Available online at www.medicinescience.org

ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2023;12(3):902-9

Can mesomorphic somatotype be a predisposing factor for rotator cuff tears?

Fatih Cavus[1], Davut Ozbag[2], Deniz Senol[3]

[1]Tekirdağ Dr. Ismail Fehmi Cumalioğlu City Hospital, Physiotherapy Unit, Tekirdağ, Türkiye
[2]Adıyaman University, Faculty of Medicine, Department of Anatomy, Adıyaman, Türkiye
[3]Düzce University, Faculty of Medicine, Department of Anatomy, Düzce, Türkiye

Received 27 July 2023; Accepted 21 August 2023
Available online 30.08.2023 with doi: 10.5455/medscience.2023.07.117

Abstract

The aim of our study was to evaluate the anthropometric features used in the determination of somatotypes of patients with rotator cuff tears (RCT) and the condition before and after physiotherapy. In our study, 84 patients (43 female, 41 male) who were admitted to Tekirdağ State Hospital in 2020-2021 and diagnosed with RCT were included. Participants were grouped and evaluated in terms of age and gender. Visual analog scale (VAS) scoring for pain, Western Ontario Rotator Cuff (WORC) index, Shoulder Pain and Disability Index (SPADI), and Quick Disabilities of Arm, Shoulder, and Hand (DASH) scores for shoulder function and range of motion (ROM) values were measured. The Heath-Carter method was used for somatotype determination. Conventional physical therapy was applied to patients. 64 (76.2%) patients had endomorph-mesomorph, 14 (17%) had mesomorph-endomorph, 4 (5%) had mesomorph-endomorph, 1 (1%) had balanced mesomorph and 1 (1%) had ectomorph-endomorph somatotype. 71.4% of the participants younger than 45 years of age and 50% of those between 45 and 55 had partial tears; 80% of those between 56 and 65 and 76.5% of those older than 65 had a complete tear. Of the patients, 53.3% had cardiovascular diseases, 41.3% had problems with the digestive system, 25% had diabetes, and 24% had problems with the musculoskeletal system. The presence of RCT in the non-dominant shoulder was detected in 33.5% of the patients. There were statistically significant differences between the median values of VAS, Quick DASH, WORC, SPADI, and ROM before and after physical therapy. Regardless of gender, RCT patients had predominantly mesomorphic body types. Individuals with mesomorphic body types are more likely to have RCT. The presence of full-thickness tears was found to be closely related to advanced age. Physiotherapy has been proven to be beneficial for RCT patients in our study.

Key words: Rotator cuff tears, somatotype, anthropometry, physiotherapy

Introduction

Rotator cuff injuries are the most common condition in the shoulder area (Yamaguchi et al., 2006). Rotator cuff injuries can be caused by external factors such as trauma or lifestyle, or they can be caused by internal factors such as the individual's advancing age, obesity, or anatomical variations, and may develop acutely or degeneratively [1]. This condition may occur with acute tendinopathy in the muscle group and progress to partial and complete tears. The most commonly affected muscles in Rotator cuff tears (RCT) are the supraspinatus and the infraspinatus [2].

The major biomechanical function of the rotator cuff muscles is to support the glenohumeral joint by compressing the humerus head into the glenoid cavity. With the exception of the inferior side, the tendons of the rotator cuff muscles combine with the joint capsule to produce a musculotendinous collar that surrounds the joint in the posterior, superior, and anterior directions. In most shoulder dislocations, the humerus slips

CITATION
Cavus F, Ozbag D, Senol D. Can mesomorphic somatotype be a predisposing factor for rotator cuff tears?. Med Science. 2023;12(3):902-9.

Corresponding Author: Fatih Cavus, Tekirdağ Dr. Ismail Fehmi Cumalioğlu City Hospital, Physiotherapy Unit, Tekirdağ, Türkiye
Email: fztfatih@hotmail.com

DOI: 10.5455/medscience.2023.07.117

down along the exposed inferior region of the joint as a result of this arrangement, which is a significant contributing factor. The rotator cuff muscles keep the head of the humerus from slipping during arm movements, allowing a full range of motion and providing stability. Furthermore, the rotator cuff muscles aid in shoulder joint mobility by promoting abduction, internal rotation, and external rotation [1].

Physical therapy can be an effective treatment option for rotator cuff tears. The goals of physical therapy for rotator cuff tears are to reduce pain and inflammation, improve the range of motion, and restore strength and function to the shoulder. The effects of physical therapy on rotator cuff injuries were shown as moderate and strong evidence, and the positive effects of the acute long-term were reviewed [3,4].

RCT impair shoulder function in the majority of patients, making it difficult for people to engage in daily activities [5]. According to several research, obesity, and a high body mass index (BMI) are risk factors for RCT [6,7]. Based on these findings, we believe somatotype may be a significant predictor for RCT. Because of the significant incidence of RCT in the population, it is critical to understand the potential risks for this disease in order to practice preventive medicine. The goal of this study is to discover the association between somatotype and RCT and to examine the influence of physiotherapy on age, gender, and somatotype.

Material and Methods

People diagnosed with RCT in Tekirdag Dr. Ismail Fehmi Cumalioglu City Hospital Orthopedics and Physical Therapy outpatient clinics between 2020 and 2021 were included in our study. Malatya Health Sciences Non-Interventional Clinical Research Ethics Committee granted the required ethics committee authorization for the study, with decisions numbered 2019/21 and 59.

The study involved 98 individuals; however, 14 were excluded because they did not match the required criteria or did not complete the therapy process. The study included 84 participants. All patients were told about the study, and all patients signed voluntary consent forms. Those involved in professional or amateur sports, patients who had shoulder procedures, those with a systemic or degenerative musculoskeletal disorder in the shoulder area, and those with a type III acromion were not included in the study. Gender and age groups of participants were analyzed and discussed. The age groups were divided into four categories: under 45 years old, 45-55 years old, 56-65 years old, and over 65 years old.

Measurements were obtained at various spots on the body to assess the patients' somatotypes and to evaluate them anthropometrically. The measurements were taken in accordance with the principles of anthropometric measurement [8,9]. The measurements were performed by the same individual and were repeated twice. For the somatotype, the Heath-Carter method was utilized. Skinfold thicknesses (SFT) from the patients' triceps, suprailiac, subscapular, and calf areas were measured using a skinfold caliper. The humerus and femoral bicondylar diameters of each patient were measured with a 300 mm Astor digital caliper. Each patient's biceps and gastrocnemius muscle circumferences, upper extremity length, shoulder circumference, arm circumference, chest circumference, waist circumference, thigh circumference, and lower extremities length were measured with a tape measure. The Harpenden (Holtain Ltd., Crymych, Dyfed, Wales, UK) anthropometric set was used to measure shoulder width (acromial), distance between both throchanters, and chest diameter. BMI was calculated based on the patients' height and weight (Kern MPE 250 digital scale and height meter were used).

To determine the somatotype in the Heath-Carter method, the program "Somatotype for Windows 1.2.5 Trial Version" was used to analyze measurement data from height, weight, skin fold thickness of four different regions (triceps, subscapular, suprailiac, and calf), bone widths in two regions (knee and elbow), and bone girths in two regions (arm and calf) [10].

The range of motion of the shoulder joint was measured using a universal goniometer with 30 cm arms. Every measurement was taken twice. The American Academy of Orthopaedic Surgeons' criteria for measurement and terminology were used [11].

Pain was assessed using a visual analogue scale (VAS). For pain and functional limitations faced by patients in daily life, three different shoulder survey scoring systems were used: the Western Ontario Rotator Cuff Index (WORC), the Shoulder Pain And Disability Index (SPADI), and the Quick DASH (Quick survey of arm, shoulder, and hand disorders) [12-14].

Following evaluation, patients who took part in the study received physical therapy. Patients received physical treatment in the Tekirdag State Hospital physical therapy hall. The conventional physiotherapy treatment consisted of 15 sessions per week, 5 days per week [15]. TENS, Infraruj, and US techniques were employed on the patients. As an exercise protocol, a three-stage Rockwood orthotherapy program was administered, which included activities such as wand stretching, Codman movements, and elastic band strengthening [16].

IBM SPSS V23 was used to evaluate the data. The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to determine suitability for normal distribution. To compare categorical data according to groups, the Chi-square test was performed. The Mann-Whitney U test was used to compare normally distributed data according to discrete groups, and the independent t-test was used to compare normally distributed data. Normally distributed data were compared using one-way analysis of variance, while the data that were not normally distributed were compared using the Kruskal Wallis test. The paired sample t test and the Wilcoxon test were used to compare the results before and after therapy. For quantitative data, the findings were reported as average standard deviation and median (min-max) and frequency (%) for categorical data. The level of significance was set at $p<0.05$.

DOI: 10.5455/medscience.2023.07.117

Results

Table 1 shows the categorized demographic data of the patients who took part in the study. The gender and age segments of the patient population were evenly distributed.

Table 1. The categorized demographic data of the study population

	Frequency (n)	Percentage (%)
Gender		
Male	41	48.8
Female	43	51.2
Age groups		
<45	11	13.1
45-55	25	29.8
56-65	25	29.8
>65	23	27.4
Shoulder with RCT		
Right	53	63.1
Left	31	36.9
RCT on dominant side		
Overall	55	66.5
Female	29	67.5
Male	26	63.4
Tear type of supraspinatus		
Partial	20	36.4
Full thickness	35	63.6
Inclusion of biceps brachii		
Yes	43	72.9
No	16	27.1
Impingement		
Yes	30	51.7
No	28	28.3
Comorbidities		
Cardiovascular diseases	40	53.3
Gastrointestinal disorders	31	41.3
Diabetes	19	25.3
Musculoskeletal	18	24
Urogenital	10	13.3
Respiratory	8	10.7
Neurologic	6	8
Thyroid-related	5	6.7
Eye disorders	5	6.7
Trauma	2	2.7
Rheumatologic	2	2.7
Infections	2	2.7
Dermatologic	1	1.3

Figure 1 depicts the somatotypes of the patients who took part in the study by gender and overall. As a result, 64 of the 84 patients (76.2%) had an endomorphic mesomorph body type, whereas about 20% had a mesomorphic endomorph body type, which was similar in both genders.

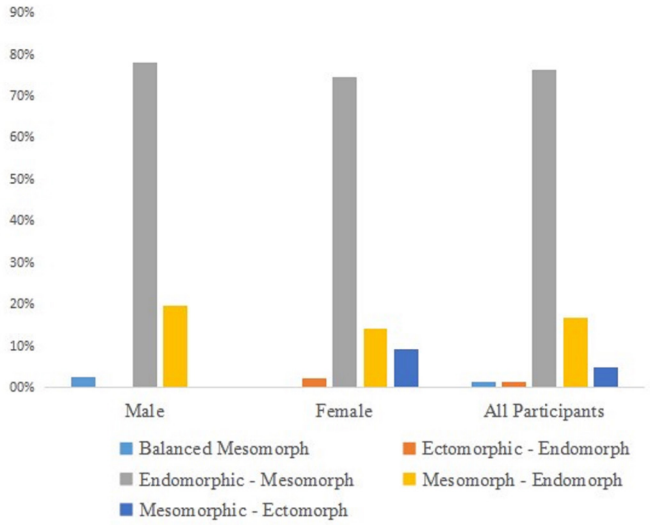

Figure 1. Somatotype distribution of the patients

Anthropometric measurements of the patients included in the study are given in Table 2.

Table 2. Various data of the participants and the duration of complaints from the symptoms

	Mean	SD	Median	Minimum	Maximum
Age	57.0	11.0	58.0	28.0	77.0
Stature (cm)	165.7	9.7	165.0	147.0	187.0
Weight (kg)	79.5	10.5	80.0	45.0	110.0
BMI (kg/m2)	29.0	3.9	28.7	18.7	41.2
Duration of symptoms (month)	7.6	17.0	2.0	1.0	120.0

In Table 3, the anthropometric measures used to determine the somatotype of the patients are classified by gender, and the statistical differences seen between men and women in several parameters are noted.

Table 4 summarizes the presence of shoulder impingement, biceps brachii involvement, and supraspinatus rupture in patients grouped by age.

Table 5 shows the change in shoulder function ratings and range of motion (ROM) before and after physiotherapy, as well as a statistical comparison of the patients.

A cross-gender examination of the changes in the scores and normal joint movements of patients before and after physiotherapy is shown in Table 6.

DOI: 10.5455/medscience.2023.07.117

Table 3. Anthropemetric results of the patients by gender

	Male		Female		P value
	Mean±SD	**Median (Min-Max)**	**Mean±SD**	**Median (Min-Max)**	
Upper extremity length (UEL, cm)	74±3.5	74 (67-81.5)	67±3.7	67 (53-73.4)	**<0.001**
LEL/ UEL.	1.2±0.1	1.2 (1.1-2)	1.2±0.1	1.2 (1-1.4)	0.094
Lower extremity length (LEL, cm)	88.1±4.9	88.3 (74-98)	82±5.5	82.5 (64.5-91.5)	<0.001
Biacromial width (cm)	41.1±3	41.1 (32.9-47.9)	37.1±2.2	37.5 (31.2-41.1)	**<0.001**
Biacromial/bitrochanteric rate	1.2±0.1	1.2 (1.1-1.4)	1±0.1	1 (0.9-1.2)	**<0.001**
Bitrochanteric width (cm)	34.2±2.8	34.5 (26.5-38)	35.7±3.3	35.5 (28.8-43.6)	**0.026**
Arm circumference (cm)	30.5±2.5	30 (25.8-36.5)	31.1±3.6	31 (22.2-43)	0.358
Thigh circumference (cm)	46.3±5	46 (37.5-57)	48.5±6.6	48 (34.5-62.5)	0.096
Deltoid circumference (cm)	36.9±3.5	37 (32-47)	35.6±3.3	35 (24.1-41)	0.228
Chest circumference (cm)	101.6±5.6	102.5 (90.5-112)	96.7±7	96.5 (74.5-111)	**0.001**
Waist circumference (cm)	100.4±8.5	99 (82.5-127)	96±9.5	98 (74-113.5)	**0.029**
Chest AP width (cm)	23±2.8	23.3 (16-28)	21.2±2.2	20.5 (17.5-26.5)	**0.001**

Table 4. Age-related differences in shoulder impingement, involvement of the biceps brachii muscle, and supraspinatus tear

	<45	**45-55ı**	**56-65**	**>65**	**Chi-square test**	**P value**
Suprasupinatus muscle						
Partial tear	5 (71.4)[a]	8 (50)[ab]	3 (20)[b]	4 (23.5)[b]	χ^2=7.951	0.047
Full thickness tear	2 (28.6)	8 (50)	12 (80)	13 (76.5)		
Biceps brachii involvement						
No	6 (75)	14 (82.4)	11 (68.8)	12 (66.7)	χ^2=1.28	0.734
Yes	2 (25)	3 (17.6)	5 (31.3)	6 (33.3)		
Shoulder impingement						
No	2 (25)	7 (41.2)	9 (56.3)	10 (58.8)	χ^2=3.244	0.356
Yes	6 (75)	10 (58.8)	7 (43.8)	7 (41.2)		

Table 5. Changes in shoulder functional score and NJM before and after treatment

	Pre-treatment	**Post-treatment**		
	Mean±SD	**Mean±SD**	**Test value**	**P value**
VAS-resting	4.6±3.3	4±3.4	Z=-2.854	**0.004**
VAS-activity	6.8±2.8	5.7±3	Z=-3.946	**<0.001**
Quick DASH	54.6±24.1	47.7±25.2	Z=-3.976	**<0.001**
WORC	1111.7±517.4	960.2±548.9	Z=-4.725	**<0.001**
SPADI	57.8±25.6	51±27.7	Z=-4.005	**<0.001**
Flexion	115.9±39	122.6±38.6	Z=-3.686	**<0.001**
Extension	50.7±13.3	52.3±13	Z=-2.307	**0.021**
Abduction	91.4±40.4	100.5±39.5	t=-4.477	**<0.001**
Internal rotation	37.6±18.2	42.5±22.1	t=-3.797	**<0.001**
External rotation	50.4±24.0	55.3±23.5	Z=-3.616	**<0.001**

Z: Wilcoxon test value; t: Paired t-test value

DOI: 10.5455/medscience.2023.07.117

Table 6. Comparison of BMI and shoulder functional assessment scores by gender before and after treatment

	Male		Female		Test value	p value
	Mean±SD	Median (min-max)	Mean±SD	Median (min-max)		
BMI	27.7±2.7	27.7 (22.5-32.8)	30.3±4.5	30.5 (18.7-41.2)	t=-3.225	**0.002**
VAS-rest PRE	4.1±3.3	4 (0-10)	5.1±3.3	5 (0-10)	U=722	0.147
VAS-rest POST	3.4±3.5	3 (0-10)	4.5±3.4	5 (0-10)	U=718	0.135
VAS-actıv PRE	6.2±2.6	6 (0-10)	7.3±2.9	8 (0-10)	U=652.5	**0.038**
VAS-actıv post	5.3±3	6 (0-10)	6.1±3.1	6 (0-10)	U=741.5	0.207
Quick DASH PRE	49.8±25.4	50 (4.5-90.9)	59.1±22.2	59.1 (0-97.7)	U=682	0.074
Quick DASH POST	43.2±25	45 (0-90.9)	52.1±25	55 (0-97.7)	U=696.5	0.098
WORC pre	1073.6±517.5	1145 (140-2030)	1148±520.7	1209 (0-1872)	t=-0.657	0.513
WORC post	915.1±561.2	920 (0-2070)	1003.3±540.1	1101 (0-1771)	t=-0.734	0.465
SPADI pre	52.5±24.5	50.8 (6.2-100)	63±25.9	68.5 (0-99.2)	U=644	**0.034**
SPADI post	46.2±27.2	45.4 (0-100)	55.5±27.7	62.3 (0-97.7)	U=716.5	0.140

Discussion

In our study, it was observed that most of the patients admitted with a diagnosis of RCT had an endomorphic mesomorph body type. As expected, significant differences were observed in some anthropometric measurements of male and female patients. Age was a prominent factor associated with RCT diagnosis. Significant improvement was observed in pain scales, shoulder function as well as ROM values after physiotherapy. Statistically significant differences were observed between genders only in post-treatment active VAS and pre-treatment SPADI.

Surgical indications for rotator cuff tears may vary according to surgeon and case, but in many cases, conservative treatment rather than surgery may be effective [17]. The physical therapy programs involved in conservative treatment can also help with the loss of shoulder strength and range of motion, which is among the reasons why surgery is indicated [18].

RCT has a progression from lesion to tendinopathy, then to partial tearing, and lastly to a full-thickness tear. Age is a significant risk factor. Injuries rise from 9.7% in individuals under the age of 20 to 62% in those aged 80 and up (with or without symptoms) [19]. In our study, individuals were separated into four groups and statistically assessed, taking into consideration their age. According to our findings, while the rate of supraspinatus full-thickness tear was lower in those under 45 years old, it increased in those 55 years old and older. According to studies, the size of the tear increases gradually with age, and the prognosis for recovery is better at younger ages [19-21]. In this regard, our age data were consistent with the findings in the literature.

Anatomical variances in the bone skeleton can cause significant changes in the shoulder muscle moment arms, increasing the risk of clinical joint instability after a severe rotator cuff rupture [22]. In light of this, we decided to eliminate anatomical variations such as type III acromion from the study.

Several intrinsic risk factors for RCT exist, such as age and scapular morphological abnormalities. According to our findings, the majority of RCT patients have a body type with a dominating mesomorphic feature, regardless of gender. In this study, we showed that the somatotypes of RCT patients are not influenced by gender. We did not find a study that searched the association between somatotype and RCT in the literature, however there are studies that examined the connection between obesity, BMI, and RCT. Obesity has been shown in a study of RCT patients to have a negative impact on functional results and to lengthen hospital stays [7]. The size of the tear was also considerably influenced by obesity and a high body fat ratio, according to a retrospective study [6]. Based on our findings, we determined that three out of every four RCT patients (76%) had an endomorphic-mesomorphic body type. Although our study revealed that mesomorphic body type may be an intrinsic risk factor for the development of RCT, advancing age is a more dominant factor for RCT.

According to studies, RCT develops more frequently in the dominant shoulder in general [23-24]. However, despite the fact that studies in the literature often discuss the prevalence of RCT in the dominant arm, based on the available data, we can not conclude that dominance is the major component in the development of CT since the impact rates of the dominant and non-dominant arms were similar in our study.

Individual professions have been identified as a risk factor in the development of RCT in certain research [25,26]. The fact that the women in our study are mostly housewives, although the men's occupations are highly diverse, does not provide insight into the influence of RCT on the work performed. However, if we pay attention to the involvement of the non-dominant arm in about 33% in our study, we think that the effect of regular activity in the establishment of RCT is not as large as assumed. It should be noted that the risk factor derived from the occupation is lower than other risk factors in the development of RCT.

DOI: 10.5455/medscience.2023.07.117

In a cadaver study, 306 cadavers ranging in age from 26 to 95 were studied. The study found that 32% of cadavers had partial tears and 19.9% had full-thickness tears [27]. In our study, 63.6% of all patients had a full-thickness tear in the supraspinatus muscle, and 27.1% had involvement of the biceps brachii muscle's long head.

The area where supraspinatus muscle connects to the humerus has inadequate vascularity. The collagen structure of the tendon deteriorates in this area, also known as the avascular region. Yet, conflicting views in the literature claim that RCT is characterized by a lack of vascularity [28-29]. The tensile and torsional forces that are always present in the tendon because of the development of tears in this region are hypothesized to have a corrosive impact [27]. Although the area's avascular structure does not induce ripping, it can be a significant element in avascularity since it inhibits healing.

Ageing and other chronic conditions, such as concurrent diabetes, exacerbate the damage. Concurrent chronic disorders have been linked to greater tendon damage, disrupting the healing cycle [30].

In other research on patients with shoulder pain, no RCT results were seen in the majority of radiographs studied. Radiographs showing RCT findings, on the other hand, revealed that the cases were largely asymptomatic [31]. More than half of asymptomatic rotator cuff tears become symptomatic in less than three years, according to studies [21]. Researchers are still baffled by the link between RCT and the development of symptoms [32]. Yet, the widespread consensus is that the symptoms are caused by the tear's growth [5]. According to the findings of our investigation, while the extent of the tear increases with age, the impingement status decreases. This corresponds to asymptomatic RCT situations described in the literature. The presence of impingement, in our opinion, is intimately related to the clinical picture.

High BMI values have been linked to difficulties in feeding and tendon repair in studies [25]. However, compelling data are lacking in the literature to recognize BMI as a risk factor for RCT (24). In our study, male patients had a BMI of 27.7 and female patients had a BMI of 30.3. The average BMI we found was in the 25.1-30 (overweight) range, which was comparable with the typical values found in the literature [33]. The gender distribution of the patients in our study was quite homogeneous, and the full-thickness tear and partial tear BMI values analyzed did not yield any results for BMI.

A large-scale case study including 5000 RCT patients was conducted. In this study, the average age of the patients was 55, whereas in our study, the average age was 57. Carpal tunnel syndrome, lateral epicondylitis, Achilles tendinitis, oral corticosteroid use, diabetes mellitus, and trigger finger were all identified as major co-morbid conditions with RCT [33]. Another study investigated 270 RCT patients over the age of 70, and an average of 58.8% of these patients had hypertension, 21.5% had diabetes, and 7.5% had thyroid gland problems [34]. Diabetes and smoking were identified as risk factors in full-thickness RCTs in a study of asymptomatic RCTs [35]. In our study, 53.3% of the patients had cardiovascular illness, 41.3% had digestive difficulties, 25% had diabetes, and 24% had musculoskeletal disorders. Cardiovascular disease could be a risk factor for RCT.

According to research conducted at various times in the literature, women have higher RCT than men [36-37]. In our investigation, however, we found a contrary result. The number of RCT patients in our study was roughly equal across men and women. Our findings corroborated previous research indicating that gender was not a risk factor [24,33].

In our study, pain was assessed using the VAS scores of patients before and after physical therapy. Similarly, shoulder functional states were collected through subjective survey scores that examined shoulder functional skills using WORC, SPADI, and Quick-DASH. All patients' ROM levels before physical therapy improved, as did their shoulder functional questionnaire scores. Ginn and Cohen found in a research that conservative treatment reduced the occurrence of discomfort in patients with shoulder pain [38]. Despite being symptomatic, patients in a study of 24 individuals with full-thickness tears with an average age of 52 years did not accept surgical therapy and instead underwent conservative treatment. No change in the size of the tear was found after the patients were monitored for 3.5 years, and it was stated that they benefited from conservative treatment [39]. Even with RCT, when surgical repair is impossible, conservative treatment may be recommended in the first instance [40]. Physical therapy for RCT patients has been found to be beneficial to the patients as a result.

As a result of the COVID-19 pandemic, various practices such as reorganization of health institutions, curfews, and the fact that patients do not want to participate because they are afraid of catching coronavirus in the hospital environment or during transportation, as well as difficulties in maintaining treatment, can be listed as factors that limit the study. We believe that expanding the number of participants and diversity will help us understand the mechanics of rotator cuff injuries and the role of physiotherapy in treatment.

Conclusion

In conclusion, it was found in our study that mesomorph-weighted somatotype may be a risk factor for RCT, and that advancing age is a dominant factor in the development of RCT. Gender was found to have no effect on RCT development. The rate of full-thickness tearing observed on the non-dominant side was remarkable. Physical therapy was also found to be helpful in all patients with full-thickness and partial tears, which is consistent with previous research. Considering the growing prevalence of orthopedic problems in the aging population, we underline the importance of physical therapy in the treatment of conditions such as rotator cuff injuries. We think that the recognition of a mesomorph somatotype as a risk factor can be exploited to protect people's health status by making a significant contribution to the field of preventive medicine.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
Malatya Health Sciences Non-Interventional Clinical Research Ethics Committee granted the required ethics committee authorization for the study, with decisions numbered 2019/21 and 59.

Acknowledgements
We would like to thank Dr. Barış Erbil, Dr. Ceyda Akçi Karadağ and Dr. Recep İsmail Akın for their invaluable contributions to our research.

References

1. Anatomy, Rotator Cuff. https://www.ncbi.nlm.nih.gov/books/NBK441844/ access date: 22.07.2023.
2. Donatelli RA. Etiology and evaluation of rotator cuff pathologic conditions and rehabilitation. In: Physical therapy of the shoulder. 5th edition. Elsevier Churchill Livingstone, St. Louis, Missouri, 2011;245-66.
3. Weber S, Chahal J. Management of rotator cuff injuries. J Am Acad Orthop Surg. 2020;28:e193-e201.
4. Longo UG, Risi Ambrogioni L, Berton A, et al. Physical therapy and precision rehabilitation in shoulder rotator cuff disease. Int Orthop. 2020;44:893-903.
5. Mall NA, Kim HM, Keener JD, et al. Symptomatic progression of asymptomatic rotator cuff tears: a prospective study of clinical and sonographic variables. J Bone Joint Surg Am. 2010;92:2623-33.
6. Gumina S, Candela V, Passaretti D, et al. The association between body fat and rotator cuff tear: the influence on rotator cuff tear sizes. J Shoulder Elbow Surg. 2014;23:1669-74.
7. Warrender WJ, Brown OL, Abboud JA. Outcomes of arthroscopic rotator cuff repairs in obese patients. J Shoulder Elbow Surg. 2011;20:961-7.
8. Akın G, Tekdemir İ, Gültekin T, et al. Antropometri tekniği. In: Antropometri ve spor. 2nd edition. Alter Yayıncılık, Ankara, 2013;67-81.
9. Norton K, Olds T. Measurement techniques in anthropometry. In: Anthropometrica: a textbook of body measurement for sports and health courses. 1st edition. UNSW Press, Sydney, 1996;25-73.
10. Norton K, Olds T. Capter 6 somatotyping. In: Anthropometrica: a textbook of body measurement for sports and health courses. 1st edition. UNSW Press, Sydney, 1996;147-187.
11. Boone DC, Azen SP. Normal range of motion of joints in male subjects. J Bone Joint Surg. 1979;61:756-9.
12. El O, Bircan C, Gulbahar S, et al. The reliability and validity of the Turkish version of the western ontario rotator cuff index. Rheumatol Int. 2006;26:1101-8.
13. Hoang-Kim A, Pegreffi F, Moroni A, Ladd A. Measuring wrist and hand function: common scales and checklists. Injury. 2011;42:253-8.
14. Roach KE, Budiman-Mak E, Songsiridej N, Lertratanakul Y. Development of a shoulder pain and disability index. Arthritis Rheumatol. 1991;4:143-9.
15. Ergun N, Baltacı G. Spor yaralanmalarında fizyoterapi-rehabilitasyon. In: Spor yaralanmalarında fizyoterapi ve rehabilitasyon prensipleri. 6th edition. Sözkesen Matbaacılık, Ankara, 2018;171-231.
16. Cakmak A. Conservative treatment of subacromial impingement syndrome. Acta Orthop Traumatol Turc. 2003;37:112-8.
17. Schmidt CC, Jarrett CD, Brown BT. Management of rotator cuff tears. J Hand Surg Am. 2015;40:399-408.
18. Osborne JD, Gowda AL, Wiater B, Wiater JM. Rotator cuff rehabilitation: current theories and practice. Phys Sportsmed. 2016;44:85-92.
19. Codding JL, Keener JD. Natural history of degenerative rotator cuff tears. Curr Rev Musculoskelet Med. 2018;11:77-85.
20. Gumina S, Arceri V, Carbone S, et al. The association between arterial hypertension and rotator cuff tear: the influence on rotator cuff tear sizes. J Shoulder Elbow Surg. 2013;22:229-32.
21. Yamaguchi K, Ditsios K, Middleton WD, et al. The demographic and morphological features of rotator cuff disease. A comparison of asymptomatic and symptomatic shoulders. J Bone Joint Surg. 2006;88:1699-704.
22. Viehöfer AF, Gerber C, Favre P, et al. A larger critical shoulder angle requires more rotator cuff activity to preserve joint stability. J Orthop Res. 2016;34:961-8.
23. Gumina S, Passaretti D, Candela V. History of shoulder pain and rotator cuff pathology. In: Rotator cuff tear: pathogenesis, evaluation and treatment. 1st edition. Springer, Cham, 2016; 3-23.
24. Sayampanathan AA, Andrew TH. Systematic review on risk factors of rotator cuff tears. J Orthop Res (Hong Kong). 2017; 25:2309499016684318.
25. Dalbøge A, Frost P, Andersen JH, Svendsen SW. Surgery for subacromial impingement syndrome in relation to occupational exposures, lifestyle factors and diabetes mellitus: a nationwide nested case–control study. Occup Environ Med. 2017;74:728-36.
26. Loew M, Doustdar S, Drath C, et al. Could long-term overhead load in painters be associated with rotator cuff lesions?. A pilot study. Plos One. 2019;14:e0213824. Erratum in: PLoS One. 2019;14:e0218484.
27. Löhr JF, Uhthoff HK. Epidemiology and pathophysiology of rotator cuff tears. Orthopäde. 2007;36:788-95.
28. Levy O, Relwani J, Zaman T, et al. Measurement of blood flow in the rotator cuff using laser doppler flowmetry. J Bone Joint Surg Br. 2008;90:893-8.
29. Rudzki JR, Adler RS, Warren RF, et al. Contrast-enhanced ultrasound characterization of the vascularity of the rotator cuff tendon: Age- and activity-related changes in the intact asymptomatic rotator cuff. J Shoulder Elbow Surg. 2008;17:S96-S100.
30. Okur SÇ, Circi E. Ultrasonographic evaluation of shoulder in patients with diabetes mellitus. Bezmialem Sci. 2019;7:8-11.
31. Dunn WR, Kuhn JE, Sanders R, et al. Symptoms of pain do not correlate with rotator cuff tear severity: a cross-sectional study of 393 patients with a symptomatic atraumatic full-thickness rotator cuff tear. J Bone Joint Surg Am. 2014;96:793-800.
32. Moosmayer S, Tariq R, Stiris MG, Smith H-J. MRI of symptomatic and asymptomatic full-thickness rotator cuff tears: a comparison of findings in 100 subjects. Acta Orthop. 2010;81:361-6.
33. Titchener AG, White JJ, Hinchliffe SR, et al. Comorbidities in rotator cuff disease: a case-control study. J Shoulder Elbow Surg. 2014;23:1282-8.
34. Shim SB, Jeong JY, Kim JS, Yoo JC. Evaluation of risk factors for irreparable rotator cuff tear in patients older than age 70 including evaluation of radiologic factors of the shoulder. J Shoulder Elbow Surg. 2018;27:1932-8.

DOI: 10.5455/medscience.2023.07.117

35. Jeong J, Shin D-C, Kim T-H, Kim K. Prevalence of asymptomatic rotator cuff tear and their related factors in the korean population. J Shoulder Elbow Surg. 2017;26:30-5.

36. Frassanito P, Cavalieri C, Maestri R, Felicetti G. Effectiveness of extracorporeal shock wave therapy and kinesio taping in calcific tendinopathy of the shoulder: a randomized controlled trial. Eur J Phys Rehabil Med. 2017;54:333-40.

37. Mouzopoulos G, Stamatakos M, Mouzopoulos D, Tzurbakis M. Extracorporeal shock wave treatment for shoulder calcific tendonitis: a systematic review. Skelet Radiol. 2007;36:803-11.

38. Ginn KA, Cohen ML. Conservative treatment for shoulder pain: prognostic indicators of outcome. Arch Phys Med Rehabil. 2004;85:1231-5.

39. Fucentese SF, Andreas L, Pfirrmann CW, et al. Evolution of nonoperatively treated symptomatic isolated full-thickness supraspinatus tears. J Bone Joint Surg. 2012;94:801-8.

40. Zingg P, Jost B, Sukthankar A, et al. Clinical and structural outcomes of nonoperative management of massive rotator cuff tears. J Bone Joint Surg. 2007;89:1928-34.