

T.C.
YEDITEPE UNIVERSITY
INSTITUTE OF HEALTH SCIENCES
DEPARTMENT OF SPORTS PHYSIOTHERAPY AND REHABILITATION

**THE EFFECT OF NEURODEVELOPMENTAL YOGA
ON BALANCE, REACTION TIME, FLEXIBILITY AND
PERFORMANCE ANXIETY AMONG YOUNG
BASKETBALL PLAYERS**

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APPROVAL

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 and numbered

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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.

05.07.2022

İrem SAVAŞKAN

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LIST OF SYMBOLS AND ABBREVIATIONS

PSLR	Passive Straight Leg Raise
NCAA	National Collage Athletic Association
NBA	American National Basketball Association
FIBA	International Basketball Federation
ART	Auditory Reaction Time
VRT	Visual Reaction Time
CNS	Central Nervous System
VCR	Vestibulo-Colic Reflex
VSR	Vestibulo-Spinal Reflex
VOR	Vestibulo-Ocular Reflex
SS	Static Stretching
DS	Dynamic stretching
PNF	Proprioceptive Neuromuscular Facilitation
GPSE	Global Postural Stretching Exercises
ROM	Range of Motion
HPA	Hypothalamic-Pituitary Adrenal Axis
SNS	Sympathetic Nervous System
CVD	Cardiovascular Disease
PT	Proprioception Training
PD	Parkinson Disease
EO	Eyes Open
EC	Eyes Closed

ABSTRACT

Savaşkan, İ (2022). The Effect of Neurodevelopmental Yoga on Balance, Reaction Time, Flexibility and Performance Anxiety Among Young Basketball Players . Yeditepe University, Institute of Health Sciences, Department of Sports Physiotherapy and Rehabilitation, Master's Thesis, Istanbul.

This study was conducted to determine whether Neurodevelopmental Yoga has an effect on balance, hand reaction time, hamstring flexibility and sportive performance anxiety in young basketball players. The study was carried out at Darüşşafaka Sports Club between April 2022 and August 2022 and volunteered for 42 (42E ; 18.59 ± 2.4 years; 200 ± 8.11 cm. ; 94.2 ± 8.3 kg) basketball players. Basketball players who fulfilled the inclusion criteria and volunteered to participate in the study were randomly assigned to two groups, the intervention group (n=21) and the control group (n=21). Y balance test was used to evaluate the balance of basketball players , Nelson Hand Reaction Test was used to evaluate hand reaction time. Hamstring flexibility was tested with Passive Straight Leg Raise (PSLR). Sports Injury Anxiety Questionnaire was used to evaluate sports injury anxiety .In the analysis of non-normally distributed (nonparametric) dependent variables, the Mann-Whitney U Test was used to evaluate between two groups. The variation of repeated measurements was examined with the Wilcoxon Test. Cases where the P-value was below 0.05 were considered as statistically significant. While presenting the independent variables, the average of the values was used.As a result, Neurodevelopmental Yoga was applied twice a week , 60-minutes per session for 6 weeks.When the Neurodevelopmental Yoga, intervention, group and the control group were compared, a statistically noteworthy increase was seen in the dynamic balance values(Y Balance total score , Y Balance anterior, Y Balance posterolateral and Passive Straight Leg Raise (PSLR) Measurement of the left side. There was no statistically remarkable difference was found between the athletes in these two groups, when the hand reaction times of the two groups mentioned in the study.In addition to this results , it was determined that there was a significant reduction in sports injury anxiety in athletes participating in neurodevelopmental yoga sessions compared to the control group.

Keywords: Basketball, Neurodevelopmental Yoga, Flexibility, Balance , Stress Management

ÖZET

Savaşkan İ. (2022) Genç Basketbolcularda Nörogelişimsel Yoga'nın, Denge , Reaksiyon Hızı , Esneklik ve Performans Anksiyetesine Olan Etkisi. Yeditepe Üniversitesi , Sağlık Bilimleri Enstitüsü, Spor Fizyoterapisi Yüksek Lisans Tezi. İstanbul

Bu çalışma, Nörogelişimsel Yoga'nın genç basketbolcularda denge, el reaksiyon süresi, hamstring esnekliği ve sportif performans kaygısı üzerine etkisinin olup olmadığını belirlemek amacıyla yapılmıştır. Çalışma Nisan 2022-Ağustos 2022 tarihleri arasında Darüşşafaka Spor Kulübünde yapıldı ve gönüllü 42 (42E; 18,59±2,4 yıl ; 200±8,11 cm. ;94,2±8,3 kg) basketbol oyuncusu değerlendirildi. Dahil etme kriterlerini karşılayan ve araştırmaya katılmaya gönüllü olan basketbolcular, müdahale grubu (n=21) ve kontrol grubu (n=21) olmak üzere randomize olarak iki gruba atandı. Basketbol oyuncuların dengelerini değerlendirmek için Y balance testi, el reaksiyon hızlarını değerlendirmek için Nelson El Reaksiyon Testi , hamstring esnekliğini değerlendirmek için Pasif Düz Bacak Kaldırma Testi (PSLR) ve spor yaralanma kaygısını değerlendirmek için de Spor Yaralanma Kaygısı Anketi'nden yararlanılmıştır. Normal dağılım göstermeyen (nonparametrik) bağımlı değişkenlerin analizinde, iki grup arasındaki sonuçlar değerlendirilirken Mann Whitney U Testi kullanılmıştır. Tekrarlı ölçümlerin grup içi değişiminin incelenmesinde ise Wilcoxon Testi kullanılmıştır. P-değerinin 0.05 'in altında olduğu durumlar istatistiksel olarak anlamlı kabul edildi. Bağımsız değişkenler sunulurken değerlerin ortalaması kullanılmıştır. Sonuç olarak genç basketbolcularda , haftada 2 seans , 60 dakika , 6 hafta boyunca , Nörogelişimsel Yoga uygulanan grup ile kontrol grubu karşılaştırıldığında , dinamik denge değerlerinde (Y Balance toplam skor , Y Balance anterior , Y Balance posterolateral ve Sol Pasif Düz Bacak Kaldırma Testinde (PSLR) anlamlı bir artış görülmüştür. Nörogelişimsel yoga uygulanan grup ile kontrol grubu karşılaştırıldığında , sporcuların el reaksiyon hızlarında anlamlı bir fark bulunamamıştır. Bu sonuçlara ek olarak , nörogelişimsel yoga seanslarına katılan sporcularda kontrol grubuna göre spor yaralanması kaygılarında anlamlı derecede bir düşüş olduğu belirlenmiştir.

Anahtar kelimeler: Basketbol, Nörogelişimsel Yoga, Esneklik , Denge , Stres Yönetimi

1. INTRODUCTION AND PURPOSE

Basketball is a sport that requires close contact, which includes complex movements such as turns, jumps, short sprints and rapid direction-speed changes. For this reason, it can cause musculoskeletal injuries from time to time in many people who are interested in this sport or professional players(1,2).

For this reason, it is important for the success of basketball to reflect the physiological, psychological and other effects of training or matches on the athletes' skills and to prevent possible injuries (3). There are many modifiable and unchangeable factors that affect performance in athletes. The modifiable factors for basketball are sports-specific physical fitness, balance and coordination skills, agility, flexibility, endurance, body composition and mental health or stress management skills.

Yoga, on the other hand, is a discipline of “exercises” originating from India and in Sanskrit it means unity, being one, bringing together. Yoga, which has its roots in Indian culture and religion, can now be used as a clinical therapeutic intervention regardless of religion.

Yoga practices may include different exercises for breathing, body, mind and emotion control. It is preferred for the continuation of the inner peace. This is a system that helps a person to change not only physically but also in mental state and attitude. The primary goal in yoga is to bring the breath, body, mind and emotions together. The most well-known techniques in society are asanas (yoga poses), pranayama (breath control exercises), meditation, relaxation and focusing techniques.

Neurodevelopmental Yoga, on the other hand, is an approach that combines anatomy, kinesiology and yoga, incorporating the principles of typical motor & postural development of human body into yoga. By perceiving the needs of the person's body regarding the movement and thus gaining body awareness, without compensating yoga postures (asanas). Neurodevelopmental Yoga helps by stimulating the vagus nerve and autonomic system with 3 dimension breathing and combine with yoga specific other breathing techniques, providing postural stabilization with bandhas, focusing on the quality of the movement. In addition, during this yoga sessions, our better known senses

such as sight, hearing, touch, taste, smell and also lesser known senses such as the vestibular, interoceptive and proprioceptive systems are activated.

Yoga is considered as one of the most important exercise modalities of the Far East culture for centuries, also improves balance and sportive skills. It is thought that Neurodevelopmental Yoga will also be effective on balance and sportive skills. Neurodevelopmental Yoga, unlike other classical yogas activates vestibular system, stimulates the vagus nerve with different breathing techniques and improves postural control with bandha without any compensation.

In the studies carried out to date, there are studies that show that yoga practices reduce the stress levels of basketball players. However, there is no study on Neurodevelopmental Yoga practices, which is a new approach in yoga. In addition, there has been no study observed that any yoga approach affects performance or performance anxiety positively or negatively. Our aim in this study is to investigate if Neurodevelopmental Yoga will positively affect balance in young basketball players. Since Neurodevelopmental Yoga flows activates the vestibular system with ocular motor and head eye movements, it is thought that it can better affect the reaction time compared to the other classical yoga studies. It may be effective in all sports related performance anxiety as a stress reduction technique through breathing and meditation. The contribution of this study to the literature is to investigate whether Neurodevelopmental Yoga practices, which is a new approach in yoga, have an effect on hand reaction time, balance, hamstring flexibility and performance anxiety in young basketball players.

2. LITERATURE REVIEW

2.1. Basketball as a sport

Basketball is an aerobic-based anaerobic sport played in an area of approximately 450 m², where low-intensity movements such as walking and stopping between high-intensity activity periods such as jumps (rebounds, blocks and smash), directional running, sprints, ball movements (1,4-7).

Gottlieb et al. defined basketball as a type of sport that combines variable movements from low-intensity jogging or walking to maximum jumps or sprints. Balčiūnas et al. In his study, he said that basketball is a sport that maximizes motor features and these motoric features should be used continuously(8).

Teams can enter the competition with a minimum of 5 and a maximum of 12 players. Teams compete with 5 players determined from the competition roster and have the right to make unlimited substitutions. The object of the game is to score points by passing the ball through the 3.05 m high hoop in the opposing team's area. Ball passing through the circle; 2 points are scored if the shot is made from inside the three-point line, 3 points if it is shot from outside, 1 point if the ball passes through the ring during foul shots. The team that has to score in 24 seconds has to leave their own half in 8 seconds(9).

The duration of the game is determined by the federations to which the competitions are affiliated. Playing time in American National College Athlete Association “National Collage Athletic Association” (NCAA) competitions; He found it appropriate to play a total of 40 minutes from two 20-minute halves, 48 minutes from four 12-minute quarters in the American National Basketball Association (NBA), and a total of 40 minutes from 4 10-minute quarters of the International Basketball Federation (FIBA). In accordance with the game rules, frequent stoppages of the game help the players to recuperate and thus allow the repetitive high-intensity activities to be performed with the same quality (9).

7-8 years old as the age to start basketball, 10-12 age for learning basketball, 20-25 age for specialization and reaching high performance are appropriate intervals(10). The age of 20-22 is the period of first achievements, the age of 23-26 is the period of optimal success, maturity and high-level achievements are between the ages of 27-30 (11). Basketball players during a 40-minute match; They make various multi-directional

movements such as dribbling, running and jumping at different intensities and cover a distance of approximately 4500-5000 meters. 600 meters of this are 7 meters of fast-paced runs; It was determined that he changed tempo 350 times, ran 250 meters with the ball, 80 times short attacks, 50 times sudden stops, 500 times lower extremity movements in defense, 90 times jumping, 150 times in defense arm movements, 250 times hip flexion and 360 times trunk rotation(12).

Due to the fact that the game is based on air dominance as well as technical skills in a short time, it clarifies the characteristics of the players based on their physical, physiological and motor skills. A total distance of 5500 to 6500 meters is covered (13-15), including when the ball is not in play, 56.8% of this distance is walking, 9% is stationary, and 34.1% is jumps and runs. (12,16) reported that 50-60 sprints with changing direction, 40-60 maximum jumps and 90-100 sports-specific high-intensity movements are performed during the game (17,18).

Basketball players; are generally classified into 3 positions as guards, forwards and centres. Rules and tactics are determined by these positions. Pivots move near the hoop and use their height advantage to get the ball during offensive and defensive rebounds, while guards play a more important role in organizing the game and often stay away from the hoop. Forwards are players who assist the guards on offense and the pivots on defense. The anthropometric measurements and physical profiles of these basketball players playing in different positions are different. Normally, pivots are the heaviest and tallest among basketball players. Forwards, on the other hand, are heavier and longer than guards(19).

2.2. Sports Performance in Basketball

The performance of the athlete in the match is the result of all the effort he/she puts into the successful fulfillment of his athletic task. Therefore, all factors affecting the performance of the athlete during the match will also affect the success of the athlete(8).

Factors affecting athletic performance are numerous and varied. They are divided into two as internal and external factors according to their formation sources.

Intrinsic Factors:

In general, they are factors that are present in humans, are partially hereditary, can differentiate with small changes over time, and have very limited or no effect on them from the outside.

Age, gender, anatomical structure, genetics, intelligence, state of the locomotor system, psychological balance, autonomic nervous system, functions of glands, metabolism, energy use mechanisms, state of organ systems, allergy, neuromuscular conduction rate, cardiovascular structure are the most important internal factors(8).

It is very possible to extend and elaborate this list.

Optimizing internal factors and calculating their effect on performance is almost impossible.

Extrinsic Factors:

These factors , as the name suggest , are not caused by the human body or structure. Therefore extrinsic factors indirectly affect sportive performance with a physical or mental component. It is easier to change external factors than to change internal factors. It can change and improve many of the extrinsic factors through appropriate interventions. Therefore, making positive changes in external factors in order to increase sportive performance will be easier and will create more effective results. Climate or temperature of the environment , nutrition & training quality and their balance , flexibility , warming up and cooling down periods , trainer and athlete relationship , materials , personal motivation , social environment , positive or negative beliefs , sleep pattern or quality , previous injuries , doping or the person's economic components are the main extrinsic factors(8).

1. Factors Affecting Sports Performance in Basketball

1. Force

Strength is an explosive power characteristic that can be done rapidly with maximum effort. This power and speed manifests itself in the activities of athletes such as jumping, throwing and throwing (20). Force has been explained as an effect that can change the shape, work order or position of an object or the ability of a muscle to resist a certain resistance through contraction and relaxation (21). In another study, strength is the basic

feature of human beings, and with the help of it, it can move a mass, overcome a certain resistance or resist it with muscle power (22).

Strength classifications according to training science are diverse; It can be classified according to maximal strength, rapid strength, continuity in strength or muscle contraction types (isometric, isotonic, isokinetic, oxotonic) (23,24,25).

Basketball is a combination of different motor activities of various intensities. Apart from that, requiring explosive force; There are also activities such as sudden runs in various directions, vertical jump (shooting or rebounding), double challenges. Due to the characteristic of basketball, vertical jump is a frequently performed movement in the game and generally depends on the strength of the quadriceps muscle (11).

2.2.1.2. Agility and Hand Reaction Time

Agility is the main parameter for most team and field sports. Agility; It is defined as being able to move the body and change direction between two points with the cooperation of balance, speed, strength and neuromuscular coordination as easily, quickly, fluently and in a controlled manner (26). In other words, it is stated that agility is the response of the whole body as a change in speed and direction in response to a stimulus (27). From a physiological point of view, muscles and nervous system need the ability to work fast in order to be fast and agile(24,28).

Many researchers define agility as dynamic sports movements that cause a change in body position or speed.

In sports such as basketball, handball, and football, players make various movements such as jogging, jogging, jumping. In light of this, agility, which is generally described as a combination of sudden stopping, acceleration or changing direction, also provides postural control in the vertical or horizontal direction.(29). In this type of sports, players exhibit movements such as accelerating, decelerating and changing direction in the directions required by the game (30,31,27).

In basketball, it can be in the form of the attacking players moving to the defenders around them with a sudden movement or the defensive players stealing the ball from the attacking players with the same movement. An athlete who is good at agility is also good at other qualifications such as dynamic balance, proprioception, and visual

processing(32).Therefore, agility, described as the ability to stop and start again quickly, is formed by a high degree of combination of all motor skills.

Performing successfully in different types of sports requires not only advanced physical capacity but also high-level perception and decision-making skills. Response time, which is a different type of agility, can be defined as the time between the arrival of a stimulus and the required voluntary motor response (34). For example, the athlete must quickly perceive the movement of the ball during the match, process it and initiate a motor response. Therefore, the athlete's reaction time is expected to be less(33).

The human body can use a variety of sensory modalities and responses at different rates when the type of stimulus changes. To explain, just as visual response time is the time required to react to visual stimuli, auditory response time is the time required to respond to auditory stimuli and the type or speed of response to these two stimuli may be different.

Movement, speed and ability to react quickly, which are the main features of basketball, partly determine whether a basketball player can be successful in defense or not. After the offensive player's move, the defender's quick or slow reaction decides success or failure (36).

Although most motoric exercises are performed using visual and auditory information, the response time to the stimulus is important for all senses during movement(37).

The reaction time is basically collected in 2 groups.

- (1) Cerebral processing time: It is the sum of the time it takes for the person to perceive the stimulus, recognize the stimulus, analyze it, and decide on the appropriate motoric response.
- (2) Motion time: It is the time required for the appropriate movement to occur after the motoric response has been determined. (38).

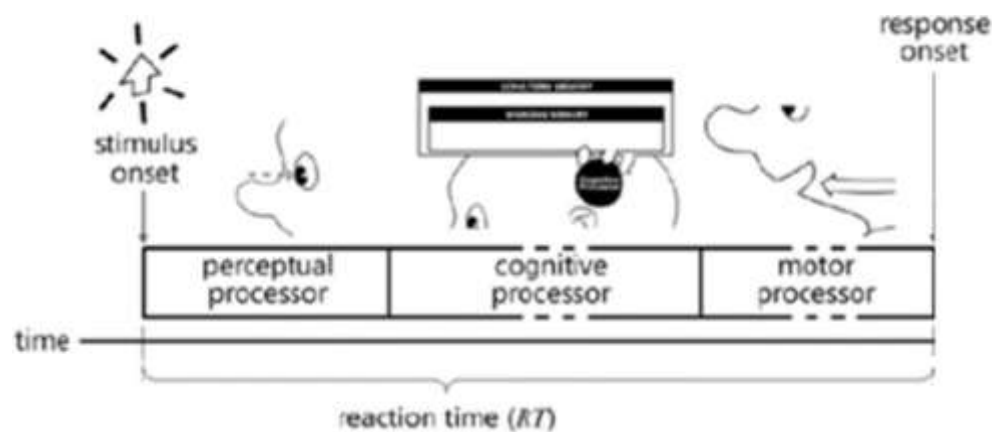


Figure 2.1. Reaction Time Schema(199).

In the experimental studies in the literature, it is observed that the time to reach the brain of a visual stimulus was 20-40 ms, while the time to reach the brain of an auditory stimulus was only 8-10 ms. For this reason, the motor response time of the person exposed to the visual stimulus will reach the cortex slower than the response to the auditory stimulus(38-40).

In a study in the literature examining the fastest response time to tactile, auditory and visual stimuli, the reaction time to a tactile stimulus was 90-180 ms, the reaction time to a visual stimulus was 150-200 ms, and the reaction time to auditory stimulus was 120-180 ms(41).

Physiological and pharmacological factors also affect the reaction time(42,43).

It has been stated that the population that reacts most rapidly to visual and auditory stimuli is young people between the ages of 11 and 18(44).

In one study, it was investigated whether there was a difference in reaction time according to gender. As a result, it was found that the response times to sound and visual stimuli were different in men and women, and it was noted that the reaction times of men to both sound and visual stimuli were faster than women(45).

Another factor affecting the visual and auditory reaction times is whether they are physically active or not. In a study conducted with volleyball players, these two reaction

times were measured before and after training(46,47). As a result, it was concluded that auditory and visual reaction times decreased at the end of the training. (48).

In the light of this study, the researchers concluded that both auditory reaction time (ART) and visual reaction time (VRT) will be shorter in athletes when compared to sedentary. In addition, it was stated that the dominant hand performed better in sleight of hand in both groups (48).

In summary, the improvement in reaction time is a factor that will improve the performance and speed of the athlete. Response time accelerates with practice. Basketball players, on the other hand, can train regularly to improve their reaction time and therefore their performance(35).

2.2.1.3. Balance and Coordination

Balance is an important factor in providing daily living activities and sportive performance. Balance contributes to a successful performance of athletes by protecting body composition against instantaneous and variable gravity centers during sports activities. The balance, which maintains the position on the support base by keeping the body's center of gravity in accordance with gravity, has a key role in preventing sports injuries(49,50).

Balance, which is accepted as a static state, is actually a dynamic state that includes many neurological states(51,52).

Balance, also known as postural control, involves the central nervous system's (CNS) ability to combine and analyze sensory input from the visual, somatosensory, and vestibular systems and generate appropriate motor responses. While the vestibulo colic reflex (VCR) is important in sending stimuli from the semicircular canals to the neck muscles, the vestibulocular reflex (VOR) provides eye movements to maintain visual acuity during head movements. It is the vestibulospinal reflex (VSR) that sends a stimulus to the antigravity muscles to help maintain postural stability. Therefore, balance, which plays an important role in the success of athletes, and all these reflexes which are components of balance, are an important component of motor skills.

Correct movement of hip, knee and ankle joints, which are controlled through coordinated movements along the kinetic chain steps, is important in the formation of balance (53).

Balance, which is an important part of the closed kinetic chain, is the most important part of sportive performance as it covers all changing movement patterns(54).

It is known that balance and dynamic postural control have an important role in showing successful sportive success, changing direction, stopping, starting, moving objects, maintaining the position of the body and performing activities of daily living.

Balance is an important factor in providing the body composition needed to maximize athletic performance. These movements also take part in the formation of fluent movements in sports.

Therefore, balance is one of the important elements of sports with sudden movement changes (55).

It is argued that static and dynamic balance should be possessed in order to exhibit appropriate performance in daily living activities and sports activities(56).

In the light of the studies in the literature, it has been shown that there is a direct proportional relationship between the sports performance of basketball players and their postural stability. (57).

A decrease in balance ability not only causes a decrease in performance, but can also increase the risk of injury(58). While balance is an important part of performing successfully and increasing performance, it is also known that deterioration in balance performance is a risk factor for injuries.

In addition, studies in the literature have shown that the decrease in balance performance increases the risk of injury in the lower extremity, especially in the ankle, in all athletes, regardless of male and female.

It is reported that balance training is an effective method in terms of preventing injuries and neuromuscular functional performance. In addition, it is known that balance training has an important place in order to return to sports after such injuries. Each sport branch has its own balance parameters and movements. Increase in performance and decrease in injury frequency can be achieved by correctly determining which balance parameters will be used in which branch (59).

Balance is specialized according to the sport branch and the athlete cannot gain balance ability according to each branch(55).

Basketball players have other situations that demand high coordination and strength, challenging the balance, such as acceleration and deceleration with sudden changes of direction in the narrow area, turning movements while jumping (especially in the pivot foot), dribbling and following the game while dribbling, and offensive and defensive rebounds (52).

Coordination is the internal regulation that best manages the motor system and its parts through the central nervous system (17). The first condition of coordination is to get correct information. In order to perform a coordinated movement, first of all, it is necessary to know the positions of the body organs related to that movement and their relations with each other (10,11,60). Coordination is the process of smooth and complex movement pattern produced as a result of muscles moving together with an approximate width and timing. The repetition of the activity and the continuity of the performance are essential in the development of coordination (60,61). In the sportive sense, coordination is the implementation of voluntary and involuntary movements in a regular, harmonious, purposeful sequence of movements and is a nervous power of the organism.

Coordination skills have two main components. These are ;

General skill; It is the general sense of body coordination that is valid for every sport.

Special skill; It is defined as the coordination of technical tactics and similar movements that include the characteristics of that sport for the applied sport(24,62).

2.2.1.4 Flexibility

Flexibility is closely related to the geometry of the articular surfaces, tendon, muscle, joint capsule or ligament laxity can be expressed as the maximum possible normal joint movement in the joint (27). In addition, flexibility defines the intrinsic properties of body tissues; It can also be defined as the normal joint movement without causing injury to the joint or joint groups (1,63,64).

Stretching, which is explained as the pulling force to lengthen connective tissues or muscles, can also be used to improve the range of motion (ROM) of the joint(65,66).

Researchers have recently avoided associating flexibility with injury, recommending that flexibility improves performance. This has been shown to be a contributing factor for physical performance and less risk of injury(67,68).

Despite various stretching techniques such as proprioceptive neuromuscular facilitation, static (passive and active) or dynamic stretching, global active (postural or Mezieres), available data on the effects of these different stretching methods have reported conflicting results.

Static stretches (SS) increase ROM and reduce performance by an average of 3.7%, limiting strength, maximum strength, running speed, balance, or sprint performance(69).

Dynamic stretching (DS) has little effect on flexibility, but can well improve muscle strength with an average improvement in performance of 1.3%(70,71).

Stretches with proprioceptive neuromuscular facilitation (PNF) techniques at the end of a session show a significant improvement in ROM compared to static stretching, while global postural stretching exercises (GPSE) improve ROM, make movement more fluid, limit functional overuse and muscle trauma.

In the literature, tight hamstrings and patellar problems trigger the development of pain. In addition, athletes with tight hamstrings show muscle damage and athletic performance following eccentric exercise(197).

In literature, recent studies on fascia have reported that self-myofascial stretching techniques also positively affect vertical jump performance and dynamic balance ability (72,73).

With the help of passive visco-elastic property, which increases with stretching exercises in the extremities, the tension in the muscle decreases, its mobility increases and less energy is required to move the extremity. Thus, the contraction force or speed of the muscle may increase(74-76).

2.2.1.4 Endurance

In general terms, endurance can be defined as the strength of the athlete to withstand physical and physiological fatigue. It is the ability to resist fatigue in long-lasting sportive activities and to maintain very high fatigue loads for a long time (24,28). Endurance is

one of the most important features that affect performance in sports. When the movements of a basketball player were analyzed, it was stated that 5.3% of the time he spent actively was sprinting and 10.4% was running. 11.6% of them are jogging, 14.4% of them are walking and 15.5% of them are activities such as just standing. It was stated that the majority of the movements (42.8%) were specific to basketball. He determined that he completed it with (77,78). When the movements are classified as low, medium and high intensity, researches show that basketball players spend 56% (16), 26% (77) and 35% (79) of active play time with low-intensity activities, and again 41% of active play time, respectively. (16) showed that in Tunisia, 28% (77) of them performed moderate-intensity activities.

5. Body Composition

The term body composition gives the percentage of body weight composed of adipose and lean tissue. Body fat percentage, body density and body mass index can be computable by taking diameter, circumference and skinfold thicknesses from different parts of the body (80). Studies conducted in recent years indicate that low body fat percentage is accompanied by increased physical activity (81).

6. Sport-Specific Physical Fitness

Physical fitness is a performance factor characterized by its ability to be evaluated using certain tests. Basketball, along with physiological fitness (intensive use of aerobic and anaerobic energy systems (82), but also physical fitness (motor - technical tactical skills, agility-speed, upper body and lower extremity strength, maximal aerobic capacity and endurance and postural control & balance, flexibility) is a team sport.

Players repeat the high-level struggle with the parameters of speed, power, strength and endurance, and technical and tactical skills specific to basketball many times with high intensity (84). The success of the players depends on the number and quality of these events that they repeat at high intensity.

Training techniques in professional sports are based on increasing and improving the performance of athletes, and identifying and eliminating the deficiencies in important physical fitness parameters. The application of technical and tactical training in the game,

in suddenly changing positions, is a key role in the advancement of features such as coordination and reaction (23).

Height is often associated with basketball success, but literature suggests that balance and quickness are the most important physical qualities a player can have(85).

Basketball players can improve balance and quickness in these trainings, and in this way, they can increase their sportive performance (85).

It is important for the success of basketball to reflect the physiological, psychological and other effects of training on the athletes' skills and to prevent possible injuries (3).

Today, there are many studies by experts that can improve and increase physical fitness parameters in order to increase the success of athletes (3, 86-89).

In this context, the physical fitness parameters that are the subject of the most researches and studied are strength and power (3,86-90). According to studies, muscle strength and strength training are also important for basketball performance, and plyometric (91) and balance-proprioceptive training have been suggested to increase these parameters or reduce the incidence and severity of sports-related injuries(92,93).

2.2.1.7. Stress/Anxiety Management

Athlete anxiety, which plays a key role in sports psychology, is typically represented by fear, irritability or worry and is defined as a negative emotional state (100). Along with the cognitive aspect of anxiety, there is also a somatic aspect (101).

Participation in sports also positively affects psychological development, as it is widely accepted that it increases self-esteem (94), supports healthier lifestyles (95), and improves self-acceptance to peers (96). However, at the same time, participation in a competitive sport such as basketball or football may affect the person negatively, as it may create a competitive situation and the ambition to win in adolescents (98,99).

Although it has been suggested that performance anxiety in competitive situations may be lower in individual sports (for example, diving) than in team sports (for example, basketball), in studies examining sports psychology, no significant difference was found in terms of competition anxiety between participants in individual and team sports (102-105).

3. Yoga

1. Yoga History and General Information

The word "yoga", which derives from the Sanskrit words yug (to unite) or yoke (to bind or centralize), is defined as a method of uniting the body, mind, and spirit, thus helping one attain one's own nature(106).

Different definitions are also available. The most well-known of these is the definition of yoga according to the Merriam-Webster dictionary. Here, yoga is described as "a system of breathing techniques, physical movements & postures, and sometimes meditation produced from Yoga" (107).

Yoga, originating from Indian culture, aims to bring self-awareness. For this purpose, there are many physical, spiritual and moral applications in yoga. Usually yoga consists of 3 main practices. These are; asanas (postures), pranayama (breathing exercises) and dhyana (meditation).

The asanas, called poses, can be in a standing position, lying position, sitting position or in 3 planes called sagittal, frontal or horizontal.

Patanjali, who was accepted as the founder of the understanding of yoga centuries ago, wrote down these practices and defined yoga with aphorisms called 'sutra'. Although this "Yoga Sutras of Patanjali" book, which consists of four chapters and one hundred and ninety-six sutras, was written in Sanskrit, it was translated over time with the own interpretations of yoga masters such as Iyengar and Godfrey.

Yoga practices that combine breathing exercises, physical postures, and meditation by Patanjali are described in the second yoga sutra of this book as "photographing altered states of mind"(108).

Today, it is used as a therapeutic intervention in the clinic, regardless of religion or any tradition. Asanas, called body practices of yoga, also improve flexibility and strength, while controlled breathing helps focus and relax the mind. Meditation aims to calm the mind (109,110).

Yoga can increase bodily awareness and proprioception as it contains many mind-body exercises such as balancing, stretching, strengthening, bodily harmony, breathing and meditation techniques (111).

Yoga has some described physiological effects. The most well-known of these is the modulation of autonomic nerve tone and the corresponding decrease in sympathetic tone and increase in vagal tone. In addition, with the activation of antagonistic neuromuscular systems, the relaxation response in the neuromuscular system increases and the limbic system is stimulated through meditation (109).

Yoga maintains the balance of body and mind in the following 3 main ways.

1. Poses (physical tone and bodily awareness);
2. Breathing techniques
3. Meditative Effect (controlled focused)(112).

There are different types of classical yoga. These are

Hatha Yoga: Beginner level coordination between breath and asanas

Ashtanga Yoga: Power Yoga (advanced level) is a type of yoga that requires serious muscle strength, balance and core muscle strength.

Yin Yoga: It is a type of yoga where we stay on an asana for minutes and more for stretching and endurance.

Restorative Yoga: It is yoga in which meditative, comfortable positions are practiced.

Kundalini Yoga: It is a type of yoga that involves especially difficult inspiration and expiration.

Vinyasa Yoga: Coordination of the asana with the breath can be thought of as an advanced level of hatha.

Bikram Yoga: It is known as hot yoga. The studio is preheated and humidified(81).

Although there are many different types of yoga, techniques from various yoga practices bring more benefits when used holistically (107).

Describing yoga as "restricting the thought process and calming the mind," Patanjali suggests that yoga ethics (yama and niyama) are the way to cleanse the body mind and

spirit. It emphasizes a psychological approach within yoga to healing and self-actualization (106).

According to Patanjali, yoga consists of 8 steps. Each of these 8 steps is equally important and forms parts of a whole, such as interrelated limbs. The purpose of these eight parts is self-actualization and wisdom. However, here we will focus on the health benefits (113).

Eight parts of yoga are as follows (Figures 2.1 and 2.2)

1. Yama: Code of ethics as the same time moral observances
As subheadings of being ethical
 - Ahimsa (sensitivity)
 - Satya (honesty)
 - Asteya (openness) not stealing
 - Brahmacharya (sincerity) non waste of energy as the same time
 - Aparigraha (generosity)
2. Niyama: spiritual rules and self diciplines
 - Sauca (purity, authenticity)
 - Samtosha(trust)
 - Tapas(passion)
 - Svadyaya (self-knowledge, awareness itself)
 - Ishvarapranidhana (closeness to the source and nature of action, spontaneity, spontaneity, spontaneity)
3. Asana: Body and movement practises, postures
4. Pranayama: increase of breath, regulation, control, life force
5. Pratyahara: Withdrawal of the senses
6. Dharana: Intense focus
7. Dhyana: Meditation
8. Samadhi: Emancipation, enlightenment, non-duality

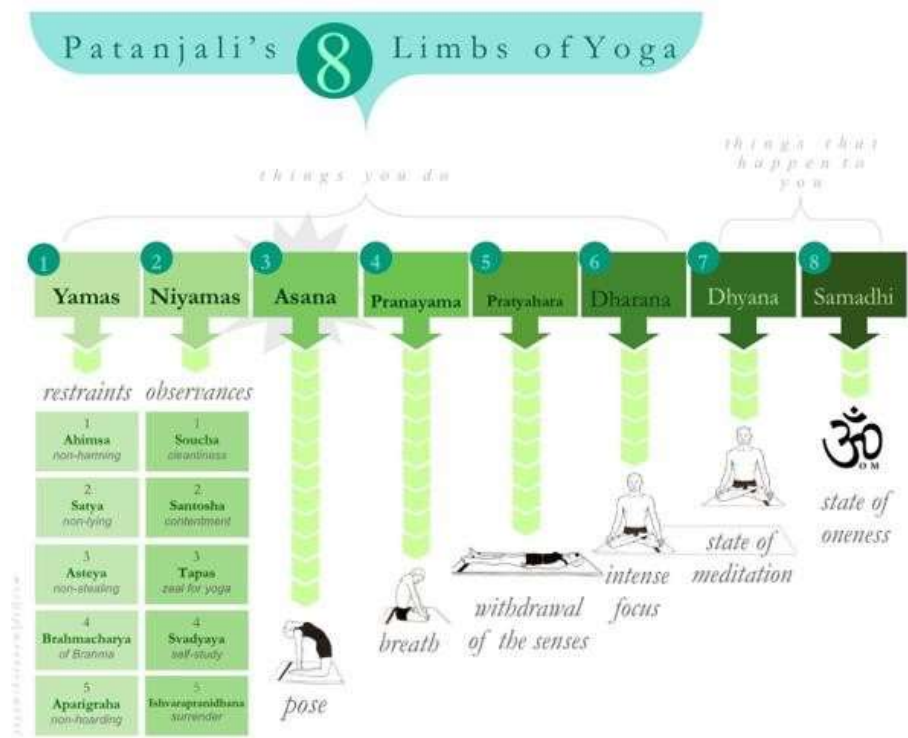


Figure 2.2. Components of Yoga

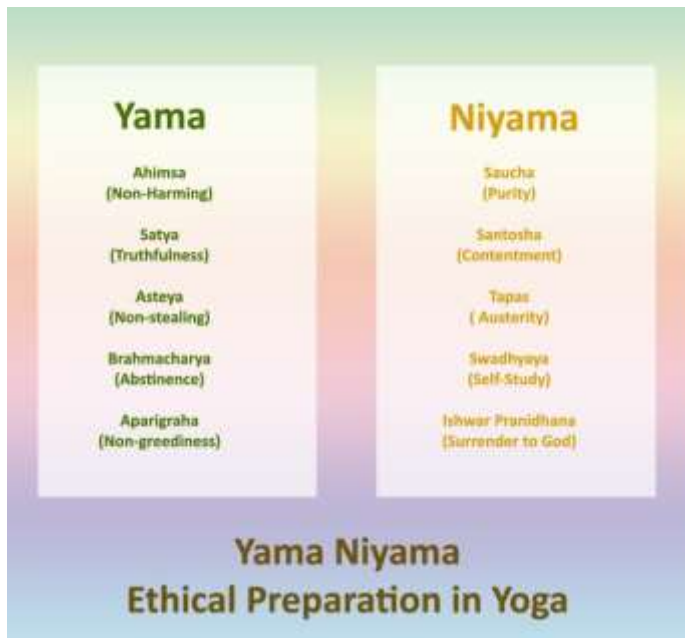


Figure 2.3. Components of Yama and Niyama

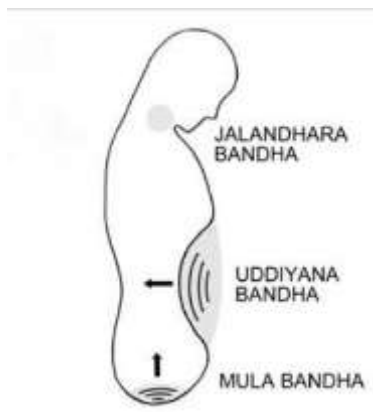


Figure 2.4. Yoga Bandhas

Bandhas used in yoga are known as energy locks(114). From the point of view of Neurodevelopmental Yoga, it is important in stabilizing this area with breathing and Transversus abdominis, multifidus, pelvic floor and diaphragm. This stabilization is also important in postural control and axial elongation of the spine.

2.3.2. Differences of Neurodevelopmental Yoga to Classical Yoga Approaches

Neurodevelopment is a process that includes the development of the brain and nervous system, which begins in infancy and even in the womb (115). It is the process of developing one's mental structure by developing neurons under the influence of external factors. These processes together with the physical development of the individual, social, emotional and mental development areas all constitute neurodevelopment.

Yoga, on the other hand, is a discipline of "exercises" originating from India and in Sanskrit it means unity, being one, bringing together.

Yoga practices, different practices for breathing, body, mind and emotion control; It is done for the continuation of health and inner peace. In this state, it is a system that causes people to change not only physically but also in their mental state and attitude.

The primary goal in yoga; is to bring together the breath, body, mind and emotions. The most well-known techniques in society; asanas (yoga poses), pranayama (breath control exercises), meditation, relaxation and focusing techniques.

This is created by the stimulating the vagus nerve and autonomic system, 3 dimensional breathing, providing postural stabilization with bandhas. Also, during this yoga sessions, our better known senses such as sight, hearing, touch, taste, smell and also lesser known senses such as the vestibular, interoceptive and proprioceptive systems are activated.

Neurodevelopmental Yoga is an approach that incorporates the knowledge of anatomy, neuroscience, kinesiology and the principles of typical motor development of humans into yoga. It is a method that focuses on the quality of the movement during practice. The

approach is pioneered by Gorkem Dizdar. The physiological explanations and interpretations he has created serves as the foundations of Neurodevelopmentalyoga. Later on these foundations were integrated into practice together with Ela Tuner. They have been teaching the approach for yoga instructors since 2015 and Neurodevelopmentalyoga Teacher Training Program for physiotherapists was established on 2019.

There are certain checklists when preparing a Neurodevelopmental Yoga sessions. These are

1. Each session should have a theme.
2. The words used in the sessions should not be repeated.
3. Every session should have a target pose
4. During the session, free space should be left for the person.
5. The bandhas should be noted and reminded during the session
6. Asanas should be performed according to the neurodevelopmental stages (first the sagittal, then the frontal, and finally the transverse plane).
7. Feedbacks of the participants are required in between the poses.
8. The instructor should explain the concepts of axial extension, 3 dimensional breathing and weight bearing to the hand and feet.
9. The instructor should support the student by getting help from the equipment or saying something to facilitate the pose.
10. Jargon should not be used.
11. The instructor can demo a pose that might seem confusing to students.
12. There should be variation in the transitions between poses.
13. A quiet space should be left for the person during the session.
14. Different variations of asanas can be included in the session.
15. Session authority should be provided by the instructor.
16. There should be reminders to sensorial systems throughout the sessions.
17. Savasana should be a minimum of 10 minutes.
18. Imagination technics should be used.
19. The session should last more than 50 minutes.

For this reason, Neurodevelopmental Yoga is a different and systematic approach compared to classical yoga principles.

Yoga is considered as one of the most important exercise modalities of the Far East culture for centuries, also improves balance and sportive skills. It is thought that Neurodevelopmental Yoga will also be effective on balance and sportive skills. Neurodevelopmental Yoga, unlike other classical yogas activates vestibular system, stimulates the vagus nerve with different breathing techniques and improves postural control with bandha without any compensation.

2.3.3.The Effect of Yoga on Balance

Balance, which is divided into static and dynamic, is the ability of people to maintain a certain body posture (107).

Perception of the position of the joint or the movement of the joint thanks to the mechanoreceptors in the muscle, fascia, joint and joint capsule is called proprioception. Proprioception occurs with the integration of physical and neurological stimuli.

Statical and dynamic balances are two of types of balances. Dynamic balance is a balance in which the person is moving or the movements are performed. A poor balance prevents a person from performing many activities, from complex movements such as jumping and running to walking. (116).These important physical independence functions are limited when a person experiences balance problems or is unable to perform other activities of daily living.

(117).

According to Franjoine et al., “Balance is an essential component for the successful completion of functional activities (e.g. showering, cooking, self-care) including locomotor and manipulative skills.” (118).

Practicing yoga has been associated with many positive outcomes in terms of physical performance and well-being(119). Asana is defined as a yoga position in which an individual retains a particular pose for a long time while breathing in concentration. An asana can be considered a balancing act of yoga. In addition, since yoga is a proprioceptive exercise, it can positively affect one's body awareness and balance(120).

Core activation and postural control of movements are important in Neurodevelopmental Yoga principles. Therefore, it is estimated that Neurodevelopmental Yoga can support balance development as in classical yoga.

2.3.4. The Effect of Neurodevelopmental Yoga on Agility and Reaction Time

Considering that yoga is done more slowly and with body awareness and the reaction time is fast and sudden in sports, these two components seem to be very separate from each other, but they are in a close relationship with each other.

Neurodevelopmental Yoga approach is more nervous system oriented approach. Stimuli such as vision and voice commands are also used abundantly in sessions, and ocular-motor exercises are added to yoga sessions.

The purpose of ocular motor exercises, which is accepted as one of the visual exercises, is to increase neuromuscular control skills by following a still or moving object with eye tracking in a smooth and fluently (121). Ocular motor exercises are collected in 4 groups. These are saccadic eye movements smooth tracking, fluid pursuit and eye fixation (122)(Table2.1).

Table 2.1 Oculo-motor and Gaze Stability Exercises (122).

number	Training type	Training
1	saccadic eye movement	The person holds his head steady. At this time, it moves the eyes horizontally between two fixed targets.
2	smooth tracking	With the head fixed, the target is moved horizontally and the person is asked to follow this target fluently with the eyes.
3	Eye fixation	The person moves his head horizontally while focusing on a fixed target. The person is asked not to disturb the focus.
4	Fluid Pursuit	While the person follows the target with their eyes, the person's head and target object are moved in opposite directions horizontally. The person is asked to follow the object fluently.

Some ocular motor exercises are shown in the picture below (Figure 2.4).

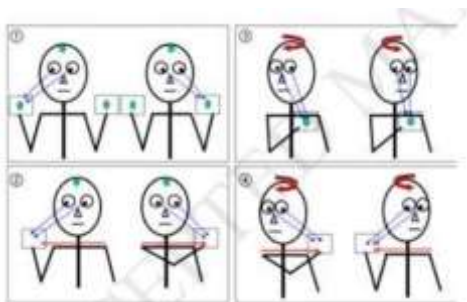


Figure 2.5. Oculo-motor and gaze stability exercises

Saccadic eye movements similar to gaze stability exercises include fluent tracking and vestibulo-ocular reflex movements, and therefore hand-eye coordination movements. The reaction rate developed to visual and audible stimuli depends on either the shortening of the mental processing time or the shortening of the movement time (38). This is only possible with the practice of ocular motor exercises. When the literature is scanned, it is stated that hand-eye coordination has a positive effect on reaction time(123).

There are afferent and efferent pathways between the brain and spinal cord in order to maintain posture and provide eye movements. Incorrect information arising from the disorder in sensory receptors leads to imbalance in vision and posture (124). Therefore, the amount of postural fluctuation increases in the absence of the visual system. Therefore, visual stability and posture are two factors that feed each other(125).

Therefore, it is thought that Neurodevelopmental Yoga may be effective in postural control or hand-eye coordination and agility due to the presence of ocular motor exercises in the sessions. When we look at the literature, while there are studies on the lower extremity explosive power and flexibility of yoga, no studies on hand reaction time have been found(63).

2.3.5. The Effect of Yoga on Hamstring Flexibility

Athletes must have sufficient flexibility in terms of adequate range of motion and proprioceptive input. When systematic reviews in the literature are examined, it has been stated that asanas in yoga, which means "union or joining", also contribute positively to hamstring flexibility (126,127). Flexibility programs can help reduce muscle stiffness, range of motion, and tension.

An athlete or an individual exercising may not be able to allocate the time they need to flexibility training. Flexibility training, which is done quickly or maybe not done during the warm-up and cool-down periods, is often skipped(130). For this reason, applying flexibility training in daily yoga flows may be a good solution for individuals (131).

Yoga can improve flexibility and reduce injury by moving from easy poses to more challenging poses (asanas). Donahoe-Fillmore et al. showed that yoga improves strength, flexibility, concentration and energy in some individuals and is widely practiced in many areas around the world(132).

Run-Kowzun et al. in their study, it is stated that tense hamstrings can create compensation patterns that lead to restrictions and thus increase the stress of the lumbar spine, and stretching practices. It may be a useful modality in acute or chronic low back pain. In terms of athletic performance, Run-Kowzun et al., in their study, pointed out that there was an increase in daily living activities with 7-week yoga sessions, as well as the effect of flexibility gained on athletic performance.

2.3.6. The Effectiveness of Neurodevelopmental Yoga on Stress Level

The body always wants to maintain homeostasis. Therefore, the stress response emerges in order for the person to survive in the face of situations that are perceived for this or that may put security at risk. This is often referred to as the 'fight or flight' response(84). If this becomes permanent, it can trigger the onset of psychiatric disorders such as anxiety and depression(135,136).

Yoga has some described physiological effects. The most well-known of these is the modulation of autonomic nerve tone and the corresponding decrease in sympathetic tone and increase in vagal tone. In addition, with the activation of antagonistic neuromuscular systems, the relaxation response in the neuromuscular system increases and the limbic system is stimulated through meditation (109).

One of the mechanisms explaining the effectiveness of yoga interventions on stress has been stated as the regulation of the Hypothalamic-Pituitary Adrenal (HPA) axis and Sympathetic Nervous System (SNS) response by directly reducing stress by increasing vagal tone(137).

As mentioned before, this system disruption triggers not only the onset of anxiety and depression, but also other chronic diseases (autoimmune disorders, obesity, cardiovascular diseases, diabetes)(138,139). Many studies have shown that yoga produces a rapid decrease in the SNS/HPA axis by reducing blood sugar and various sympathetic nervous system hormones (cortisol, norepinephrine and epinephrine)(79,140-143). In addition, regular yoga practices increase the levels of Natural Killer cells and immunoglobulin A while balancing heart rate and blood pressure(84, 144-147).

Blood cholesterol balance by effect of rapid SNS and HPA axis ; it provides the balance of BMI, body weight and waist circumference (148-153). It promotes sleep patterns and reduces fatigue in healthy and diseased populations (154-156).

For this reason, yoga practices aiming to unite the body, mind and spirit have become used as the ability to manage stress (157).

Meta-analyses in the literature show that yoga practice effectively reduces symptoms of depression and anxiety (158). Furthermore, it is a method that can be used in addition to the treatment in these chronic health problems, as yoga also increases sleep quality and psychological well-being (137). In addition, since increased physical activity will cause significant changes in morbidity and mortality rates (159-161), it is thought that yoga can be used to prevent such situations.

2.3.7. Physiotherapeutic Effect of Neurodevelopmental Yoga

Some publications have stated that yoga interventions can affect the neuromuscular systems through automatic mobilization of joints, nerves or soft tissues (162,163). To explain, the trunk extension as the same time "Cobra" asana is a static movement of McKenzie. This result can directly reveal that there are similarities between these two approaches. From a physiotherapeutic perspective, flexibility and range of motion can be increased by reducing somatic dysfunction. Therefore, physiotherapeutically, yoga can be interpreted as a series of "static procedures of the nervous system, spine and all limbs by harmonizing them with breathing and dynamizing them.

If we combine Neurodevelopmental Yoga with this example, Uddiyana Bandha, Mula Bandha and Jalandhara bandha play an active role in the cobra movement, asanas are practiced in the body with 3 dimensional breathing in the core region, transversus abdominis, multifidus, pelvic floor and diaphragm activation and stabilization of this region and axial elongation of the lumbar region.

Another physiotherapeutic effect of yoga is the use of diaphragmatic breathing together with abdominal breathing. With abdominal breathing, the autonomic nervous system and endocrine system are stimulated (165). For this reason, it is thought that yoga can create positive changes on the cardiorespiratory system.

4. Yoga Practices in Athletes

1.The Effect of Neurodevelopmental Yoga Practices on Balance Among Basketball Players

Yoga practices include both static and dynamic forms, the practice of certain physical postures. Asanas are used to increase postural control, mobility, flexibility and strength. Alignments are often practiced in asanas. Depending on the type of yoga, only a few breaths or a few minutes are held in this asana. There are countless different postures and variations in the 3 planes called sagittal, frontal or transverse.

For this reason, thanks to yoga asanas, it can enable the athletes to improve their postural control and thus their static and dynamic balance , which can improve their control of movements, their position in space, and thus the technique and coordination of movements(119).

2.The Effect of Neurodevelopmental Yoga Practices on Reaction Time and Agility Among Basketball Players

A basketball player is constantly in motion during matches or training sessions and must be dynamic enough to take a current position at any time (166).Therefore, it must adapt to these rapid displacements in terms of balance, stance control and dynamic visual acuity (167).

Because basketball skills are based on the correct integration of all sensory systems with each other, along with physical fitness and specialist skills (122). In a basketball game, it is very critical for the ball to be followed quickly by the players (168). The ability to provide this skill is thanks to its dynamic vision feature. Dynamic vision refers to the ability of the athlete to see clearly when moving or following a moving object (169). Regardless of the type of sport, dynamic vision is a key role for every dynamic sport(168). Because the ability to see dynamically has a significant effect on the performance and static visual acuity of the athletes.

In this process, a basketball player focuses his eyes on the spatial position of the ball with the environmental awareness of the other players (166). In fact, the sense of sight measures the direction of the eyes and plays an important role in maintaining balance as

well as moving towards surrounding objects (170). To access visual information, the eyes must be fixed on the ball before touching it with the hand (166).

Ocular motor exercises, which are considered as one of the visual exercises, are widely used in Neurodevelopmental Yoga. With these exercises, people's neuromuscular control skills can be followed smoothly and fluently to the moving target.

Despite this remarkable role of vision and the positive effects of ocular exercises on functional skills in athletes, studies on this subject are limited. Neurodevelopmental Yoga approach is more nervous system oriented approach. Stimuli such as vision and voice commands are also used abundantly in sessions, and ocular-motor exercises are added to yoga sessions.

2.4.3.The Effect of Neurodevelopmental Yoga Practices on Stress Level Among Basketball Players

Anxiety disorders or stress situations experienced by athletes during the season can also affect the performance of the athlete. Therefore, athletes need to keep their anxiety levels at an optimal level during matches or training.

Some researchers stated that more injuries were observed in some athletes with high anxiety levels (171).

Anxiety, which negatively affects the performance of the athlete, can be expressed as tension and fear under threat (172). In all sports branches, the prevention of injuries and the appropriate treatment of injuries have an important place in achieving success. For this reason, it is of great importance to predict the injuries and injuries that may occur in the relevant sports branch, in terms of the precautions that can be taken (173).

Utilize a multitude of strategies to cope with stressful situations (174). Yoga discipline is one of these stress reduction techniques. Yoga provides a holistic state of health and well-being through balancing one's general physical and mental health with the yoga of inner peace and well-being. Yoga reduces the flying of the mind and is used as a method of focusing on the main and coping with stress (175). It is thought that Neurodevelopmental Yoga will reduce the anxiety of sports injuries in athletes with breathing, body awareness and asana practices and meditation.

3. MATERIAL AND METHOD

1. Participants

This study was carried out at Darüşşafaka Sports Club by İrem Savaşkan, who work as researcher, Ayça Aklar working as the adviser. The sample size was calculated with G Power and the sample group size was found to be 34. Darüşşafaka Sports Club basketball players aged 16-26 participated in the study voluntarily. 42 athletes (n=42) playing basketball in the professional league participated in this research. All participating basketball players are licensed players of Darüşşafaka Basketball Team. Subjects were homogeneously divided into intervention (n=21) and control groups (n=21). Average age of the participating Players (42 males ; 18.59 ± 2.4 years; 200 ± 8.11 cm. ; 94.2 ± 8.3 kg).

The intervention group consisted of 21 men (18.76 ± 2.1 year ; height, 201.6 ± 7.8 cm ; weight is 93.5 ± 9.3 kg), while the control group consisted of 21 men (19.19 ± 2.1 year ; height , 199.6 ± 8.6 cm ; weight is 96 ± 7.2 kg)

Inclusion Criteria

Being a licensed basketball player between the ages of 16-26

Volunteer to participate in the study

Attending at least 9 out of 12 yoga sessions

Exclusion Criteria

Have had any surgery in the last 6 months

To be absent from more than 3 sessions

2. Intervention

Our study is a non-interventional clinical research approved by Yeditepe University Ethics Committee. Forty-two basketball players were informed before the study was conducted, and participants gave written informed consent. After volunteering, the inclusion and exclusion criteria of the athletes were questioned. Demographic characteristics of all athletes were taken before evaluating the athletes who met the conditions included in the study; age, height, mass and gender. All athletes performed the tests individually on the same day. The tests were called Y balance test , Nelson Hand Reaction Test, Passive Straight Leg Raise (PSLR) Measurement three functional tests. In

addition, the Sports Injury Anxiety Questionnaire was given to basketball players in order to measure sports performance anxiety.

After the measurements were made, the basketball players in the intervention group received Neurodevelopmental Yoga sessions twice a week , 60-minutes per session for 6 weeks and as the same time the subjects continued their basketball training. No intervention was made in the control group. During this period, 3 people in the intervention group were excluded from work due to absenteeism and 1 person due to surgery due to disability. A total of 17 people remained in the intervention group and 21 in the control group. Measurements were repeated for both groups 6 weeks later.

3.3. Y Balance Test

The Y balance test is useful for evaluating movement disorder in basketball players. According to the literature, Y balance test is in a significant relationship in determining the risk of injury in court sports. According to the results of this test, if the composite score difference is less than 94% and the front reach distance difference is more than 4 cm, it can be said that the possibility of injury is high. Moreover, YBT is a practical functional test that can predict dynamic balance and postural stability. The player's performance improves with balance, flexibility, coordination and power integration. In addition, SCT contributes to the determination of lower extremity risk, musculoskeletal pathologies and to measure the usefulness of the training program (189). A 'Y' shaped strip was formed by using rigid tape adhered to the ground. YBT was responsible for the assessment of dynamic balance in 3 access directions(190). The first row is designed to be anterior (ANT) to one apex and the other to be in the posteromedial (PM) and posterolateral (PL) directions with a 135 degree angle between them. Each length of tape should be between 1, 8-2, 5 meters. Athlete limb length was measured using a manual tape measure from the anterior superior iliac spine (SIAS) to the medial malleolus while the subject was in the supine position. The validity and reliability of the test were determined by Plisky et al. (ICC range 0.85-0.01 intrarater and 0.99-1.00 (34)) The content of the test and how to apply it were explained and taught to the individuals.

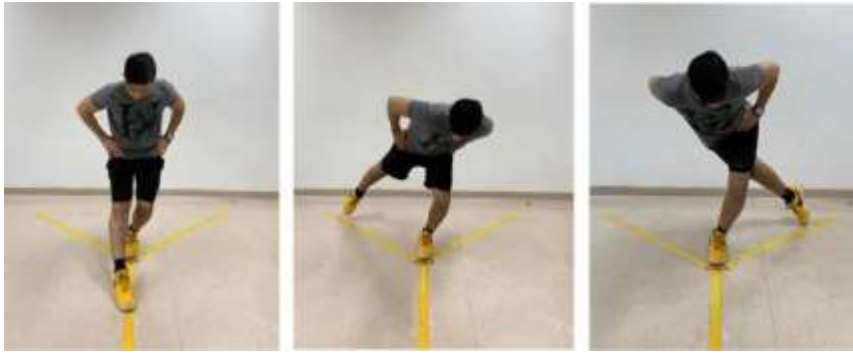


Figure 3.1. Y Balance Test

Leg lengths of individuals are measured in the lying position.

The subject is asked to stand on one leg at the midpoint of the test setup and touch the other foot with the tip of the big toe while maintaining balance. The subject touches the anterior, posteromedial, and posterolateral directions, respectively. The test is repeated 3 times in all directions, averaged and recorded in cm.

Athletes were informed to stand in the center of the Y barefoot with an equal portion of the stance foot the anterior and posterior of the middle of Y. This point was started points of reach attempt anteriorly. In order to reach the posteromedial and posterolateral athlete was placed the heel on the target area. Athletes achieved a range of maximal reach across the three vectors, compromising the opposite leg support base. Athletes used the most distal part of the foot of the extremity that touched the ground with their toes(Figure 3.1.). After reaching out, the athlete should return to an initial stopping point while maintaining their balance. Maximum reach distances were measured and recorded from the starting point to the maximum reach point on the toe. The test is considered unsuccessful if the athlete removes his hands from his hips, fails to return to the starting point, applies weight to the reaching leg to increase the reach distance, if the reaching leg is out of line, or if he lifts or moves the reaching leg after touching the ground. Before testing, participants performed a 10-minute standard warm-up with 5 minutes of submaximal jogging (191). The original of this test is the 'Star Travel Balance Test'. However, while there are 8 aspects in this test, there are only 3 aspects in the Y Balance Test based on recommendations for minimization. This process was repeated while standing on the other limb. The distances reached were divided by each athlete's own limb length, and a score was calculated by averaging the normalized reach distances in 3 directions.

The composite reach distance was the sum of the 3 access directions divided by 3 times the limb length and then multiplied by 100 (Table 3.1).

Table 3.1 was shown calculating normalized composite reach distance in YBT.

$$\text{Composite Score} = \frac{(\text{Anterior} + \text{Posteriomedial} + \text{Posterolateral})}{(3 \times \text{Limb Length})} \times 100$$

Table 3.1. The formula for calculating of normalized composite reach distance in YBT

Each result was generated by averaging 3 trials (189). In addition, the highest reach was collected to obtain the total distances reached for the analysis of the overall performance in the test. YBT was calculated as the difference between right and left extremity access as asymmetry by summing the 3 access directions and normalizing to the lower extremity length.

Studies in the literature have associated right and left lower extremity anterior extension differences greater than 4 cm with lower extremity injuries. It has been reported that if this difference is more than 4 cm, the probability of lower extremity injury is 2.5 times higher. Therefore, the practical importance of SCT for physiotherapists and professionals is that it can be applied as a predictive tool to identify functional deficits related to the lower extremity (190). Since reach is related to limb length, reach was normalized to limb length to allow for more precise comparison between players. It has been reported that players with a total reach of less than %94 will be 6.5 times more likely to suffer lower extremity injuries (192).

3.4. Passive Straight Leg Raise (PSLR) Measurement

Less than normal stretching capacity of soft tissues is a usual consideration in the evaluation of hamstring muscle flexibility in athlete rehabilitation, as it will be a predisposing factor to increase the possibility of hamstring muscle injury(196).

The PSLR is a test that allows for passive assessment of apparent hamstring flexibility(193).

Each leg was tested separately. While performing the PSLR test, the athletes were placed on their back without a pillow under their head. To maintain knee extension on the leg to

be tested, the physiotherapist performing the test passively raises the leg with one hand on the athlete's heel and one hand on the knee. The clinician raises the leg straight from the hip joint until the subject complains of pain and tightness in the leg or back (194,195).

An assistant stabilized his contralateral leg in an extended position during the procedure. ROM measurement was recorded with a smartphone inclinometer placed on the thigh with the help of a tape. Compensations that could develop in the pelvis or knee were prevented during the test.

3.5.Nelson Hand Reaction Test

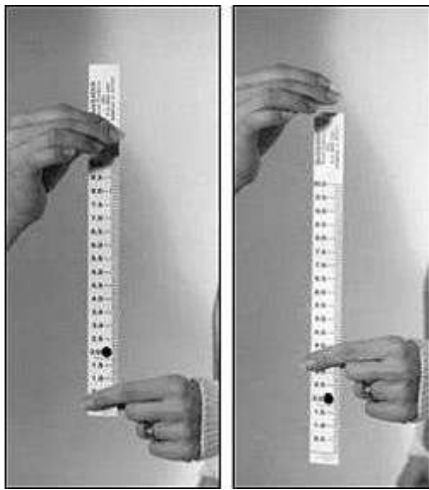


Figure 3.2. Nelson Hand Reaction Test

Nelson's hand reaction test can be measured using the ruler method. The subject sits in a chair with the forearm and hand relaxed on the table. Thumb and index finger tips 8–10 cm from the table, are approximated to be parallel to each other on the outside.

The tops of the thumb and index finger should be horizontal to each other. The person administering the test holds the tip of the test ruler between the thumb and forefinger of the subject.

The subject is made to look directly at the concentration region (the black region between the lines 0.120 and 0.30) and is told to catch the ruler when the ruler is released. 20 attempts are made and each attempt starts after the 'ready' command. The result is read from the line on the upper edge of the subject's thumb after the subject has caught the ruler. The lowest 5 and the highest 5 trials are discarded and the average of the remaining

10 trials is recorded as the result. The digits on the time scale represent one-thousandth of a second.

Auditory response time is as important as visual response time in basketball players. In the literature studies (34-37), it was stated that this test can also be used to evaluate the auditory reaction time when performed with eyes closed and accompanied by audible stimuli.

This test was applied to basketball players in 2 ways:

- 1) The subject tried to catch the ruler with his eyes open, as mentioned above(EO).
- 2) While the subject's eyes were closed (EC), the test was repeated by giving an auditory command such as "go" as soon as the ruler was released by the clinician.

The test was applied only to the dominant side of the subjects in the first and last measurements.

While converting this distance to time, the formula " $t = (2d/9.81)^{1/2}$ " was used. (t = reaction time; d = distance traveled by ruler and g = 9.81m/s² (gravitational constant) (198).

6. Sports Injury Anxiety Scale

It is a 19-item Likert questionnaire filled out via Google Form. Turkish validity and reliability Jazz. C. et al (177). It was determined that the Turkish version of the scale had language equivalence; it was determined that the measurement structure of the adaptation scale consisted of 19 items and six sub-factors and explained 65% of the total variance. Necessary permissions have been obtained.

7. Neurodevelopmental Yoga Flowchart for Intervention Group

In the table below(Table 3.2), the yoga flows that predominate in Neurodevelopmental Yoga flows are indicated. Each session includes ocular motor, balance, meditation and stretching, but the first 3 sessions are focused on ocular motor exercises and the yoga flow is designed. Sessions 3-6 are prepared by focusing mostly on meditative breathing and stretching techniques. While 6-9 sessions focused on stretching, 9-12 sessions focused more on balance.

Table 3.2. Neurodevelopmental Yoga Flow for Basketball Players

0-3. session	3-6. session	6-9. session	9-12.session
Target -Preparation for balance -Much more ocular motor exercises -Stretching	Target -Balance -Ocular motor -Much more meditative breathing and stretching	Target -Balance -Ocular motor -Much more stretching	Target -Much more balance -Ocular motor -Stretching

0-3 sessions→

Theme : Neurodevelopmental Yoga

Target Pose: Virabhadrasana I (Warrior 1)

Diaphragmatic breathing (thoracic and abdominal disassociation)

3 dimentional breathing

10 min.

Moon Salutation Series

Hasta Balasana - Open half way - Hasta Balasana

Satargasana (Cat camel)

Adho Mukha Svanasana (spine mobilization)

Ardha Uttanasana - Uttanasana

Utkatasana (with scapula retraction) (note the lumbar spine)

Tadasana (Foot Pressure awareness)

Urdva Hastasana

Join hands between chest

Side openings in Tadasana (ocular motor)

Utkatasana

Uttanasana - Ardha Uttanasana

Adho Mukha Svanasana (Here one heel touches the other) (ocular motor)

Satangasana (hip roll)

Hasta Balasana



Fig.3.3. Moon Salutation Series

Satangasana
Anjaneyasana (Low lunge)

} ulola x3

Virabhadrasana I (warrior 1)

Virabhadrasana I – Virabhadrasana II – Parshkonavasana - Reverse
Virabhadrasana I – Anjaneyasana (Low lunge) (ocular motor practises)

Fighter –

Hamstring Dynamic Stretch

Uttanasana (deep pressure here with breathing and hands)

Urdva Hastasana

Tadasana(3 dimensional breathing remind)

Hasta Trikonasana – Trikonasana

Piegon

Janusirsana

Dandanasana

Pashimottasana

Baddha Konasana (Body Rotation)

Upavisthakonasana

Setu Bandasana

Apasana

Savasana

3-6.session →

Theme : Breathing

Target Pose : 3rd session Ardha Chandrasana , 4th session Vrikshasana (tree) pose, 5th session Virabhadrasana III (warrior 3)

Nuloma viloma

3 dimensional breathing } 10 min.

Interoception !! Pay attention to your breath.

Surya Namaskar A(Sun Salutation A)

Tadasana

Urdva Hastasana

Uttanasana

Ardha Uttanasana

Urdva Hastasana

Tadasana (ocular motor)

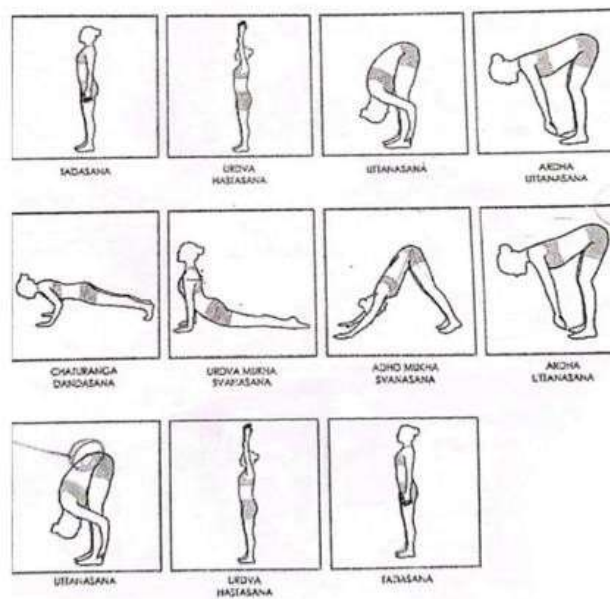


Fig.3.4. Surya Namaskar A (Sun Salutation A)

Virabhadrasana I – Virabhadrasana II

Utthitta Trikonasana

Prassarita Padouttanasana Series

Utthitta Trikonasana

Ardha Chandrasana

Trikonasana – Hasta Trikonasana (ulola) (3 dimensional breathing emphasis)

Phalakasana (Plank)

Chaturanga

Bhujangasana (Cobra)

Adho Mukha Svanasana

Satvangasana (Half Vasisthasana Here)

In The 4th Session

Virabhadrasana I - Vrikshasana – Virabhadrasana I → Ulola.

In The 5th Session

Virabhadrasana I - Vrikshasana – Virabhadrasana I - Virabhadrasana III - Vrikshasana
– Virabhadrasana I → Ulola

6.-9. Session

Theme : Mental & Body Flexibility

Target Pose : Uthita Patient Padangustana

Sun Salutation B (Surya Namaskar B)

Tadasana

Utkatasana(Chair)

Uttanasana

Ardha Uttanasana

Chaturanga

Bhujangasana (Cobra)

Adho Mukha Svanasana (Right Leg Up Then Between Hands)

Anjaneyasana (Low lunge) (Here Hamstring Dynamic Stretching)

Virabhadrasana I (Jump up 3 times here)

Virabhadrasana II (Lateral flexion here)

Prassarita Padauttanasana Series (Dynamic Hamstring Stretching)

Ohm → For vocalisation and vibration

Tadasana

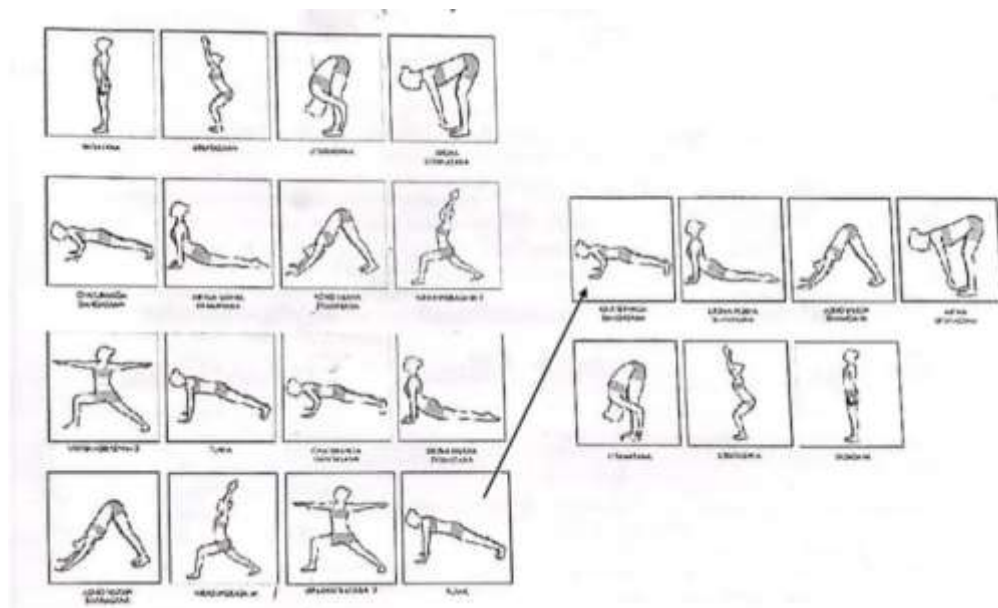


Fig.3.5. Surya Namaskar B(Sun Salutation B)

Utkatasana(Chair)

Virabhadrasana I

Vrikshasana (Tree pose)

Uthita Hasta Padangustana (With Belt Or Direct Hand)

Malasana (Rotation)

Navasana

Janushirshasana

Piegon

Baddha Konasana

Uphavistakonasana

Dandanasana

Supta Utthita Padangustahasana (Supported)

9-12.Session

Theme : Balance

Half Sun Salutation

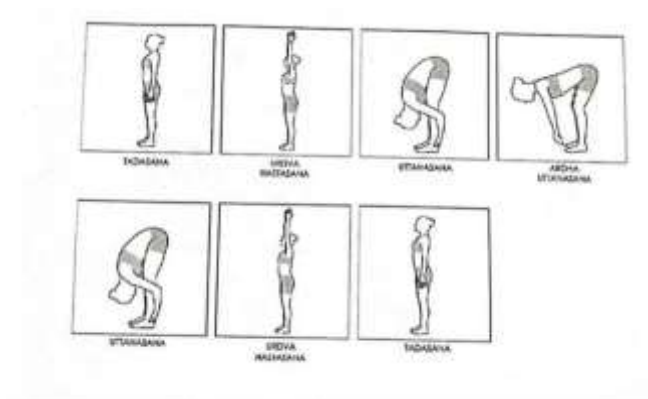


Fig.3.6. Ardha Surya Namaskar (Half Sun Salutation)

(Give This in The Form Of Ulola 2 times)

Weight Transfer Between Hands And Knees in Uttanasana

(Switch To Crow)

Adho mukha svanasana

Ohm.

Sun Salutation A

Phalakasana(Plank)

Vasistasana(Side Planks)

Sun Salutation B

Ardha Chandrasana

Malasana After Tadasana (Trunk Stretches Here)

Low Lunge – Hamstring Dynamic Stretch - Piegon – Flexing the Iliopsoas with a belt)

Bakasana(Crow trials)

Matsyasana(Fish Pose)

Savasana

10th Session : Dynamic movements in Navasana

11th Session: Phalakasana(Plank) Variations

12th Session : Virabhadrasana I - Vrikshasana – Virabhadrasana III - Uthitahasta Padangustana - Put your foot on your knee and sit on the chair - Natarajasana (Dancer)

The primary purpose of this study is to determine whether Neurodevelopmental Yoga practices have an effect on hand reaction time, balance, hamstring flexibility and performance anxiety of young basketball players.

Two hypotheses were defined in this study.

H0 : Neurodevelopmental Yoga practices have an effect on hand reaction time, balance, hamstring flexibility and performance anxiety of young basketball players.

H1: Neurodevelopmental Yoga practices have no effect on hand reaction time, balance, hamstring flexibility and performance anxiety of young basketball players.

4. DATA ANALYSIS

In this part of the research, descriptive and statistical analyzes of the data collected for research purposes are included. SPSS for Windows software (version 25.0) was used for statistical analysis of the data. Dependent variables of this study are Y Balance score, Nelson Hand Reaction Time Test results, Passive Straight Leg Raise and Sports Performance Anxiety results. Independent variables are age, gender, height and weight of individuals. Values for independent variables (age, height, weight and gender data) were presented as mean $\pm$ standard deviation. Before statistical analyses, normality analysis of the data was carried out, it was seen that the data did not show normal distribution with the Shapiro-Wilk test performed. It was decided to use non-parametric tests for statistical analysis. The Mann Whitney U Test was used to evaluate data between two groups with non-normally distributed (non-parametric) variables. Variation within the group was analyzed with the Wilcoxon Test, with repeated measures analysis. Cases where the P-value was below 0.05 were considered as statistically significant.

5. RESULTS

Table 5.1. Distribution of Physiological Variables of Research Groups

	Intervention Group		Control Group	
	Mean±Sd	Min-Max	Mean±Sd	Min-Max
Age(year)	18.76±2.1	16-26	19.19±2.1	16-23
Size(cm)	201.6±7.8	188-210	199.6±8.6	184-215
Weight(kg)	93.5±9.3	80-107	96±7.2	82-110

In this part of the study, the distribution of the research data was examined with descriptive methods, and the average height ,weight and age of the research sample and the distribution of the scores they got from the research measurements were given.

Table 5.1 presents the mean age, height and weight, classified as the physiological variables of the research groups.

Table 5.1. First Performance Measurement Value Averages of the Research Groups

First Measurement				
	Intervention Group (N=17)		Control Group (N=21)	
	Mean±Sd	Min-Max	Mean±Sd	Min-Max
Y balance (cm)	95.1±8.6	77.1-109-1	98.3±10.8	72.3-125
Y Balance Anterior(cm)	105.4±13.7	86.4-127.1	105.4±14.2	77.3-127.1
Y Balance Posteromedial(cm)	98.7±10.8	77.1-117.3	99.4±13.3	72.4-125.4
Y Balance Posterolateral(cm)	102.8±9.2	86.8-117	103.8±12.3	80.5-131.3
Nelson Hand Reaction Test EO(sec)	2,01±0,3	1,7-2,8	1,9±0,3	1,5-2,8
Nelson Hand Reaction Test EC(sec)	2,08±0,4	1,4-3	2,05±0,4	1,4-3,5
Passive Straight Leg Raise (PSLR) Measurement (Right side)(degree°)	90.4±13.6	65-110	91.4±11.2	65-110
Passive Straight Leg Raise (PSLR) Measurement (Left side)(degree°)	90.5±14.7	55-112	92.3±10.1	50-110

In Table 5.2. , the first performance measurement averages of the research groups are given.

Table 5.2. Last Performance Measurement Value Averages of the Research Groups

Final Measurement				
	Intervention Group (N=17)		Control Group (N=21)	
	Mean±Sd	Min-Max	Mean±Sd	Min-Max
Y_balance(cm)	111.6±11.4	90.9-131.5	103.8±11.9	72.3-125
Y Balance Anterior(cm)	123.1±17.1	84.6-152.6	112.3±14.7	77.3-127.1
Y Balance Posteromedial(cm)	114.7±12	98.8-114.8	107±9.8	72.4-125.4
Y Balance Posterolateral(cm)	120.8±15.1	95.4-141.1	105.4±11.5	80.5-131.3
Nelson Hand Reaction Test				
EO(sec)	1,7±0,3	1-2,3	1,8±0,3	1,2-2,8
Nelson Hand Reaction Test				
EC(sec)	1,9±0,5	1-2,9	2±0,4	1,4-3
Passive Straight Leg Raise (PSLR)				
Measurement (Right side)				
(degree°)	97.8±6.2	89-112	91.5±10.9	65-110
Passive Straight Leg Raise (PSLR)				
Measurement (Left side) (degree°)	101.7±7.7	90-121	92.7±9.8	50-110

Table 5.3 shows the last performance measurement value averages of the research groups. Considering the findings within the framework of the first measurements, an increase was observed in Y Balance total score , Y Balance Anterior, Y Balance Posteromedial, Y Balance Posterolateral, right and left side of Passive Straight Leg Raise (PSLR) Measurements, especially for the intervention group, while a decrease was observed in Nelson hand reaction test EO and EC averages. When the averages of the control group are examined, the differences are not as obvious as in the intervention group, and the values are close to each other.

Table 5.3. Intervention Group Sports Injury Anxiety Assessments

Intervention Group (N=17)				
	First Measurement		Final Measurement	
	Mean±Sd	Min-Max	Mean±Sd	Min-Max
Sports Injury Anxiety (points)	38.8±16	19-67	28.29±15.2	18-64

Table 5.4. shows the total scores of the intervention group from the sports injury anxiety scale, as the first and last measurement. While the anxiety level of the intervention group was 38.8±16 in the first measurement, it was seen that the anxiety level decreased and became 28.29±15.2 in the last measurement.

Table5.4. Control Group Sports Injury Anxiety Evaluations

Control Group (N=21)				
	First Measurement		Final Measurement	
	Mean±Sd	Min-Max	Mean±Sd	Min-Max
Sports Injury Anxiety(points)	39±19	19-73	39.6±19	19-75

Table 5.5 shows the first and last measurement values of the sports injury anxiety levels of the control group. When the findings are examined, it is seen that the first measurement anxiety level of the control group was 39±19, the last measurement anxiety level was 39.6±19, and no change was observed.

Table5.5. Intervation Group Performance Measurement Values Average Differences

		Cover	ss	Z	p
Y Balance (cm)	First Measurement	95.19	8.68	-3,244	0.001
	Final				
	Measurement	111.63	11.43		
Y Balance Anterior (cm)	First Measurement	105.47	13.79	-2,911	0.004
	Final				
	Measurement	123.15	17.14		
Y Balance Posteromedial (cm)	First Measurement	98.74	10.83	-3,006	0.003
	Final				
	Measurement	114.78	12.08		
	First Measurement	102.80	9.28	-3,432	0.001

Y	Balance	Final				
Posterolateral (cm)		Measurement	120.78	15.10		
Nelson	Hand	First Measurement	2,01	0,3	-1,942	0,052
Reaction	Test	Final				
EO(sec)		Measurement	2,08	0,4		
Nelson	Hand	First Measurement	1,7	0,3	-0,450	0,653
Reaction	Test	Final				
EC(sec)		Measurement	1,9	0,5		
Passive Straight Leg		First Measurement	90.41	13.69	-1,944	0.052
Raise	(PSLR)	Final				
Measurement (Right		Measurement	97.71	6.28		
side) (degree°)						
Passive Straight Leg		First Measurement	90.59	14.77	-2,441	0.015
Raise	(PSLR)	Final				
Measurement (Left		Measurement	101.71	7.74		
side) (degree°)						

(P<0.05 is statistically significant.)

Table 5.6. shows the results of the Wilcoxon signed-rank test, which was performed to determine the statistically significant mean differences between the first and last performance measures of the intervention group. According to the findings, there is a statistically significant mean difference between the first and last measurements of the y balance, y balance anterior, y balance posteromedial, y balance posterolateral and Passive Straight Leg Raise (PSLR) Measurement of the left side values of the intervention group (p<0.05). When these differences are examined, the last measurement values for Y Balance, Y Balance Anterior, Y Balance Posteromedial, Y Balance Posterolateral And Passive Straight Leg Raise (PSLR) Measurement left are higher than the first measurement values.

Table 5.6. Mean Differences in Control Group Performance Measurement Values

		Cover	ss	Z	p
Y Balance (cm)	First Measurement	98.33	10.83	-2,113	0.350
	Final Measurement	105.41	14.24		
Y Balance Anterior (cm)	First Measurement	99.49	13.35	-2,017	-0.054
	Final Measurement	103.80	12.36		
	First Measurement	19.21	3.05	-1,681	0.093

Y	Balance	Final				
Posteromedial (cm)		Measurement	20.19	4.28		
Y	Balance	First				
Posterolateral (cm)		Measurement	91.48	11.25	-1,037	0.300
		Final				
		Measurement	92.33	10.12		
Nelson	Hand	First				
Reaction	Test	Measurement	1.9	0.3	-1,450	0.281
EO(sec)		Final				
		Measurement	1.8	0.4		
Nelson	Hand	First				
Reaction	Test	Measurement	2nd	0.4	-0.124	0.804
EC(sec)		Final				
		Measurement	2nd	0.4		
Passive Straight Leg		First				
Raise	(PSLR)	Measurement	18.63	2.97	-0.312	0.755
Measurement (Right		Final				
side) (degree°)		Measurement	20.19	4.28		
Passive Straight Leg		First				
Raise	(PSLR)	Measurement	91.52	10.91	0.590	0.555
Measurement (Left		Final				
side) (degree°)		Measurement	92.71	9.98		

(P<0.05 is statistically significant.)

Table 5.7 shows the results of the Wilcoxon signed-rank test, which was performed to determine the statistically significant mean differences between the first and last performance measurements of the control group. According to the findings, there was no statistically significant mean difference between the performance measurement values and the measurements for the control group ($p>0.05$).

Table 5.7. Intervention Group Sports Injury Anxiety Mean Differences

		Cover	ss	Z	p
Sports Injury	First Measurement	38.88	16.04	-3,412	0.001
Anxiety(points)	Final Measurement	28.29	15.28		

(P<0.05 is statistically significant.)

In Table 5.8 , the results of the Wilcoxon signed-row test, which was carried out to determine the mean differences in sports injury anxiety within the framework of the first and last measurement of the intervention group, are presented. When the findings are examined, there is a statistically significant mean difference between the sports first measurement and the last measurement sports injury anxiety for the intervention group

($p < 0.05$), and when this difference is examined, the last measurement anxiety level (28.29 ± 15.28) is found in the first measurement. anxiety level (38.88 ± 16.04).

Table 5.8. Control Group Sports Injury Anxiety Mean Differences

		Cover	ss	Z	p
Sports Injury	First Measurement	39.09	19.03	-0.171	0.200
Anxiety(points)	Final Measurement	39.61	19.22		

($P < 0.05$ is statistically significant.)

Table 5.9 shows the results of the Wilcoxon signed-row test, which was performed to determine the mean differences in sports injury anxiety in the first and last measurement framework of the control group. According to the findings, there is no statistically significant mean difference between the first and last measurement for the control group ($p > 0.05$).

Table 5.9. Mean Differences in Performance Measures of Intervation and Control Groups

		Cover	ss	Z	p
Y Balance(cm)	Intervention Group	111.63	11.43	-2,040	0.041
	Control Group	103.88	11.91		
Y Balance Anterior(cm)	Intervention Group	123.15	17.14	-1,982	0.048
	Control Group	112.37	14.70		
Y Balance Posteromedial(cm)	Intervention Group	114.78	12.08	1,820	0.069
	Control Group	107.01	9.86		
Y Balance Posterolateral(cm)	Intervention Group	120.78	15.10	-2,936	0.003
	Control Group	105.48	11.52		
Nelson Reaction EO(sec)	Intervention Group	1.7	0.3	-1.387	0.174
	Control Group	1.8	0.3		
Nelson Reaction EC(sec)	Intervention Group	1.9	0.5	-0.641	0.532
	Control Group	2	0.4		
Passive Straight Leg Raise (PSLR) Measurement (Right side) (degree°)	Intervention Group	97.71	6.28	-1,828	0.068
	Control Group	91.52	10.91		
Passive Straight Leg Raise (PSLR) Measurement (Left side) (degree°)	Intervention Group	101.71	7.74	-2,961	0.003
	Control Group	92.71	9.98		

($P < 0.05$ is statistically significant.)

Table 5.10 contains the results of the Mann-Whitney U test, which was carried out to determine the statistically significant mean differences between the performance measurements of the research and control groups in the last measurement of the study. According to the findings, there is a statistically significant mean difference in the scope of y balance, y balance anterior, y balance posterolateral and Passive Straight Leg Raise (PSLR) Measurement left ($p < 0.05$) within the framework of the research groups, and when these significant differences are examined, the intervention group is higher than the control group for all dimensions. has high averages.

Table 5.10. All Groups Sports Injury Anxiety Mean Differences

		Cover	ss	Z	p
Sports					
Injury	Intervention Group	28.29	15.28	-2,178	0.031
Anxiety					
(points)	Control Group	39.62	19.22		

($P < 0.05$ is statistically significant.)

In Table 5.11, the results of the Mann-Whitney U test, which was carried out to determine the statistically significant mean differences between the groups and sports injury anxiety in the last measurement framework of the research and control groups of the study, are presented. According to the findings, there is a statistically significant mean difference between intervention and control groups ($p < 0.05$) in sports injury anxiety. According to this difference, the anxiety level of the intervention group (28.29 ± 15.28) was lower than the anxiety level of the control group ($39, 62 \pm 19.22$) is lower.

6. DISCUSSION

Today, yoga practices are recommended as a rehabilitation or performance improvement method consisting of intense exercise programs with the active participation of the individual instead of the passive treatment method.

When the physiological variables of the intervention group of this study were averaged, age was 18.76 ± 2.1 year ; height, 201.6 ± 7.8 cm ; weight is 93.5 ± 9.3 kg. When the physiological variables of the control group were averaged, age was 19.19 ± 2.1 year ; height , 199.6 ± 8.6 cm ; weight is 96 ± 7.2 kg. (Table 1).

The results of the Y Balance Balance Test, Nelson Hand Reaction Test, Passive Straight Leg Raise (PSLR) for Hamstring flexibility performance measurement averages (Table 5.2) and Sports Injuries Anxiety Scale Questionnaire (Table 5.4-5.5), for both the control and intervention groups (Tables 5.4-5.5) were found to be close to each other.

When the last performance measurement averages of the intervention group were examined within the group, an increase was observed in all Y Balance Test values and right and left hamstring flexibility, while a decrease was observed in the Nelson Hand Reaction Test eyes open and eyes closed averages. In addition, it is seen that the total scores of the intervention group from the sports injury anxiety scale, including the first measurement and the last measurement, were 38.8 ± 16 points and 28.29 ± 15.2 points , and the level of anxiety decreased (Table 5.4). Determining whether the differences within the intervention group were statistically significant was calculated using the Wilcoxon signed-rank test. According to the findings, a statistically significant mean difference was found between the first and last measurements of the Y Balance all points except Y balance posteromedial and Hamstring Flexibility Left values (Table 5.6) and sports injury anxiety (Table 5.8) score of the intervention group ($p < 0.05$).

Y Balance all points except Y balance posteromedial and hamstring flexibility of the left side, and Sports Injury Anxiety scores of the athletes who apply the Neurodevelopmental Yoga program are compatible with Hypothesis 0.

When the means of the control group are examined, the differences are not as significant as in the intervention group, and the values are close to each other (Table 5.3). Wilcoxon signed-rank test was used to analysis whether these differences were statistically significant . According to the results obtained, there was no statistically remarkable

difference between the control group performance measurement values (Table 5.7) and Sports Injury Anxiety (Table 5.9) scores ($p>0.05$).

When the intervention group that participated in Neurodevelopmental Yoga sessions for 6 weeks and the control group compared, according to the findings obtained, the intervention group had higher averages than the control group in line with the H0 hypothesis. The Mann-Whitney U test was used to analyse whether this change was statistically significant in terms of intergroup performance measurements and sports injury anxiety parameters.

According to the statistical analysis, in accordance with Hypothesis 0, a statistically significant improvement was observed in the parameters of Y balance total points($p=0.041$), Y balance anterior($p=0.048$), Y balance posteriolateral($p=0.003$), hamstring flexibility of left side ($p=0.003$) and sports injuries anxiety scale($p=0.031$) parameters compared to the control group that did not participate in any Neurodevelopmental Yoga session (Table 5.10). However, although there were improvements in the H0 direction in the Y Balance posteromedial($p=0.069$), Hamstring flexibility of right side ($p=0.068$, Nelson Hand Reaction Test Eyes Open($p=0.142$), Nelson Hand Reaction Test Eyes Closed ($p=0.499$) parameters, which were compatible with Hypothesis 1, these improvements were not statistically significant.

We think that this insignificant improvement in Y balance posteromedial, right Passive Straight Leg Raise Measurement (PSLR) and Nelson Hand Reaction Test are parameters that cannot be changed such as training intensities, fatigue levels of individuals or match patterns, which are among the limitations of our study.

Similar to our study Chaudhari, PR (119) selected a male basketball player under the age of 14-16 from Jalgaon in his study. All athletes who regularly play basketball were randomly included in the study. Athletes were randomly divided into experimental group (Group A N1 = 30) and a control group (Group B, N2 = 30).

"Shuttle Run Test" (for agility), "Sit and Reach Test" (for flexibility), "Vertical Jump test" (for strength), "20 m" Sprint test (for speed measurement), "Body fat monitor" "(for body fat mass), "Johnson 1/2-minute shooting test" (for shooting ability), "Push Pass Test" (to analyze passing accuracy) and "Johnson Ball After" (for dribbling ability). After the pre-tests, all basketball players in group A participated in training and yoga practices, while those in group B only participated in basketball training. This indicates that both groups

participated in basketball training, as in our study. This joint training is given to both groups for 1 hour every day except Sundays and holidays. However, 1 hour later, group A attended the yoga training (30 minutes), while group B did not attend the yoga training. The yoga practices applied in this study were physical poses (Asanas) and breathing techniques (Pranayama) performed under the guidance of a yoga expert. However, in our study, in addition to these practices, there is also a dhyana (meditation) part.

Similar asanas used in this study were Ardha Halasana, Brahma mudra, Ardha Matsyendrasana, Sarvangasana, Matsyasana, Halasana, Paschimotanasana, Bhujangasana, Viparitakarni, Dhanurasana, Supta Vajrasana and Yoga Mudra and breathing exercises were also done by Anulom Vilom, Uja Kapalyi. The asanas and breathing techniques and meditation techniques used in our yoga flow are shown in Table 3.2 in the methods section. In our study, according to Neurodevelopmental Yoga principles, the main goal is to bring body awareness to the person rather than the size of the movement or the advanced level, and to improve the flexibility, balance and reaction time of the athletes in terms of athletic performance as it includes basketball-specific movements. In terms of breathing techniques, the breathing techniques used in our study are 3 dimensional and Anulom Vilom, Kapalhabati breathing that stimulate the vagus nerve.

In our study, yoga sessions take 60 minutes. It was applied twice a week for 6 weeks. However, in a similar study in the literature, no information was given about the frequency or duration of yoga interventions. It was said that the study only lasted 6 weeks. When the yoga and control groups of the similar study were compared, at the end of the yoga sessions in the intervention group, there was a significant increase in agility($t=13.39$, $df=29$, $p<0.001$), flexibility($t=16.57$, $df=29$, $p<0.001$), speed($t=9.96$, $df=29$, $p<0.001$), strength($t=8.40$, $df=29$, $p<0.001$), shooting ability($t=9.5$, $df=29$, $p<0.001$), passing ability($t=17.55$, $df=29$, $p<0.001$) and dribbling ability($t=19.44$, $df=29$, $p<0.001$), while there was a significant decrease in body fat mass($t=10.42$, $df=29$, $p<0.001$).

In our study, the last measurement values in the left and hamstring flexibility parameters of the yoga group were found to be significantly higher than the first measurement values. The results of the control group of this similar study are; agility($t=0.05$, $df=29$, $p>0.05$), flexibility ($t=0.30$, $df=29$, $p>0.05$), power ($t=0.28$, $df=29$, $p>0.05$), speed ($t=0.80$, $df=29$, $p>0.05$), Throwing ability ($t=0.65$, $df=29$, $p<0.05$), passing ability ($t=2.77$, $df=29$,

$p < 0.05$) , dribbling ability ($t = 1.23$, $df = 29$, $p > 0.05$) and body fat ($t = 1.49$, $df = 29$, $p > 0.05$). No increase was observed.

In our study, in the control group who did not practice yoga, no statistically significant change was observed in the Passive Straight Leg Lift (PSLR) measurement applied for both legs in parallel with this study.

In addition, when the yoga group and the control group were compared in the aforementioned study, there was a significant increase in strength and power ($t = 6.34$, $p < 0.001$) , flexibility ($t = 8.39$, $p < 0.001$), speed ($t = 9.32$, $p < 0.001$) , agility ($t = 12.25$, $p < 0.001$), data of physical performance. A decrease was observed in body fat ratios ($t = 3.26$, $p < 0.01$). Considering the basketball skills between the two groups, a significant increase was observed in the passing ability ($t = 7.79$, $p < 0.001$), shooting ability ($t = 6.41$, $p < 0.001$), and dribbling skill ($t = 9.28$, $p < 0.001$) in the yoga group.

In our study, when the yoga group and control groups were compared, statistically significant improvements were observed in flexibility (left hamstring) and balance (Y balance total scores, Y balance anterior and Y balance posterolateral) values, similar to this study.

However, there was no significant difference in hand reaction rate in our study. Although there was also improvement in right Passive Straight Leg Raise (PSLR) Measurement, this was not significant. It is thought that this difference is due to the fact that the basketball players in our study are determined as 5 hours of basketball training every day and only one day of rest a week and the frequency of the matches.

Brinzak, Savva; SV et al. (178) investigated whether it has an effect on vertical jump, endurance, balance, speed, free throw with movement, tactical applications and three-point shooting in basketball players. The school basketball team, consisting of 25 athletes aged 17-20, was randomly assigned to the experimental and control groups. In addition to classical basketball training, the experimental group ($n = 13$) was given 2 hours of yoga practice during 9-week , 4 sessions per week. During this period, the control group ($n = 12$) continued classical basketball training. Considering the specificity of basketball, within yoga are 3-5 minutes meditation in lotus position, bending forward in sitting position, cobra, Dhanurasana, shoulder pose, fish, tree, dancer pose, bakasana, T pose, eagle pose, Trikonasana, Anjaneyasana and downward dog poses.

As a result, when the results of the control and experimental groups were compared, it was noted that the indicators examined in both groups had positive changes, but the data in the control group remained significantly lower in the experimental group. (<0.05). When the yoga group and control groups were compared in our study, statistically significant improvements were observed in balance (Y balance total points, Y balance anterior and Y balance posterolateral) values similar to this study.

The findings regarding the balance revealed by this study support the current study conducted in this thesis. However, no significant difference was found in hand reaction rate in our study. Although there was also improvement in right Passive Straight Leg Raise (PSLR) Measurement, this was not significant. This difference is also thought to be due to the frequency of matches, the frequency of double training days, and insufficient rest periods despite training intensities, which are the limitations of our study.

Considering the other studies on yoga in the literature, Run-Kowzun et al. reported that hamstring flexibility can be improved with a 7-week yoga session and used as a modality to improve flexibility and function in activities of daily living and athletic performance(133).

However, although there were improvements in hamstring flexibility values in the right leg in our study, this improvement was not statistically significant. An increase in value was observed in hamstring flexibility in the left leg, and this increase was statistically significant.

Considering that similar research is a 7-week program and our study is a 6-week program, it is thought that applying Neurodevelopmental Yoga for a period longer than 6 weeks will positively affect flexibility and other parameters.

Looking at the literature, Malipatil, RP, et al (63) found that yoga has a positive effect on lower extremity explosive power and flexibility. However, as in our study, no study on hand reaction time was found.

A 2018 systematic review (conducted by Wooten, SV et al) investigated whether yoga meditations had an effect on balance and proprioceptive function in individuals who had previously experienced a fall risk(120). Persons over the age of sixteen were randomly assigned to either the Proprioception Training Group (PT) or the YoMed Group (YM).

Each group was subjected to a 6-week program. According to this program, training was given in 3 sessions per week and 45 minutes in each session. In order to measure the comparative effects of the interventions, measurements were made before and after the application. These tests; Tenetti Balance and Gait Analysis, Balance Error Scoring System (BESS), dynamic , joint position sense, posturography, joint kinesthesia test and leg extensor strength tests were applied. The yoga meditation group met at a local yoga studio for 3 sessions of 45 minutes per week for a total of 6 weeks. During the training session, a 15-minute body scan meditation was first performed in a sitting position. The body scan was done from the bottom up. The students were asked to draw a mental picture of the position of each part, toes, foot, leg, thigh, and in this way a body scan of the whole body was made from the bottom up.

In our study, only 2 sessions of yoga, "Savasana" ' section, body scanning was done in 3 sessions. The yoga program (120) in this study, which is similar to our study, is similar to our yoga program (shown in section 3.7 of the Methods section).

The results of this similar study in the literature showed statistical improvements in the Yoga Meditation or PT intervention groups ($d=1.238$; $p=0.049$), excluding the dynamic posturography overall score (DMA), which showed significant improvement by the yoga meditation group.

Looking at the literature, Akila, S. et al. (179) investigated the effectiveness of yoga training on playing skills in basketball players. Forty-five basketball players aged between 11-14 were selected as subjects in the study. There are 3 groups here, different from the literature and our study. The first group was named basketball skill training group (STG). The second group was called the skill+yoga training group (SYTG), and the third group was called the control group (CG). After assigning the subjects to various groups, pre-tests such as fast dribbling and wall bounce were applied to the selected variables. The training period was planned to be 12 weeks. Experimental group 1 passed the basketball skill group (STG) skills training program. The experimental group 2 basketball skill + yoga training group (SYTG) underwent a combination of both skills training and yogic training, and the control group did not undergo any specific training.

Skill training group (STG) and skill + yoga combined training group (SYTG) showed significant improvement in variables such as fast dribbling and wall bounce ($P<0.05$).

The experimental group 1 (STG) skills training group also gave better results than the control group. The skills training group did not show significant results from the yoga+skills combined training group. Experimental group 2 (SYTG), yoga+skills combined skills training and yoga training group compared with the control group showed better results than the control group. Experimental group 2 Skill + yoga training group (combined group), Experimental group 1 was better than skill training group. The control group did not show any significant improvement in any of the selected variables. Fast dribbling and wall bouncing included balance - coordination and agility sub-components.

Balance and agility parameters in our study When the yoga group and control groups were compared, statistically significant improvements were observed in balance (Y balance total points, Y balance anterior and Y balance posterolateral) values similar to this study. However, in our study, unlike this study, there was not any significant difference in hand reaction time in terms of agility.

This study confirms that school basketball players' speed ball dribbling and wall-bouncing parameters improve when training and yoga practice are combined.

Another study (178) on yoga compared yoga and classical physiotherapy programs. The subjects were selected from individuals with chronic low back pain (CBA) and it was examined whether these individuals had an effect on their pain levels, quality of life and sleep, and balance. Before starting the research, individuals were randomly assigned to two groups. The first group was given a yoga program with 5 sessions per week for 4 weeks.

However, the second group received a physiotherapy program consisting of ultrasound, hotpack and exercise for 2 weeks, 5 sessions a week, and after the end of this 2-week program, 5 sessions of exercises per week were continued for 2 weeks. The yoga training applied to the intervention group in our study consisted of 12 sessions, 2 sessions per week for 6 weeks. In the aforementioned similar study, there is a total of 20 sessions of yoga training 5 sessions per week for 4 weeks. In our study, it was adjusted by considering the training intensity and applicability of the basketball players, and by considering the similar durations in the yoga practices with basketball players. In this study, which is similar to the one in the literature, all individuals participating in the study were given the one-leg standing test to evaluate balance, the Visual Analogue Scale for the evaluation of

pain severity, the Pittsburgh Sleep Quality Scale for the evaluation of sleep quality, the Oswestry Functional Disability Scale for the evaluation of function, and the evaluation of the quality of life. Short Form - 36 was used for the study and the measurements were repeated before and after the treatment, as in our study.

Pain severity, balance scores, functional disability and quality of life parameters were improved in both groups after treatment ($p < 0.05$). There was no significant difference between the two groups in terms of sleep quality ($p > 0.05$). In the comparisons between the groups, the difference in pain intensity was found to be statistically more significant in the physiotherapy group ($p < 0.05$). In conclusion, it has been shown that both treatment programs have positive effects on balance, function, pain and quality of life in individuals with CKD.

A systematic review (conducted by Ban, M et al.) investigating the effect of yoga on balance in individuals with Parkinson's Disease (PD) found that yoga can significantly improve balance, quality of life and functional mobility while also reducing depression or anxiety.

Again, in a study (performed by Cherup, N.P et al) examining the effect of yoga on proprioception, functional movement, and balance in Parkinson's disease, 33 subjects with mild to moderate Parkinson's disease were randomly assigned to a yoga meditation program (YoMed) or Proprioceptive Training Program (PRO) (180).

Both interventions were performed in two-week sessions spanning 12 weeks, with each session lasting 45 minutes. The Falls Efficacy Scale (FES), Joint position detection (JPS45, JPS55, JPS65), dynamic posturography (DMA and TIME), Joint Kinesthesia, Tinetti Balance Assessment Tool (TIN), Balance Error Scoring System (BESS), and Timed Up-and-Go Tests (TUG) was applied.

Tinetti Balance Test and Joint Kinesthesia tests were increased more in YoMed group compared to other group. DMA and TIME scores increased statistically in both groups.

When examining the studies on yoga's agility and flexibility in the literature, Bal, BS; et al (158) examined effectiveness of hatha yoga on agility and flexibility in individuals aged 18-25. People are divided into two groups.

While the intervention group was “A”, the “B” group was determined as the control group. “Sit and Reach Test” was used to measure flexibility and “Hexagonal Barrier Test” was used to measure agility. After the measurement, yoga practices including certain asanas (Swastikasana, Mayurasana, Matsyendrasana, Paschimottanasana and Gomukhasana) were performed with the people in group A for 6 weeks. As a result, the six-week yoga training program showed a significant increase in flexibility and agility.

There are many studies that show that yoga has a positive effect on different types of balance (107). In a systematic review by Jeter, PE et al., it was stated that yoga performed with healthy individuals may be beneficial on balance (181). In a systematic review conducted by Green et al (182), it was stated that yoga creates mind and body flexibility, improved posture control, relaxation, and also reduces anxiety and stress.

In conclusion, moderate evidence supports the use of yoga to reduce fall risk for community-dwelling older adults and people with CVA, dementia, and AD-type dementia and MS.

Ülger et al., who investigated the effectiveness of yoga on gait and balance disorders caused by musculoskeletal problems, stated that yoga practices had a positive effect on balance and walking parameters. (183).

A different study in the literature investigated whether yoga affects dynamic balance in a study they conducted on 30 staff, students or faculty members at a university. The intervention group (n=6) received 2 sessions of Hatha Yoga per week for 6 weeks. No intervention was applied to the control group (n=7). But knowledge of yoga flow or asanas used is not given. All participants underwent one static and two dynamic tests on a force plate 6 weeks prior to the study. The only significant difference was NP leg swing (dynamic balance) in the x direction. They found that the training stimuli of 2 sessions per week and/or 6 weeks of yoga were not sufficient to significantly affect the static and dynamic balance.

In our study, since Y balance is counted as a dynamic balance measurement, our dynamic balance results Statistically significant improvements were observed in Y balance total points , Y balance anterior and Y balance posterolateral values. The findings regarding the balance revealed by this study support the current study conducted in this thesis.

It is thought that this difference between the 2 studies is due to both the difference in the applied yoga flows and the small sample size of the intervention group in this similar study.

Pilkington K, et al. (110) examined 8 studies on this subject in a systematic review investigating whether yoga is effective on stress levels and stress-related disorders. As a result, it was observed that yoga has beneficial effects in addition to the treatment of people coping with depressive disorders. In the literature, Taneja DK et al. In their study, they stated that yoga supports that it will be beneficial on stress and stress-related disorders. As a result of studies conducted on hypertensive individuals, it has been found that regular yoga practices for 1 hour a day are effective in controlling blood pressure. It has also been reported to have a convincing hyper-result effect, along with yoga, psychotherapy, biofeedback, and transcendental meditation(113).

In our study, a notable improvement was seen in the parameters of stress and anxiety level in basketball players when the anxiety level of the yoga group was compared before and after in-group yoga. In addition, similar to the previous study, in our study, when the intervention and control group were compared, the anxiety level of the group who did Neurodevelopmental Yoga for 6 weeks showed a highly significant decrease compared to the control group.

In literature, there are studies showing that yoga is also effective on chronic diseases. Balaji PA, et al. reported that when yoga asanas and pranayamas are performed in the presence of a yoga instructor for 1 hour in the morning for 3 months, there may be a decrease in acetated hemoglobin and postprandial blood sugar levels, as well as a decrease in hunger rate(184,185).

In addition, there are studies showing that regular yoga practice in patients with severe coronary artery disease reduces the course of atherosclerosis (186) and significantly improves lung function and strength of inspiratory and expiratory muscles(187).

In a study examining the effect of 3-month yoga treatment (Mula Bandha practices) on perineal pain, perineal muscle laxity, pelvic vaginal discharge and the feeling that something is coming out in female patients with pelvic organ prolapse (114), Mulabandha (Root Lock) practices were applied to one group and traditional treatments were applied

to the other group. When the Pelvic Floor Impact Scale - 7 (PFIQ-7) and Pelvic Floor Distress Inventory - 20 (PFDI-20) were applied to these individuals, the difference between the groups was below the level of clinical significance (15 points), although there was a significantly greater improvement in both groups.).

More studies are needed to examine the success and long-term effects of Mulabandha (Root Lock) practice within yoga.

One of the other studies on young basketball players in the literature was conducted by Boccolini, G et al. This study investigated whether a 12-week balance training program had an effect on the players' balance and vertical jump skills (52). 23 players from two teams under the age of 15 participated in the study. Participants were randomly assigned to two training groups (Balance training (BAT , n=11) and isotonic training (ISO, n = 12)). Balance and vertical jumps were evaluated in both groups at the beginning of the season and at the end of this training program (12 weeks). All tests were done bilaterally. The results indicated a significant increase in balance and muscle strength. As a result, balance training can be used as an effective training method to improve balance and vertical jump, which is a basketball-specific action. In our study, there are also yoga asanas that include many balances. For this reason, it is thought that these asanas can also be used as balance exercises in a balance training to be applied to basketball players.

Notarnicola, A., et al. compared the effectiveness of different stretching types on basketball players and stated that dynamic stretching techniques can be suggested to increase the flexibility of the hamstring muscles. Also, this research requires basketball, which requires flexibility, strength and agility, to offer performance advantage and reduce injury events in different parts of the body. indicates that stretching protocols should be used.

In addition, when the literature is examined, it has been reported that self-myofascial stretching techniques affect vertical jump performance and dynamic balance ability in a positive way in studies conducted on fascia in recent years (72).

In the literature review, it has been revealed that there are a limited number of studies examining the effectiveness of ocular motor exercises on athletes. The only study investigating the effectiveness of ocular motor exercises in athletes is the study of

Minoonejad, H et al. (123). In this study, the effect of ocular motor exercises on stability limit and dynamic visual acuity in female basketball players was investigated. Thirty female basketball players (18-24 years), who met the inclusion criteria of at least 3 years of basketball experience, were randomly divided into two intervention and control groups. A four-week (6 sessions per week) oculomotor exercise program was applied to the athletes in the intervention group. They also continued their routine training. The control group only continued their daily routine training. While dynamic visual acuity was measured with PowerPoint and stability (balance) was tested, assistance was obtained from the Biodex balance system SD.

The obtained results showed that oculomotor exercises can be used to increase dynamic visual acuity and balance in basketball players or other dynamic sports (123).

In our study, on the other hand, all ocular motor exercises were performed within the yoga sessions and Y Balance dynamic balance measurement results increased significantly in the findings obtained from our study.

Dynamic visual acuity, of moving objects while the head is stationary, or when the head/trunk is moving but the subject is stationary; is the ability to analyze spatial details of objects (188). In our study, no measurement of dynamic visual acuity was made, but Nelson Hand Reaction Test was applied with eyes open and closed to determine hand reaction rate. In this application, it is necessary to notice the moving ruler while the head is fixed and to create an appropriate motor response to it. In our study, when the Nelson Hand Reaction Test was applied with the eyes open, there was a value difference between the groups, but this difference was not significant.

Additionally, there is a component of dynamic vision ability and appropriate motor response quickly for the application of this test. Therefore, since these two components were not differentiated in this study, the dynamic visual ability in our study is uncertain.

In addition, the yoga training applied to the intervention group in our study consisted of 12 sessions, for 6 weeks, 2 sessions per week. However, in this study, although the duration was 6 weeks, a total of 24 sessions of ocular eye exercises were applied in 4 sessions per week. Therefore, it is thought that studies performed longer than 6 weeks may yield different results in terms of ocular motor or hand reaction rate parameters.

6. CONCLUSION AND RECOMMENDATIONS

In our study, it was investigated whether the Neurodevelopmental Yoga practices of young basketball players have an effect on hand reaction time, balance, hamstring flexibility and sports injury anxiety.

By discussing the findings, the conclusions and recommendations of the study were reached;

1. A statistically significant increase in dynamic balance values(Y Balance total points, Y Balance anterior, Y Balance posterolateral) was detected in the Neurodevelopmental Yoga group compared to the control group for young basketball players.
2. A significant increase in hamstring flexibility of the left leg was observed in the intervention group that applied Neurodevelopmental Yoga (2 sessions per week for 6 weeks and 60 minutes each session) compared to the control group.
3. No significant difference was found between the hand reaction times of the athletes in the intervention group that applied Neurodevelopmental Yoga (2 sessions per week for 6 weeks and 60 minutes each session) compared to the control group.
4. It was concluded that there was a significant decrease in the sports injury anxiety of the athletes in the intervention group that applied Neurodevelopmental Yoga (2 sessions per week for 6 weeks and 60 minutes each session) compared to the control group.

At the end of our study, the following recommendations are made for further research. brought,

1. Neurodevelopmental Yoga combines both static and dynamic stretches. Therefore, it is thought that it will shed light on future studies as it will have an effect on both joint range of motion and muscle strength.
2. Another physiotherapeutic effect of yoga is that it stimulates the autonomic nervous system and endocrine system with an increased pressure on the

abdominal wall. Therefore, it is thought that Neurodevelopmental Yoga may improve the cardiorespiratory system and may inspire further studies on this subject.

3. More studies are needed to examine the long-term effects of using Mula Bandha practices, which are also used in pelvic floor rehabilitation, in Neurodevelopmental Yoga sessions.
4. Neurodevelopmental Yoga performed for 6 weeks is uncertain when applied for a longer period of time. It is recommended to investigate the longer-term effects in future studies on this subject.

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7. APPENDIX

APPENDIX 1. Yeditepe University Non-Interventional Clinical Research Ethics Committee Decision Form

		YEDİTEPE ÜNİVERSİTESİ GİRİŞİMSSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU		Versiyon No 2.0 13.02.2022 Sayfa 1 / 2	
		KARAR FORMU			
ETİK KURUL BİLGİLERİ		Etik Kurulun Adı: Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu			
		Karar Tarihi: 12.04.2022			
DEĞERLENDİRİLEN BELGELER		İslak imzalı başvuru dosyası, CD'si ve elektronik başvuru			☒
		Araştırma başlığı ve araştırmacıların isimleri			☒
		Başvuru dilekçesi			☒
		Başvuru Formu- Araştırmanın;			☒
		• Niteliği			☒
		• Önemi ve özgün değeri			☒
		• Amaç ve hedefleri			☒
		• Yöntemi			☒
		• Yönetimi			☒
		• Yaygın etkisi			☒
		• Araştırma bütçesi (Mevcutsa)			☒
		• Süresi ve uygunluğu (Zaman cetveli)			☒
		• Kaynakları			☒
		Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış)			☒
		Taahhütname-1			☒
		Araştırmanın yapılacağı kurumdan izin alma sorumluluğunun araştırmacılara ait olduğuna dair taahhüt			☒
		Taahhütname-2			☒
		Dünya Tıp Birliği Helsinki Bildirgesinin son versiyonunun ve Sağlık Bakanlığı'nın ilgili tüm kılavuzlarının okunmasına dair taahhüt			☒
Taahhütname-3			☒		
Daha önce yapmış etik kurul başvuruları mevcut olup olmadığına dair taahhüt			☒		
Taahhütname-4			☒		
Araştırma sırasında araştırmacı bütçesinde yer almayan ve gönüllünün kendisine veya Sosyal Güvenlik Kurumuna ek yük getirecek hiçbir işlem uygulanmayacağına dair taahhüt			☒		
Taahhütname-5			☒		
COVID-19 hastalarında tedavi yaklaşımları ve bilimsel araştırmalar genelgesi okunmasına dair taahhüt			☒		
Taahhütname-6			☒		
MİE Eğitim Bakanlığı Araştırma Uygulama İzinleri konulu yazının okunmasına dair taahhüt			☒		
Araştırmacıların her birisine ait özgeçmiş formu			☒		
Ek belgeler (Varsa kullanılan ölçek izinleri vb.)			☒		
KARAR BİLGİLERİ		Başvuru Numarası: 202203Y0216			
		Toplantı Tarihi: 08.04.2022			
		Toplantı Yeri: Çevirim içi (Google Meet)			
		Karar No: 7			



BAŞVURU NUMARASI: 202203Y0218

12.04.2022

KARAR

☒ ŞARTLI KABUL
(BAZ. GEREKÇELER)

APPENDIX 2: Sociodemographic Information Form

Tarih:

Demografik Bilgi Formu

Ad Soyad

.....

Yaş

.....

Cinsiyet

.....

Boy – Kilo

.....

Varsa önceki yaralanmalarınız ?

.....

.....

Varsa önceden geçirdiğiniz ameliyat ?

.....

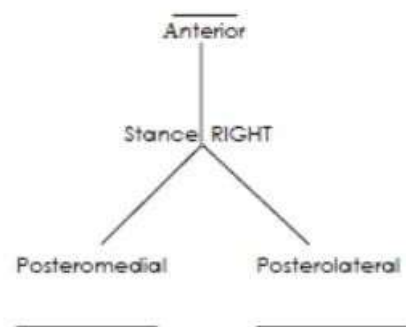
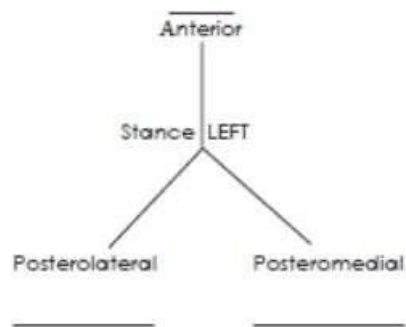
.....

APPENDIX 3 : Y Balance Test Measurement Form

Score Sheet for Y Balance Test™ & Limb Length

Athlete Name: _____ Date: _____

RIGHT Limb Length: _____



	Left	Right	Difference
Anterior			
Posteromedial			
Posterolateral			

*** Difference should be less than 4 cm. for return to sport and preparticipation screening ***

$$\text{Composite Score} = \frac{(\text{Anterior} + \text{Posteromedial} + \text{Posterolateral})}{(3 \times \text{Limb Length})} \times 100$$

Composite	
Right	
Left	

APPENDIX 4: Nelson Hand Reaction Test Measurement Form

Name: _____

Attempt Number	Distance the ruler dropped
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Mode:

Median:

Mean:

Mean divided by 10:

APPENDIX 5: Sports Injury Anxiety Scale Questionnaire

SPOR YARALANMASI KAYGI ÖLÇEĞİ		Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Yeteneğini Kaybetme Kaygısı						
10	Yaralandığımda spor yeteneğimi kaybederim.	1	2	3	4	5
14	Yaralandığımda bazı spor becerilerimi kaybederim.	1	2	3	4	5
21	Yaralandığımda özsaygımı kaybederim.	1	2	3	4	5
Zayıf Algılanma Kaygısı						
5	Yaralandığımda bazı insanlar benim bebek olduğumu düşünür.	1	2	3	4	5
8	Yaralandığımda bazı insanlar tembel olduğumu düşünür.	1	2	3	4	5
13	Yaralandığımda bazı insanlar bunu rol olarak yaptığımı düşünür.	1	2	3	4	5
Acı Çekme Kaygısı						
11	Yaralandığım zaman çok acı çekerim.	1	2	3	4	5
16	Yaralandığımda çok canım yanar.	1	2	3	4	5
20	Yaralandığımda zonklama ağrısı yaşarım.	1	2	3	4	5
Hayal Kırıklığına Uğratma Kaygısı						
6	Yaralandığımda takım arkadaşlarımı hayal kırıklığına uğrattırım.	1	2	3	4	5
18	Yaralandığımda antrenörlerimi hayal kırıklığına uğrattırım.	1	2	3	4	5
19	Yaralandığımda arkadaşlarımı hayal kırıklığına uğrattırım.	1	2	3	4	5
Sosyal Desteği Kaybetme Kaygısı						
1	Yaralandığımda bazı insanlar benden uzaklaşır.	1	2	3	4	5
3	Yaralandığımda bazı insanlar beni aramayı keser.	1	2	3	4	5
7	Yaralandığımda bazı insanlar sosyal desteğini keser.	1	2	3	4	5
Yeniden Yaralanma Kaygısı						
4	Yaralandığımda bedenimin nasıl görüldüğü konusunda endişelenirim.	1	2	3	4	5
9	Yaralandığımda aynı yaralanmanın tekrar olacağı konusunda endişelenirim.	1	2	3	4	5
12	Yaralandığımda spora geri döndüğümde tekrar yaralanabileceğimi düşünürüm.	1	2	3	4	5
17	Yaralandığımda kilo almaktan endişelenirim.	1	2	3	4	5

- Ölçekte ters (olumsuz) kodlanması gereken madde yoktur.
- Ölçekten alınan puan ortalaması (toplam puan ve alt boyutlar) arttıkça, yaralanma kaygısının arttığını göstermektedir.

Atıf Bilgisi:

Caz, Ç., Kayhan, R.F. ve Bardakçı, S. (2019). Spor Yaralanması Kaygı Ölçeği'nin Türkçeye Uyarlanması: Geçerlik ve Güvenirlilik Çalışması. *Spor Hekimliği Dergisi*, 54(1): 52-63. DOI: 10.5152/tjsm.2019.116

APPENDIX 6: Scale / Survey Permissions

ÖLÇEK KULLANIM İZNİ

Merhaba İrem, uyarlanmasını yapmış olduğumuz "Spor Yaralanması Kaygı Ölçeği" çalışmalarınızda kullanabilirsiniz.

APPENDIX 7: Research Permit

EK 1. ARAŞTIRMA İZİN BELGESİ

4 Mart 2022

T.C. YEDİTEPE ÜNİVERSİTESİ

GİRİŞİMSSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU BAŞKANLIĞI' NA,

Sorumlu araştırmacısı olan Basketbolcularda Nörogelişimsel Yoganın, Denge , Reaksiyon Hızı , Esneklik Ve Performans Anksiyetesine Olan Etkisi başlıklı araştırma önerisinin veri toplama kısmı kurumumuzda yapılacaktır. Gereğini arz ederim.

Kurum Bilgileri

Adı

Anabilim Dalı / Bölüm Adı

Darüşşafaka Spor Kulübü

4.03.2022

T.C. YEDİTEPE ÜNİVERSİTESİ

GİRİŞİMSSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU BAŞKANLIĞI' NA,

T.C. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü - Spor Fizyoterapisi Ana Bilim Dalında yüksek lisans öğrencisi 20183035001 numaralı İrem SAVAŞKAN adlı öğrencinizin "Genç Basketbolcularda Nörogelişimsel Yoganın, Denge , Reaksiyon Hızı , Esneklik Ve Performans Anksiyetesine Olan Etkisi " adlı yüksek lisans tezi için gerekli araştırmaları kurumumuz Darüşşafaka Spor Kulübü içerisinde 05.01.2022 – 05.04.2022 tarihleri arasında gerekli araştırmaları yapabilmesine izin verilmiştir.

APPENDIX 8: Informed Voluntary Consent Form (For Adult)

BİLGİLENDİRİLMİŞ GÖNÜLLÜ ONAY FORMU (erişkin için)

Sayın katılımcı, bu çalışma bilimsel bir araştırma olup, "Genç Basketbolcularda Nörogelişimsel Yoganın, Denge, Reaksiyon Hızı, Esneklik Ve Performans Anksiyetesine Olan Etkisi" başlığını taşımaktadır. Bu çalışmanın temel amacı, nörogelişimsel yoganın genç basketbolcularda vestibular ve proprioseptif sistemi aktive etme ve postüral kontrolü geliştirme yoluyla dengeyi, yoga akışlarında oküler motor vasıtasıyla ve diğer baş göz hareketleriyle vestibular sistemi etkilediğinden reaksiyon hızını da etkileyebileceği ve diğer klasik yoga araştırmaları göz önünde bulundurularak esneklik ve nefes ve meditasyon yoluyla stres azaltma tekniği olarak spor performansı anksiyetesinde de etkili olup olmadığını belirlemektir.

Bu çalışmada, dengeyi test etmek için "Y Balance Test", El reaksiyon hızını test etmek için "Nelson El Reaksiyon Testi", hamstring esnekliğini ölçmek için gonyometre, ve yaralanma kaygısı ve stresini ölçmek için " Spor Yaralanması Kaygı Ölçeği" kullanılacaktır. **Çalışmanın örneklem sayısı 42** olmaktadır.

Katılımcıların demografik bilgileri alındıktan sonra araştırmaya katılanlar randomize olarak çalışma grubu (yoga) ve kontrol grubu olmak üzere iki gruba ayrılacaktır. Yoga eğitimi 6 hafta boyunca haftada 2 gün yapılacak. Yoga seansları Darüşşafaka Spor Kulübü Jimnastik odasında eğitmen gözetiminde ve karşılıklı geri bildirimlerle gerçekleştirilecektir. Katılımcıların üç devamsızlık hakkı vardır. Bu hakkın sonunda kişiler araştırma dışı bırakılır. Bu araştırma Fizyoterapist İrem SAVAŞKAN tarafından yürütülecek ve Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Fakültesinde Dr. Öğr. Üyesi Ayça Aklar Çörekçi tarafından gözetilecektir.

Bir araştırma projesine davet ediliyorsunuz. Bir karar vermeden önce bu araştırmanın neden ve nasıl yapılacağını anlamamız çok önemlidir. Lütfen biraz zaman ayırın ve aşağıdaki bilgileri dikkatlice okuyun, isterseniz başkalarıyla tartışın. Anlaşılmayan bir bölümünüz varsa veya daha detaylı bilgiye ihtiyaç duyuyorsanız bizden bilgi alabilirsiniz. Dahil edilecek kriterlere uygun olduğunuzu düşündüğümüz için araştırmamıza davetlisiniz. Katılımın isteğe bağlı olduğunu ve katılmayı reddetmenin herhangi bir cezaya veya herhangi bir menfaat kaybına yol açmadığını belirtmek isteriz. Aynı şekilde istediğiniz zaman araştırmadan çekilebilirsiniz.

Araştırmamızda katılımcılara uygulanan değerlendirmelerin bilinen bir zararı bulunmamaktadır. Katılımcılara herhangi bir zarar verilmesi durumunda gerekli başvurular araştırmacılar tarafından karşılanacaktır.

Bunun için ne sizden ne de sosyal güvenlik sigortanızdan herhangi bir ücret talep edilmeyecektir. Araştırmaya katılmak araştırma sonuçlarımızın gelecekte kurum, toplum veya bilim için yararları olacağı umulmaktadır. Araştırmanın amaçları veya bağlı olduğunuz sosyal güvenlik kurumu için sizden herhangi bir ücret talep edilmeyecektir.

Katılımcının Onayı

Bilgi formunun tamamını net bir şekilde okudum ve anladım veya nasıl okuyacağımı bilmediğim/anlayamadığım yerlerde araştırmacı benim dilime çevirdi. Başvurum sırasında ve sonrasında ve bu formu doldururken düşünme, değerlendirme ve karar verme fırsatım oldu.

Katılımcı ve Yasal Temsilcinin Adı ve Soyadı:

Tarih İmza:

Fizyoterapist Beyanı

Katılımcılara çalışma ve yapılacak işlemler hakkında gerekli bilgileri verdim. Hastanın bu bilgiyi anladığını, sormak istediği soruları bana sorduğunu ve özgür iradesiyle süreci kabul ettiğini düşünüyorum.

Araştırmacı: Fizyoterapist İrem SAVAŞKAN

Katılımcı Beyanı

İrem SAVAŞKAN, tıbbi bir araştırma yapılacağını ifade etti ve bu araştırmayla ilgili yukarıdaki bilgiler tarafıma anlatıldı. Bu araştırmaya bir katılımcı olarak davet edildiğimi biliyorum. Bu araştırmaya katılırsam, araştırma sırasında bilgilerimin gizliliğine büyük özen ve saygıyla davranılacağına inanıyorum. Araştırmanın kullanımı sırasında kişisel bilgilerimin özenle korunacağı ve sonuçların sadece eğitim ve bilimsel amaçlarla kullanılacağı konusunda yeterli bilgi verildi. Araştırma sırasında, herhangi bir neden göstermeksizin herhangi bir zamanda araştırmadan ayrılabilirim (Ancak bu durumda, herhangi bir bildirimde bulunmazsam araştırmacılara ne kadar zor bir durum yaratacağının farkındayım). Araştırma masrafları için herhangi bir mali sorumluluk kabul etmiyorum. Benim için herhangi bir ödeme olmayacak. Araştırma sırasında oluşabilecek herhangi bir sağlık sorununu doğrudan, dolaylı olarak ortaya çıkarsa da, herhangi bir maddi yük altında bulunmayacağım. Araştırma sırasında herhangi bir sağlık sorunu ile karşılaştığımızda; +90 539610 61 01'den (cep telefonu) fizyoterapist İrem SAVAŞKAN'ı her saat arayabileceğimi biliyorum.

Bu araştırmaya katılmak zorunda değilim veya katılmayabilirim. Araştırmaya katılmaya yönelik herhangi bir zorlayıcı davranışla karşılaşmadık. Katılmayı reddedersek, bunun tıbbi bakımımıza ve fizyoterapistimle olan ilişkimize herhangi bir zarar vermeyeceğini biliyorum.

Bana yapılan tüm açıklamaları detaylı bir şekilde anladım. Kendi başıma belirli bir düşünme sürecinin sonunda bu araştırma projesinde katılımcı olarak yer alabileceğime karar verdim. Bu daveti gönüllü olarak kabul ediyorum. Gönüllü Onay Formu, araştırmaya başlamadan önce gönüllüye verilmesi gereken bilgileri gösteren yukarıdaki metni okudu. Bunlar yazılı olarak sözlü olarak anlatıldı. Bu şartlarla, üzerimde herhangi bir baskı veya zorlama olmaksızın bu araştırmaya katılmayı kabul ediyorum. 2 sayfadan oluşan bu formun imzalı 2 nüshası, belgelerin bir nüshası bana verilecektir.

Katılımcı Adı ve Soyadı:

APPENDIX 9 : Informed Voluntary Consent Form (For Children)

BİLGİLENDİRİLMİŞ GÖNÜLLÜ ONAY FORMU (Çocuk İçin)

Sayın katılımcı, bu çalışma bilimsel bir araştırma olup, "Genç Basketbolcularda Nörogelişimsel Yoganın, Denge, Reaksiyon Hızı, Esneklik Ve Performans Anksiyetesine Olan Etkisi" başlığını taşımaktadır. Bu çalışmanın temel amacı, nörogelişimsel yoganın genç basketbolcularda vestibular ve proprioseptif sistemi aktifleştirme ve postüral kontrolü geliştirme yoluyla dengeyi, yoga akışlarında oküler motor vasıtasıyla ve diğer baş göz hareketleriyle vestibular sistemi etkilediğinden reaksiyon hızını da etkileyebileceği ve diğer klasik yoga araştırmaları göz önünde bulundurularak esneklik ve nefes ve meditasyon yoluyla stres azaltma tekniği olarak spor performansı anksiyetesinde de etkili olup olmadığını belirlemektir.

Bu çalışmada, dengeyi test etmek için "Y Balance Test", El reaksiyon hızını test etmek için "Nelson El Reaksiyon Testi", hamstring esnekliğini ölçmek için gonyometre, ve yaraanma kaygısı ve stresini ölçmek için " Spor Yaralanması Kaygı Ölçeği" kullanılacaktır. Çalışmanın örneklem sayısı 42 olmaktadır.

Katılımcıların demografik bilgileri alındıktan sonra araştırmaya katılanlar randomize olarak çalışma grubu (yoga) ve kontrol grubu olmak üzere iki gruba ayrılacaktır. Yoga eğitimi 6 hafta boyunca haftada 2 gün yapılacak, Yoga seansları Darüşşafaka Spor Kulübü Jimnastik odasında eğitmen gözetiminde ve karşılıklı geri bildirimlerle gerçekleştirilecektir. Katılımcıların üç devamsızlık hakkı vardır. Bu hakkın sonunda kişiler araştırma dışı bırakılır. Bu araştırma Fizyoterapist İrem SAVAŞKAN (Tel: 0 539 610 61 01) tarafından yürütülecek ve Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Fakültesinde Dr. Öğr. Üyesi Ayça Aklar Çörekçi tarafından gözetilecektir.

Bir araştırma projesine davet ediliyorsunuz. Bir karar vermeden önce bu araştırmanın neden ve nasıl yapılacağını anlamanız çok önemlidir. Lütfen biraz zaman ayırın ve aşağıdaki bilgileri dikkatlice okuyun, isterseniz başkalarıyla tartışın. Anlaşılmayan bir bölümünüz varsa veya daha detaylı bilgiye ihtiyaç duyuyorsanız bizden bilgi alabilirsiniz. Dahil edilecek kriterlere uygun olduğunuzu düşündüğümüz için araştırmamıza davetlisiniz. Katılımın isteğe bağlı olduğunu ve katılmayı reddetmenin herhangi bir cezaya veya herhangi bir menfaat kaybına yol açmadığını belirtmek isteriz. Aynı şekilde istediğiniz zaman araştırmadan çekilebilirsiniz.

Araştırmamızda katılımcılara uygulanan değerlendirmelerin bilinen bir zararı bulunmamaktadır. Katılımcılara herhangi bir zarar verilmesi durumunda gerekli başvurular araştırmacılar tarafından karşılanacaktır.

Bunun için ne sizden ne de sosyal güvenlik sigortanızdan herhangi bir ücret talep edilmeyecektir. Araştırmaya katılmak araştırma sonuçlarımızın gelecekte kurum, toplum veya bilim için yararları olacağı umulmaktadır. Araştırmanın amaçları veya bağlı olduğunuz sosyal güvenlik kurumu için sizden herhangi bir ücret talep edilmeyecektir.

Katılımcının Onayı

Bilgi formunun tamamını net bir şekilde okudum ve anladım veya nasıl okuyacağımı bilmediğimi/anlayamadığımı yerlerde araştırmacı benim dilime çevirdi. Başvurum sırasında ve sonrasında ve bu formu doldururken düşünme, değerlendirme ve karar verme fırsatım oldu.

Katılımcı ve Yasal Temsilcinin Adı ve Soyadı:

Fizyoterapist Beyanı

Katılımcılara çalışma ve yapılacak işlemler hakkında gerekli bilgileri verdim. Hastanın bu bilgiyi anladığını, sormak istediği soruları bana sorduğunu ve özgür iradesiyle süreci kabul ettiğini düşünüyorum.

Katılımcı Beyanı

İrem SAVAŞKAN, tıbbi bir araştırma yapılacağını ifade etti ve bu araştırmayla ilgili yukarıdaki bilgiler tarafıma anlatıldı. Bu araştırmaya bir katılımcı olarak davet edildiğimi biliyorum. Bu araştırmaya katılırsam, araştırma sırasında bilgilerimin gizliliğine büyük özen ve saygıyla davranılacağına inanıyorum. Araştırmanın kullanımı sırasında kişisel bilgilerimin özenle korunacağı ve sonuçların sadece eğitim ve bilimsel amaçlarla kullanılacağı konusunda yeterli bilgi verildi. Araştırma sırasında, herhangi bir neden göstermeksizin herhangi bir zamanda araştırmadan ayrılabilirim (Ancak bu durumda, herhangi bir bildirimde bulunmazsam araştırmacılara ne kadar zor bir durum yaratacağının farkındayım). Araştırma masrafları için herhangi bir mali sorumluluk kabul etmiyorum. Benim için herhangi bir ödeme olmayacak. Araştırma sırasında oluşabilecek herhangi bir sağlık sorununu doğrudan, dolaylı olarak ortaya çıkarsa da, herhangi bir maddi yük altında bulunmayacağım. Araştırma sırasında herhangi bir sağlık sorunu ile karşılaştığımızda; +90 539610 61 01'den (cep telefonu) fizyoterapist İrem SAVAŞKAN'ı her saat arayabileceğimi biliyorum.

Bu araştırmaya katılmak zorunda değilim veya katılmayabilirim. Araştırmaya katılmaya yönelik herhangi bir zorlayıcı davranışla karşılaşmadık. Katılmayı reddedersek, bunun tıbbi bakımımıza ve fizyoterapistimle olan ilişkimize herhangi bir zarar vermeyeceğini biliyorum.

Bana yapılan tüm açıklamaları detaylı bir şekilde anladım. Kendi başıma belirli bir düşünme sürecinin sonunda bu araştırma projesinde katılımcı olarak yer alabileceğime karar verdim. Bu daveti gönüllü olarak kabul ediyorum. Gönüllü Onay Formu, araştırmaya başlamadan önce gönüllüye verilmesi gereken bilgileri gösteren yukarıdaki metni okudu. Bunlar yazılı olarak sözlü olarak anlatıldı. Bu şartlarla, üzerimde herhangi bir baskı veya zorlama olmaksızın bu araştırmaya katılmayı kabul ediyorum. 2 sayfadan oluşan bu formun imzalı 2 nüshası, belgelerin bir nüshası bana verilecektir.

Katılımcı Adı ve Soyadı:

Katılımcının Yasal Temsilcisinin Beyanı

İrem SAVAŞKAN, tıbbi bir araştırma yapılacağını ifade etti ve bu araştırmayla ilgili yukarıdaki bilgiler tarafıma anlatıldı. Bu araştırmaya bir katılımcının yasal temsilcisi olarak davet edildiğimi biliyorum. Bu araştırmaya çocuğum katılırsa, araştırma sırasında bilgilerimin gizliliğine büyük özen ve saygıyla davranılacağına inanıyorum. Araştırmanın kullanımı sırasında kişisel bilgilerimin özenle korunacağı ve sonuçların sadece eğitim ve bilimsel amaçlarla kullanılacağı konusunda yeterli bilgi verildi. Araştırma sırasında, herhangi bir neden göstermeksizin herhangi bir zamanda araştırmadan ayrılabilirim (Ancak bu durumda, herhangi bir bildirimde bulunmazsam araştırmacılara ne kadar zor bir durum yaratacağının farkındayım). Araştırma masrafları için herhangi bir mali sorumluluk kabul etmiyorum. Benim için herhangi bir ödeme olmayacak. Araştırma sırasında oluşabilecek herhangi bir sağlık sorununu doğrudan, dolaylı olarak ortaya çıkarsa da, herhangi bir maddi yük altında bulunmayacağım. Araştırma sırasında herhangi bir sağlık sorunu ile karşılaştığımızda; +90 539610 61 01'den (cep telefonu) fizyoterapist İrem SAVAŞKAN'ı her saat arayabileceğimi biliyorum.

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Katılımcı Yasal Temsilcisinin Adı ve Soyadı:

APPENDIX 10: Curriculum vitae

Personal Information

First Name	İREM	Last name	SAVAŞKAN
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Education status

Degree	Domain	Name of Graduate Institution	Graduation Year
Doctorate			
Degree			
Licence	Yeni Yüzyıl University	Physiotherapy and Rehabilitation	2017
High school	Kadir Has Anatolian High School		2012

Work Experience (Sort from penultimate)

Mission	Organisation	Duration (Year - Year)
Senior Physiotherapist	OrtoSpor Physical Therapy and Sportive Rehabilitation Clinic, İstanbul / Levent	August 21 – cont.
Physiotherapist	Gebze Yüzyıl Hospital, Kocaeli / Gebze	January 2019- November 2019

Computer skills

Program	Ability to use
Office Programs	Good

* Rate as very good, good, moderate, poor