers can contract strongly and quickly, contributing to overall force generation and its overall resistance to fatigue could increased by constantly maintaining contractions (63, 65).

It is expressed as diaphragmatic or abdominal breathing caused by the respiration which happen with the movement of the diaphragm (60, 62).

In diaphragmatic breathing, it is important not only to reestablish a correct respiratory pattern but also to ensure lumbar spine stabilization by increasing intraabdominal pressure(IAP) and activation of the core structures to transfer forces from the center of the body to the lower extremities (66, 67).

2.3.2. Respiratory Mechanism

Gas exchange occurs in three stages during respiration.

1) Ventilation

2) Diffusion

3) Perfusion

Ventilation; contraction of respiratory muscles increases the intrathoracic volume during inhalation; this lowers the pressure of the airways below atmospheric pressure and cause air to enter the lungs. The delivery of air to the blood gas barrier located in the alveoli is called ventilation. Ventilation takes place in two stages as inhalation and exhalation. The number of ventilation is 16-20 per minute (68).

Diffusion; The exchange of gas across the blood gas barrier is called diffusion.It is the transport of gas from capillary blood to the alveoli and from alveoli to capillary blood. While the oxygen diffusing from gas to blood continuously in the alveoli; carbon dioxide is constantly diffused from the blood to the alveoli. Gas composition in the alveoli is constant. Breathing air mixes with the gas in the alveoli. It completes the space left by the oxygen that has passed into the blood and dilutes carbon dioxide. Some of this mixture is expelled by exhalation.

Perfusion; It is the flow of blood into the lung capillary bed. Perfusion is a mechanism that works in accordance with hemodynamic principles like in other body systems (68).

2.3.3. Respiratory Function Tests

Respiratory function tests are commanly used to understand and grade abnormalities in respiratory system dysfunction (51). Suitable environment, trained stuff and the patient who is taught appropriate respiratory maneuvers must be provided for performing respiratory function tests in healthy way (69). Respiratory function tests is done in two ways as static and dynamic. In static tests, only volume is evaluated without taking time into account. Dynamic tests are made take into account a certain time (70).

2.3.3.1. Static Measurement Values

Lung volumes:

1) Tidal Volume: is the amount of air taken or given during inspiration or expiration

and it is 500 ml.

2) Inspiratory Reserve Volume: It is the amount of air that enters the lungs with deep breathing after normal inhalation. It is up to 3000 ml.

3 Expiratory Reserve Volume: It is the amount of air that can be removed from the lungs by a deep expiration after a normal exhalation. It is about 1100 ml.

4) Residual Volume: It is the amount of remaining air cannot be removed even with the most difficult expiration in the lungs . It is about 1200 ml. Residual volume ensures continuous continuity between blood and alveoli (71, 72).

Lung capacities;

Inspiration capacity: It shows the maximum amount of air that can be taken into the lungs with maximum inspiration after a normal expiration. It equals the sum of the inspiratory reserve volume with tidal volume (3500 ml).

Functional residual capacity: It is the volume of air remaining in the lungs after a normal expiration. It equals to the sum of expiratory reserve volume and residual volume (2300 ml).

Vital capacity: It is the volume of air that can be removed by maximum expiration after a maximum inspiration .It is equal to sum of the volume of three volumes other than the residual volume or to sum of the inspiratory capacity and the expiratory reserve volume (4600 ml).

Total lung capacity: It is the total air volume in the lungs after maximum inspiration. It equals to sum of four volumes or vital capacity and residual volume(5800-6000 ml) (71, 72). (Fig. 2.11)

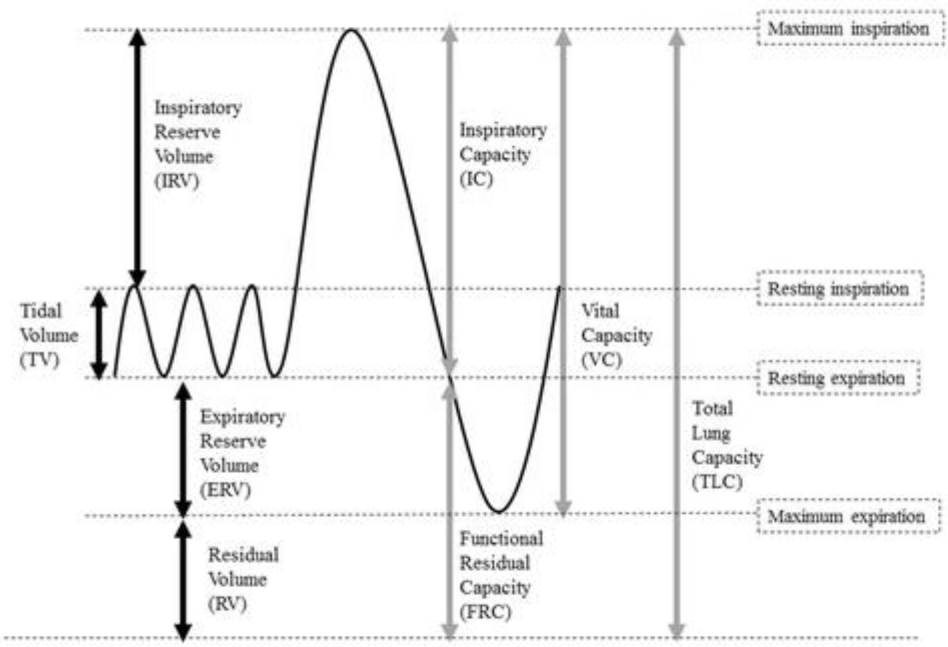


Figure 2. 11. Standard lung volumes and capacities(73)

2.3.3.2. Dynamic Measurement Values

It is important that the ability to move fast enough of the air entering and leaving the lungs and has a decisive role over a person's physical capacity. The traveling speed of the air varies according to the resistance of the airway. The obstructions on this path, the resistance of chest and lung tissues affects dynamic measurements.

1. Forced Vital Capacity (FVC): It is the total amount of air exiting the lungs after maximum inspiration at maximum expiration.
2. FEV1: It is the challenging volume that can be removed in the first second. It is the most frequently used value for measuring lung functions.
3. FEV1 / FVC%: The percentage of expiration performed in 1 second. It is normally about 80-90%. Low level of this value indicates obstructive disorder.
4. Forced Exhalation Current Rate (FEF) 25%, 50%, 75% Values: These are the flow rate values when 25%, 50% and 75% of FVC are removed. (FEF 25%, FEF 50%, FEF 75%)

5. FEF 25- 75: The average forced expiratory flow during the middle half of FVC. It is the flow velocity between the first and last 1/4 of the forced expiration. In other words, it is the flow velocity detected while the 50% volume is took off after the first 25% of the air is removed during forced expiration.
6. Peak Expiratory Flow Rate (PEF): indicates the highest current removable during FVC maneuver (71, 72).
7. Maximum Voluntary Ventilation (MVV): It is the measurement of the maximum amount of air that can be exchanged between the lungs and atmosphere and. It is usually measured within 15 seconds.

Respiratory minute volume: It is the total amount of air that enters and comes out the lungs through the airways in one minute. Tidal volume (500 ml) equals the product of the respiratory minute frequency (71, 72).

2.3.4. Relationship between Respiratory Functions and Core Stabilization

There are very few studies in the literature on how exercises affects the strength and endurance of respiratory muscles outside of breathing. Studies in the literature provide conclusive evidences that abdominal muscles are important muscles in ventilation. However, on the effect of expiratory muscles on ventilation is not emphasized. It seems that more emphasis the effect of inspiratory muscles on ventilation in the literature (74). There was no study on how respiratory function values were affected during endurance testing using abdominal muscles until the study by Christopher et al in 2009. Christopher et al. Examined the effect of exercise on respiratory parameters such as forced vital capacity, MIP and MEP by performing sit-ups on participants (74).

2.4. Trunk Muscle Endurance

Endurace is a skill the ability to continue to withstand an energy or a force. In general, it is defined as the ability to resist to the effects that cause fatigue and the formed tiredness (75, 76). On the other hand, muscle endurance is the ability to remain in the contraction for a certain period of time or repeat certain movements of muscle groups working together (76).

Muscle endurance is essential for all kinds of physical activity. American Health and Disease Service defined muscle endurance as ‘‘ the ability to continue the certain movement of a muscle without fatigue picture ’’(77).

A person with low muscular endurance has difficulty to do or cannot do long-term activities in daily life. In a previous study, it is found that poor performance is associated with low back muscle endurance (78).

Many activities need a constent effort performed over a period of time in daily living. Therefore, muscle endurance is a significant aspect of physical performance, and requires to be considered when evaluating musculoskeletal functions (16).

Muscle endurance is divided into two groups as static and dynamic endurance in terms of movement of muscles.

Static Endurance: It is the state to continue a certain contraction for a long time without movement of the muscle (79).

Dynamic Endurance: It is the situation to continue the cycle for a certain period that occurs when the muscle contracts and relaxes in a harmonious way (75).

Low back muscle endurance is related with passive sitting, inactivity and low back pain. Sitting for a long time and low activity level can cause low trunk muscle endurance (80).

2.5. Postural Stabilization

In recent years the term of postural stabilization has became quite popular especially in health, fitness, sport fields. However, when looking at the literature, this term could not be expressed clear. According to some researchers, postural stabilization muscles occur the muscles that provide extension, flexion, lateral flexion and rotation of the spine. According to a more complex approach, it covers all the muscles between the shoulders and pelvis. Muscles in the hip area modulates the trunk muscles in stabilization and alignment of the spine due to its position, therefore we can say that these muscles are also within the body stabilization muscles (36).

Willson et al. defined the core region as the lumbo-pelvic hip complex formed by the lumbar spine, pelvis, hip and active and passive tissues that produce or limit the movement of joints and of these segments in 2005 (81). Although this definitionis suitable for rehabilitation, considering forces and momentum on the spine, a broader definition is required. When the literature is scanned, 'core' anatomically covers axial skeleton (including pelvic belt and shoulder belts) and ,soft tissues (joints and fibro-cartilages, ligaments, tendons, muscles and fascia) and soft tissue on the axial or appendicular skeleton regardless of whether it is terminated (upper and lower extremities). In addition, these soft tissues can produce movement (concentric movements) or they can resist movement (eccentric and isometric actions) (82).

Although terms 'Stabilization', 'muscle strength' and 'muscle activation' are often used side by side stabilization is free from the influence of muscle forces. The spine is stable and safe thanks to the activation and contraction potential of the trunk muscles. Thanks to the stimuli from the central nervous system, how much power the mucle will produce is determined and stabilization is provided. The movement of the terminal segment and the force applied to the segment is generated in an interrelated and optimal way with core stabilization and thus segment is taken under control during a kinetic chain activity (83).

Providing stabilization of the trunk is essential for maintaining daily life activities by the neuromuscular system, for example; such as lifting, carrying and dragging, standing, walking (36). In addition, it is shown by many studies that reduced body stabilization seriously increases the risk of injury (83).

The state of being in balance against the change of the gravity center of the body is divided into dynamic and static balance, depending on whether the surface is moving or not.

Static Balance: called the protection of the position of the body's center of gravity on a fixed surface. For the continuity of static balance, the body gravity center should be at the level of the second vertebra of the sacrum and within the support surface (84).

Dynamic Balance: It is the ability of the body's center of gravity to remain within the support surface when the body or the contact surface is mobile.

The main function of the system that controls the balance is holding the center of gravity of the body within the support surface. Because the center of the gravity of the body changes place constantly with movement.

The state of being in balance and being able to maintain it, is done within a complex control system by receptors in visual, auditory and somatosensory centers (85). The 3 sensory mechanisms that provide balance are vision, proprioception (muscle and through receptors in the joints) and the vestibular system (inner ear) (86).

The outer ear, middle ear and inner ear are the organs which are responsible for balance in our body. The vestibular system keeps the body in normal posture and balance with information from the inner ear and other parts (87). Somatosensory system manages information received from receptors in the muscle, ligament, tendon, and joint capsule, and sends warnings to the muscles to contract and relax properly. As a result, it provides control in joints and muscles and maintains the body in a proper posture (84). In addition, the visual system keeps the body in balance and controls it through increasing the proprioception together with visual mechanisms. Apart from these, the spinal cord, brain the cerebellum are other structures responsible for balance. Golgi tendon and muscular spindle are the other structures which are responsible in the body (86). Central Nervous System protects the body's balance mechanism and posture by receiving stimulation from here.

3. MATERIALS AND METHODS

3.1 Study Design

This study is designed as a randomized controlled trial. Since participants were distinguished the assessment protocols, blinding of the study could not be possible.

3.2 Ethics Statements

All participants were provided informed, written consent and all procedures were conducted according to the declaration of Helsinki prior to participating in this study. The purpose and plan of the study were explained to the participants. All participants were involved in the study on a voluntary basis and informed written consent was obtained from each (Appendix 1). Considering ethical violation, we received a session at the end of the study mainly for the control group. In that session, it has been shared the study results and received an education in terms of some core exercises and importance of exercise adherence.

The study protocol was approved by the Yeditepe University Ethical Committee at the date of 09.04.2020 and issue number was 37063608-6100-15-1843 (Appendix 2).

3.3 Study Population

Precize sample size calculation was not possible as similar studies have not been performed. However comparing an intervention group with a control group, we expected to have a medium effect size (0.5). Therefore, a sample size of >13 in each group would provide a power for a t-test with an $\alpha < 0.05$ to be more than 0.8. However, sampling was stopped after significantly differences were achieved.

3.3.1. Inclusion Criterias

The inclusion criterias of this study are;

Being volunteer

whose ages between 18-40 years

whose taking basic acting education course at DC Kozmos Art Academy

3.3.2. Exclusion Criterias

Volunteers were excluded from the study if the following conditions will be presented:

chronic respiratory disease,
back pain within the last two months,
pregnancy,
refusal to sign the informed consent document.

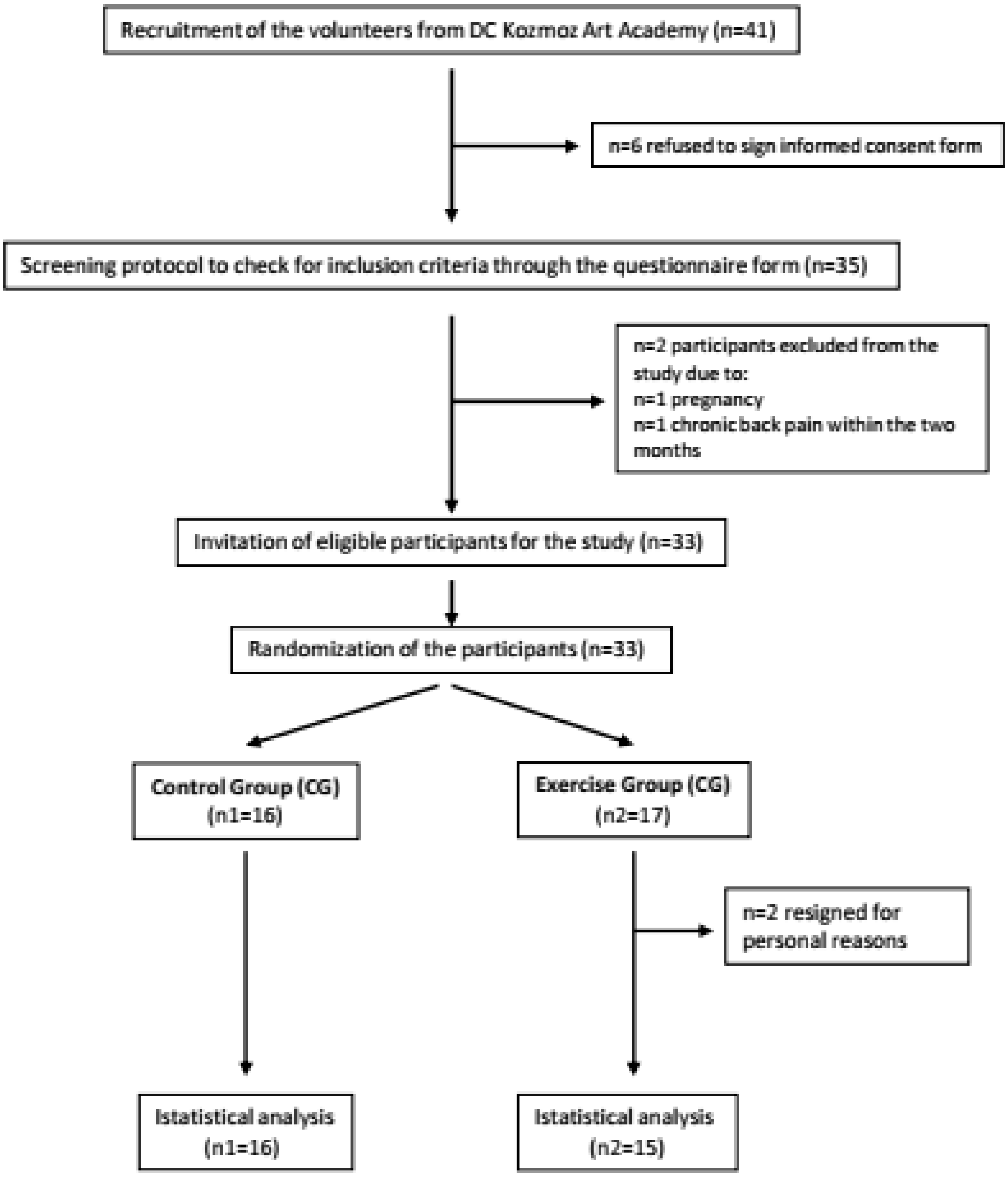
3.4 Study Protocol

41 volunteers were screened at DC Kozmos Art Academy to be eligible for the study through the questionnaire form. 6 participants refused to sign the informed consent document. In total 35 participants completed the questionnaire form (Appendix 1) Although they signed the written consent, completed the questionnaire form and met the inclusion criteria, 2 participants excluded from the study since one of them had a pain history within the last month and one of them got pregnant. but only 33 participants met the inclusion and exclusion criteria but , 2 participants did not want to attend the rest of the assessments therefore 31 participants took part in the study and completed. Details can be seen at the study flow chart. (Figure 3.1)

Exercise group was given core stabilization exercises by the physiotherapist for 8 weeks, two days a week, during 45 minutes before the acting lessons started. The control group was only evaluated at the beginning and at the end of the study.

A core set of demographic and participant characteristics including age, gender, bodyweight, height, BMI, dominant side, education level, job, marital status, smoking and alcohol habit, surgical and medical history and activity level were determined by a standard questionnaire form (Appendix 3), which is specially designed for this study. In addition, this questionnaire was completed as the initial stage of data collection. All participants completed the questionnaire including demographic information and medical history related to their back region to ensure they had no underlying back problems.

Figure 3. 1. Study flow chart



3.5. Assessment Protocols

After checking for eligibility, participants were invited for the measurements yet only 31 participants attended for the assessment protocols. Each participant was followed by a standard protocol for the reliability of the study. First, assessment of respiratory functions with spirometer, then performing Trunk Flexors Endurance, Biering-Sorenson and Lateral Bridge Test respectively to assess trunk muscles endurance, measuring the arch height ratio, performing Y Balance Test (YBT) to evaluate dynamic balance and Flamingo Balance Test (FBT) for static balance.

3.5.1 Assessment of the Respiratory Functions

Pulmonary Function Test assessed with spirometer Contec™ SP10W Hand-Held Spirometer according to American Thoracic Society (ATS) and European Respiratory Society (ERS) criteria.It was carried out properly (Fig 3.2). Forced vital capacity (FVC), Forced expiratory volume at 1st second (FEV1), Tiffeneau ratio (FEV1 / FVC) and Peak expiratory flow rate (PEF) values and percentage of predictive values recorded (88).

It is the most commonly used respiratory function test (RFT). It is a physiological test based on the measurement of current or volume changes occurring during inhalation as a derivative of time. Standard maneuver used during spirometry application; after rapid and deep inspiration; maximal expiration at the total lung volume level. The test procedure was explained to the patient. The patient was comfortably in a sitting position. The nose was closed with a latch. It was emphasized that the patient should not leak around the mouthpiece during the procedure. The participant is asked to show maximal effort. It was told to expire for at least 6 seconds or until plateau is formed. The test was repeated 3 times and averaged. If the test is repeated 8 times but the participant still fails the test or if the participant is tired, the test was terminated (89).

Figure 3. 2. Evaluation of Spirometer

3.5.2 Assessment of the Trunk Muscles Endurance

To determine trunk endurance; Trunk Flexors Endurance Test, Biering-Sorenson Test and Lateral Bridge Test were performed.

3.5.2.1. Trunk flexors endurance test

Individual was positioned as 60 degrees flexion of trunk and 90 degrees flexion of knees and hips. The physiotherapist who carried out the assessment supported the toes and fixed the feet on the ground 60 degrees. (Fig. 3.3) The test was terminated when trunk flexion was impaired and the time was recorded by stopwatch (90).

Figure 3. 3. Trunk Fleksor Endurance Test

3.5.2.2. Biering-Sorenson Test

This test is a muscle performance test and measures trunk muscle fatigue. The participant, whose prone body was laid by hanging from the bed from the anterior superior to the spina iliaca, was fixed at the level of the gastrocnemius muscle and was asked to keep his body parallel to the ground by clamping his hands on the chest. The time was recorded by stopwatch until parallelism maintains (91).

Figure 3. 4. Biering Sorenson Test

3.5.2.3. Lateral Bridge Test

The side bridge endurance test has high intra-rater and inter-rater reliability (92). The person was asked to position the knee with the dominant side down, the knees in extension, the upper foot in front of the lower foot, the upper arm on the opposite shoulder to establish a lateral bridge by command (Fig. 3.5). While the person is in the bridge position, the body had to stay on the straight line. The time was measured by the physiotherapist with a stopwatch until the pelvis touches the mat (93,94).

Figure 3. 5. Lateral Bridge Test

3.5.3. Assessment of Postural Stabilization

3.5.3.1. Flamingo Balance Test

It is a valid and reliable test that allows the measurement of static balance. The reliability coefficient is reported below 0.70, which is the confidence limit for the test (95).

The individual stood on the balance material with his selected foot and got support from the physiotherapist in order to maintain his balance and took the correct position before testing. The person flexed his free knee and held it in the same direction with his hand. (Fig. 3.6) When he is ready, he left the physiotherapist's hand and run the stopwatch at the same time. Each time the person loses his balance (touching the ground, leaving his feet) the stopwatch stopped and restarted when the participant is ready. The total number of loses recorded in the period in 60 seconds (96).

Figure 3. 6. Flamingo Balance Test

3.5.3.2. Y Balance Test

The Y Balance Test modified and developed by Star Excursion Balance for measuring dynamic balance was used (97). A fixed point has been determined and 3 different tape was placed in a Y-shaped in these 3 directions between 90° and 135°. The leg lengths of each participant was recorded in centimeter by measuring from the anteriorsuperioriliac point to the distal part of medial malleol in the supine position. Measurements were performed in bare feet in 3 directions. The value of anterior reach was recorded from the participant’s tip of the toe in the center to the farthest point, for PL and PM value the distance between from the heel to farthest point that he could reach. During the trial, individuals were asked to keep their heels on the floor, their hands on the SIAS and make a light touch with the tip of the furthest point (Fig. 3.7). A demonstration was made by the physiotherapist about how to do this test before the measurement and participants were allowed to trials in all directions at least 6 times (98). After the test trials were completed, each participant were given 2 minutes to rest and then 3 reaches were performed in each direction. During the measurement, transfering participants' body weight to the reclining foot, separating the heel of foot from the floor or separating his hands from the hip were accepted as a mistake and the measurement was repeated after the participant was verbally informed. All reach distances were recorded and averaged in centimeters. After the data is obtained, the formula which is '(Averaged Reach Distance / Leg Length)x100 =% maximum reach distance' was used to eliminate the leg length advantage. The scores obtained were normalized (99).

a) anterior b) posteromedial c) posterolateral

Figure 3. 7. Y Balance Test (a, b, c)

3.6 Randomization of the Groups

33 participants were divided into two groups which are Control Group (CG) and Exercise Group (EG). www.randomizer.org website was used to perform randomization of the individuals. 16 participants were allocated to the CG while 17 participants were counted in the EG. 2 participants from EG resigned the study for personal reasons. 31 participants completed the study.

1.7. Exercise Protocol

3.7.1. Education of Core Stabilization

Individuals included were randomly divided into two exercise group (EG) and control group (CG). Exercise group was given exercises by the physiotherapist for 8 weeks, two days a week, during 45 minutes before the acting lessons started. The control group was evaluated at the beginning and at the end of the study. Training session was given to the exercise group before starting the exercises. In this session:

-First of all, participants were on the supine position, hip-knee were flexed on the mat.

-In this position ankle, knees and hips were aligned.

- The neutral position of the lumbar spine was taught. To understand the neutral spine various imagery was used. (Imaging example: Think your waist as a clock and move it in a 6-12 direction.)

Then the key elements of pilates were used and taught(100). These are;

Centering: In the neutral position of the lumbar spine, the TrA muscle is most important component of the activation. In order to realize centering, first spina iliaca anterior superior (SIAS) palpation was taught to the participant. Then, the placement of the fingers up to 2 centimeters medial and inferior of the SIAS has been asked. TrA activation was asked to do from the person with using various imaging methods and asked the contraction could be felt or not under her hands. TrA activation through the pelvic floor was also taught. Whichever method the person felt the activation of TrA better, was asked to repeat the activation until she learns completely. The difference in contraction between superficial and deep muscles was explained for the prevention of superficial abdominal muscles involvement. (Fig. 3.8)

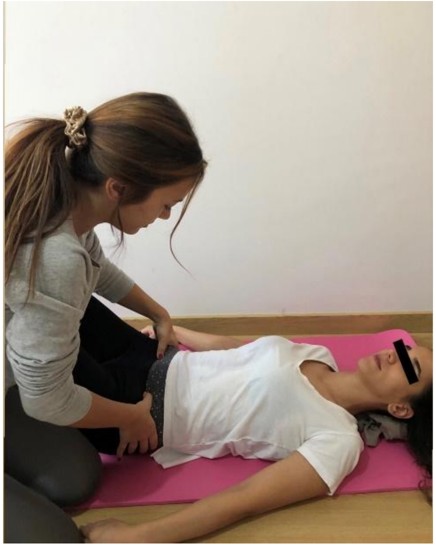


Figure 3. 8. Teaching TrA activation by the physiotherapist

Head and neck positioning: Neck was positioned in chin tuck position and head in elongation position.

Shoulder girdle positioning: Shoulders were positioned on adduction and depression and the scapulae was positioned in retraction and depression.

Lateral breathing: It refers to the lateral expansion of the lower rib cage. This type breathing takes place effectively to push the ribs laterally if there is sufficient production of intra-abdominal pressure (IAP) between the diaphragm and the lower thorax. IAP produced by respiration also contributes to the posture and stabilization system [50]. To teach lateral breathing, physiotherapist placed her hands towards the lower ribs lateraly and asked to breathe under her hands (Fig. 3.9). Meanwhile, the individual should not have done abdominal breathing. It was practiced until she learned this breathing pattern.

Figure 3. 9. Teaching lateral breathing by the physiotherapist

Chest cage positioning: It is very important the positioning of the rib cage to allow lateral breathing. For this purpose, the participant has been taught stabilization and protection the chest cage on the ground during exercises.

After these elements was taught, stabilizer was used to teach core stabilization better.

Centering was thought through the Stabilizer Pressure Biofeedback unit (Chattanooga Group Limited, Bicester, UK). (Fig. 3.10)

Figure 3. 10. Stabilizer Pressure Biofeedback unit

It is used for the ability of abdominal muscles to actively stabilize the lumbar spine and lumbar stabilization. The pressure cell of the device was placed in the lumbar region. The device was inflated up to 40 mmHg to support the natural lumbar curvature. Participant was asked to maintain this pressure value during exercise.

The biofeedback unit has allowed researchers to reach objective conclusions about trunk stabilization (101). (Fig.3.11).

Figure 3. 11. Teaching of centering with Stabilizer Pressure Biofeedback unit

One of the contents of basic acting education was diaphragmatic breathing which was done twice a week before every lesson. The examples were like that:

Take a diaphragmatic breath as deep as possible and exhale in one line.

Take a fast diaphragmatic breath, hold and exhale fast.

Take a fast diaphragmatic breath, hold and exhale slowly.

Take a diaphragmatic breath and rotate your neck while exhaling.

Take a diaphragmatic breath and exhale while leaning down.

Take a diaphragmatic breath on bending position and exhale while straightening up.

Take a deep diaphragmatic breath from mouth and exhale slowly.

Inhale for 8 seconds, hold for 8 seconds, and exhale for 8 seconds.

Take a diaphragmatic breath and exhale with increasing severity.

Take a diaphragmatic breath and exhale with decreasing severity.

Take a diaphragmatic breath and exhale while hissing like a snake.

Considering that both groups received diaphragm training exercises within the scope of basic acting education;

Planned exercises started to be implemented after one session of training. Exercise group was given exercises by the physiotherapist for 8 weeks, two days a week, during 45 minutes before the acting lessons started. The control group was evaluated at the beginning and at the end of the study. Each of the exercises were diversified from easy to difficult on the same basis. The degree of intensity of the exercise program is planned in accordance with individuals' evaluation results in two-week periods.

- It was started with warm-up exercises with standing position and on the mat.
- Body alignment and centering were checked before the exercises; after that exercises started. It was asked to focus on the principles.
- All exercises were shown first by the physical therapist.
- Exercises which start on supine position were completed on side position, prone position, crawling, sitting and standing position.
- Lateral breathing and centering were emphasized in all exercises.
- The breathing pattern can also be used to make movements difficult and increase endurance.
- In preparation for a movement of the exercise, inhalation was done and exercise was performed while exhalation.
- Corrections were made with various auditory and tactile stimulation during exercises.
- The exercises progressed every two weeks.
- The number of exercises was done with 10 repetitions in the first 4 weeks and 15 repetitions in the next 4 weeks.
- Exercises were finished with cooling down and stretching.

Core stabilization exercise examples are listed below.

Figure 3. 12. Lateral breathing with neutral position

a) 90° hip knee flexion with one leg b) 90° hip knee flexion with both legs

Figure 3. 13. Progressions of exercises on supine position (a, b)

Figure 3. 14. Shoulder bridge and progression

Figure 3. 15. Lifting and lowering of upper leg on side

Figure 3. 16. Hip extension on prone position

Figure 3. 17. One leg kick exercise

Figure 3. 18. Exercise progressions on crawling position

Figure 3. 19. Spine twist exercise

Figure 3. 20. Exercise progressions on standing position

3.8 Data Management and Statistical Analysis

Following data collection, all data were transferred from participants reports to Microsoft® Excel for Windows (Office 2016 version) spread sheets. IBM® SPSS Statistics (version 23.0) Software for Windows (SPSS, Chicago, Illinois, USA) were performed for statistical analysis.

For all statistical tests, we set the level of significance to $\alpha = 0{,}05$ in order to determine significance with 95% confidence intervals (CIs). Data were expressed as {mean ± standard deviation ($X \pm SD$); median (min, max)}z unless otherwise stated.

Wilcoxon test was employed to compare measurements before and after the exercise protocol. Data were assessed for normality of distribution via scatter plots and homogeneity of variance using Levene's test to determine suitability for paired-sample t test. Mann Whitney U was performed to understand relationships between main outcome variables among CG and EG.

Prediction of significant relationship amongst the pair of variables was determined by the Spearman's Correlation Coefficient 'r' where it was applicable. Correlations were also explored using scatter plots.

4. RESULTS

4.1. Normality Tests

A Shapiro- Wilk's test (p>0,05) (Shapiro & Wilk,1965; Razali &Wah, 2011) and a visual inspection of their histograms, normal Q-Q plots and box plots showed that arch height ratios were approximately normally distributed for both EG and CG, with a skewness of 0.18 (SE = 0,388) and a kurtosis of -0,365 (SE = 0,759) for CG FVC and with a skewness of -0,471 (SE = 0,501) and a kurtosis -0,246 (SE = 0,972) for EG FVC.

4.2. Demographic Descriptive Analysis

The study included 31 actor candidate taking basic acting education. There was statistically no significance (p>0,05) between age, height, weight as well as BMI for the EG and CG. It was highly likely due to randomization of the patients homogeneously. The sample comprised 31 participants of both genders (13 Males and 18 Females) in the age group 18-40 years old. Demographic variables are shown in Table 4.1.

6 (40%) subjects of EG and 3 (18,7%) of CG were reported smoking habit. It has been also reported that 7 (46,7%) individuals from EG and 9 (56,2%) individuals from CG were drinking alcohol.

Table 4. 1. Physical Features of Study Groups

	EG (X±SD)	**CG (X±SD)**	**MD**	**t**	**p value**
Age	29.27 ± 6.44	25.07 ± 4.92	4.200	2.007	0.055
Height	16.73 ± 8.82	171.47 ± 8.33	-1.733	-0.553	0.585
Weight	62.20 ± 12.52	64.93 ± 13.49	-2.733	-0.575	0.570
BMI	21.39 ± 2.39	21.92 ± 3.25	-0.534	-0.512	0.613

Data expressed as mean ± standard deviation. CG: Control Group, EG: Exercise Group, BMI: Body Mass Index, MD: Mean Difference, t: t score, p: the level of significance

*Independent Samples t-test

The gender, dominant hand and foot in the study groups were given Table 4.2. As a result of the statistical analysis of these values, a statistical difference was found between the two groups ($p<0.01$) about dominancy.

Table 4. 2. Comparison of Gender, Dominant Side of Hand and Foot among the Study Groups

		EG % (n)	CG % (n)	λ^2	p value
Gender	**Female**	53.3 (8)	62.5 (10)	1.20	0.273
	Male	46.7 (7)	37.5 (6)		
Dominant Hand	**Right**	66.7 (10)	87.5 (14)	8.53	**0.003****
	Left	33.3 (5)	12.5 (2)		
Dominant Foot	**Right**	66.7 (10)	87.5 (14)	8.53	**0.003****
	Left	33.3 (5)	12.5 (2)		

Data expressed as % (n). EG: Exercise Group, CG: Control Group, λ^2:Chi Square Test, p value: the level of significance, ** : correlation is significant at 0.01 level.

4. 3. Respiratory Functions Measurement Findings

Comparing pre and post measurement findings of spirometric values were showed that there were a significant difference on FVC, FEV1 and PEF (p=0.001) in EG and there were statistically difference on FVC, FEV1 and PEF in CG (p= 0.039, p=0.010 and p=0.049 repectively).

To understand the effectiveness of the intervention between two groups, Independent Samples t-test was run. As a result of these statistical analysis, there were a statistical difference on FVC, FEV1 and PEF values between EG and CG (p=0.001, p=0.038 and p= 0.003 respectively). (Table 4.4)

Table 4. 3. Comparison of Respiratory Functions Measurements within and Groups

	EG			CG					
	Before	After	p	Before	After	p	MD	t	p
FVC	3.05 ± 0.56	4.48 ± 0.70	**< 0.001****	3.24 ± 0.46	3.36 ± 0.37	**0.039**	0.77 ± 0.93	-5.348	**< 0.001****
FEV1	2.39 ± 0.25	3.53 ± 0.62	**< 0.001****	2.09 ± 0.95	2.55 ± 0.52	**0.010**	0.73 ± 0.98	-2.180	**0.038***
PEF	4.17 ± 0.83	8.53 ± 2.99	**< 0.001****	4.13 ± 1.32	5.06 ± 0.93	**0.049**	2.64 ± 3.26	-3.344	**0.003****
FEV1/FVC	0.79 ± 0.09	0.79 ± 0.10	0.883	0.66 ± 0.29	0.76 ± 0.17	0.213	0.047 ± 0.23	1.241	0.225

Data expressed as mean ±standard deviation. FEV1: Forced vital capacity at 1st second, FVC: Forced Vital Capacity, FEV1/FVC: Tiffeneau Ratio, EG: Exercise Group, CG: Control Group

*Paired Samples t-test, Independent Samples t-tes

4.4. Endurance Tests Measurements Finding

BST, FTET and LBT scores were found statistically different within EG ($p= 0.004$, $p<0.001$ and $p<0.001$ respectively) while only LBT score was found statistically different within CG ($p<0.001$).

A significant difference was found between EG and CG on BST, FTET and LBT scores ($p=0.023$, $p=0.005$, $p=0.010$ respectively).

Table 4. 4. Comparison of Balance Tests Measurements within and Groups

	EG			CG			MD	t	p
(sn)	**Before**	**after**	**p**	**before**	**after**	**p**			
BST	62.09 ± 30.65	72.33 ± 31.06	**0.004**	67.20 ± 27.04	69.40 ± 27.46	0.181	6.21 ± 28.03	-2.401	**0.023**
FTET	106.26 ± 20.23	126.13 ± 19.08	< **0.001**	103.06 ± 21.39	105.13 ± 18.85	0.334	9.49 ± 19.02	3.069	**0.005***
LBT	38.30 ± 24.56	56.0 ± 27.15	< **0.001**	41.20 ± 24.67	48.40 ± 26.37	**<0.001**	12.44 ±25.23	-2.851	**0.010****

Data expressed as mean ± standard deviation. Sn: Second, BST: Biering Sorenson Test, FTET: Fleksor Trunk Endurance Test, LBT: Lateral Bridge Test, EG: Exercise Group CG: Control Group

*Paired Samples t-test, Independent Samples t-te

4. 5. Balance Tests Measurements Findings

Paired Samples t-test was used to examine group differences in regard to pre and post values of Y Balance Test and Flamingo Balance Test. As per results of Y Balance Test, EG showed statistically difference in ANT and PM on both sides ($p<0.05$) and left side of PL ($p<0.001$) while CG showed enhancement outcomes in ANT and PM on only right side ($p<0.05$).

According to flamingo balance test results EG group had significant improvement ($p=0.002$) while CG did not. (Table 4.5).

Table 4. 5. Balance Tests Measurements Findings within and Groups

			EG			CG					
			before	after	p	before	after	p	Δ	t	p
Y Balance Test(cm)	**ANT**	right	67.11 ± 6.79	68.37 ± 6.76	**<0.01***	66.18 ± 5.68	66.74 ± 6.13	**0.008**	0.70	1.543	0.134
		left	70.79 ± 6.26	71.73 ± 6.13	**0.015**	68.24 ± 6.01	68.86 ± 6.08	0.149	0.32	0.824	0.418
	PM	right	69.92 ± 5.22	71.70 ± 5.79	**0.010**	66.71 ± 4.45	66.07 ± 6.01	**0.002**	2.41	2.526	**0.017**
		left	71.96 ± 7.50	74.01 ± 7.54	**<0.001***	64.63 ± 7.07	65.11 ± 6.93	0.400	1.57	4.799	**<0.001***
	PL	right	56.39 ± 7.84	57.30 ± 7.43	0.109	54.05 ± 5.74	54.44 ± 5.20	0.192	0.51	1.396	0.173
		left	58.39 ± 7.84	58.94 ± 7.77	**0.002**	53.28 ± 4.50	53.60 ± 4.06	0.290	0.23	0.529	0.601
Flamingo Balance Test (number of falling)			15.67 ± 3.10	12.53 ±1.72	**0.002**	15.06 ± 2.83	14.81 ±1.64	0.458	-1.88	-2.005	0.058

Data expressed as mean ± standard deviation. EG: Exercise Group, CG: Control Group, ANT: Anterior, PM: Posteromedial, PL: Posterolateral, **Δ:** Mean Difference, t: t score, p: the level of significance *Paired Samples t-test

5. DISCUSSION

The main goal of this study was to examine the effectiveness of the 8-week core stabilization exercise training on respiratory functions, trunk muscle endurance and postural stabilization in individuals taking basic acting education in addition to the diaphragm exercise program given in acting education. Consistent with hypothesis, core stabilization exercise program was effective to improve respiratory functions, trunk muscle endurance and postural stabilization in people taking basic acting education.

In the literature, there is no study examining the effectiveness of CSE training on respiratory functions of individuals taking BAE. For this reason, we compared the effectiveness of other abdominal strength exercise training with our own study. In the present study, FEV1, FVC, FEV1/FVC outcomes showed statistically significant improvements in both groups ($p<0.05$) after diaphgram training within BAE and core stabilization program. Kim et al. aimed to examine the effects of deep abdominal muscle strengthening exercises on respiratory function and lumbar stability and they found the comparison of FVC and FEV1 before and after the training, the experimental group showed significant increases in both FVC and FEV1. Their study noticed that the deep abdominal muscle strengthening exercise was effective at increasing vital capacity. The contractility of the diaphragm and the TrA in particular influences the partial stabilization of the lumbar spine and functions as a type of regulatory mechanism (102). Cavaggioni et al. investigated the effects a new modality of core stabilization exercises based on diaphragmatic breathing on pulmonary function, abdominal fitness, and movement efficiency.Thirty two physically active, healthy males were taken combined diaphragmatic breathing exercises with global stretching postures, and the control group performed common abdominal exercises (e.g., crunch, plank, sit-up), both for 15 minutes twice weekly for 6 weeks. They found significant changes in all pulmonary parameters were recorded in the experimental group at the posttraining assessment, whereas in the control group, no significant differences over baseline were observed in any parameters (103). The reason of achieving better results in respiratory function parameters in CG may be caused by diaphragmatic breathing exercises in scope with BAE in the present stu

The diaphragm, the main muscle of inspiration, is involved in trunk stability and posture control (104), and the TrA engages in posture and motor control and respiration (105) as we think. Among studies on respiratory muscle training, Hall et al. (102) suggested a respiratory muscle training method, while Richardson et al.(106) examined a deep abdominal muscle training method, and Roussel et al. (107) looked into the changes in breathing patterns and they found meaningful correlations. To conclude, enhanced diaphragmatic function achieved via deep abdominal muscle strengthening exercises not only increased respiratory volume but also played a role in postural stabilization owing to stabilizing the lumbar spine through the co-contraction of the TrA.

Our study showed statistically significant improvements in EG for trunk muscle endurance tests which are BST, FTET and LBT ($p<0.05$). Also we observed that CG had also significant improvement in LBT ($p<0.05$). Several possible explanations may be laid down for the improved endurance performance after core stabilization training in our study. During transverse abdominis and multifidus activation, the increase in intra-abdominal pressure (IAP) occurs (108), which ensures additional mechanical support to the spine, decreases the muscle load, delays fatigue of spinal stabilizers and prolongs performance. The reason of the improvement in LBT measurements in CG may be dominancy of hand and foot on the same side in addition to diaphragmatic breathing training.

Core endurance is achieved through the stabilization of one’s trunk, thus allowing optimal production, transfer and control of force and motion to the distal segment during an integrated kinetic chain activity (33). Recently, some studies have demonstrated that strengthening of lumbar muscles has improved spinal posture and postural stability, reduced the risk of falls which is important on stage (109-111). Aggarwal et al. aimed to evaluate the effect of the lumbar core stabilization training on the lower trunk endurance among recreationally active players. This study was a randomized controlled trial in which 40 recreationally active subjects aged 18–27 years were equally alloted into two groups. One group was the control group (CG), which received no intervention, and other group was the experimental group (EG), which received lumbar core stabilization training of six-week duration. Lower trunk endurance performance was evaluated using "time" (in seconds) as the dependent variable according to the various clinical tests such as Sorensen test, Plank tests (prone, right side, left side) and abdominal fatigue test. All test performance was performed at day zero (pre-test) and after six weeks (post-test). They found that core stabilization training significantly improved ($p \leq 0.05$) for the lower trunk endurance performance. Control group did not show any significant improvement in lower trunk endurance performance (112). In parallel with the studies in the literature, we also believe that core exercise training has positive effects on postural stability and balance.

Performance on the core endurance isometric tests is directly related to the ability of deep lumbar stabilizer muscles to maintain submaximal isometric contraction for extended time period (42). This endurance in turn is related to the stable maintenance of spinal posture (113).

Postural stability is the ability to maintain balance during activities. Any problems that occur in the cognitive, sensory or motor systems affect postural stability (114). It is very important that the actor can maintain his center of gravity and maintain his balance while performing on stage because all movements the person makes, from breathing to blinking, must be in a certain sequence. The actor candidate has to preserve his balance while exhibiting certain postures, positions, gestures, choreographies and movement patterns on the stage. Shin et al. (2012) investigated the effects of 3-week lumbar stabilization exercises applied to 18 patients on postural oscillation, and a significant improvement was found in forward-backward, right-left swing angles after exercise (115). Research by Hodges et al. (1996) supports that TrA to have an anticipatory function, contracting prior to distal activity, consequently improving spinal stabilization. In addition, mechanics of selective contraction of the TrA decreases the laxity of the SI joint (Richardson et al., 2002) thus enhancing the stability of the joint thereby relieving pain and disability (116, 117). Acar Y. et al aimed to compare core stability and balance between ankilozan spondylitis patients and healthy controls. Trunk flexor and extensor endurance, lateral side bridge tests were used for static core endurance (118).

Pilates is an exercise program as a core stability approach to amplify the neuromuscular system to control and protect the body or spine. It is a comprehensive body-mind conditioning, which composes core stabilizing exercise with mind and breath control challenging by flowing movement of the whole body. Phrompaet et al.

aimed to evaluate and compare the effects of pilates exercises on flexibility and lumpo-pelvic movement control between pilates group and control group. Pilates-based group joined 45-minute training sessions, twice a week during 8 weeks. The Modification of Pilates-based training consisted of initial period (0–4th week) and advanced period (4th–8th week). The results of this study recommend that Pilates method can be used as an adjunctive exercise program for improving control-mobility of trunk and pelvic segments. As with par with the previous studies the ultimate goal of the present study was to focus on normal automatic functioning of TrA, enhancing the stabilizing system which is achieved through CSE (119). In the present study, we showed the greater developments on dynamic balance in EG for ANT and PM directions on both sides and left side of PL ($p<0.05$), CG showed enhancement outcomes in ANT and PM on only right side. According to flamingo balance test results EG group had significant improvement while CG did not. As expected,the lowest falling numbers on the flamingo tests for measuring static balance were recorded by participants in the exercise group.

It is considered that the verbal and tactile stimulation by the therapist which is required for activation of deep muscles and protection of lateral respiration was effective in the exercise group superiority over the control group. We believe that these stimulation contributes to the habit of maintaining stabilization throughout all exercises and thus causes a further increase in core strength and endurance.

Measuring core stability is a hard task with no test or measure serving as a gold standard. It is a wide construct that includes proprioceptive control, strength, power, and endurance. Tests need to be determined for each of these sub-categories since it remains unclear as to which element may be the most important for different participation. A creation of a gold standard test or test battery would greatly enhance the current knowledge of and the ability to study the relationship between CES and basic acting education. Its the fact that acting education is for everyone brings with the problem of evaluation by approaching the theory of this education with a wider perspective.

The limitations of our study;

- The duration of exercise training is our limitation. If we look at the treatment period of Core Stabilization exercise training programs in the literature, it varies between 10 weeks and 12 weeks (120-122). We think that the shorter duration of our study is lacking in reflecting the effectiveness of exercise training on evaluation parameters. The long follow-up results were needed to evaluate the long-term effects of the core stabilization exercise on individuals taking basic acting education.

- Other limitation of our study is that we performed YBT on dominant side, the results would have been more effective if the test was performed bilaterally.

- We did not know that whether they had any previous acting education. This may affected the results of study.

-Another limitations of present study is to investigate respiratory muscle strength and trunk muscle strength. We suggest that future studies in this field can research effectiveness of core stabilization exercises on respiratory and trunk muscle strength in basic acting education.

6. CONCLUSION

The reason why we preferred core stabilization training in our study was to determine or predict that individuals who received basic acting training need voice, breath, balance and therefore core control on the stage. One of the biggest factors that improve the actor’s performance is the right breathing. His physical energy and movements increase on the stage when he uses his breath and body consciously and economically.

Our results confirmed our all hypothesis that;

Core stabilization exercises affected respiratory functions in individuals taking basic acting education.

Core stabilization exercises affected trunk muscle endureance in individuals taking basic acting education.

Core stabilization exercises affected postural stabilization in individuals taking basic acting education

We determined that CSE made important contributions to endurance, balance, postural stabilization especially lung capacities in line with the anatomical and biomechanical connections.

Synthesizing the all results above, we suggest that CSE training is useful in basic acting education.

This is the first study investigated the effects of core stabilization exercises on respiratory function, trunk muscle endurance and trunk stabilization in individuals taking basic acting education in literature.

It may be a new employment area for physiotherapists by raising awareness among individuals interested in acting education and explaining the effects of CES.

More studies are needed showing the effectiveness of CES on acting education in the literature.

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APPENDIXES

7.1. Appendix 1 Informed Written Consent

BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU

TEMEL OYUNCULUK EĞİTİMİ ALAN BİREYLERDE CORE STABİLİZASYON EGZERSİZLERİNİN; SOLUNUM FONKSİYONLARINA, GÖVDE KAS ENDURANSINA VE POSTURAL STABİLİZASYONA ETKİSİ

Bu çalışma, temel oyunculuk eğitimi alan bireylerde bu eğitim kapsamında aldıkları diyafram kuvvetlendirme programına ek olarak verilen kor stabilizasyon egzersizlerinin bireylerin solunum fonksiyolarına, gövde kas enduransına ve postural stabizasyonuna etkilerini incelemek için yapılacaktır. Egzersizler haftada 2 gün günde 45 dakika 8 hafta süreyle fizyoterapist eşliğinde ve grup şeklinde yapılacaktır. Solunum fonksiyonlarının değerlendirilmesi için taşınabilir spirometre, gövde kas enduransını değerlendirmek için; Biering Sorensen Testi, Gövde Fleksor Endurans Testi ve Lateral Köprü Testi, postural stabilizasyonu değerlendirmek için ise Flamingo denge testi ve Y Denge Testi kullanılacaktır. Çalışma sonunda kor güçlendirme ve stabilizasyon eğitimi ile kişilerin solunum fonksiyonlarının, kas gücünün ve dengesinin artması hedeflenmektedir. Bu çalışmaya katılmış olmanız nedeniyle size herhangi bir ödeme yapılmayacak; aynı şekilde çalışma dahilinde size sağlanan bütün malzeme, değerlendirme ve egzersiz hizmetleri için sizden veya bağlı bulunduğunuz sosyal güvenlik kurumundan hiç bir ücret talep edilmeyecektir.

Bu çalışmaya dahil olmak tamamen sizin isteğinize bağlıdır ve gönüllülük esastır. Araştırmada yer almayı reddedebilirsiniz ya da herhangi bir aşamada araştırmadan ayrılabilirsiniz; bu durumda herhangi bir ceza ya da sizin yararlarınıza engel duruma yol açmayacaktır. Araştırmacı bilginiz dahilinde veya isteğiniz dışında, uygulanan çalışma şemasının gereklerini yerine getirmemeniz, çalışma programını aksatmanız gibi nedenlerle sizi araştırmadan çıkarabilir. Araştırmanın sonuçları bilimsel amaçla kullanılacaktır; çalışmadan çekilmeniz ya da araştırıcı tarafından çıkarılmanız durumunda, sizle ilgili tıbbi veriler de gerekirse bilimsel amaçla kullanılabilecektir.

Size ait tüm tıbbi ve kimlik bilgileriniz gizli tutulacaktır ve araştırma yayınlansa bile kimlik bilgileriniz verilmeyecektir, ancak araştırmanın izleyicileri, yoklama yapanlar, etik kurullar ve resmi makamlar gerektiğinde tıbbi bilgilerinize ulaşabilir. Siz de istediğinizde kendinize ait tıbbi bilgilere ulaşabilirsiniz.

KATILIMCI BEYANI

Sayın Fzt. Helin Dicle Çelik tarafından DC Kozmos Sanat Akademisi’nde yapılacak olan çalışma ile ilgili yukarıda izah edilen bilgiler tarafıma aktarıldı. Bu bilgilerin aktarılması sonrasında, yapmış oldukları bilimsel araştırmaya “katılımcı” olarak davet edildim. Eğer bu araştırmaya katılırsam fizyoterapistimiz ile aramızda kalması gereken bana ait bilgilerin gizliliğine bu araştırma sırasında da büyük özen ve saygı ile yaklaşılacağına inanıyorum. Araştırma sonuçlarının eğitim ve bilimsel amaçlarla kullanımı sırasında kişisel bilgilerimin büyük önem gösterilerek korunacağı konusunda bana yeterli güven verildi. Projenin yürütülmesi sırasında herhangi bir sebep göstermeden araştırmadan çekilebilirim (Ancak araştırmacıları zor durumda bırakmamak için araştırmadan çekileceğimi önceden bildirmemim uygun olacağının bilincindeyim). Ayrıca tıbbi durumuma herhangi bir zarar verilmemesi koşuluyla araştırmacı tarafından araştırma dışı da tutulabilirim.

Araştırma için yapılacak harcamalarla ilgili herhangi bir parasal sorumluluk altına girmiyorum. Bana da bir ödeme yapılmayacaktır. İster doğrudan, ister dolaylı olsun araştırma uygulamasından kaynaklanan nedenlerle meydana gelebilecek herhangi bir sağlık sorunumuzun ortaya çıkması halinde, her türlü tıbbi müdahalenin sağlanacağı konusunda gerekli güvence verildi.

Araştırma sırasında bir sağlık sorunu ile karşılaştığımda; herhangi bir saatte, Fzt. Helin Dicle Çelik’i 0545 868 2029 numaralı telefondan arayabileceğimi veya Dumlupınar Mah. Doruk Sok. Baysaş İstanbul 216 2.Etap A Blok Daire:90 Kadıköy/İstanbul adlı adresinden ulaşabileceğimi biliyorum.

Bu araştırmaya katılmak zorunda değilim ve katılmayabilirim. Araştırmaya katılmam konusunda zorlayıcı bir davranışla karşılaşmış değilim. Eğer katılmayı reddedersem, bu durumun tıbbi bakımıma ve fizyoterapist ile olan ilişkime herhangi bir zarar getirmeyeceğini de biliyorum.

Bana yapılan tüm açıklamaları ayrıntılarıyla anlamış bulunmaktayım. Kendi başıma belli bir düşünme süresi sonunda adı geçen bu araştırma projesinde “katılımcı” (denek) olarak yer alma kararını aldım. Bu konuda yapılan daveti büyük bir memnuniyet ve gönüllülük içerisinde kabul ediyorum.

İmzalı bu form kâğıdının bir kopyası bana verilecektir.

GÖNÜLLÜ ONAY FORMU

Yukarıda gönüllüye araştırmadan önce verilmesi gereken bilgileri gösteren metni okudum. Bunlar hakkında bana yazılı ve sözlü açıklamalar yapıldı. Bu koşullarla söz konusu klinik araştırmaya kendi rızamla hiçbir baskı ve zorlama olmaksızın katılmayı kabul ediyorum.

Gönüllünün;
Adı-Soyadı:
Telefon:
Adres:

Tarih:
İmza:

Araştırmacının;

Adı-Soyadı:
İmza:

Gerekiyorsa olur işlemine tanık olan kişinin/Yasal temsilcinin:

Adı-Soyadı:
Telefon:
Adres:

Tarih:
İmza:

7.2. Appendix 2 Ethical Committee Approval

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15- 1843 **09/04/2020**
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

İlgili Makama (Helin Dicle Çelik)

Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Fizyoterapi ve Rehabilitasyon Bölümü Dr. Öğr. Üyesi Feyza Şule Badıllı Demirbaş'ın sorumlu araştırmacı olduğu **"Temel Oyunculuk Eğitimi Alan Bireylerde Kor Stabilizasyon Egzersizlerinin ; Solunum Fonksiyonlarına, Gövde Kas Enduransına ve Postural Stabilizasyona Etkisi"** isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası **(1826)** kayıt Numaralı KAEK Başvuru Dosyası, Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından **08.04.2020** tarihli toplantıda incelenmiştir.

Sağlık Bakanlığı'nın Covid-19 pandemisi nedeniyle uygulamakta olduğu ''toplumsal izolasyon veya karantina'' uygulamalarının bitiminde başlanması şartıyla;

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (**KAEK Karar No: 1184**).

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

Yeditepe Üniversitesi 26 Ağustos Yerleşimi, İnönü Mahallesi Kayışdağı Caddesi 34755 Ataşehir / İstanbul
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8.3. Appendix 3 Structured Questionnaire for Patient's Demographic Characteristics

DEMOGRAFİK BİLGİLER FORMU

Demografik Bilgiler Formu karşılıklı görüşme ve kayıt yöntemi ile doldurulacaktır.

Tarih :...../...… /………

Katılımcı Ad Soyad : ……………………….....

Tlf Cep:………………………….......

Ev:………………………….............

Adres:…………………………………………………………………………

……………...……………………………………………………………….....

....

2) Yaş :

3) Cinsiyet : ( ) Kız ( ) Erkek

4) Boy uzunluğu (cm) :

5) Vücut ağırlığı (kg) :

6)VKİ (kg/m^2) :

7) Dominant taraf el : ( ) sağ ( ) sol

Ayak : ( ) sağ ( ) sol

8) Eğitim durumu : ( ) İlkokul ( )Ortaokul ( ) Lise ( ) Üniversite ( ) Yüksek Lisans/Doktora

9) Çalışıyor musunuz ? ( ) Evet ( ) Hayır

Evet ise mesleğiniz………………………….

10) Medeni durum: ( ) Evli ( ) Bekar ( ) Boşanmış ( ) Dul

11) a) Sigara kullanıyor musunuz ?

( )Hiç içmedim ( )Sigara içtim ama bıraktım ( )Halen içiyorum

b) Günde kaç adet sigara içiyorsunuz ?

..............Adet/gün

.............Paket/Yıl

12) Alkol kullanıyor musunuz ? ( ) Evet ( ) Hayır

Hangi sıklıkla ?...........

13) Herhangi bir sürekli hastalığınız var mı ? Varsa hangileri ?

( ) Sürekli bir hastalığım yok.

( ) Ortopedik hastalıklar

( ) Kalp damar hastalıkları

( ) Solunum problemleri

( ) Nörolojik problemler

( ) Travma

( ) Diğer................................(Lütfen belirtiniz)

14) Şu an herhangi bir ağrı kesici ilaç kullanıyor musunuz ?

( ) Evet ( ) Hayır

Evet ise ne zamandır ?.................

15) Herhangi bir ameliyat geçirdiniz mi ?

( ) Evet.............................. ( ) Hayır

16) Spor yapıyor musunuz ? Yapıyorsanız ne sıklıkta ?

( ) Yapmıyorum

( )Ayda bir kereden az ( ) Ayda 2 kere ve fazla ( )Haftada 1 kere

( )Haftada 2-3 kere ( )Haftada 4-5 kere ( )Her gün

17) (Egzersiz yapanlar için) Yaptığınız egzersiz her seferinde kaç dakika sürüyor ?

( )20 dk.da az ( )20-30 dk ( )30 –60 dk ( )60 dk. dan fazla

18) Son 2 ay içerisinde bel bölgenizde ağrı şikayetiniz oldu mu ?

( ) Evet ( ) Hayır

8.4. Appendix 4 Evaluation Measurements Score Card

DEĞERLENDİRMELER

Spirometre Ölçümleri

	İLK	SON
FEV1		
FVC		
PEF		
FEV1/FVC		

Biering Sorensen Testi Ölçümleri

	İLK	SON
sn		

Trunk Fleksor Endurance Testi Ölçümleri

	İLK	SON
sn		

Lateral Köprü Testi Ölçümleri

	SAĞ	SOL	SAĞ	SOL
İL K				

SON				

Flamingo Denge Testi Ölçümleri

	SAĞ	SOL	SAĞ	SOL
İLK				
SON				

Y Balance Test Ölçümleri

Bacak Boyu Uzunluğu (cm): Sağ: Sol:

	ANT-sağ	PM-sağ	PM-sağ	ANT-sol	PM-sol	PL-sol
İLK						
SON						

8.5. Appendix 5 Curriculum Vitae

Kişisel Bilgiler

Adı	Helin Dicle	**Soyadı**	ÇELİK
Doğum Yeri		**Doğum Tarihi**	
Uyruğu		**TC Kimlik No**	-
E-mail		**Tel**	-

Öğrenim Durumu

Derece	**Alan**	**Mezun Olduğu Kurumun Adı**	**Mezuniyet Yılı**
Doktora	-	-	-
Yüksek Lisans	-	-	-
Lisans	Fizyoterapi ve Rehabilitasyon	Yeditepe Üniversitesi	2016
Lise	-	Tunceli Türk Telekom Fen Lisesi	2010

Bildiği Yabancı Dilleri	**Yabancı Dil Sınav Notu (#)**
İngilizce	62.5 (YDS)

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	**Kurum**	**Süre (Yıl - Yıl)**
Fizyoterapist	Özel Asya Fizik Tedavi Merkezi	2016-2018

Bilgisayar Bilgisi

Program	**Kullanma becerisi**
Microsoft Office Program	İyi

Bilimsel Çalışmaları

SCI, SSCI, AHCI indekslerine giren dergilerde yayınlanan makaleler

Diğer dergilerde yayınlanan makaleler

Uluslararası bilimsel toplantılarda sunulan ve bildiri kitabında (*Proceedings*) basılan bildiriler

Hakemli konferans/sempozyumların bildiri kitaplarında yer alan yayınlar

Diğer (Görev Aldığı Projeler/Sertifikaları/Ödülleri)

Omurgada Manuel Değerlendirme ve Tedavi Teknikleri I ve Kinezyolojik Bantlama 1, (Erdem Yörükoğlu-Okan Keleş), İstanbul 2016
Alt ve Üst Ekstremitede Manuel Değerlendirme ve Tedavi Teknikleri 1 ile Lenf Drenajda Bandajlama, (Erdem Yörükoğlu-Okan Keleş), İstanbul 2016
Lenfödem Tedavisinde Hasta Odaklı Kompresyon Uygulamaları Kursu, (Erdem Yörükoğlu-Okan Keleş), İstanbul 2016
Basic Dry Needling, (Ümit Erkut), İstanbul 2016
The Australian Physiotherapy&Pilates Institute Matwork Level 1, (Özlem Üstünkaya), İstanbul 2017
The Australian Physiotherapy&Pilates Institute Matwork Level 2, (Özlem Üstünkaya), İstanbul 2018
The Australian Physiotherapy&Pilates Institute Matwork Level 3, (Özlem Üstünkaya), İstanbul 2018

The Australian Physiotherapy&Pilates Institute Antepostnatal Pilates, (Özlem Üstünkaya), İstanbul 2018