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YEDİTEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION

THE RELATIONSHIP BETWEEN KINESIOPHOBIA AND PHYSICAL ACTIVITY IN ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS WITH CHENEAU BRACE AT EARLY AND LATE STAGE

MASTER THESIS

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ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun 16.../07.../2019.... tarih ve 2019/12-10..... sayılı kararı ile onaylanmıştır.

Prof. Dr. Bayram YILMAZ

Sağlık Bilimleri Enstitüsü Müdürü

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.

Büşra YILDIRIM

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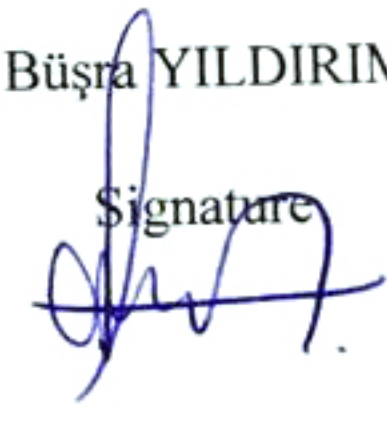

DEDICATION

I would like to dedicate my thesis to my lovely sister with Adolescent Idiopathic Scoliosis, Dilara YILDIRIM as her sister and her physiotherapist.

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LIST OF ABBREVIATIONS

AIS	Adolescent Idiopathic Scoliosis
BMI	Body Mass Index
CBH	Chiba brace high type
CSL	Central Sacral Line
CTLSO	Cervicothoracolumbosacral orthosis
IPAQ	International Physical Activity Questionnaire
IPAQ-SF	International Physical Activity Questionnaire-Short Form
IS	Idiopathic Scoliosis
LEV	Lower end vertebra
LMN	Lower motor neurone
MET	Metabolic Equivalent Task
OMC	Osaka Medical College
SOSORT	Society on Scoliosis Orthopaedic and Rehabilitation Treatment
SPSS	Statistical Package for Social Science
SRS	Scoliosis Research Society
TLSO	Thoracolumbosacral orthosis
UEV	Upper end vertebrae
UMN	Upper motor neurone
WRVAS	Walter Reed Visual Assessment Scale

ABSTRACT

Yıldırım, B. (2018) The Relationship Between Kinesiophobia and Physical Activity in Patients with Cheneau Brace with Adolescent Idiopathic Scoliosis in Early and Late Stage. Yeditepe University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, MSc thesis. Istanbul

We included 60 individuals who aged between 10 and 16 years old are followed by Formed Orthosis and Prothesis Center to investigate the kinesiophobia and physical activity level and detect the relationship between these factors depending on the duration of brace treatment in individuals with Adolescent Idiopathic Scoliosis (AIS). Participants were divided into two groups: early stage; the individuals who were under brace treatment for 1-4 months named as Group 1 and late stage; the individuals who were under brace treatment for 8-18 months named as Group 2. Tampa Kinesiophobia Questionnaire, International Physical Activity Questionnaire-Short Form (IPAQ-SF) and the scoliosis evaluation form created by ourselves that contains Walter Reed Visual Assessment Scale (WRVAS) was performed for evaluating the perceived body image. It also contains clinical parameters too. Statistical Package for Social Science (SPSS) Windows Version 22.0 was used for analyzing the variables. Significant level was accepted with the p value of less than 0,05 ($p<0,05$). A significant difference was found in IPAQ score between the groups ($p<0,05$). There was a statistically significant difference between groups in the Tampa Score. ($p<0,05$). There was no significant difference in perceived body image between groups. ($p>0,05$). A relationship was found in Group 1 between the monthly in-brace time and Tampa score. ($p<0,05$) In addition; there was also a relationship in Group 1 between the daily in-brace time and Tampa score ($p<0,05$). The relationship was found in Group 1 between the IPAQ score and Kinesiophobia-Tampa score ($p<0,05$) even so no relationship in Group 2 was found between them ($p>0,05$). Considering all of these, it is found that with the increasing duration of brace treatment, physical activity level decreases. In addition, kinesiophobia level rises with the duration of daily and monthly in-brace time in the patients who are at the early stage of their brace treatment and kinesiophobia level is in relationship with decreased physical activity level in these patients.

Key Words: Scoliosis, Physical Activity, Kinesiophobia

ÖZET

Yıldırım, B. Cheneau Gövde Ortezi Kullanan Adölesan İdiopatik Skolyozlu Bireylerde Erken Dönem ve Geç Dönem Kinezyofobi ve Fiziksel Aktivite Düzeyi Arasındaki İlişki. Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Fizyoterapi ve Rehabilitasyon ABD, Master Tezi. İstanbul.

Cheneau gövde ortezi kullanan adölesan idiopatik skolyozlu bireylerde korse kullanım süresine göre erken dönem ve geç dönem kinezyofobi ve fiziksel aktivite düzeyi ile aralarındaki ilişkiyi belirlemek amacıyla, Formed Özel Ortez ve Protez Uygulama Merkezi'nde hekim tarafından takip edilmekte olan 10-16 yaş aralığında 60 adölesan idiopatik skolyozlu birey çalışmaya dahil edildi. Katılımcılar tedavi sürelerine göre 2 gruba ayrıldı. 1-4 ay arası gövde ortezi kullanan ve tedavilerinin erken döneminde olan katılımcılar Grup 1 olarak adlandırıldı. 8-18 ay arası gövde ortezi kullanan ve tedavilerinin geç döneminde olanlar Grup 2 olarak adlandırıldı. Tüm katılımcılara Tampa Kinezyofobi anketi ile uluslararası fiziksel aktivite değerlendirme anketi (IPAQ) uygulandı. Buna ek olarak tarafımızdan oluşturulan ve katılımcıların klinik parametreleri ile beden imaj algısını ölçen Walter Reed Görsel Değerlendirme Skalası (WRVAS) ölçeğinin dahil edildiği skolyoz değerlendirme formu tüm katılımcılara uygulandı. Verileri analiz etmek için Statistical Package for Social Science (SPSS) Windows Version 22.0 kullanıldı. Yapılan tüm analizler için $p<0,05$ olasılık değeri istatistiksel olarak anlamlı kabul edildi. Fiziksel aktivite IPAQ skoru gruplar arası anlamlı fark bulundu ($p<0,05$). Kinezyofobi Tampa skoru gruplar arası anlamlı fark bulundu($p<0,05$). Grupların beden imaj algısı arasında anlamlı bir fark bulunmadı. ($p>0,05$) Grup 1 için korse tedavisi altında takip edildiği aylık süre ve günlük korse kullanım süresi ile kinezyofobi düzeyi ilişkili bulundu ($p<0,05$). Grup 1 için IPAQ skoru ve kinezyofobi düzeyi ilişkili bulundu ($p<0,05$) Fakat Grup 2 için bir ilişki bulunmadı. ($p>0,05$). Tüm bunlar göz önünde bulundurulduğunda; korse tedavi süresindeki artışın fiziksel aktivite seviyesini yetersizleştirdiğini, kinezyofobi düzeyini ise arttırdığına inanıyoruz. Öte yandan, çalışmamız sonucunda korse tedavisinin erken dönemindeki skolyozlu katılımcılarda aylık ve günlük korse kullanım süresinin arttıkça kinezyofobi düzeyinin de arttığı ve artan kinezyofobi düzeyinin düşük fiziksel aktiviteyle ilişkili olduğu sonucuna varılmıştır. Buna ek olarak, korse tedavisinin uzun süreli-geç dönemindeki skolyozlu bireylerde ise kinezyofobi ile fiziksel aktivite düzeyi arasında bir ilişki bulunamamıştır.

Anahtar Kelimeler: Skolyoz, Fiziksel Aktivite, Kinezyofobi

1. INTRODUCTION

The lateral curve of the more than 10 degree with the rotation which improves during growth period fast is called adolescent idiopathic scoliosis (1) (2) Prevalence of idiopathic scoliosis is changing between 0,35% to 13,0% according to ethnic and geographic features on the literature. (3) (4) (5) (6) In addition, the prevalence of idiopathic scoliosis is found % 2.3 at Turkey. (7) Although there are some factors like genetic, hormonal factors etc. and they are thought to be associated with scoliosis, the etiology of idiopathic scoliosis is still unknown. (8) Despite the fact that there are some types of scoliosis that are result of some problems, more than 80 % of scoliosis is classified as idiopathic scoliosis which is seen mostly in individuals. Moreover, it is more widespread in girls than boys. (9) (8) The progression of scoliosis increases during growth period. Patient's age and maturation, greatness of initial curvature, cosmetic and emotional problems and the type and place of curvature is substantial for planning of the treatment. (10) (11) Risser sign and Tanner stage is important for specify the maturity which is essential for potential progression. (12) Observation, bracing, exercise treatment and surgery are the options of treatment of AIS according to progression. (13) Observation is recommended for the curve below 20° with the Risser 0-4. Bracing as a conservative treatment is recommended for the curve between 25° and 40° during growth period. Brace treatment is necessary for nearly 10% of patients and surgery is necessary for 0,1% of patients. Exercise treatment is suggested for every patient to control balance of muscles and the body also. Surgery is proposed as a final treatment option for the curvatures more than 40° with the Risser 0-4 and more than 50° with Risser 5. (14) (11) (15) (16)

Exercise treatment contains scoliosis specific exercises which are programmed for patients depending on their deformity and their curve types. These types of exercise treatment comprise certain physical exercises that are formed with the therapeutic goal of decreasing the deformity. (17) Studies show that scoliosis specific exercise helps to control curvature size even if it is with bracing together. (18) (19)

The target of bracing in AIS is to control curvature progression and develop cosmetic view with the keeping balance of the vertebrae during the maturation. It is claimed that brace treatment can protect the vertebrae from the surgery statistically. Cervicothoracolumbosacral orthosis (CTLSO) and thoracolumbosacral orthosis (TLSO) are the types of braces which are used for the management of scoliosis according the

location of the curvature. CTLSO is used for the thoracic curvature above T7. On the other hand, patients approve CTLSO hardly because of the presence of the neck part. Milwaukee brace is only type of CTLSO while TLSO is categorized and named as Boston, Wilmington, Providence, Rosenberg from North America, Chêneau and Sforzesco from Europe, OMC brace (Osaka Medical College), CBH (Chiba brace high type) and TLSO Hiroshima from Japan. (20)

The effective result of bracing depends on the type of brace which is suitable for the patient's curvature, daily in-brace time, physical, emotional and social welfare of patient. In literature; 23 hours daily in-brace time is proposed for the efficient treatment of scoliosis. (21) (22) Although there is a successful correction of scoliosis with brace treatment, it has also some traumatic effects including attitude and lifestyles of patients especially in long period of treatment. Because of these effects, about 9% of patients stop brace treatment and their treatment is affected by these problems. (23) (24) Not only the physical activity level in AIS, but also the effect and relationship between the wearing time of vertebral braces and physical activity is still controversial on literature. It is claimed that the decreasing physical activity level is seen in the patients with brace treatment in some studies. (25) (26) (27) (2) (28) (29) (30)

Apprehension of physical activity is described as kinesiophobia. (31) It is shown in the studies that lower physical activity is associated with the fear of movements which is named kinesiophobia. (32) Past literature contains researches about kinesiophobia in different diseases, for example low back pain, cervical problems, Coronary Artery Disease etc. (33) On the other hand, there is restricted literature existing of Kinesiophobia in adolescent idiopathic scoliosis and the relationship between physical activity and Kinesiophobia in these patients.

Therefore, we purpose to explore the Kinesiophobia in the patients with AIS who are under bracing treatment for different durations and physical activity level and the relationship between them with this study.

2. GENERAL INFORMATION

2.1 Scoliosis

2.1.1 Definition and classification

The spine is observed as vertically straight from the back (posteriorly). Increasing or decreasing of the natural curve is referred as a specific spinal abnormality (34) (35) More than 10 degrees lateral curvature with the rotation of the spine is defined scoliosis which is much more complex and comprises both transverse and sagittal plane components. (36) (12) (37). Scoliotic spine may be shaped like S or a C instead of straight appearance from the back. (38)

Figure 2.1 Spine with scoliosis (From Physiotherapist Büşra Yıldırım's Archive)

A scoliosis can be classified depending on its apex which is the most tilted, most rotated and the most displaced vertebrae from the midline. Left and right refer to the convexity of the major curvature. (39). The classification of scoliosis is defined by the Scoliosis Research Society (SRS) according on the etiology. (39) (40)

Classification of scoliosis depending on etiology

1.Idiopathic (cause unknown)

- Infantile below the age of 3 years
  - Resolving
  - Progressive
- Juvenile between the ages of 3-10 years
- Adolescent from 11 years to skeletal maturity
- Adult

2.Neuromuscular

- Neuropathic

1.Upper motor neurone (UMN)

-Cerebral palsy

-Spinocerebellar degeneration

Friedreich's ataxia

Charcot-Marie-Tooth disease

Roussy Levy

-Syringomyelia

-Spinal cord tumor

-Spinal cord trauma

-Others

2. Lower motor neurone (LMN)

- Poliomyelitis

- Myelodysplasia

- Myelomeningocoele (spina bifida)

- Spinal muscular atrophy

- Myopathic
  1. Arthrogryposis
  2. Muscular dystrophy

- Duchenne

- Becker

- Other

3. Congenital hypotonia

4. Others

- Congenital

- Osteopathic vertebral/skeletal anomaly

A) Failure of formation

1.Complete unilateral (hemivertebra)

2-Partial Unilateral (wedge vertebrae)

B) Failure of Segmentation

1-Partial or unilateral (bar)

2-Complete or Bilateral (bloc vertebrae)

3-Mixed

4- Neurofibromatosis

5- Skeletal dysostosis

- Ehler-Danlos Syndrome
- Marfan or Marfanoid Syndrome

6-Osteocondrodistrophy

- Mucopolysaccharidoses
- Spondyloepiphyseal dysplasia
- Multiple epiphyseal dysplasia
- Achondroplasia

2.2. Idiopathic Scoliosis

Idiopathic scoliosis (IS) is common three-dimensional spinal deformity which is formed 80% of all scoliosis with unknown reason that can seem at any age during growth. (41) (12) (42)

Idiopathic scoliosis is divided into three types according to the age at which deformity comes up. (40)

- **Infantile** (occurs under 3 years of age): This type is based in the thoracic area 82% of cases and more common in boys than girls. (%55-%45). This type is formed %1 of idiopathic scoliosis. Generally left thoracic scoliosis is seen and frequently with kyphosis. (43) (44)
- **Juvenile** (from 3 to 10 years of age): Juvenile type is seen between age at 3 and 10. Although more commonly seen in boys until the age at 6, its more often in girls after the age of 6. This type usually is not resolved by itself. %95 of them are progressive. (43) (45) (44)
- **Adolescent** (from 10 to skeletal maturity): Adolescent type is affecting 2–3 % of adolescents. It is formed %80-90 of idiopathic scoliosis. This type is 5 times more common in girls than boys and frequently located at thoracic are on the right side. (44) (43) (40)

2.2.1. Prevalence of idiopathic scoliosis

Total amount of the cases of the illness which influence the inhabitants at a given time is referred prevalence. Prevalence of idiopathic scoliosis is differ between 0,35 to 13% according on the Cobb angles, age of diagnosis, gender and race/genetic factors. (4) (5) (6) On the other hand, this grand range represents several detection processes and the prevalence differs 1.5 to 3.0% if it is taken only curvatures of greater than 10 degrees.

The prevalence of infantile type is formed around 1% of idiopathic scoliosis which is generally seen as left thoracic curves frequently in boys at the beginning but with the time, girls are influenced more and consequently ratio from 10 years old depending on gender is going to be 6:1.Juvenile type consists 12% to 21% of idiopathic scoliosis. (46)

Before the age at 6, though the girl to boy ratio is 1:1, it rises to 4:1 after the age of 6 years to 10 years, and eventually it becomes 8:1. (47) AIS composes roughly 90% of idiopathic scoliosis. (48)

Prevalence of adolescent idiopathic scoliosis (AIS) differ from 0,47 to 5,2% according to the gender, race and curvature and it is detected % 2.3 at Turkey. (7) (49) (48) Prevalence of adolescent idiopathic scoliosis according to Cobb angle and gender is seen on the table below (Table 2.2). (47)

Table 2.2 Prevalence of adolescent idiopathic scoliosis according to Cobb angle and gender

Cobb Angle (Degree)	Female: Male	Prevalence (%)
>10	1,4:1	2-3
>20	5,4:1	0,3-0,5
>30	10:1	0,1-0,3
>40		<0,1

2.2.2 Progression of idiopathic scoliosis

Curve progression is a significant major topic for treatment option and background of the idiopathic scoliosis and gives an estimated period of spinal growth. Gender, future growth possibility and Cobb angle while diagnosis are major factors of progression in idiopathic scoliosis. Girls are under the risk of curvature progression more 10 times than boys. (5) Before the puberty, growth possibility and curvature factors are connected to the risk of progression.

Curvature Factors: (49)

1-The greater Cobb angle are under the risk of progression. More than 50° Cobb angle at the puberty is likely to be progressed

2-Thoracic apex is a risk factor for progression of 58-100%

3-Existence of double major curvature is connected with progression

Growth Possibility: (49)

1-Age when the scoliosis is diagnosed is important; the young age is correlated to more progression risk (Table 2.3)

2-The curve which occurs before the beginning of the menarche is related to the progression.

3-The lower Risser sign is a risk factor for progression on the other hand it means more time before the puberty (Table 2.4)

Table 2.3. Risk of progression depending on the Cobb angle and age (50)

Cobb Angle	Age 10-12 yrs.	Age 13-15 yrs.	Age over 16 yrs.
<20°	25%	10%	0%
20°-30°	60%	40%	10%
30°-60°	90%	70%	30%
>60°	100%	90%	70%

Table2.4. Risk of progression depending on the Cobb angle and Risser sign (51) (14)

Cobb Angle	Risser 0-1	Risser 2-3-4
5-19°	22%	2%
20-29°	68%	23%

Risser sign and Tanner stage skeletal maturity assessment method that are used for the estimated possible growth and they have an important role for maturation which is the key of curve progression. (12) Risser sign is used for to have a predictive information about maturation time of the bony fusion of the iliac apophysis by grading 0 to 5. (11) Generally, bony fusion starts from the anterior superior iliac spine to posterior superior iliac spine.

Risser 0: No ossification

Risser 1: Indication of the ossification between 0%-25%

Risser 2: Indication of the ossification between 26%-50%

Risser 3: Indication of the ossification between 51%-75%

Risser 4: Indication of the ossification between 76%-100%

Risser 5: Completed bony fusion of the apophysis to ilium (5) (12)

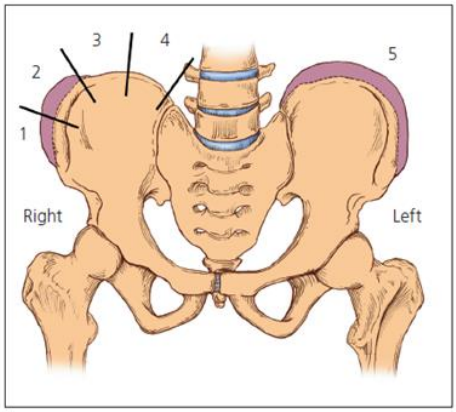

Figure 2.2 Assessment of Risser skeletal maturation (51)

Curves frequently progress just before the puberty and for to determine which level of puberty is, Tanner Skeletal Maturity Assessment is used as a second method. It contains 5 stages which are about the breast & penis growth and pubic hairs. Curve progression is shown when the tanner stage between the stage 2 and 3 which can be also named curve acceleration part. (11) (49)

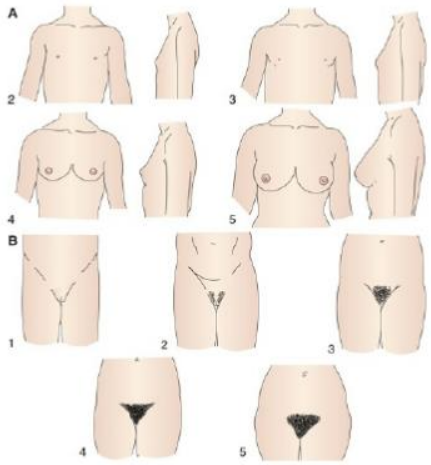

Figure 2.3 Female Tanner stages**.** (52)

A. Growth of breast in female

Stage 1: (not shown): prepubescent; just rising of papilla.

Stage 2: breast buds occur; areola is getting slightly broaden and protrude like small hill.

Stage 3: growth of the all breast without rising of the nipple.

Stage 4: development of the breast with protuberance of areola and papilla as a second hill.

Stage 5: final adult form of the breast with projection of the nipple

B. Female pubic hair development. (52)

Stage 1: prepubescent; no absence of pubic hair.

Stage 2: Vertical hair spread throughout the labia and begins on the pubis.

Stage 3: pubic hair reproduced as number, turns to black, and exist in the ordinary female triangle with low density.

Stage 4: pubic hair is getting more thick, frizzly, and the place of them look like adult but the volume is less than adult's

Stage 5: density of pubic hair which can also spread towards to the legs is getting much more, this stage represents adult kind.

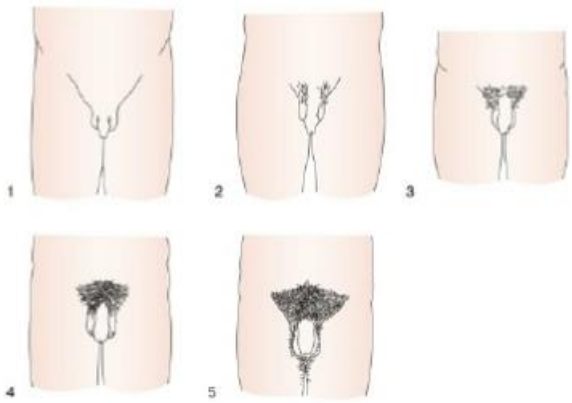

Figure 2.4 Male Tanner stages. (52)

Secondary Sex Characters and Pubic Hair

Stage1: prepubescent; not absence of pubic hair

Stage 2: smoothly, feathery and light hair absence; penis and testes may be a little bit longer; first signs of growing are shown on the scrotum and testes

Stage 3: Pubic hair increases and going to be thick but still rare as number. Penis is longer than before.

Stage 4: Increasing the volume of pubic hair with curls with enlargement of the head of the penis, scrotum and testes.

Stage 5: Penis, testes and scrotum reach adult level. Curly, black pubic hairs exist throughout thigh

2.2.3 Etiology of idiopathic scoliosis

The etiology of idiopathic scoliosis is not known clearly in spite of the researches on it and it is accepted as a multifactorial disease. Although some theories are found in the literature about etiology of idiopathic scoliosis, the primary theory on AIS have contained genetic factors, hormonal factors, neuromuscular factors.
(53) (54) (5) (55)

2.2.3.1 Genetic Factors

It's found that the ratio of scoliosis in first degree family members or twins is more common in population on some researches and it is accepted that is associated with the genetic factors. (56) (57) Currently AIS is considered to be a complex genetic disorder which consist of one or multiple genes and their interaction with the environment. Already stated opinion is due to the strong data that demonstrates its domestic clustering. (5)

2.2.3.2 Hormonal Factors

Even though the role of the growth hormone and the other hormones like estrogens and melatonin is controversial, it is indicated that rising in the level of growth hormone in adolescent idiopathic scoliosis by some studies. In addition, quick progression in scoliosis on some cases from the individuals who are ongoing growth hormone treatment have been observed. (5) The idea that having an important role in bone density of the estrogen level for AIS is also submitted by some clinical experiences. Nevertheless, it is still unknown the role of hormonal factors in AIS. (58)

2.2.3.3 Neuromuscular Factors

An abnormality of the neural pathways which are responsible for making human beings feel their position of their bodies or problems of central nervous system may cause scoliosis (5) (59). It is indicated in some studies that physiological dissymmetry in balance can be result of the problem in the spinal marrow or mid brain because of some neurological harms.

2.2.4 Clinical assessment of idiopathic scoliosis

Detailed anamnesis comes as a first step of evaluation in scoliosis. Prenatal, natal and postnatal duration of patient should be questioned, the information of family history and existence of twin included. (60) Respiratory function should be controlled and the presence of pain, neurological symptoms and if there is any other disease should be noted. (14) Weight and height of the patient are important for the physiological development therewithal the Tanner stage is also important for the development of the puberty. (11)

Patient's posture and asymmetry should be analyzed from the anterior, posterior and lateral view, with photography if it is possible. Balance between shoulder and clavicula, position of the head and neck, chest wall from the anterior, presence of hump from the posterior, symmetry of breasts, leg length discrepancy, hypokyphosis/hypolordosis, lateral deviation of the trunk and balance between pelvis and iliac wing should be examined, (7) (60) Lower extremities especially hip should be assessed regarding range of motion and trunk should be evaluated as regards the flexibility. (61) (7) With the change of the weight bearing, normal pressure areas of the foot are changed so that walking analysis is essential. Neurological examination of the patient included gauging muscle strength, reflexes, sensation, atrophy of the extremities and existence of pain should be done. (62) (60)

The position of the head on the pelvis is examined for the balance of the vertebrae with using a plumb line which is oscillated from the seventh cervical vertebrae**.** It is decided whether or not scoliosis is balanced depending on the distance between the plumb line and gluteal sulcus. Plumb line passing over the gluteal sulcus indicates that the scoliosis is balanced. (53)(Figure 2.5)

Figure 2.5 Assessment of the balance of scoliosis with plumb line (53)

2.2.4.1 Assessment of flexibility

Flexibility of vertebra can be assessed with different radiographical methods. The x-ray of the spine with lateral flexion is the primary way of flexibility evaluation.(Fig. 2.6) (63) In addition, for the identification of the existence of hypermobility, the special assessment named Beighton is used. (64)

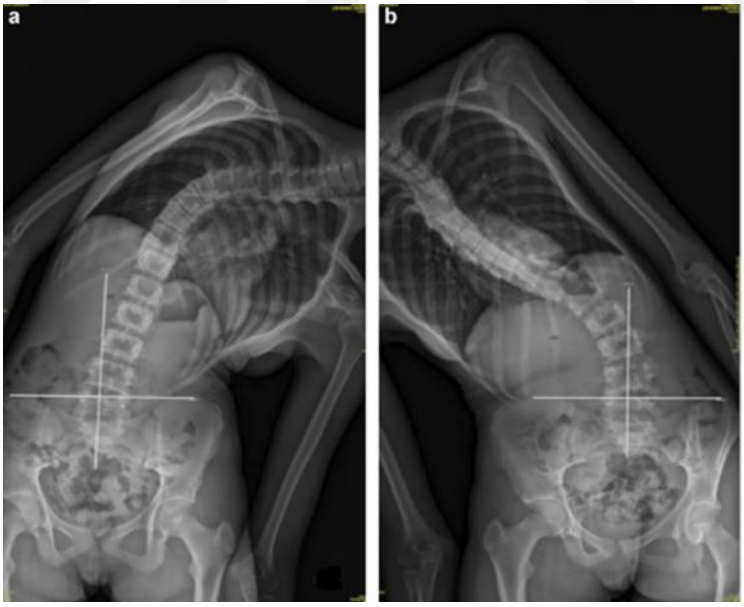

Fig. 2.6. Lateral flexion of the spine to the left side(a) and lateral flexion of the spine to the right side (65)

2.2.4.2 Assessment of gibus

Gibus is evaluated in a special test named Adam's forward bend test. Patients are asked to come to the forward bend position when his/her feet be parallel, knees extension and hands hanging independently**.** (Figure 2.7) Rotation of the vertebrae with the ribs on the thoracic area forms a prominence named as a rib hump anteriorly and it also forms prominence posteriorly in the lumbar area. (42) Angle of vertebral rotation is measured with special device which is scoliometer. (66)

Figure 2.7. Adam's forward bend test (66)

A special straight edge which should be set on the maximal prominence is used for evaluating gibus. (Figure 2.8) (12)

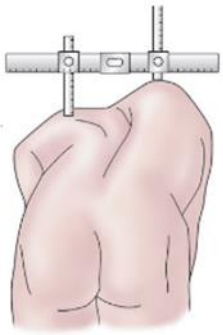

Figure 2.8. Assessment of the maximum prominence (67)

2.2.5 Radiological Assessment of Scoliosis

2.2.5.1 Assessment of curvature

Cobb method and Ferguson methods are both used for the radiological assessment of the curvature in scoliosis. (68) (Figure 2.10, Figure 2.11) The assessment is applied on a x-ray which is anteroposterior (AP) view of the full vertebrae while standing. The Cobb angle is defined as an angle between two end vertebras which are the most tilted vertebras placed at the top of the curve and the end of the curve. (69) The end vertebra which is on the top of the curvature is named upper end vertebrae (UEV) and the one on the end of the curvature is called lower end vertebra (LEV) (Figure 2.9)

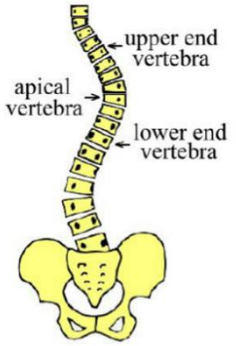

Figure 2.9. Upper End Vertebra and Lower End Vertebrae (12)

Two lines which should be on the UEV and below the LEV is drawn. The angle created by the lines which are drawn vertically to the previous drawn line is called Cobb angle. (70) (Figure 2.10)

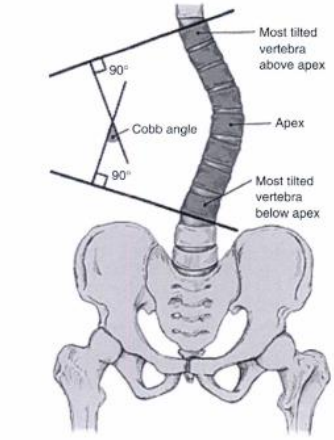

Figure 2.10. Measurement of Cobb angle (71)

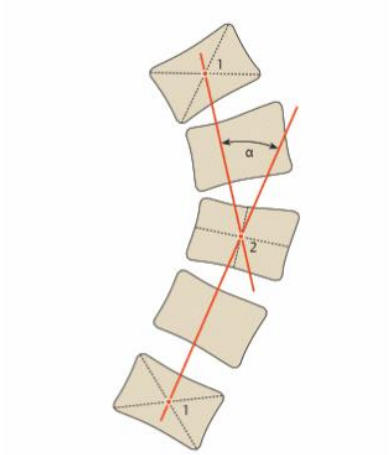

Figure 2.11. Measurement of Cobb angle with Ferguson Method (70)

Rotation and progression of the infantile and juvenile scoliosis can be evaluated with the Mehta angle (costovertebral angle) inferentially. (72) (Figure 2.12) Angle between a straight line which is drawn to vertebral body of the apex and the line parallel to the costa is called Mehta angle. Assessment should be done bilaterally. If the variation between the angle of convex side and angle of concave side is more than 20°, it is indicated that the curve is going to be progressive. (43)

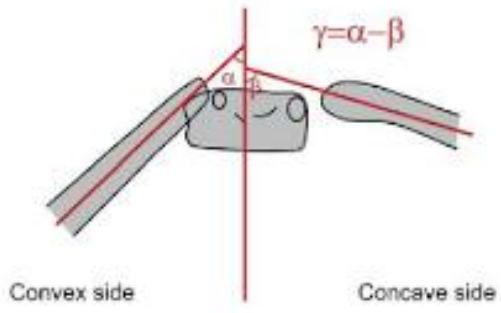

Figure 2.12. Assessment of Mehta angle (43)

2.2.5.2. Radiological assessment of the rotation of the vertebrae

There are three methods that are Nash, Perdriolle and Raimondi methods for identifying rotation of the vertebra with the location of pedicles are used. (73) The rotation is graded into 5 stages depending on the distance between the pedicle and the center of the vertebral body with a Nash method (Figure 2.13)

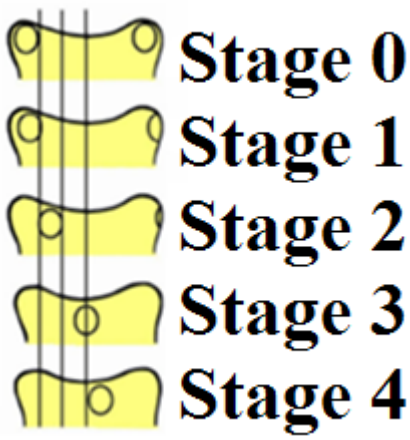

Figure 2.13. Assessment of rotation with Nash Moe method (12)

Torsion-meter is used in the method of Pedriolle. (Figure 2.14) Pedriolle method represents rotation of the vertebrae with the increasing of 5° while it is 2° in Raimondi Method. (74) (Figure 2.15)

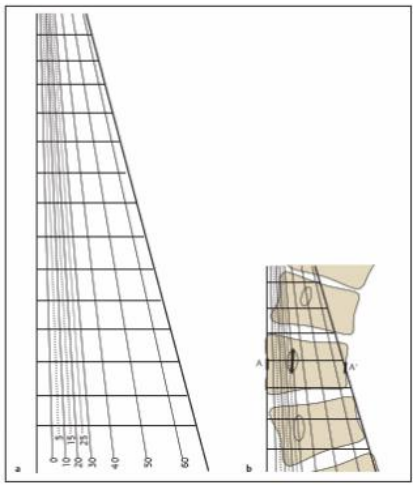

Figure 2.14. Assessment of rotation with Pedriolle method (70)

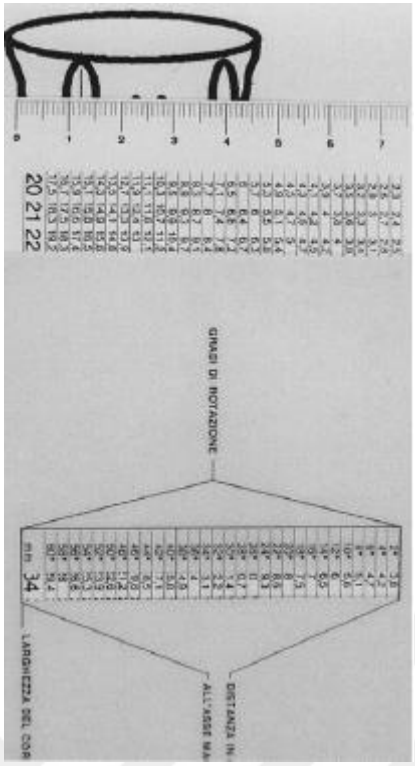

Figure 2.15. Assessment of rotation with Raimondi Method (75)

2.2.6 Types of idiopathic scoliosis

Curve pattern is significant factor for to understand the natural history in AIS. (49) Assorting of the patients depend on the classification by layout gives information about the feasibility of the different treatment options (76) Type of scoliosis is important for defining the deformity and treatment. The deformity of scoliosis can be divided into two major types: Non-structural and structural. On physical examination; spine is observed with normal mobility with nonstructural scoliosis which is not progressive. Lateral flexion is symmetrical on physical examination and x-ray too. The curves are mostly characterized as a lumbar or thoracolumbar curve type. Leg length discrepancy may be the cause of nonstructural lumbar curvature with convexity to the side of the shorter leg. On the other hand, there is a rotational prominence on the convex side of the scoliosis with the structural curves unlike nonstructural curves. It is clearly observed if the patient goes to forward bend position. (40) A structural scoliosis has one major curvature which is not flexible. In addition; the vertebrae compensate it with another curve. The goal is to maintain the balance of body while keeping neck on the line through from the sacrum. The compensatory curve may be structural in the process of time despite it starts as a

flexible nonstructural curve. (40) Location of the major curve sets the ground for apex level based on curvature classification**.** Regarding the location of the deformities on the vertebrae; the classification in accordance with the apex can be seen on the table. (Table 2.5) (49)

Table 2.5. Classification of scoliosis in accordance with the apex (39)

Type of Scoliosis	Location of Apex
Cervical	C1-C7
Cervicothoracic	C7-T1
Thoracic	T2-T11
Thoracolumbar	T12-L1
Lumbar	L2-L4
Lumbosacral	L5-S1

King, Lenke, Peking Union Medical College Method, Lehnert-Schroth and Rigo systems are used for subclassification for surgical or non-surgical treatment types in Idiopathic Scoliosis. (49) (13) King, Lenke and Peking Union Medical College systems are used for surgical treatment while Lehnert Schroth and Rigo systems are used for the decision of non-surgical treatment. Firstly; King classification was presented by Howard King for AIS, especially for thoracic deformities at 1983 (77) (78) (79) . King classification includes five curvature types which are categorized to base on the place of the structural and compensatory curves, their relation to the central sacral vertical line (CSVL) and on their flexibility in the x-ray of spine with side bending.

King at all described five curve types (80) (Figure 2.16)

Type 1: There are thoracic and lumbar curvatures which are both structural but lumbar curve is larger and more rigid

Type 2: There are thoracic and lumbar curvatures which are both structural but thoracic curve is larger and more rigid

Type 3: There is main thoracic curvature which is structural and rigid

Type 4: Long main thoracic curvature which contains tilted forth lumbar vertebra. Fifth lumbar vertebra is into the middle.

Type 5: Double thoracic curvature

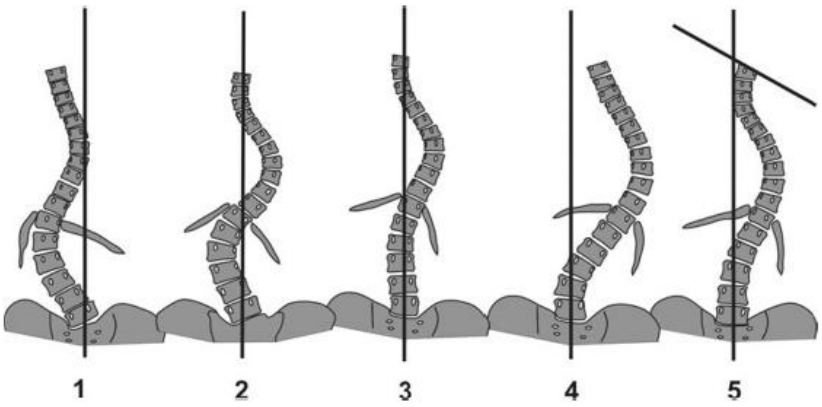

Figure 2.16. King classification of curvature (80)

2.2.7 Muscles in scoliosis

The posture of body is balanced with three dimensions in healthy people and head, shoulder, trunk and pelvis are stable on the coronal plane although pelvis and trunk are in counter rotation to each other's in people with scoliosis. The counter rotation of pelvis and trunk to each other can affect abdominal muscles. Some variations of muscles and ligaments which are cause of the pathological alterations of the vertebrae are seen in scoliosis. In addition to abdominal muscles, quadratus lumborum, iliocostalis muscles, iliopsoas, erector spinae muscles and latissimus dorsi are also affected in scoliosis. When the concave and convex side of the scoliosis is analyzed, it's seen that internal and external abdominal oblique muscles are shortened on one side, their tense increases on the other side and it causes the rotation of costa that create rib hump on the convex side and costal collapse on the concave side. Quadratus lumborum muscle is shortened and it pulls the pelvis towards to gibus. Erector spinae muscles and quadratus lumborum are important for the balance of trunk because of their anatomical places. With the extreme tension of the quadratus lumborum, the transverse processes of the lumbar vertebrae are pulled towards one side and spinous processes move to the concave side. (Figure 2.17)

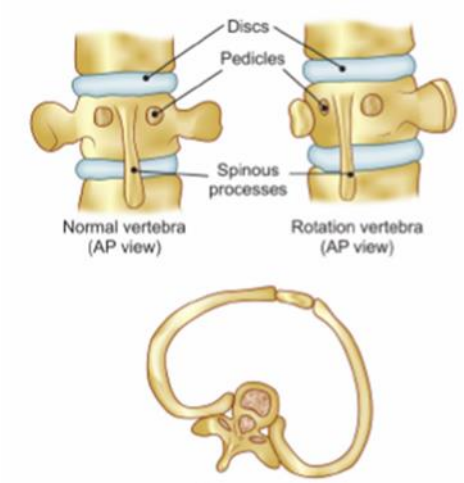

Figure 2.17. Rotation of the vertebra (81)

The tension of the iliocostalis muscles on the concave side and weakness of them on the convex side is observed that causes decreased costal balance, rib cage shifts with attendance of latissimus dorsi to the side at which scoliosis is. Because of the increased tension of latissimus dorsi muscle on the convex side, costa are moved backwards and the anterior rotation with rising of scapula is seen. (82) (81) (83) (Figure 2.18)

Figure 2.18. Muscles in scoliosis (83)

With the progression of scoliosis, compression and distraction are increased on the concave side. Some structural alterations like wedged vertebrae is formed on account of the dissymmetrical burden (Figure 2.19., Figure 2.20.) (84) (85) It rises on the convex side and it gets lower on the concave side with the loading. The body of vertebrae moves to the convex side with rotation and the spinous process turns with ribs against to the concave side. Rotated ribs generate a rib hump (Figure 2.21.)

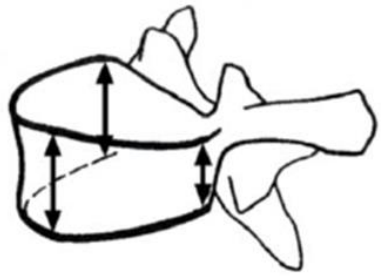

Figure 2.19. Wedge shaped vertebrae (86)

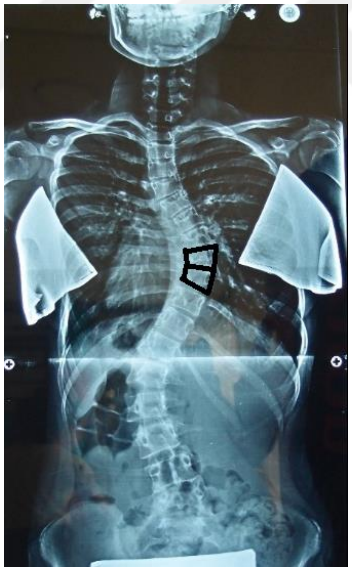

Figure 2.20. X-ray-wedge shaped vertebrae (Physiotherapist Büşra Yıldırım's archieve)

Figure 2.21. Rib hump (37)

2.2.8 Treatment of adolescent idiopathic scoliosis

The goal in the treatment of scoliosis is to control the curve progression and respiratory functions, decreasing the pain level and correct the cosmetic deformity for to control balance of body. (81) (12) (86) Patient's age and maturation, greatness of initial curvature, type and location of curvature is substantial for planning of the treatment. There are two treatment options of scoliosis which are conservative treatment and surgery. Conservative treatment is divided into branches are observation, brace treatment and scoliosis specific exercises. The indications of treatment options can be seen in table below.(Table 2.6.) (14) (11) (15)

Table 2.6 Indications of treatment options (11, 14, 15)

Curvature	**Risser**	**Radiography**	**Treatment Option**
10°-19°	0-1	Every 6 month if it is necessary	Conservative Treatment *Follow and Observation (Every 3/6 months)*
10°-19°	2-4	Every 6 month if it is necessary	Conservative Treatment *Follow and Observation (Every 3/6 months)*
20°-29°	0-1	Every 6 month	Conservative Treatment *Bracing on the curves more than 25°*
20°-29°	2-4	If it is necessary	Conservative Treatment *Follow and Observation or Bracing*
29°-40°	0-1	If it is necessary	Conservative Treatment *Bracing*
29°-40°	2-4	If it is necessary	Conservative Treatment *Bracing*
>40°	0-4	If it is necessary	Surgery
5°- 30°	5	If it is necessary	Conservative Treatment *Follow and Observation(Every 3-5 years)*
30°-50°	5	If it is necessary	Conservative Treatment *Follow and Observation(Every 1-2 years)*
>50°	5	If it is necessary	Surgery or Conservative Treatment *Follow and Observation(Every year)*

2.2.8.1 Conservative treatment

Purposes of the conservative treatment are to stop curve progression, decreasing the Cobb angle, protect problems related respiratory functions, providing the spinal mobility, organize the physical activities and control the psychological and aesthetic problems related to visual form. (87) Conservative treatment has branched into options which are formed by Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) depending on the risk of curve progression formula which is found by Lonstein and Carlson. (86) (Figure 2.22)

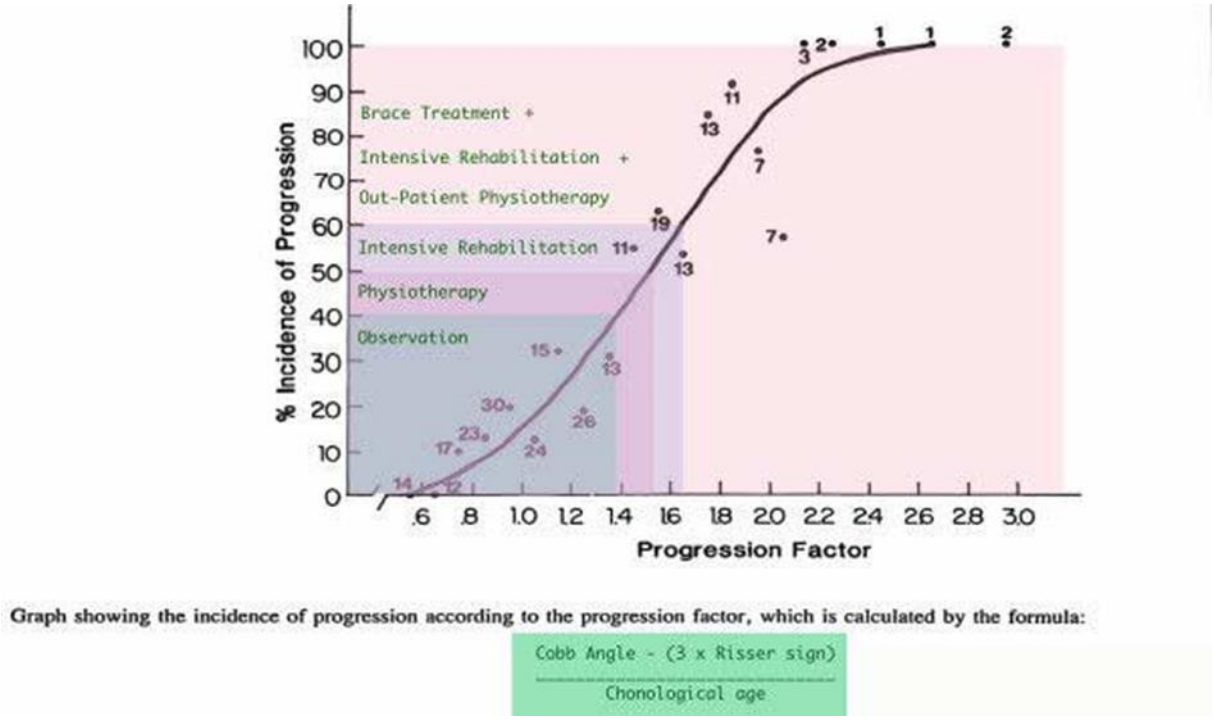

Figure 2.22. Progression formula by Lonstein and Carlson (86)

2.2.8.2 Brace treatment

Main targets are to stop the progression of curvature, having control on the balance and appearance of the affected body while growing cycle in brace treatment. (88) There are some criteria's of the Scoliosis Research Society for the evaluation of bracing: (89)

- Older than 10 years
- Risser Stage 0-2
- The Cobb between 25-40°
- Girls with AIS before the first menstruation or maximum a year after the menstruation

Patients should be also evaluated according on the indications and contraindications in brace treatment at the beginning of the treatment. (Table 2.7) (89)

Table 2.7. Indications and contraindications in brace treatment (89)

Indications of Brace Treatment	Contraindications of Brace Treatment
20-25° Cobb angle	Short-Stiff Curvatures, lordosis at the thoracic region of the vertebrae
Risser Stage 0-2	Risser Stage 4

Braces can be produced depending on the principle of derotation, traction or the aim of 3-point pressure (90)

2.2.8.3 Brace Types

Several brace types have been improved for the treatment of AIS with time. Although recommended wearing time changes among braces, most of them should be worn 16-23 hours/day. (91)

The types of braces;

- Milwaukee Brace (Cervicothoracolumbosacral orthosis)
- TLSO Brace (The thoracolumbosacral orthosis)
- Nighttime orthoses (Providence and the Charleston orthoses)
- SpineCor Braces
- Boston Brace
- Cheneau Brace

2.2.8.3.A Milwaukee brace (Cervicothoracolumbosacral orthosis)

Milwaukee brace is a cervicothoracolumbosacral orthosis (CTLSO) which is used for the postoperative patients until 1954.It has been applied on the patients who has double curve or upper thoracic curve (over 7th thoracic vertebrae) after 1954. (88)(Figure 2.23)

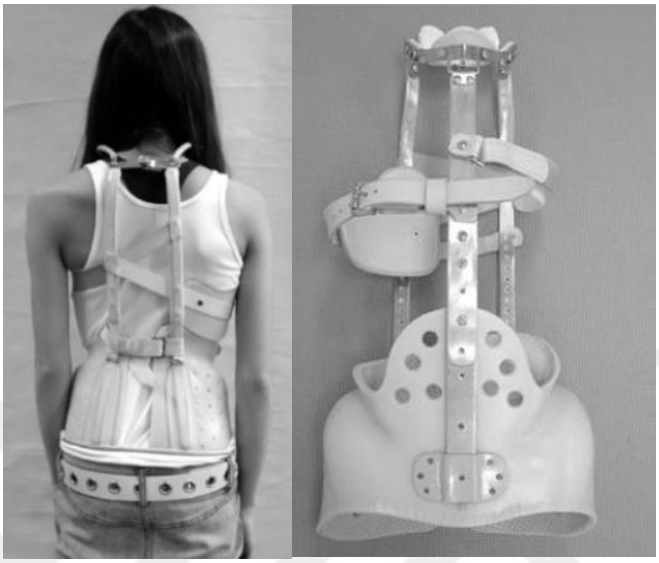

Figure 2.23. Milwaukee brace (88)

The metal circle around the neck is linked together of the 3 metal sticks that one of them is located on the front and other two of them are located on the back. All of them are connected to the plastic which is responsible for decreasing lordosis and fixing pelvis. These 3 metal sticks form superstructure. (92) (93) Traction forces with the help of the superstructure and the correction forces through the pads that can be added to the lumbar area of the spine are provided with the using of Milwaukee spinal brace. (92) Milwaukee brace benefits for the control of the curve over T7 and it has to be worn 23 hours per day for the efficient treatment. However, some psychosocial problems can be consequences of the treatment with Milwaukee brace.

2.2.8.3.B Thoracolumbosacral (TLSO) braces

The thoracolumbosacral (TLSO) orthosis is used for the curve below T8 and lumbar curvatures. (13) (88) TLSO braces are produced in accordance with the purpose of the three- or four-point force systems. (Figure 2.24) There are several brace types of TLSO are Boston braces, Providence and the Charleston braces, Spinecore braces, Rigo design CAD CAM Cheneau Braces. (94)

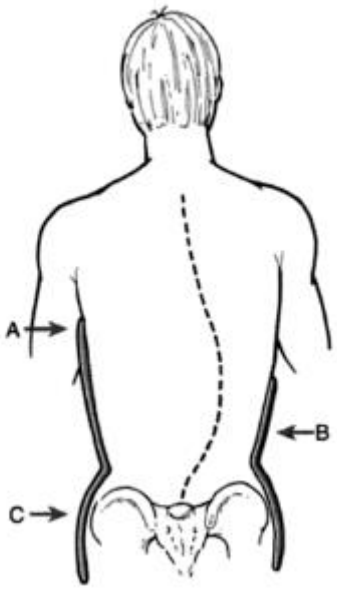

Figure 2.24. Three-point forces in the TLSO system: Pressure of the lower thoracic curvature(B), pressure for balancing with the high thoracic (A) and pelvis pressure (C) (94)

2.2.8.3.C Boston braces

Boston brace is tended easy to be accepted aesthetically, existing in six size and main purpose of Boston brace is stop the curve progression. (94) (91)

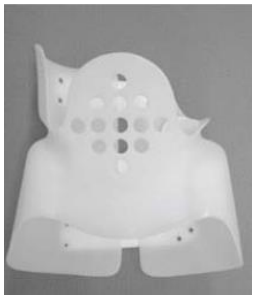

Figure 2.25. Boston brace (94)

2.2.8.3.D The Charleston Bending Brace

The Charleston brace is also known as a night time brace, its principle is overcorrection by bending the vertebrae. (Figure 2.26) It is preferred by the patients who doesn't want to wear scoliosis brace full time and it is recommended to wear for 8 hours per day .On the other hand, apex of the curve is pushed to the center by the force of the Providence brace.(Figure 2.27) (91) (86)

Figure 2.26. Charleston bending brace (95)

Figure 2.27. Providence brace (95)

2.2.8.3.E SpineCor Brace

SpineCor brace is made of flexible soft material and it is used for the curvature of 15°(Figure 2.28.). Time of wearing is 20 hours per day. (96)

Figure 2.28 SpineCor brace (91)

2.2.8.3.F Cheneau Braces

Cheneau brace also known as Chêneau-Toulouse Münster (CTM brace) is designed with the principle of the three-point force system that can control the thoracic gibus with no limitation of the pulmonary functions. (Figure 2.29.) Despite the Cheneau braces were used to produce with the cast of the patients before, CAD/CAM technology is preferred for the designing now. (97)

Figure 2.29. Cheneau brace (98)

It’s hard to evaluate the efficiency of treatment of brace. The efficient result of brace treatment depends on the type of brace that is appropriate for the patient’s scoliosis, time of wearing, physical, emotional and social wellbeing of patient. 23 hours per day of wearing time is suggested for the treatment of scoliosis. (21) (22) Despite the existence of several research about efficient treatment with orthosis on scoliosis, efficacy of the role of braces on treatment of scoliosis is not clear yet. (91)

2.2.8.3 Exercise Treatment

Exercise treatment is the most common option after and with brace treatment in conservative treatment. The aim of the exercise treatment in scoliosis based on providing spinal balance, protecting flexibility, supporting respiratory functions. (99) Due to the imbalance of the muscles between the convex side and the concave side of the scoliosis, asymmetrical exercise methods are used in the literature. Patients are being treated with these methods in 7 schools all around the world, especially in Europe, which are all based on three-dimensional treatment for years. (100)

Two options of asymmetrical exercise treatment are existing which are intensive programs and physiotherapeutic scoliosis-specific exercises programs. (101)Patients attend a clinic for several weeks to have intensive exercise treatment in intensive programs. On the other hand, patients are controlled by the physiotherapist different times per week in the physiotherapeutic scoliosis-specific exercises programs. Patients can do exercises alone or they can be a group with the other patients who have similar curvatures. (101) (102) (Figure 2.30., Figure 2.31.)

Figure 2.30. Exercise sample with group (102)

Figure 2.31. Exercise sample individually (102)

2.2.8.4 Surgical Treatment

Patients who didn't have successful treatment with brace and still have progression will be offered surgery. (12) The aim of the surgical treatment is to control frontal plane, keep the vertical plane into the normal physiological border and adjust and decrease the rotation. (103) The indications of surgical treatment can be seen at the table below (Table 2.8) There are some techniques of surgery is preferred by the surgeon according to the curve. (104)

Table 2.8. Indications of surgical treatment (47) (46)

Skeletally immature patients with more than 45°
Skeletally mature patients with more than 50°
Severe problems related aesthetic
Thoracic lordosis
Extreme pain

2.2.9. Physical activity level and adolescent idiopathic scoliosis

Motion of the body with the consumption of the energy is described physical activity. It's not easy to evaluate physical activity level to obtain approximate value of it. On the other hand; detection of the physical activity level is substantial for interference if necessary. (105)International Physical Activity Questionnaire-Short Form (IPAQ-SF) is used for the assessment of physical activity level.

Physical activity level is as important as age onset and the magnitude of the curvature for the handling of the scoliosis treatment and there is an important correlation between the physical activity and AIS. Sufficient physical activity level is essential during growth period of individuals until the adulthood because physical activity affect the cardiopulmonary functions and muscle strength (29) (106). Individuals with AIS restrict themselves about joining the games or physical activities intraday among the same aged individuals because of their braces or their cosmetic related worry (25).

The physical activity level is affected by some factors related the treatment options in AIS. Carsten Müller et al found that step activity level in patients with AIS who are under brace treatment decreased compared after the brace treatment (27). In addition, Parsch et al also found that individuals with AIS who are treated by operation and bracing are facing some difficulties of their physical activities with the time in their study (2).

2.2.10. Kinesiophobia and adolescent idiopathic scoliosis

Kinesiophobia is described as unreasonable and weaken fear of physical motion and it was defined at 1990. It is claimed that kinesiophobia is important for the improvement of the chronic signs and the sensation of the patients with different psychological agents too. (107) Tampa questionnaire is used for evaluating kinesiophobia. Although there are some version of adaptive Tampa questionnaire for some diseases, there is no version of Tampa questionnaire for evaluating the kinesiophobia in scoliosis. (108) Kinesiophobia is one cause of limited physical activity. (109) Monticone et al found that, exercise which is designed individually has positive effect on kinesiophobia in the adult patients with idiopathic scoliosis. (110) In addition; Ye et al claimed that patients with adolescent idiopathic scoliosis have higher kinesiophobia score after the surgery of scoliosis. (111)

3. SUBJECTS AND METHODS

Ethical approval for the present thesis study was approved by Medical Ethics Committee of Medical, Surgical and Drug Researches of Yeditepe University Medical Faculty (Meeting Date:16.01.2019, Decision Number:1554) (See Attachment-2).

3.1. Individuals

This study was performed on the individuals with AIS who have already been followed by the physician at the Formed Healthcare Orthosis and Scoliosis Center, İstanbul between February 2019 and April 2019. 70 patients with AIS had been invited to attend in the study and 70 of them who were all informed about the research participated and their and parents of their permits were taken with signatures.(See Attachment-3) Participants were divided into two groups according to the duration of their treatment with Cheneau brace. 35 participants who have been using their Cheneau braces for maximum 4 months were defined as individuals at early stage. They were named as Group 1. On the other hand, other 35 of them were chosen from the patients who has been under treatment with their braces between 8-18 months and they were defined as Group 2 and accepted as late stage of their treatment. 5 participants from Group 1 and 5 participants from Group 2 were excluded from the study because of uncompleted questionnaires. (Figure 3.1, Figure 3.2). Criteria for relevance in this study were:

Inclusion criteria

- The age of 10-16 years old
- Diagnosed with Adolescent Idiopathic Scoliosis by the physician
- Under the treatment with Cheneau Braces
- Being voluntary
- Understanding and speaking Turkish with no mental problems

Exclusion Criteria

- Other scoliosis types
- Not to diagnosed with Adolescent Idiopathic Scoliosis by the physician
- Problems about understanding and speaking Turkish or mental problems
- Under the age of 10 and older than 16 years old
- Not under treatment with Cheneau Braces
- Not being voluntary

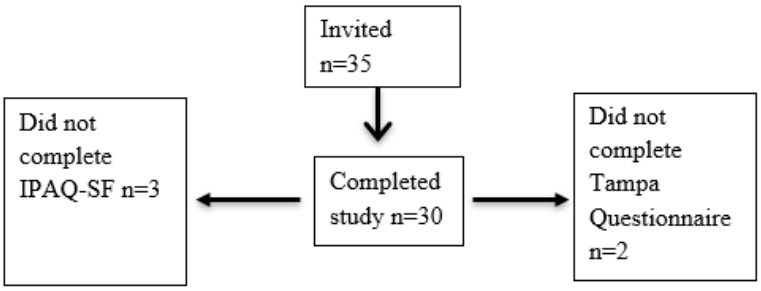

Figure 3.1. Flow chart of Group 1

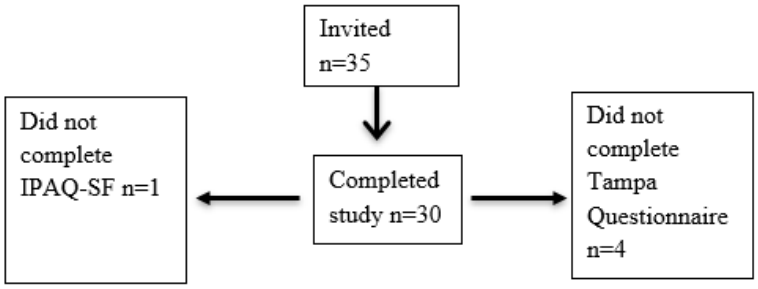

Figure 3.2. Flow chart of Group 2

3.2. Evaluation Method

Following questionnaire were performed by the participants in one time in this study. Researcher was with the participants for the necessary of support or explanation if they need.

Questionnaires

i. Scoliosis Evaluation Form (consist of demographic information of patients)
ii. Walter Reed Visual Scale
iii. International Physical Activity Questionnaire Short Form (IPAQ-SF)
iv. TAMPA Kinesiophobia Questionnaire

were performed for the data collection from this study.

3.2.1. Scoliosis Evaluation Form

Scoliosis evaluation form was created for having information about clinical features that includes the family history, age of first menstruation, location of curvature, angle of trunk rotation (ATR), Cobb angle, apex, Risser and Tanner stage, Beighton score, the score of perceived body image and it also contains demographic information of participants. (See Attachment-4)

3.2.1.1. The Walter Reed Visual Assessment Scale (WRVAS)

The Walter Reed Visual Assessment Scale (WRVAS) is formed for evaluating of the cosmetic deformity depending on the comprehension of the individuals with AIS. WRVAS contains 7 parts which are all related the appearance of deformity and evaluate the curve, rib hump, lumbar prominence, the relationship between the costa and pelvis, levels of shoulders, location and rotation of the scapula, the relationship between the head and pelvis position (112) (Figure 3.3)**.** We evaluated perceived body image with WRVAS in this study as including it to scoliosis evaluation form. (See Attachment-5)

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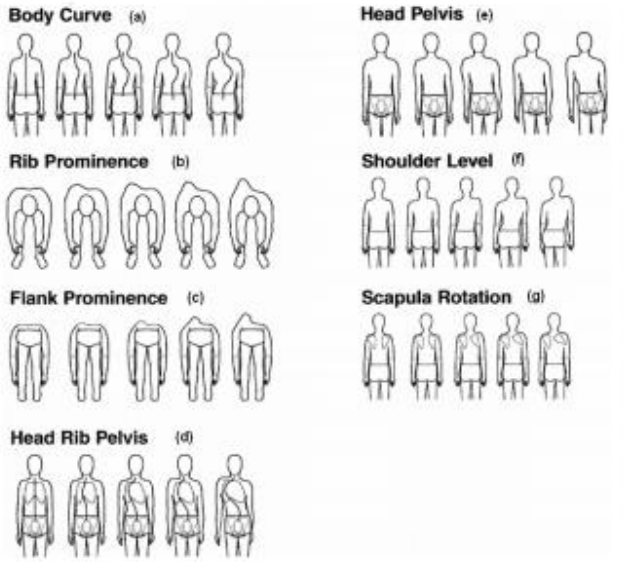

Figure 3.3. Walter Reed Visual Assessment Scale (112)

3.2.1.2. Evaluation of Trunk Rotation with Scoliometer

The scoliometer is a basic, reliable, easy to use, radiation-free, noninvasive instrument is used for to measure trunk rotation in scoliosis. Measurement of at least 5° trunk rotation with the scoliometer indicates of 20°or more than 20° curvatures with the 1% of mistake it is accepted as a good standard. (113) (114) The trunk rotation degrees are measured by putting the middle of the scoliometer on the spinous process vertically with the Adam's Forward Test. (Figure 3.4)

Figure 3.4. Assessment of trunk rotation with scoliometer (115)

In this study, evaluation of the trunk rotation with scoliometer was performed on the patients went to forward bend position while standing without shoes and socks. The feet of participants were positioned parallel to each other with the intervention of the researcher. Position of being parallel of trunk to the floor, position of pelvis and swinging arms were controlled while testing. Cervical, thoracic, thoracolumbar and lumbar area between C7 and L5 were assessed by one by Baseline scoliometer (12-1099) was used for the assessment.

3.2.1.3. Assessment of Cobb angle

Cobb method is used for the evaluation of the deformity on the frontal plane. The angle between the UEV and LEV is called Cobb angle which is used most common. (116) (117) In this study, Cobb angle of the participants were evaluated by the using of Surgimap Spine which is computer based program can calculate the several angles on the vertebrae. (Figure 3.5) (118)

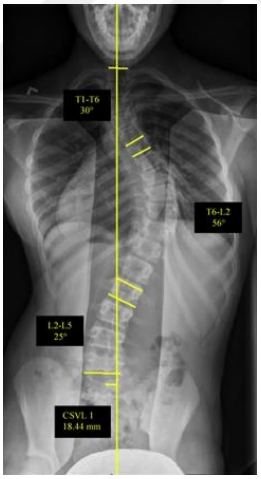

Figure 3.5. An example assessment of the cobb angle with Surgimap (118)

3.2.1.4. Determination of apex

Apex is formed by the apical vertebra which is most rotated, most deviated to lateral side of the body. (119) Most rotated, most deviated vertebra is accepted as apical vertebra in this study.

3.2.1.5. Determination of skeletal maturation with Risser sign

Skeletal maturity is assessed with the Risser sign which gives an information about maturation with the evaluation of the 5 stage of bony fusion at the iliac apophysis (11) (12).(Figure 3.6)

Figure 3.6. Risser sign (120)

3.2.1.6. Assessment of Beighton score

Beighton score is used for the assessment of hypermobility of the joints. It is a 9 points easy method that its greater score represents hypermobility. Presence of the hyperextension of the little finger worth 1 point for one side, apposition of the thumb to the flexor side of the forearm worth 1 point for one side, more than 10° hyperextension of the knees, more than 10° hyperextension of the elbows and putting the palm side of the hands on the floor with the bending to forward while the knees are hyperextended worth 2 points. (Figure 3.7) Total score ≥4 demonstrates abnormal joint laxity and the score ≥6 means hypermobility (121) (122)

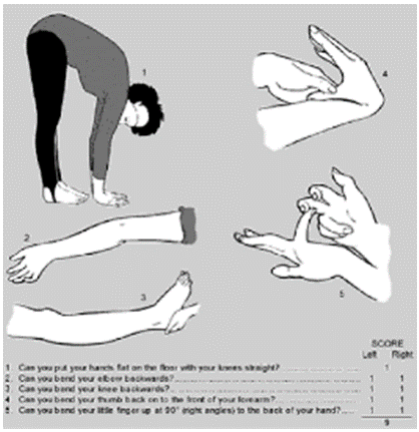

Figure 3.7 Beighton score (121)

3.2.2. International Physical Activity Questionnaire-Short Form (IPAQ-SF)

International Physical Activity Questionnaire-Short Form is used for to identify the physical activity level of individuals. The level of activity is evaluated the individuals as inactive, minimum active and maximum active depending on their total score of IPAQ. It contains 7 questions about spending time of the physical activities on last 7 days for minimum 10 minutes and sitting time is also assessed with IPAQ (123) (124). Metabolic Equivalent Task (MET) is found with the total calculation of the METs of the physical activities which are classified as walking activity, moderate activity and intense activity. Metabolic Equivalent Task is calculated into 3 categories. MET of an activity is found to the multiplication of the minutes of performed activity and the MET value of the activity. We used IPAQ-SF to evaluate the daily physical activity level of participants in our study. (See Attachment-6)

For walking activity

MET = 3,3 x the time of performed activity (minutes) x performed activity/week

For moderate activity

MET = 4,0 x the time of performed activity (minutes) x performed activity/week

For intense activity

MET = 8,0 x the time of performed activity (minutes) x performed activity/week

If the total MET value is <600 MET-Minutes/Week, the individuals are classified as inactive, individuals are classified as a minimum level active if the total MET value of them is between 600 and 3000 MET-minutes/week and they are classified as an active if the total MET value is over 3000 MET minutes/week. (125) (124)

3.2.3. TAMPA Kinesiophobia scale

Kinesiophobia is defined as a fear of movement which is an excessive, disproportionate and weaken and was evaluated with TAMPA Kinesiophobia Scale in this study. (See Attachment-7) Tampa Scale contains 17 items for identify the level of Kinesiophobia of the individuals. It has been confirmed for chronic low back pain and fibromyalgia but it is being used with other orthopedic conditions too. The total mark can be changed between the 17 and 68, total mark of 37 or more than 37 is indicated an excessive level of Kinesiophobia in some studies. (125) (126)

3.3. Statistical Method

Our variables were analyzed with the computer-based program of SPSS version 22 for Windows (SPSS Inc. Chicago, IL, USA) Significance level was accepted with the p value of less than 0,05 ($p < 0.05$). Numeric variables of the descriptive analyses were expressed with the means and standard deviations (SD), nominal and ordinal variables were presented with the frequencies (%) at the tables. Kolmogorov- Smirnov test was used to detect the normality of the distribution for the total participants and Shapiro Wilk test was used to detect the normality of the distributions for the separated groups. Independent sample t test was used for the comparison of the groups for the variables that distributed normal, Chi-square test was used for the categoric variables, Mann-Whitney U test was used for the comparison of groups for the numeric variables which did not distribute normal. Pearson and Spearman correlation analysis tests were used for to detect the relationship between the variables.

4.RESULTS

The questionnaires which are used for this study were applied to the patients with AIS were being followed by a physician and were already wearing Cheneau braces for their treatment between February 2019'' and March 2019.The data of this study was analyzed with the computer program named as Statistical Package Analyze for Social Sciences (SPSS) version 22. Significant level was accepted as $p \leq 0,05$.

The mean values of age, height, weight, and body mass index of groups were given on Table 4.1. On the other hand, the comparison of gender between the Group 1 and Group 2 was given in the Figure 4.1 According to the findings, there is a significant difference of age and height in demographic features between the groups. ($p \leq 0,05$) In addition, there is no significant difference in the value of weight, gender and body mass index (BMI) between the groups. ($p > 0,05$)

Table 4.1. Comparison of the demographic features of groups

	Group 1(N=30) Mean ± SD (Min. – Max.)	**Group 2(N=30) Mean ± SD (Min.- Max.)**	**p value**
Age (yrs)	12,53 ± 1,35 (10-15)	13,7 ± 0,91 (12-15)	**0,00**
Height (cm)	156,2 ± 7,67 (134-166,7)	160,50 ± 7,04 (144-179)	**0,04**
Weight (kg)	48,24 ± 10,22 (29,20-78,40)	50,31 ± 7,81 (34,90-69,80)	0,2
BMI(kg/m2)	19,60 ± 2,92 (14,7-28,20)	19,47 ± 2,42 (15,40-26,70)	0,7

Group 1= Participants who were wearing their braces less than 4 months. **Group 2=** Participants who were wearing their braces between 8 months and 18 months**, N:** Number **BMI:** Body Mass Index **SD:** Standard Deviation **Min:** Minimum **Max:** Maximum Significance was accepted as $p \leq 0,05$.

Table 4.2 Comparison of gender between the groups

	Male N (%)	**Female N (%)**	**Total N (%)**	**p value**
Group 1	3 (10%)	27 (90%)	30 (100%)	0,68
Group 2	4 (13,3%)	26 (86,7%)	30 (100%)	

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4.1 Evaluation of the Clinic Features Depending on the Groups

The comparison of the age of diagnosis and onset of the first menarche, Beighton score, Risser sign and Tanner stage were examined on the Table 4.3. There are significant differences of the Risser sign and Tanner Stage between the groups. ($p<0,05$)

Table 4.3. Comparison of clinical features depending on groups

	Group 1 (N=30) Mean ± SD (Min-Max)	**Group 2 (N=30) Mean ± SD (Min-Max)**	**p value**
Age of Diagnosis	11,60 ± 2,11 (7-15)	11,56 ± 1,97 (7-15)	0,746
Age of Onset of Menarche	12 ± 0,84 (10-13)	12,46 ± 1,17(10-15)	0,164
Beighton Score	3,66 ± 2,92(0-8)	4,06 ± 2,82(0-9)	0,590
Risser Sign	1,43 ± 1,43(0-4)	2,67 ± 1,33(0-4)	**0,001**
Tanner Stage	2,76 ± 0,85(1-4)	3,33 ± 0,54(2-4)	**0,006**

The distribution of the family history between the groups is shown at the Table 4.4. There is no significant difference in the family history between the groups. ($p>0,05$)

Table 4.4. Distribution and comparison of the family history between the groups

	Group 1 N (%)	**Group 2 N (%)**	**p value**
Positive	4 (13,3%)	6 (20%)	0,488
Negative	26 (86,7%)	24 (80%)	

Table 4.5. shows the comparison in the daily in-brace time and monthly in-brace time between the groups. The difference in both monthly and daily in-brace time between the groups were found statistically significant. ($p<0,05$)

Table 4.5. Comparison of daily in-brace time and monthly in-brace time between the groups

	Group 1 Mean ± SD (Min-Max)	**Group 2 Mean ± SD (Min-Max)**	**p value**
Daily in brace Time (hours)	19,20±3,48 (8-23)	17,03±3,63 (8-22)	**,007**
Monthly in brace Time(months)	2,21±1,06 (1-4)	13,46±2,96 (8-18)	**,00**

Distribution of the apex of the curvatures in total participants and according to the groups were shown on the Table 4.6.

Table 4.6. Distribution of the apex of the curvatures

Apex	Total Number of Participants (n)	Total Distribution (%)	Number of Participants in Group 1 (N)	Distribution of Group 1 (%)	Number of Participants in Group 2 (N)	Distribution of Group 2 (%)
T8	10	16,7	4	13,3	6	20,0
T9	12	20	7	23,4	5	16,7
T10	5	8,3	3	10	2	6,7
T11	6	10,0	2	6,7	4	13,3
T12	5	8,3	1	3,3	4	13,3
L1	7	11,7	4	13,3	3	10,0
L2	14	23,3	9	30,0	5	16,7
L3	1	1,7	-	-	1	3,3
Total	60	100,0	30	100,0	30	100,0

T=thoracic apex **L**=Lumbar apex

Distribution and frequency of the scoliosis location in total participants and according to the groups were showed on the Table 4.7.

Table 4.7. Distribution of the scoliosis location

Type of Scoliosis	Total Number of Participants (N)	Total Distribution (%)	Number of Participants for Group 1 (N)	Distribution of Group 1 (%)	Number of Participants for Group 2 (N)	Distribution of Group 2 (%)
Right Thoracic Left Lumbar	17	2,3	10	33,3	7	23,3
Left Thoracic Right Lumbar	1	1,7	-	-	1	3,3
Right Thoracic	20	33,3	10	33,3	10	33,3
Left Lumbar	9	15,0	5	16,7	4	13,3
Left Thoracolumbar	7	11,7	3	10	4	13,3
Right Thoracolumbar	5	8,3	1	3,3	4	13,3
Right Lumbar	1	1,7	1	3,3	-	-
Total	60	100,0	30	100,0	30	100,0

The mean values of angle of trunk rotation (ATR) according to location were shown on the Table 4.8. There were no statically differences between the groups. (p>0,05)

Table 4.8. Comparison of ATR values according to location of curvature

Area of Vertebrae for Rotation	**Mean ± SD of Total Participants (Min-Max)**	**Mean ± SD value of ATR for Group 1 (Min-Max)**	**Mean ± SD value of ATR for Group 2 (Min-Max)**	**p value**
Cervicothoracic	,150 ± ,633 (0-4)	,133±,507 (0-2)	,166±,746 (0-4)	1,000
Thoracic	6,833±3,450 (1-15)	6,90±4,011 (2-15)	6,766±2,848 (1-13)	,789
Thoracolumbar	4,63±3,025 (0-15)	4,433±2,635 (0-10)	4,833±3,404 (0-15)	,905
Lumbar	4,166±2,719 (0-12)	4,366±2,658 (1-12)	3,966±2,809 (0-11)	,395
Sacrum	,800 ± 1,161 (0-4)	,933±1,284 (0-4)	,666±1,028 (0-3)	,416

The findings of the comparison of the Cobb angles between the groups were showed at the Table 4.9. There were not found significant difference between the groups. (p>0,05)

Table 4.9. Comparison of the Cobb angles between groups

	Number of Participant (N) Group 1	Mean ± SD (Max-Min) Group 1	Number of Participant (N) Group 2	Mean ± SD (Max-Min) Group 2	p value	t value
Maximum Cobb Angle	30	34,33 ± 6,37 (22-48)	30	32,90 ± 7,03 (20-46)	,591	,827
Thoracic Cobb Angle	21	33,83 ± 6,41 (22-45)	21	32,47 ± 6,77 (20-46)	,919	,555
Thoracolumbar Cobb Angle	4	28 ± 3,65 (24-32)	7	25,57 ± 5,09 (16-30)	,631	,831
Lumbar Cobb Angle	18	33,60 ± 6,55 (24-48)	19	33,89 ± 6,64 (20-44)	,786	-,029

Comparison of WRVAS score between the groups can be shown at Table 4.10. There was no significant difference between the Group 1 and Group 2. (p>0,05)

Table 4.10. Comparison of WRVAS score

	Total Participants Mean ± SD (Min-Max)	Group 1 Mean ± SD (Min-Max)	Group 2 Mean ± SD (Min-Max)	P value
WRVS	14,28±4,71(8-28)	13,76±3,82 (8-22)	14,80±5,48 (9-28)	,767
Number of Participants	60	30	30	

The relationship between WRVAS score and Maximum Cobb Angle

The relationship between WRVAS score and maximum Cobb angle in total participants were shown at Table 4.11. Positive correlation was found between WRVAS score and maximum Cobb angle. ($p<0,05$) Furthermore; there were relationship between WRVAS score and maximum Cobb angle for Group 1 and Group 2 which were shown at Table 4.12. ($p<0,05$)

Table 4.11. Relationship between WRVAS score and maximum Cobb angle in total participants

Total Participants	p value	r value
WRVAS-Maximum Cobb Angle	**,000**	r= 0,650

Table 4.12. Relationship between WRVAS score and maximum Cobb angle in groups

		p value	r value
Group 1	Walter Reed Visual Scale-Maximum Cobb Angle	**,000**	0,711
Group 2	Walter Reed Visual Scale-Maximum Cobb Angle	**,001**	0,596

Relationship between the WRVAS score and Cobb angle

The relationship between Cobb angle and WRVAS score in total participants were shown at Table 4.13. The relationship between the thoracic Cobb, lumbar Cobb and WRVAS score were found statistically significant. ($p<0,05$). The relationship between the thoracolumbar Cobb angle and WRVAS score was not found significant. ($p>0,05$)

Table 4.13 Relationship between WRVAS and Cobb angles in total participants

Total Participants	p value	r value
Thoracic Cobb- WRVAS	0,000	0,557
Thoracolumbar Cobb-WRVAS	0,261	0,371
Lumbar Cobb-WRVAS	0,006	0,447

The relationship between Cobb angle and WRVAS score in Group 1 were shown at Table 4.14. The relationship between the thoracic Cobb and WRVAS was found statistically significant. ($p<0,05$). The relationship between the thoracolumbar Cobb angle, lumbar Cobb angle and WRVAS score was not found significant in Group 1. ($p>0,05$)

Table 4.14 Relationship between WRVAS and Cobb angles in Group 1

Group 1	p value	r value
Thoracic Cobb-WRVAS	**0,008**	0,559
Thoracolumbar Cobb-WRVAS	0,600	0,400
Lumbar Cobb-WRVAS	0,336	0,241

The relationship between Cobb angle and WRVAS score in Group 2 were shown at Table 4.15. The relationship between the thoracic Cobb angle, lumbar Cobb angle and WRVAS score was found statistically significant. ($p<0,05$). The relationship between the thoracolumbar Cobb angle and WRVAS score was not found significant in Group 2. ($p>0,05$)

Table 4.15 Relationship between WRVAS and Cobb angles in Group 2

Group 2	p value	r value
Thoracic Cobb-WRVAS	**0,003**	0,612
Thoracolumbar Cobb-WRVAS	0,354	0,415
Lumbar Cobb-WRVAS	**0,009**	0,585

Relationship between WRVAS score and in-brace time

Relationship between the WRVAS score and daily in-brace time were showed at Table 4.16 and relationship between monthly brace wearing time and WRGS were showed at Table 4.17. No correlation between WRGS and not only daily in-brace time but also monthly in-brace time was found for none of groups. ($p>0,05$)

Table 4.16. Relationship between the WRVAS score and daily in-brace time

		p value	r value
Total Participants	WRVAS-Daily In-Brace Time	,541	,081
Group 1	WRVAS-Daily In-Brace Time	,324	,186
Group 2	WRVAS-Daily In-Brace Time	,889	,027

Table 4.17. Relationship between WRVAS score and monthly in-brace time

		p value	r value
Total Participants	WRVAS - Monthly In-Brace Time	,489	,091
Group 1	WRVAS - Monthly In-Brace Time	,889	,027
Group 2	WRVAS - Monthly In-Brace Time	,287	,201

Relationship between WRVAS and ATR values

The relationship between the ATR values and WRVAS score in total participants were shown at Table 4.18. It's seen that thoracic rotation, thoracolumbar rotation and lumbar rotation were correlated positively with WRVAS score according to Table 4.18.($p<0,05$) However, it was found that ATR value of cervicothoracic area and sacrum were not correlated with the WRVAS score for all participants in this study. ($p>0,05$)

Table 4.18. Relationship between the ATR values and WRVAS score in total participants

Total Participants	p value	r value
Cervicothoracic ATR – WRVAS	0,803	0,033
Thoracic ATR- WRVAS	**0,003**	0,374
Thoracolumbar ATR – WRVAS	**0,005**	0,354
Lumbar ATR – WRVAS	**0,031**	0,279
Sacrum ATR - WRVAS	0,360	-0,120

The relationship between the WRVAS score and ATR values in Group 1 were shown at Table 4.19. It's seen that the value of thoracic rotation and cervicothoracic rotation were correlated positively with WRVS score according to Table 4.19. ($p<0,05$) However, it is found that ATR value of thoracolumbar, lumbar and sacrum were not correlated with the WRVAS score for Group 1 in this study. ($p>0,05$)

Table 4.19. Relationship between ATR values and WRVAS score in Group 1

Group 1	p value	r value
Cervicothoracic ATR- WRVAS	**0,038**	0,380
Thoracic ATR- WRVAS	**0,010**	0,465
Thoracolumbar ATR- WRVAS	0,690	0,076
Lumbar ATR- WRVAS	0,091	0,314
Sacrum ATR- WRVAS	0,549	-0,114

The relationship between the ATR values and WRVAS score in Group 2 were showed at Table 4.20. It's seen that there is only one correlation which is positively and between thoracolumbar rotation and WRVAS score according to Table 4.20 ($p<0,05$) On the other hand; it is found that ATR value of cervicothoracic, thoracic, lumbar and sacrum were not correlated with the WRVAS values in Group 2 in this study .($p>0,05$)

Table 4.20. Relationship between ATR values and WRVAS score in Group 2

Group 2	p value	r value
Cervicothoracic ATR - WRVAS	0,186	-0,248
Thoracic ATR- WRVAS	0,138	0,277
Thoracolumbar ATR- WRVAS	**0,002**	0,550
Lumbar ATR- WRVAS	0,187	0,248
Sacrum ATR- WRVAS	0,663	-0,083

Distribution of Schroth exercise program

Distribution of Schroth Exercise Program in all participants was showed in the Figure 4.1. 12 participants (20%) were doing their Schroth exercises regularly, 25 (41,7%) participants were doing their Schroth exercises without any regular program although 23 participants (38,3%) were not doing Schroth exercises.

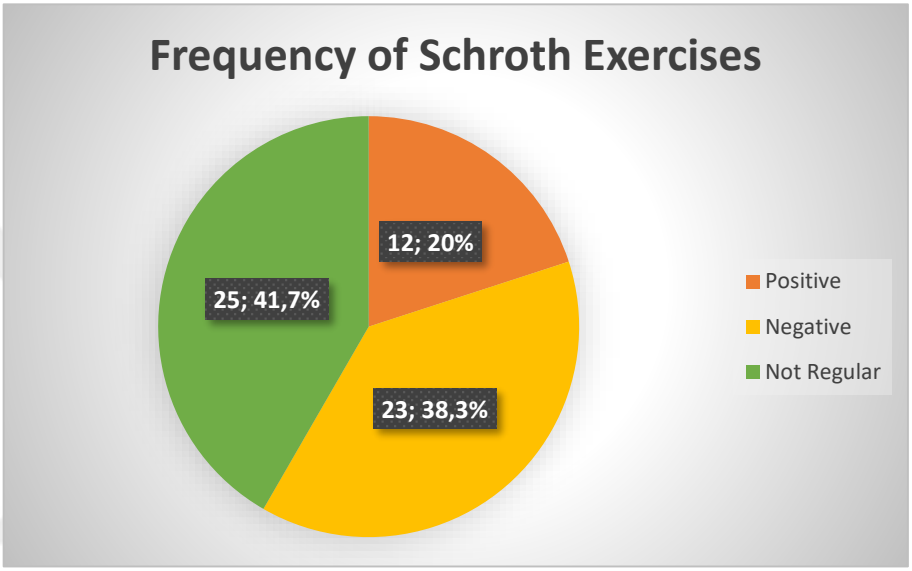

Figure 4.1. Distribution of Schroth Exercise Program

In addition; according to the Figure 4.2, 9 participants (30%) were doing Schroth exercises regularly, 10 participants (33,3%) were not doing their exercises regularly. On the other hand, 11 participants (36,7%) were not doing any Schroth exercises in Group 1.

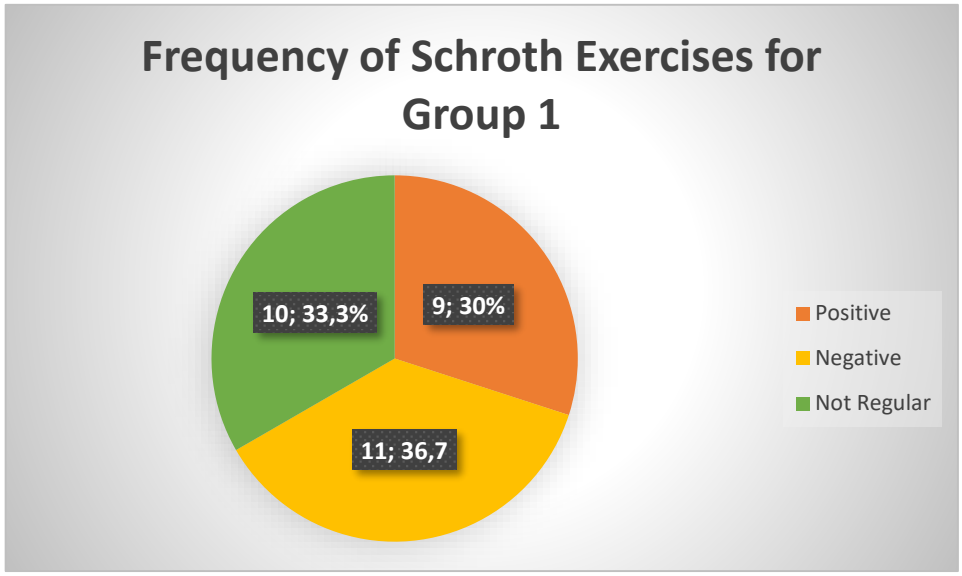

Figure 4.2. Distribution of Schroth Exercise Program in Group 1

It's seen at the Figure 4.3. that participants (10%) were doing Schroth exercises regularly, 15 participants (50%) were not doing their exercises regularly and 12 participants (40%) were not doing any Schroth exercises in Group 2.

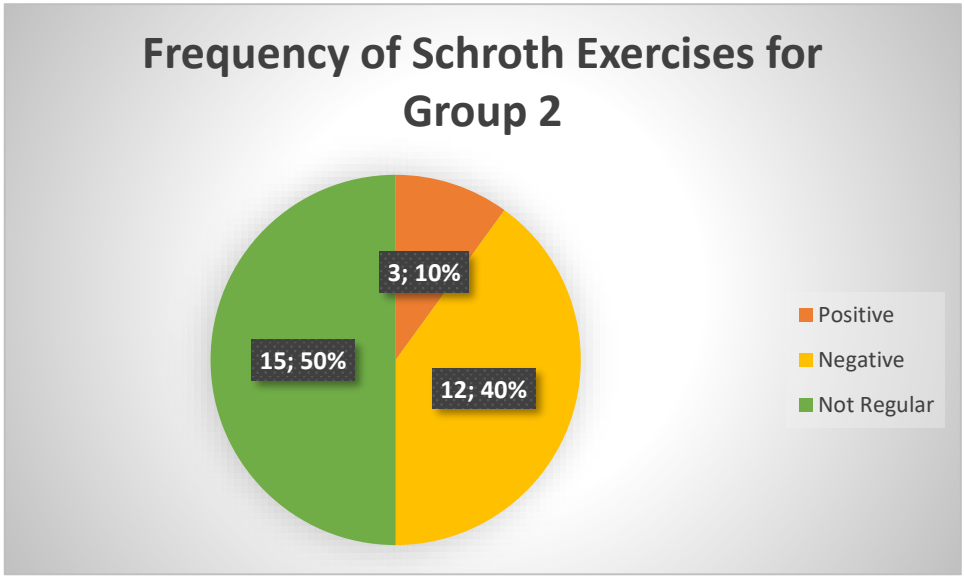

Figure 4.3. Distribution of Schroth Exercise Program in Group 2

Comparison of IPAQ score between the groups

Findings related mean values and comparison of IPAQ score of total participants were shown at and between the groups were shown at Table 4.21. The IPAQ scores between the groups were found significantly different. (p<0,05)

Table 4.21. Comparison of IPAQ score between the groups

	Total Participants (N=60) Mean ± SD (Min-Max)	**Group 1 (N=30) Mean ± SD (Min-Max)**	**Group 2 (N=30) Mean ± SD (Min-Max)**	**p value**
IPAQ Score	623,00±651,46 (0,00-3620)	822,66±702,30 (,00-3620,00)	423,35±53,413 (,00-2407,50)	**,003**

Distribution of physical activity level in groups

Distribution of the physical activity level depending on the IPAQ score were shown at Figure 4.4. 30 participants were classified as an inactive (50%) while 29 participants were categorized into the moderate level (48,3%) and 1 participant was included into the high physical activity level depending on their IPAQ score. (1,70%)

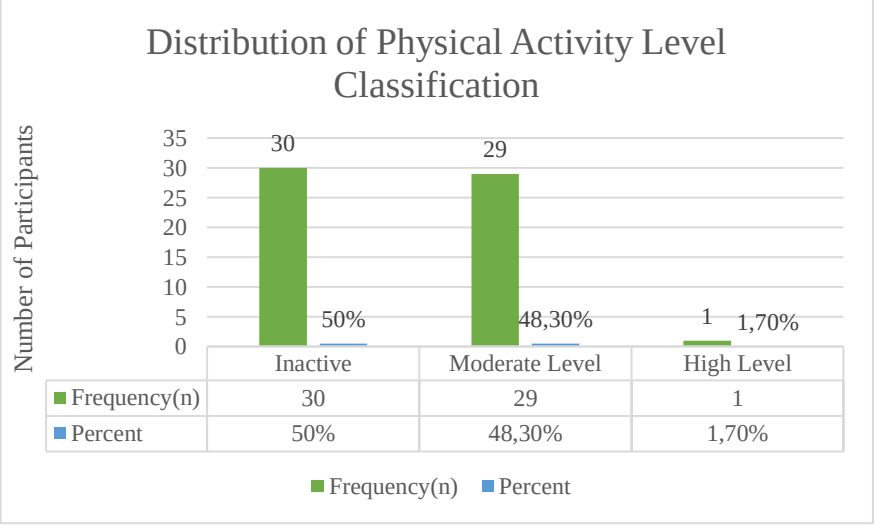

Figure 4.4. Distribution of the physical activity level depending on the IPAQ score

In addition; according to the Figure 4.5 participants (30%) were classified into the inactive level, 20 participants (66,70%) were categorized into the moderate level and 1 participant (3,30%) was involved into the high-level physical activity in Group 1. 21 participants (70%) were classified into the inactive level, 9 participants (30%) were categorized into the moderate level and there was no one into the high physical activity level in Group 2 when Figure 4.6. was examined. Statically significant differences of inactive level and moderate level were found ($p<0,05$) while there was not found a significant difference of high level of physical activity between groups. ($p>0,05$) (Table 4.22)

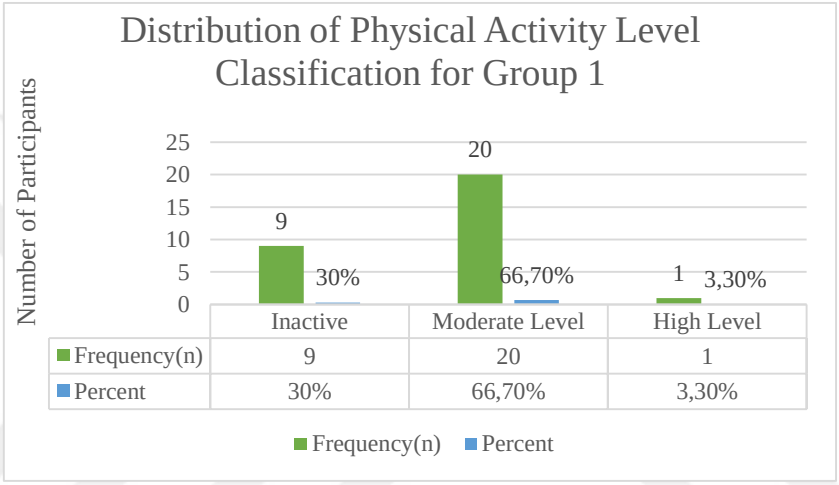

Figure 4.5. Distribution of the physical activity level in the Group 1 depending on the IPAQ score

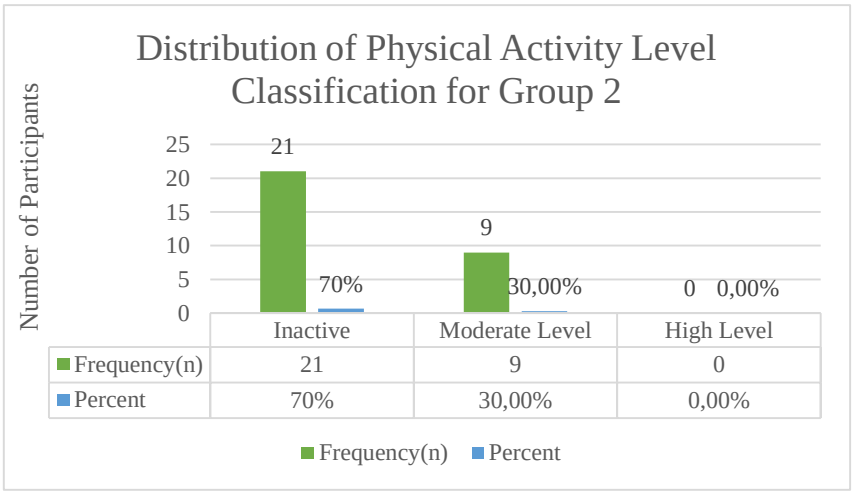

Figure 4.6. Distribution of the physical activity level in the Group 2 depending on the IPAQ score

Comparison of physical activity levels between groups were showed at Table 4.22. There were significant differences of inactivity level and moderate level between Group 1 and Group 2.

Table 4.22. Comparison of the physical activity levels between the groups

	p value
Inactivity Level	**,000**
Moderate Level	**,000**
High Level	,313

Comparison of the sitting time and Tampa score between the groups

Comparison of the sitting time between the groups were shown at Table 4.23. According to this table, there was no significant difference in sitting time between the groups (p>0,05).

Table 4.23. Comparison in sitting time between the groups

	Total Participants (N=60) Mean ± SD (Min-Max)	**Group 1 (N=30) Mean ± SD (Min-Max)**	**Group 2 (N=30) Mean ± SD (Min-Max)**	**p value**
Sitting Time (minute)	551,33 ± 173,825(240-960)	554,00 ± 175,84 (300-960)	548,66 ± 174,74 (240-900)	,917

Table 4.24. shows the comparison of Tampa score between the groups. There was a significant difference in Tampa score between the groups. (p<0,05)

Table 4.24. Distribution of Tampa score between the groups

	Total Participants (N=60) Mean ± SD (Min-Max)	**Group 1 (N=30) Mean ± SD (Min-Max)**	**Group 2 (N=30) Mean ± SD (Min-Max)**	**p value**
Tampa Score	34,95±7,40 (20-53)	33,33±8,23 (20-49)	36,56±6,19 (22-53)	**,014**

Relationship between the Tampa score and Sitting Time

Relationship between the Tampa score and sitting time measurements in total participants and groups were showed at Table 4.25. There was a positive relationship between sitting time and Tampa score in Group 1 and total participants. ($p<0,05$) On the other hand, no correlation was found in Group 2. ($p>0,05$)

Table 4.25 Relationship between the Tampa score and Sitting Time

		p value	**r value**
Total Participants	Tampa-Sitting Time	**0,007**	0,345
Group 1	Tampa-Sitting Time	**0,010**	0,462
Group 2	Tampa-Sitting Time	0,327	0,185

Relationship between kinesiophobia and physical activity

Relationship between Tampa score and IPAQ score were shown at Table 4.26. The negative relationship was found in not only the total participants but also in Group 1 too. ($p<0,05$) There was no relationship between the kinesiophobia and IPAQ scores in Group 2. ($p>0,05$)

Table 4.26. Relationship between Tampa score and IPAQ score

		p value	**r value**
Total Participants	Tampa-IPAQ	**0,002**	-,397
Group 1	Tampa-IPAQ	**0,021**	-,420
Group 2	Tampa-IPAQ	0,147	-,271

Relationship between the in-brace time and IPAQ, Tampa score

Relationship between daily in-brace time and IPAQ score were showed at Table 4.27. while relationship between monthly in-brace time and IPAQ score were showed at Table 4.28. No correlation was found between the IPAQ score and daily in-brace time for all participants and groups. (p>0,05) On the other hand, it is found that IPAQ score related to monthly in-brace time negatively for Group 1. (p<0,05)

Table 4.27. Relationship between daily in-brace time and IPAQ score

		p value	**r value**
Total Participants	Daily in-brace time-IPAQ	,704	-,050
Group 1	Daily in-brace time-IPAQ	,114	,-295
Group 2	Daily in-brace time-IPAQ	,203	-,239

Table 4.28. Relationship between monthly in-brace time and IPAQ score

		p value	**r value**
Total Participants	Monthly in brace time-IPAQ	**,000**	-,467
Group 1	Monthly in brace time-IPAQ	**,000**	-,795
Group 2	Monthly in brace time-IPAQ	,096	,310

Relationship between in-brace time and Tampa score in total participants were shown at Table 4.29. Table 4.29 shows that daily in-brace time is correlated with the Tampa score for total participants. (p<0,05)

Table 4.29 Relationship between in-brace time and Tampa score

Total Participants	**p value**	**r value**
Wearing Time (Daily)-Tampa	0,847	-0,025
Wearing Time (Monthly)-Tampa	**0,047**	**0,257**

Correlation between daily in-brace time and Tampa score in groups was shown at Table 4.30 which shows that there is a positive correlation between the daily in-brace time and Tampa score in Group 1 ($p<0,05$). On the other hand, correlation was not found between the daily in-brace time and Tampa score in Group 2. ($p>0,05$)

Table 4.30 Relationship between daily in-brace time and Tampa score

		p value	**r value**
Group 1	Daily in brace time- Tampa score	**0,037**	0,383*
Group 2	Daily in brace time- Tampa score	0,360	-0,173

Relationship between monthly in-brace time and Tampa score in groups was shown at Table 4.31 and it is shown that there is a positive correlation between the monthly in-brace time and Tampa score in Group 1 ($p<0,05$). In addition, there was no correlation was found between the monthly in-brace time and Tampa score in Group 2.

Table 4.31 Relationship between monthly in-brace time and Tampa score

		p value	**r value**
Group 1	Monthly in brace time-Tampa Score	**0,017**	0,434*
Group 2	Monthly in brace time-Tampa Score	0,848	-0,036

Comparison of Tampa score depending on the group of Schroth exercise program was shown at Table 4.32 According to this table, there was found a significant difference between the groups. ($p<0,05$)

Table 4.32 Comparison of Tampa score depending on the Schroth Exercise Program

	p value	**F value**
Between Groups	**0,008**	5,272

5.DISCUSSION

We aimed to investigate effect of the duration of brace treatment on kinesiophobia and physical activity and we also aimed determine the relationship between the Kinesiophobia and physical activity level in the patients with AIS who are under treatment with a Cheneau brace for between 1-4 months and for between 8-18 months. We also investigated to compare these findings between the groups.

The participants who are named Group 1 with mean age of 12,53±1,35 accepted as they are at early stage of their treatment and the participants who are named Group 2 with mean age of 13,7±0,91 accepted as they are at the late stage of their treatment were included in our study. There was a significant difference in age between the groups. Age and progression which can be estimated according to maturity are the main factors for deciding the brace treatment. The study done by Little et al claimed that peak speed is a trustworthy clinical sign for the estimated growth possibility and progression of scoliosis (127). The time of peak speed of growth happens between the age at 11 and at 13 years of in females and between the age at 13 and at 15 years in males and it is defined as peak growth for spine. (128) According to Lonstein and Winter's study, the curvature of patients with a Risser sign of 0 or 1 lean to progress more than patients with a Risser sign between 2 and 5. (129) (130) Another study done by Nault et al showed that Risser sign 0 and 1 are defined as the progression of curvature stage. (131). In addition, in the study done by Karol at al showed that progression of scoliosis is related to Risser sign which is also important for brace treatment. (132) The study is done by Aulisa et al at 2017, the mean age was 11.1 ± 2.4 at the beginning of the study and the mean age was 17.1 ± 2.0 at the end of the study which is followed the patients in the study for a long time. (133) We think that, the significant difference of age is related to the clinical relationship between the Risser stage and brace treatment.

Vertebral growth means changing the height of vertebrae and there are two stages in human life; first stage occurs at the age of 3, second stage occurs during puberty. Tanner stage and Risser sign are used for not only to estimate remaining growth, but also to predict progression. Tanner stage 2 for females and Tanner stage 3 for males are the stages of maximum growth. (134) In addition; Risser stage 1 also indicates the maximum growth

of the vertebrae. For the criteria of SOSORT; patients are treated with scoliosis braces between the Risser stage 0 and Risser stage 4. (13) In our study, there was a significant difference of Risser sign, Tanner scale and height between the groups. We consider that the difference in maturation between the participants result of the difference of the duration of their brace treatment.

Its claimed that AIS is more common in girls than boys in the studies related the prevalence of scoliosis. (4) (135) (136) Because of the fact that the girls with AIS applied more than boys to the center which this study have been done, 27 girls and 3 boys are included into the study for Group1. On the other hand, 26 girls and 4 boys are included into our study for Group 2 and there was no significant difference of genders between the groups that means the homogeneity is achieved. This is important for the reliability of our study.

It is claimed that idiopathic scoliosis frequently is observed in different family members. (137) There are some studies show the prevalence of scoliosis in family members in the literature. In the study of Riseborough and Wynne-Davies, scoliosis is found 11% of first degree 2,4% of second degree and 1,4% of third degree relatives of 207 patients with scoliosis. (47) (138) In our study, family history was positive for 4 participants and was negative for 26 participants in Group 1. However; family history was positive for 6 participants and was negative for 24 participants in Group 2. First degree relative was found in one participant with positive family history from Group 1 even though all participants with positive family history have first degree relative in Group 2. There was no significant difference of family history between the groups and homogeneity was achieved.

It is recommended that brace should be worn between 18 hours to 23 hours in patients with AIS until the end of the maturity at the study done by Jonathan R et all. (139) In addition, SOSORT recommend to arrange brace wearing time depending on the progression risk which is also related with the age and maturation. (86) If the progression risk is around 60%, brace should be worn between 16 hours and 23 hours per day. On the other hand, if the progression risk is around 80%, brace should be worn for 23 hours per day. In our study, daily in-brace time and monthly in-brace time were noted per every patient depending on the declaration of them and their parents. The mean value of daily

in-brace time in Group 1 was found 19,20±3,48 hours while it is found 17,03±3,63 in Group 2. Values of in-brace time in both groups are coherent to the treatment guideline of ‘’SOSORT’’ and there was a significant difference in daily in-brace time depending on the which part of the treatment they were in. In addition; mean value of the monthly in-brace time was found 2,21±1,06 month in Group 1 while it was found 13,46±2,96 month in Group 2. A significant difference was found in monthly in-brace time between the groups as like our expectation. Negrini et al. recently recommend brace wear 23 hours per day and at least 18 hours per day for patients with moderate AIS (140) .

The mean value of maximum Cobb in Group 1 was found 34,33± 6,37 and it was 32,90 ± 7,03 in Group 2. There was no significant difference in maximum Cobb angles between the groups. We thought that the reason of this result depends on the patients whose curvatures were detected late with delayed onset of the brace treatment and also because of the higher Risser sign and already started maturation before the brace treatment. The study done by Ming-Qiao Fang et all**,** Cobb angle was measured before the bracing and after the end of the brace treatment. The mean Cobb angle developed from 30,6 to 27,3 without any statistical difference. (141)

The participants who were wearing their braces more than 1 month for the time for overcome and the time for adaptation of bracing in full time included for Group 1 into our study. A study done by Lori A. Karol et al. showed that relationship between the Risser sign and bracing success is important and daily wearing time is changing depending on the Risser sign. (132) It is recommended minimum 18 hours daily brace wearing for the patients with Risser 0 and it is also recommended of daily brace wearing between 12 hours and 16 hours for the patients with Risser stage 1 at this study.

In AIS, patients examine their body changes cosmetically and they are tend to compare their bodies to bodies of same aged adolescents, consequently body displeasure, negative body view can be the results of perceived negative self-assessment. (142) The brace treatment can be considered annoying by the adolescents and because of that; perceived body image can be affected in a negative way. (143) The report done by Reichel and Schanz explained the anxiety of the patients who are under the brace treatment about negative effect of their body image to others. (144) There are some assessment tools are used to evaluate self-body perceptions of patients with AIS in the literature. In our study, Walter Reed Visual Assessment was used for the evaluation of perceived body image of

patients with AIS. (145) In 2016, Schwieger et al. found that there is no negative effect of bracing on body image on patients with AIS comparing to the patients with observation and no treatment. (146) Another study done by Paolucci et al at 2017; 32 participants with AIS were included in their study. They are subdivided into two groups: under brace treatment and treatment without bracing. They found that there is no significant difference of body image between the groups but when they are asked to draw their bodies on the paper, participants with bracing treatment drew their bodies with less deformity than the group of treatment without bracing. (147) In our study, there was no significant difference of perceived body image between groups ($p>0,05$) In addition; we didn't find any correlation between the brace wearing time both daily and monthly and perceived body image (WRGS).

We found that the WRVAS scores in total individuals and separated groups were correlated with the maximum Cobb angle. In addition; perceived body image was developing negatively with the increasing maximum Cobb angle in our study. The study done by Sonia Pineda et al., 70 patients that 42 of them undertreatment of bracing were included and correlation is found between the maximum Cobb and WRVAS score. (148) In addition; Wang et al at 2014 found a significant negative correlation between the body image and main Cobb angle in their study. (149) Another study done by Sanders, Polly & Cats- Baril, *et al* 182 patients who are divided into 4 groups: not scoliosis, observation, brace treatment, surgery recommended were included into the study the significant relationship between the curve size and WRVAS score was found as like we found in our study. (150). Moreover, the study done by Misterska et al; 36 girls with AIS enrolled the study. The trunk appearance perception scale (TAPs) was used for detection of the perceived body image. They found a significant moderate relationship between the Cobb angle and TAPS score in their study. They also claimed that the evaluation of their participants related body function did not get worse with bracing treatment (151)

The study done by Watanabe, they found a relationship between the thoracic cobb angle higher than 40 and perceived body image of the patients. They also reported that there is a relationship between the rotation of spine and perceived body image of patients (152) In our study; we also found a relationship between the thoracic Cobb angle and perceived body image for both of groups. In addition, we also found a relationship between the lumbar Cobb angle and perceived body image for both of groups. On the

other hand, we found a relationship between the rotation by scoliometer of thoracic, thoracolumbar and lumbar area and perceived body image for total participants. In addition, we found a relationship between the rotation by scoliometer of cervicothoracic and thoracic area and perceived body image for Group 1 while the relationship was found for only thoracolumbar area for Group 2. We think that, the number of patients who has thoracolumbar curvature and cervicothoracic curvature did not evaluated as large sample and these results were affected by the reasons related sample size.

The physical activity level of the patients with AIS under treatment of bracing is controversial in the literature. According to the study done by Baker and Patel at 2004, patients under treatment of bracing may have limitations of physical activities. On the other hand, from the systematic literature review of Green et al, Liljenqvist et al claimed that encouragement of physical activity is important for physical and psychologic wellbeing for patients who are undertreatment of bracing in AIS. (153) In the study done by Ronald Adams et al, they found that participation in sports for increasing the physical activity is important for overcoming the problems of bracing. (154) Elias Diarbakerli et all included 88 patients with AIS without any treatment, 43 braced before, 36 with under treatment of bracing and 72 with surgical treatment and they found no difference of physical activity-IPAQ score in the under treatment of bracing group between the full time bracing and part time bracing. (28) In our study, we investigated physical activity depending on a monthly in-brace time and we found a significant difference of physical activity - IPAQ score between the groups. We also analyzed the relationship between not only daily in-brace time and IPAQ score but also relationship between monthly in-brace time and IPAQ score. We found a negative relationship in Group 1 between monthly in-brace time and physical activity IPAQ score. Nevertheless, there was no relationship in any group between physical activity IPAQ score and daily brace wearing time.

There are some studies about kinesiophobia in scoliosis especially with adults but there is no study in the literature comparing two adolescent scoliosis group who are under treatment of bracing. In our study, we performed kinesiophobia on the two separated individuals with AIS who are under treatment with bracing for different duration and we found a significant difference of kinesiophobia-Tampa score between the groups. ($p<0,05$). Group 2 had a higher score from Tampa than Group 1 therefore we thought that

longer duration of the brace treatment can be cause of increased kinesiophobia on the patients with AIS.

Although there is no previous study in literature on AIS patients with brace treatment according to our knowledge, there are some studies about kinesiophobia on some other diseases and problems. The study done by Hallman et al. shows that lower physical activity is related to the increased lying time on the patients with cervical problems. (155) Kinesiophobia can cause negative behavioral effect may be a consequence or contrarily a cause of decreased physical activity in musculoskeletal problems. At 2015, Petteri Koho et all found a relationship between Kinesiophobia and musculoskeletal disease. (156) They also found an association between physical activity and kinesiophobia score on the patients who are categorized depending on their problems. In addition, negative relationship of weak strength between the physical activity level and kinesiophobia score found in the study of Ilkşan Demirbüken et al. for women with cervical pain. (109) In our study, there was a significant difference of Kinesiophobia score between the groups of physical activity levels.

There are also some studies about the relationship between kinesiophobia and physical activity on some patients with different diseases but there is no research about the relationship between the kinesiophobia and physical activity on the patients with scoliosis who are under treatment of bracing. Shruti Prabhakaran Nair et all claimed a “strong” negative correlation between the IPAQ physical activity score and Tampa kinesiophobia score with the patients with arterial hypertension on their studies at 2017. (33) We found negative relationship between kinesiophobia score and physical activity score for total participants and also for Group 1 too. ($p<0,05$) On the other hand, we did not find a correlation between the kinesiophobia score and physical activity values for Group 2 in our study. ($p>0,05$)

Carsten Müller et al found that step activity level in patients with AIS who are under brace treatment decreased compared after the brace treatment. (157) In our study; we found a correlation between IPAQ score and monthly brace wearing time negatively for Group 1 but we didn’t find any correlation between IPAQ score and monthly brace wearing time for Group 2. We thought that with the duration of the under treatment of bracing in AIS, physical activity score is decreasing.

Nor Azizah Ishak et al. emphasized that prolonged sitting can provoke kinesiophobia on their study. In our study also, we detected a positive relationship between sitting time and kinesiophobia Tampa score for Group 1. (r=462) (158)

Although there are many studies about the relationship between maximum Cobb angle and some clinical features; according to our knowledge, there was no research about the relationship between Tampa score and maximum Cobb angle. In our study, we investigated the relationship for groups between kinesiophobia-Tampa score and maximum Cobb angle and we didn't find any correlation for any group between them.

We discovered the relationship between the duration of brace treatment and kinesiophobia-Tampa score for the total individuals in our study and found a relationship between these two parameters. In addition, we also analyzed the relationship both daily and monthly in-brace time and kinesiophobia Tampa score consequently we found a positive correlation between the daily in-brace time and kinesiophobia Tampa score for Group 1. There was also a positive correlation for Group 2 between kinesiophobia and monthly in-brace time. Even if there was no statically evidence, we observed an increasing fear avoidance related the duration of the scoliosis brace usage on daily life of the patients with AIS with their verbal expression and their behaviors.

6.CONCLUSION

In summary; at the end of the study, a significant difference was found in physical activity-IPAQ score between the groups. The participants who are included in Group 1 had higher physical activity score than Group 2.

The significant difference was found in Kinesiophobia-Tampa score between the groups. The participants who are included in Group 2 had higher Kinesiophobia score than Group 1. The longer duration of brace usage for treatment may be the cause of higher Kinesiophobia.

The significant difference was found in maximum Cobb angle between the groups. In addition, a significant correlation in both groups was found between maximum Cobb angle and perceive body image. Unrelated the duration of brace treatment, perceived body image of both groups were affected with the increasing Cobb angle. On the other hand, there was no significant difference in perceived body image between the groups. It indicate that perceived body image is not related to duration of the brace treatment. That's why there was no correlation between perceived body image and brace wearing time. Furthermore; there was a correlation in Group 1 between the ATR value of cervicothoracic and thoracic area and perceived body image besides correlation was found in both groups between the thoracic Cobb angle and perceived body image. The high thoracic Cobb angle can be related with the more deformed gibus on thoracic area. Thoracic gibus can be the main result of increasing perceived body image score.

A correlation was found in total participants and in Group 1 between Kinesiophobia Tampa score and daily sitting time. No correlation was found in Group 2 between them. A correlation was found in Group 1 between the monthly brace wearing time and Kinesiophobia Tampa score. In addition, there was a correlation in Group 1 between the daily brace wearing time and Kinesiophobia-Tampa score. At the beginning of the brace treatment, patients may have some anxiety about braces.

Although there was a correlation in Group 1 between the monthly brace wearing time and physical activity-IPAQ score, no correlation was found between physical activity IPAQ score and daily brace wearing time. The correlation was found in Group 1 between the physical activity- IPAQ score and Kinesiophobia-Tampa even so no correlation in Group 2 was found between them.

Finally; there are some limitations of our study. First of all, the sample size was small. It will be better to be done the coming studies with large size. Secondly, although there are some studies about kinesiophobia in some other diseases, less studies were done about kinesiophobia in AIS. Because of the fact that; the new version of Tampa scale for the kinesiophobia level related in-brace time for AIS may be formed for studies in future.

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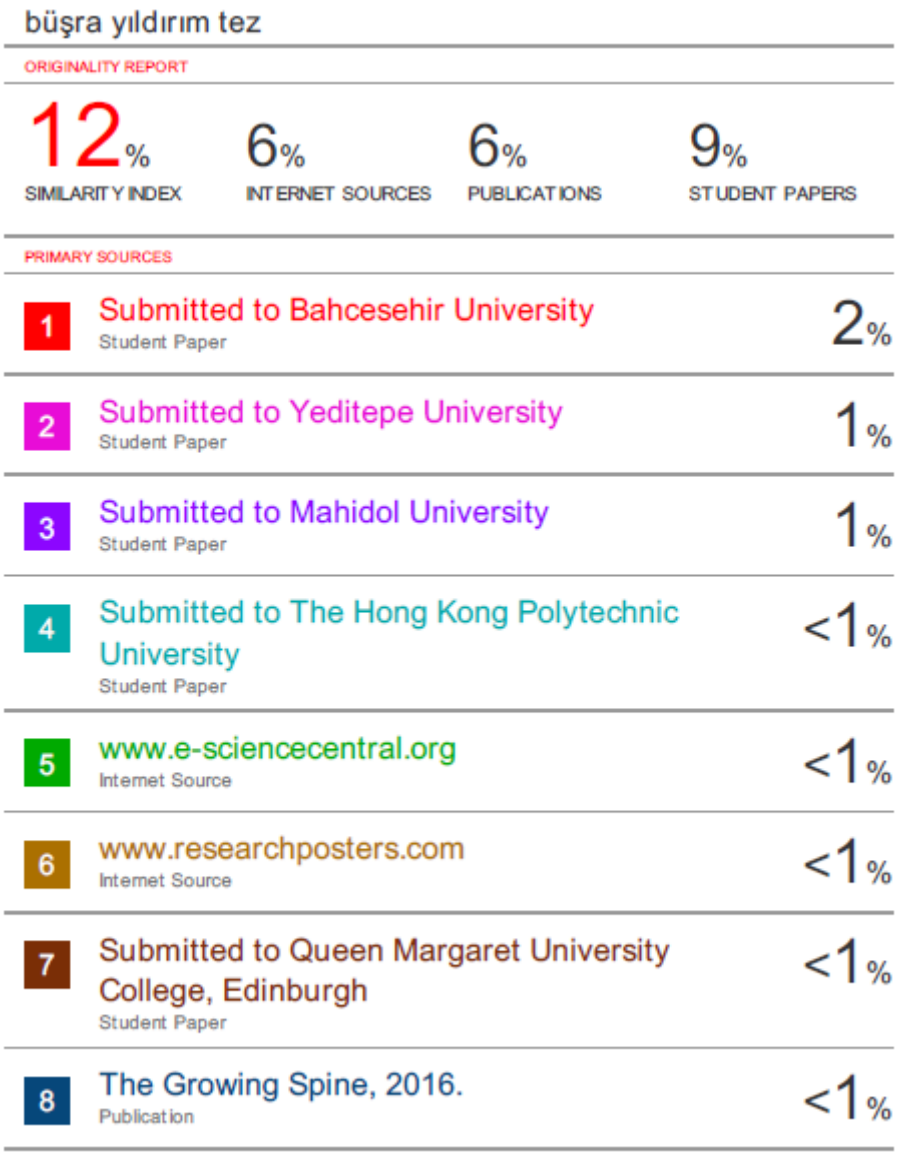
APPENDICES

Appendix 1



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Appendix 2

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15- 1584 **17/01/2019**
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

İlgili Makama (Büşra Yıldırım)

Yeditepe Üniversitesi Fizyoterapi ve Rehabilitasyon Bölümü Dr. Öğr. Üyesi Şule Badılı Demirbaş'ın sorumlu olduğu **"Cheneau Gövde Ortezi Kullanan Adölesan İdiopatik Skolyozlu Bireylerde Erken Dönem ve Geç Dönem Kinezyofobi ve Fiziksel Aktivite Düzeyi Arasındaki İlişki"** isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası (**1554** kayıt Numaralı KAEK Başvuru Dosyası), Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından **16.01.2019** tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (**KAEK Karar No: 937**).

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
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Appendix 3

T.C. YEDİTEPE ÜNİVERSİTESİ

ASGARİ BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU

Bu araştırma 10-16 yaş arasında omurgasında skolyoz tespit edilmiş ve Cheneau gövde ortezi kullanan toplam 70 kız ve erkek genç bireylerde bireyin fiziksel aktivite ile kinezyofobi durumlarının ilişkisini ve gövde ortezi kullanım süresiyle ilgisini araştırmak üzere planlanmış olup, kişinin sağlık durumuna herhangi olumsuz bir etki oluşturmayan bir analiz çalışmasıdır. Çalışmanın adı ‘’Cheneau Gövde Ortezi Kullanan Adölesan İdiopatik Skolyozlu Bireylerde Erken Dönem ve Geç Dönem Kinezyofobi ve Fiziksel Aktivite Düzeyi Arasındaki İlişki’’ olup Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Anabilim Dalı Yüksek Lisans öğrencisi Fzt. Büşra YILDIRIM ile Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi öğretim üyelerinden Dokt. Öğr. Üyesi F. Şule BADILLI DEMİRBAŞ tarafından yürütülmektedir. Skolyoz nedeniyle hekiminiz tarafından önerilen korse kullanımı sürecinde çocuğunuza Tampa kinezyofobi anketi, Uluslararası Fiziksel Aktivite Anketinin kısa formu ve Skolyoz Değerlendirme Formu uygulanacaktır. Kinezyofobi anketinde verilmiş 17 tane cümlenin çocuğunuzdan kendisindeki karşılığını seçmesini isterken, Uluslarası Fiziksel Aktivite Anketinin kısa formunda ise son 7 gün içinde yaptığı aktiviteler sorgulanacaktır.Skolyoz Değerlendirme Formunda yaş, cinsiyet gibi sosyodemografik verilerle birlikte çocuğunuzun elinizde olan son röntgeninden bazı veriler not edilecektir.Buna ek olarak; Skolyoz Değerlendirme Formunun içerdiği Walter Reed Görsel Değerlendirme skalası, çocuğunuzun resimlerden kendi algıladığı vücut eğriliği ve görünüşü ile ilgili tercihte bulunması suretiyle görsel vücut algısını test edilecektir.Bu anket uygulamaları esnasında hiçbir sağlık sorunu veya anketlere özgü bir olumsuzluk çıkması beklenmemektedir.Bu araştırma sonucunda gövde ortezi kullanmının ve kullanım süresinin fiziksel aktivite seviyesine etkisi olup olmadığının yanında kinezyofobiye sebebiyet verip vermediğinin tespit edilmesi ve süreçle ilişkisinin analiz edilmesi planlanmaktadır.Çalışmamıza vermiş olduğunuz destek ile; bu bilimsel sorgulamanın oluşturulmasına katkı sağlamış olacaksınız. Çalışmaya katılım gönüllülük esasına bağlı olup, bu araştırmayı istediğiniz zaman bitirme, katılmayı reddetme hakkına sahipsiniz.Ayrıca size ait kişisel veriler büyük bir titizlikle korunacak olup bu araştırma dışında hiçbir platformda kullanılmayacaktır.**Araştırmaya katılan bireyin velisi olarak konuyla ilgili detaylı bilgileri edindiğiniz ve çocuğunuza anketlerin uygulanmasına onay verdiğiniz bu araştırmada gönüllülük esası olduğuna ikna olduğunuz varsayılmaktadır.**Bu anketler için sizlerden hiçbir ücret talep edilmeyecektir ve siz de bu araştırmaya katılım nedeniyle araştırmacılardan herhangi bir ücret talep etmediğinizi kabul etmiş varsayılmaktasınız.

T.C. YEDİTEPE ÜNİVERSİTESİ

ASGARİ BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU

Ben,.....[Gönüllünün adı, soyadı (Kendi el yazısı ile)]

Bilgilendirilmiş Gönüllü Olur Formundaki tüm açıklamaları okudum. Bana, yukarıda konusu ve amacı belirtilen araştırma ile ilgili yazılı ve sözlü açıklama aşağıda adı belirtilen araştırmacı tarafından yapıldı. Katılmam istenen çalışmanın kapsamını ve amacını, gönüllü olarak üzerime düşen sorumlulukları tamamen anladım. Çalışma hakkında soru sorma ve tartışma imkanı buldum ve tatmin edici yanıtlar aldım. Araştırmaya gönüllü olarak katıldığımı, istediğim zaman gerekçeli veya gerekçesiz olarak araştırmadan ayrılabileceğimi biliyorum..

Bu koşullarda;

- Söz konusu anket çalışmasına hiçbir baskı ve zorlama olmaksızın kendi rızamla katılmayı kabul ediyorum.
- Gerek duyulursa kişisel bilgilerime mevzuatta belirtilen kişi, kurum ve kuruluşların erişebilmesine,
- Çalışmada elde edilen bigilerin (*kimlik bilgilerim gizli kalmak koşulu ile*) yayın için kullanılma, arşivleme ve eğer gerek duyulursa bilimsel katkı amacı ile ülkemiz ve/veya ülkemiz dışına aktarılmasına olur veriyorum.

Gönüllünün (Kendi el yazısı ile)
Adı-Soyadı:
İmzası:
Adresi:
(varsa Telefon No, Faks No):
Tarih (gün/ay/yıl): ..../..../....

Araştırma Sorumlusunun (Kendi el yazısı ile)
Adı-Soyadı:
İmzası:
Tarih (gün/ay/yıl):.../..../.....

Açıklamaya Tanık Olan Kurum Çalışanının (Kendi El Yazısı ile)
Adı-Soyadı:
İmzası:
Tarih(gün/ay/yıl):..../..../....

Velayet veya vesayet altında bulunanlar için veli veya vasinin Adı-soyadı, İmzası, Adresi (varsa telefon no., faks no,...)

NOT: Bu formun bir kopyası gönüllüde kalacak, diğer kopyası ise hasta dosyasına yerleştirilecektir.

Appendix 4

SKOLYOZ DEĞERLENDİRME FORMU

Hasta Adı Soyadı:

Telefon:

Adres:

Doğum Tarihi:

Cinsiyeti:

Boy:

Kilo:

BMI:

Korse kullanma süresi ____saat/gün

Korse kullanma süresi ____ay

Tanı Yaşı:

Menarş Yaşı:

Beighton Skoru:

Skolyoz Yerleşim Yeri:

ATR Rotasyon Değeri:

Torakal Cobb Torakolomber Cobb Lomber Cobb Maximum Cobb

Cobb Açısı:

Torakal Apex Torakolomber Apex Lomber Apex

Apex:

Risser:

Tanner:

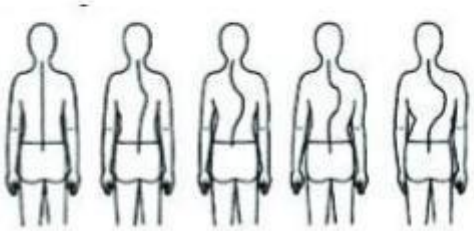
WRVAS skoru:

Schroth Sorgulama: ☐ **Düzenli Program** ☐ **Düzensiz Program** ☐ **Yapmıyor**

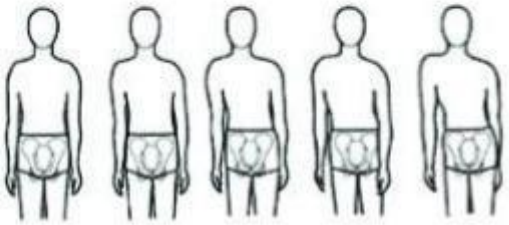
Appendix 5

Walter Reed Görsel Değerlendirme Skalası (WRVAS)

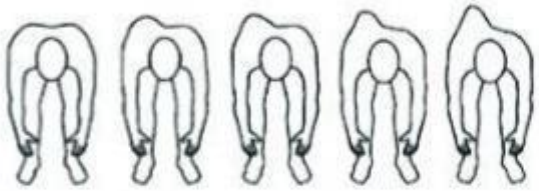
Vücut Eğrisi



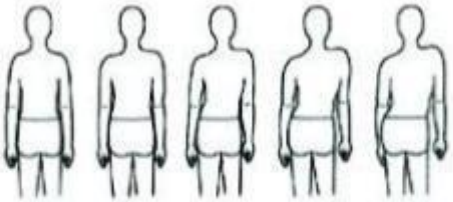
Baş ve Leğen Kemiği



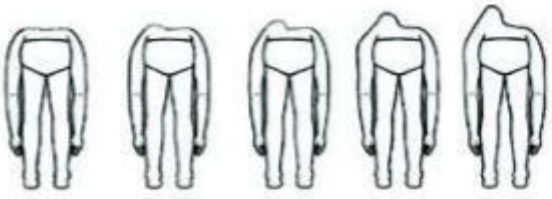
Kaburga Çıkıntısı



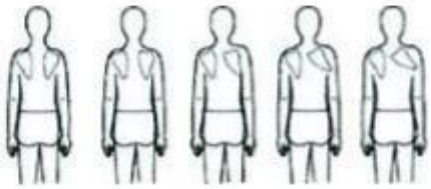
Omuz Seviyesi



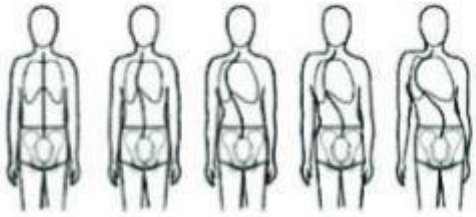
Bel Çıkıntısı



Kürek Kemiği



Baş-Kaburgalar-Leğen Kemiği



Appendix 6

ULUSLARARASI FİZİKSEL AKTİVİTE ANKETİ (KISA FORM)

İnsanların günlük hayatlarının bir parçası olarak yaptıkları fiziksel aktivite tiplerini bulmayla ilgileniyoruz. Sorular son 7 gün içerisinde fiziksel olarak harcanan zamanla ilgili olarak sorulacaktır. Lütfen yaptığınız aktiviteleri düşünün; işte, evde, bir yerden bir yere giderken, boş zamanlarınızda yaptığınız spor, egzersiz veya eğlence aktiviteleri.

Son 7 günde yaptığınız şiddetli aktiviteleri düşünün. Şiddetli fiziksel aktiviteler zor fiziksel efor yapıldığını ve nefes almanın normalden çok daha fazla olduğu aktiviteleri ifade eder. Sadece herhangi bir zamanda en az 10 dakika yaptığınız bu aktiviteleri düşünün.

1.Geçen 7 gün içerisinde kaç gün ağır kaldırma, kazma, aerobik,basketbol,futbol veya hızlı bisiklet çevirme gibi şiddetli fiziksel aktivitelerden yaptınız?

Haftada___gün

□ Şiddetli fiziksel aktivite yapmadım. → (3.soruya gidin.)

2.Bu günlerin birinde şiddetli fiziksel aktivite yaparak genellikle ne kadar zaman harcadınız?

Günde ___ saat

Günde ___ dakika

□ Bilmiyorum/Emin değilim

Geçen 7 günde yaptığınız orta dereceli fiziksel aktiviteleri düşünün. Orta dereceli aktivite orta derece fiziksel güç gerektiren ve normalden biraz sık nefes almaya neden olan aktivitelerdir. Yalnız bir seferde en az 10 dakika boyunca yaptığınız fiziksel aktiviteleri düşünün.

3.Geçen 7 gün içerisinde kaç gün hafif yük taşıma, normal hızda bisiklet çevirme, halk oyunları, dans, bowling veya çiftler tenis oyunu gibi orta dereceli fiziksel aktivitelerden yaptınız? Yürüme hariç.

Haftada___gün

□Orta dereceli fiziksel aktivite yapmadım. → (5.soruya gidin.)

4.Bu günlerin birinde orta dereceli fiziksel aktivite yaparak genellikle ne kadar zaman harcadınız?

Günde ___ saat

Günde ___ dakika

 Bilmiyorum/Emin değilim

Geçen 7 günde yürüyerek geçirdiğiniz zamanı düşünün. Bu işyerinde, evde, bir yerden bir yere ulaşım amacıyla veya sadece dinlenme, spor, egzersiz veya hobi amacıyla yaptığınız yürüyüş olabilir.

5.Geçen 7 gün, bir seferde en az 10 dakika yürüdüğünüz gün sayısı kaçtır?

Haftada___gün

 Yürümedim. → (7.soruya gidin.)

6.Bu günlerden birinde yürüyerek genellikle ne kadar zaman geçirdiniz?

Günde ___ saat

Günde ___ dakika

 Bilmiyorum/Emin değilim

Son soru, geçen 7 günde hafta içinde oturarak geçirdiğiniz zamanlarla ilgilidir. İşte, evde, çalışırken ya da dinlenirken geçirdiğiniz zamanlar dahildir. Bu masanızda, arkadaşınızı ziyaret ederken, okurken, otururken veya yatarak televizyon seyrettiğinizde oturarak geçirdiğiniz zamanları kapsamaktadır.

7.Geçen 7 gün içerisinde, günde oturarak ne kadar zaman harcadınız?

Günde ___ saat

Günde ___ dakika

 Bilmiyorum/Emin değilim

SORULARIMIZ SONA ERMİŞTİR.KATILIMINIZ İÇİN TEŞEKKÜRLER

Appendix 7

Tampa Kinezyofobi Ölçeği

(Kesinlikle Katılmıyorum, Katılmıyorum, Katılıyorum, Tamamen Katılıyorum)

1. Egzersiz yaparsam kendi kendimi sakatlarım diye kaygılanıyorum. ☐ ☐ ☐ ☐

2. Ağrımla baş etmeye çalışacak olsam, ağrım artar. ☐ ☐ ☐ ☐

3. Ağrımdan dolayı vücudum bana tehlikeli derecede yanlış giden bir şeyler olduğunu söylüyor.

☐ ☐ ☐ ☐

4. Egzersiz yaparsam sanki ağrım hafifleyecekmiş gibi geliyor. ☐ ☐ ☐ ☐

5. İnsanlar benim tıbbi sorunlarımı yeterince ciddiye almıyorlar. ☐ ☐ ☐ ☐

6. Yaşlanmam nedeni ile vücudum hayat boyu risk altında olacak. ☐ ☐ ☐ ☐

7. Ağrımın olması her zaman, vücudumu sakatladığım bir problemim olduğu anlamına gelir.

☐ ☐ ☐ ☐

8. Sırf bazı şeylerin ağrımı artırıyor olması, onların tehlikeli oldukları anlamına gelmez.

☐ ☐ ☐ ☐

9. Kendimi kazara sakatlamaktan korkuyorum. ☐ ☐ ☐ ☐

10. Ağrının artmasını engellemenin en basit ve güvenli yolu gereksiz hareketler yapmaktan kaçınmaktır. ☐ ☐ ☐ ☐

11. Vücudumda tehlike arz eden bir şey olmasaydı, bu kadar çok ağrı hissetmezdim.

☐ ☐ ☐ ☐

12. Ağrıma rağmen, fiziksel olarak aktif olsaydım, durumum daha iyi olurdu.

☐ ☐ ☐ ☐

13. Ağrı, kendimi sakatlamamam için egzersizi ne zaman bırakmam gerektiği konusunda bana sinyal verir. ☐ ☐ ☐ ☐

14. Benim durumumda olan birinin, fiziksel olarak aktif olması pek güvenli değildir.

☐ ☐ ☐ ☐

15. Normal insanların yaptığı her şeyi yapamam, çünkü çok kolay sakatlanırım.

☐ ☐ ☐ ☐

16. Bazı şeyler çok fazla ağrıya neden olsa bile, bunların gerçekte tehlikeli olduklarını düşünmem. ☐ ☐ ☐ ☐

17. Hiç kimse ağrı hissederken egzersiz yapmak zorunda olmamalı ☐ ☐ ☐ ☐

Appendix 8

Özgeçmiş

Kişisel Bilgiler

Adı	Büşra	**Soyadı**	YILDIRIM
Doğum Yeri	Antalya	**Doğum Tarihi**	25.08.1991
Uyruğu	T.C.	**TC Kimlik No**	31333695182
E-mail	ptbusrayildirim@gmail.com	**Tel**	+905425000782

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans	Fizyoterapi ve Rehabilitasyon	Yeditepe Üniversitesi	
Lisans	Fizyoterapi ve Rehabilitasyon	Yeditepe Üniversitesi	2014
Lise	Sayısal(MF)	Antalya Adem Tolunay Anadolu Lisesi	2009

[#] Başarılmış birden fazla sınav varsa(KPDS, ÜDS, TOEFL; EELTS vs), tüm sonuçlar yazılmalıdır

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu ([#])
İngilizce	

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Koordinatör Schroth Fizyoterapisti	Formed Healthcare Ortez&Protez Uygulama Merkezi	2017-2018
Fizyoterapist	Özel Yeditepe Özel Eğitim ve Rehabilitasyon Merkezi	2014-2017

Bilgisayar Bilgisi

Program	Kullanma becerisi
Microsoft Word	Çok iyi
Microsoft Excel	Çok iyi

*Çok iyi, iyi, orta, zayıf olarak değerlendirin

Bilimsel Çalışmaları
SCI, SSCI, AHCI indekslerine giren dergilerde yayınlanan makaleler

Diğer dergilerde yayınlanan makaleler

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

04/2018 SOSORT POSTER PRESENTATION-*"RESPIRATORY FUNCTION IN ADOLESCENT IDIOPATHIC SCOLIOSIS"*

Hakemli konferans/sempozyumların bildiri kitaplarında yer alan yayınlar

Diğer (Görev Aldığı Projeler/Sertifikaları/Ödülleri)

Skolyoz Araştırma ve Tedavi Derneği- Kurucu Asil Üye (2017)
Skolyoz Araştırma ve Tedavi Derneği-Dernek Saymanı(2017-halen)