ATATÜRK ÜNİVERSİTESİ YAYINLARI
ATATURK UNIVERSITY PUBLICATIONS

Research Article *Araştırma Makalesi* DOI: 10.62425/rses.1493631

Changes in Physical Fitness Parameters with Increasing Age

Fiziksel Uygunluk Parametrelerinin Yaşla Beraber Değişimi

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ABSTRACT

It is inevitable to see changes in physical fitness parameters with age. This study compares the physical fitness parameters, body composition, laxity, balance, proprioception, and muscle strength between different age groups. The study comprised 44 healthy individuals, divided into two age groups: 20-39 and 40-65. Body composition was measured with Tanita BC 418; balance was measured with a Biodex Biosway stabilometer device, and laxity was measured with a GNRB® knee arthrometer. The isokinetic system (Cybex NORM®, Humac, CA, USA) was used for strength and proprioception measurements. Anteroposterior, mediolateral, and overall stability index among the balance parameters between the two groups was significant. Among the groups, a statistically significant difference was observed in terms of body mass index (BMI), total body fat ratio, trunk fat ratio, and dominant leg fat ratio (p<.05). It was determined that individuals between the ages of 40-65 had higher BMI, total body fat ratio, trunk fat ratio, and dominant leg fat ratio compared to individuals between the ages of 20-39, and their postural stability was worse. There was no difference between the groups regarding laxity, proprioception, and muscle strength (p>.05). With increasing age, it is essential to be aware of the negatively changing body composition and deteriorating balance and encourage participation in physical activity and exercise to prevent physical fitness loss, especially from 40.

Keywords: Age, body composition, laxity, balance, proprioception, muscle strength

ÖZ

Yaşla birlikte fiziksel uygunluk parametrelerinde değişiklikler görülmesi kaçınılmazdır. Bu çalışma, farklı yaş grupları arasındaki fiziksel uygunluk parametrelerini, vücut kompozisyonunu, laksiteyi, dengeyi, propriyosepsiyon ve kas gücünü karşılaştırmaktadır. Araştırmaya 20-39 ve 40-65 yaş olmak üzere iki yaş grubuna ayrılan, sağlık durumu iyi olan 44 kişi katıldı. Vücut kompozisyonu, Tanita BC 418 ile; denge, Biodex Biosway stabilometre cihazı ile ölçüldü ve laksite GNRB® diz artrometresi ile ölçüldü. Kuvvet ve propriyosepsiyon ölçümleri için izokinetik sistem (Cybex NORM®, Humac, CA, ABD) kullanıldı. İki grup arasındaki denge parametreleri arasında ön-arka, mediolateral ve genel stabilite indeksi anlamlıydı. Gruplar arasında vücut kitle indeksi (BMI), toplam vücut yağ oranı, gövde yağ oranı ve dominant bacak yağ oranı açısından istatistiksel olarak anlamlı farklılık gözlendi (p<,05). 40-65 yaş arası bireylerin 20-39 yaş arası bireylere göre VKİ, toplam vücut yağ oranı, gövde yağ oranı ve dominant bacak yağ oranının daha yüksek olduğu ve postüral stabilitelerinin daha kötü olduğu belirlendi. Laksite, propriyosepsiyon ve kas kuvveti açısından gruplar arasında fark yoktu (p> ,05). Yaş ilerledikçe olumsuz yönde değişen vücut kompozisyonu ve bozulan dengenin farkında olmak ve bunları önlemek için özellikle 40'lı yaşlardan itibaren fiziksel aktivite ve egzersize katılımı teşvik etmek önemlidir.

Anahtar Kelimeler: Yaş, vücut kompozisyonu, laksite, denge, propriyosepsiyon, kas kuvveti

Geliş Tarihi/Received	31.05.2024
Kabul Tarihi/Accepted	03.09.2024
Yayın Tarihi/Publication Date	25.09.2024

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Cite this article: Akaras, E., Çobanoğlu, G., Keklik, S.S., Gökdoğan, Ç.M. Zorlular, A., Polat, E.A., Kafa, N & Güzel, N.A. (2024). Changes in physical fitness parameters with increasing age. *Research in Sport Education and Sciences, 26*(3), 88-97.

Introduction

Physical fitness encompasses the ability to engage in daily activities without fatigue, sustaining this capacity over a lifetime(GÜNAY et al., 2008). Therefore, physical fitness is closely related to both health and sportive performance. Health and performance will likely be affected by the inadequacy or deterioration of physical fitness parameters such as balance, muscle strength and endurance, and body composition.

Balance is the ability to maintain a steady position on a stable surface with minimal movement, as well as to perform tasks while sustaining this stability (Bressel et al., 2007). Coordination of afferent inputs from the visual, somatosensory, and vestibular systems is needed for balance regulation (Melo et al., 2020). Postural balance (control) depends on somatosensory information from muscle and joint proprioceptors, cutaneous sensory information describing surface features, vestibular information for head and trunk orientation in the cavity, gravity information from gravity receptors in the trunk, and sensory input from visual inputs (Viswanathan & Sudarsky, 2012). Postural balance control involves integrating sensory input with information from the musculoskeletal systems. Proprioception, cutaneous sensitivity, and muscle strength are essential to balance control. It has been reported that postural balance, one of the basic parameters of functional capacity, deteriorates with age (Era et al., 2006). With increasing age, changes in the proprioceptive system may cause changes in postural control (balance) (Anson et al., 2017). Previous study results showed that poor joint position sense with increasing age is associated with greater body oscillations (Lord et al., 1991). Proprioception is a crucial component of the somatosensory system and plays a vital role in movement control via sensory signals from proprioceptors in muscles, tendons, and joint capsules (Riemann & Lephart, 2002).

Adequate muscle strength to maintain functional mobility is also one of the essential parameters in adults. For this reason, the loss of muscle strength with increasing age has become an increasingly important research topic in recent years(Newman et al., 2003). It is stated that there will be a 15% reduction in muscle strength every ten years after the ’50s (Larsson, 1983). Kallman et al. emphasized that hand grip strength starts to decrease after the age of 40. Previous studies have shown that hand grip strength is also related to other physical fitness parameters. Taking this study as a reference, we divided the groups into two groups before and after 40 years of age.

Optimal alignment and stability of the joints are biomechanically essential to maintain joint integrity and indicate the degree of joint laxity. Results regarding the change in knee laxity with age are contradictory. While some study results indicate that knee laxity decreases with age (Zyroul et al., 2014), different studies have shown that knee laxity increases with increasing age(Noyes & Grood, 1976). These conflicting results are thought to be caused by gender, knee ligament injuries, hormonal conditions, chronic joint pain and degeneration, collagen tissue diseases, and several types of metabolic syndromes (Zyroul et al., 2014). For this reason, it is crucial to reveal the change in joint laxity in different age groups.

Body composition assessment is an essential tool for assessing the nutritional status and health of the population, particularly concerning the prevention and treatment of cardiometabolic diseases (Carvalho et al., 2019). In general, as individuals age, the percentage of body fat increases, and it is known that lean mass and bone mineral density decrease(St-Onge & Gallagher, 2010).

As individuals age, various physiological systems, including proprioception and laxity, undergo significant changes, impacting physical fitness parameters. Decreased proprioception increases the risk of falls and negatively affects joint biomechanics. As a result of changes in neuromuscular control and proprioception in the lower extremities, the balance of individuals weakens, and the possibility of damage as a result of falls increases. In this case, with the results of our study, it will be possible to determine the degree of loss of knee proprioception and laxity in addition to physical fitness with age in individuals and to recommend appropriate physical activity and exercise programs. Alternatively, it will be possible to recommend preventive programs to prevent significant losses. While it's established that fitness levels deteriorate with age, our study specifically focuses on comparing physical fitness parameters such as body composition, balance, proprioception, and muscle strength across different age groups. This comparative approach provides valuable insights into how these parameters change with age and offers evidence for developing targeted interventions to mitigate age-related declines. This approach highlights the early onset of physical fitness decline in individuals as young as 40, underscoring the importance of early intervention and targeted exercise programs to mitigate these effects. To the best of our knowledge, no studies in the literature investigate the changes in physical fitness parameters, knee proprioception, and laxity between 18-65 years of age. Therefore, this study aims to reveal differences in body composition, balance, proprioception, muscle strength, and laxity during aging in healthy individuals and differences between groups.

Methods

Participants

This research was conducted at Gazi University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Sports Health Unit. Healthy individuals (University employees of Caucasian origin and their relatives) between the ages of 20-65 (36 men and 8 women) who do not have regular exercise habits were included in the study, and they were divided into two groups: 20-39 years (25 people) and 40-65 years (19 people). All participants signed informed consent forms, and permission was obtained from the ethics committee of Gazi University (December 09, 2013, decision number: 241). The participant's physical activity levels between the ages of 20-65 were evaluated with the IPAQ short form. Sedentary participants whose physical activity was less than 3000 MET, min./week, were included in the study. The study excluded individuals with neurological or rheumatic conditions, as well as those experiencing balance issues (such as vestibular problems or diabetic foot syndrome), recent lower extremity surgery, more than three units of pain according to the visual analog scale, pregnancy or within one year postpartum, and professional athletes. Regular drug users and individuals with chronic diseases were not included in the study. We contacted the volunteers to participate in the study using snowball sampling.

Procedures

Bodyweight, total fat percentage, body mass index (BMI), individual muscle mass, and fat percentage of lower extremities were evaluated by a segmental body composition analysis scale (Tanita Corp, Tokyo, Japan). Prior to measurement, participants were instructed to abstain from alcohol for at least 24 hours, avoid vigorous exercise for at least 12 hours, refrain from eating or drinking for 3 hours, and empty their bladder immediately before measurement(Kutáč, 2015). Participants' age, gender, height, and clothing weight information were entered into the device, and the individuals were asked to climb on to the platform with bare feet and grasp the handpieces of the device (Kelly & Metcalfe, 2012). The measurement was taken while remaining firmly and comfortably on the device for approximately 10 seconds. After this measurement, BMI, whole-body fat ratio, body fat ratio, muscle mass, dominant leg fat ratio, and muscle mass values were recorded.

The strength of the knee muscles was evaluated with an isokinetic dynamometer (Cybex NORM®, Humac, CA, USA). For measurements, subjects were seated with their hips at 90° of flexion. The dynamometer's rotation axis aligned with the knee joint's anatomical axis (lateral femoral condyle)(Arikan et al., 2021). Concentric strength evaluation of quadriceps femoris and hamstring muscles was performed in the 0-90° knee flexion range at a speed of 60° / sec. The tests were started from the 90° knee flexion position. Submaximal three repetitions were performed before the test for warming. After a minute of rest, five maximal test repetitions were performed (Arikan et al., 2021). Peak torque/body weight values and hamstring/quadriceps muscle strength ratio (H / Q ratio) were recorded for the hamstring and quadriceps muscles of the dominant limb.

Proprioception was evaluated by an active joint reposition test using an isokinetic system (Cybex NORM®, Humac, CA, USA). Subjects were placed in a suitable position where strength assessments were made. The subjects were asked to knee extension from the starting position for the dominant leg (90° knee flexion) until the patient reached the target angle of 60°. After waiting 5 seconds in this position, he returned to his starting position. After the target angle was felt three times, individuals were asked to find the target angle they felt five times (Suner-Keklik et al., 2017).

The participants ' static balances were evaluated using the Biodex BioSway Balance System. Participants were asked to maintain their balance for 20 seconds while standing on the dominant side; 3 measurements were taken after a trial test. Overall stability index (OSI), anteroposterior stability index (APSI), and mediolateral stability index (MLSI) scores were obtained. These scores express the deviation between the participant's center of gravity and the center of the firm surface. Low scores indicate less deviation and good postural stability(Hinman, 2000).

The laxity of the ACL was evaluated with a GNRB® (GeNouRoB SAS, Montenay, France) knee arthrometer at 20 degrees of knee flexion in the Lachman test position. The measurements were made in the supine position. Before the measurement, the information of the individuals (name, date of birth, dominant extremity) was recorded in the system. The back of the treatment table was adjusted with a 30-degree tilt. The anterior tibial tubercle and the inferior of the patella were palpated and marked. The participant's extremity was placed in the device in neutral rotation. The marked inferior of the patella was parallel to the line that should be in the knee apparatus of the device. The limb was fixed at the ankle and patella. The device sensor, which records the amount of displacement of the anterior tibial tubercle relative to the femur, was inserted into the anterior tibial tubercle. Measurements were made three times at a force of 200 N. The average displacement amount of the tibial tubercle in 3 measurements made at 200 N on the dominant side was calculated (Robert et al., 2009).

Statistical analysis

Sample size calculation was done using the G * Power 3.1 program (post-hoc power calculation). According to the power analysis, the study's sample size was estimated at 83%, with a 0.05 margin of error, using the data from Jia's study(Jia & Lubetkin, 2005).

Results

Thirty-six males, eight females, and a total of 44 people between the ages of 20-65 were evaluated. The demographic information of the participants is given in Table 1.

Table 1.

Demographic values of participants

	Male (n=36) (X±SD)	**95% CI**	**Female (n=8) (X±SD)**	**95% CI**	***p***
Age (year)	38.36 ±14.63	33.58 ± 43.14	36.67 ±10.94	32.38, 40.95	.668
Height (cm)	176.64 ±6.00	174.68 ± 178.60	166.50 ±4.99	164.54, 168.45	**.012***
Weight (kg)	71.64 ±14.02	67.06 ± 76.22	83.73 ±11.29	79.30, 88.15	**.001***
BMI (kg/m²)	26.84 ± 3.50	25.69 ± 27.98	25.98± 5.77	23.71, 28.24	.581

BMI: Body Mass Index, * p<0.05

Significant moderately positive correlations were observed between age and various parameters. These included whole body fat ratio, trunk fat ratio, and dominant leg fat ratio (p < 0.05). Additionally, moderate positive correlations were found between age and anterior-posterior stability index, medial-lateral stability index, and overall stability index (p < 0.05), as detailed in (Table 2).

Table 2.
Age correlation with body composition, laxity, balance, proprioception, and muscle strength

		Whole body fat ratio (%)	Trunk fat ratio (%)	Trunk muscle mass (kg)	D.Leg Fat ratio (%)	D.Leg Muscle mass (kg)	Laxity (mm)	APSI	MLSI	OSI	Knee Proprio-ception (º)	Quadriceps Concentric PT/BW (N /kg)	Hamstring Concentric PT/BW (N/kg)	H/Q ratio (%)
Age	r	0.55	0.55	-0.01	0.45	-0.01	-0.20	0.54	0.41	0.44	-0.18	-0.21	-0.24	-0.17
	p	**.001***	**.001***	.94	**.001***	.96	.18	**.001***	**.006***	**.002***	.22	.17	.11	.26

* *p*<0.05, APSI: Anterior-Posterior Stability Index, MLSI: Medio-Lateral Stability Index, OSI: Overall Stability Index, PT/BW: Peak torque/body weight, H / Q ratio: Hamstring /Quadriceps Ratio, D: Dominant

When the two groups were compared, it was observed that total body fat ratio, trunk fat ratio, and dominant leg fat ratio of participants between the ages of 40-65 were statistically significantly higher than those aged 20-39 (*p*<.05, Table 3). Other parameters (trunk muscle mass and dominant leg muscle mass) related to body composition were found to be similar in the two groups (*p*>.05, Table 2).

A statistically significant difference was observed in the balance measurements between the two groups in APSI, MLSI, and OSI parameters (*p*<.05, Table 3). The postural stability of participants between 40 and 65 was worse than the 20 to 39 age group. There was no statistically significant difference between the two groups in laxity and proprioception (*p*>.05, Table 3). The two groups had no statistically significant difference in muscle strength measurements regarding hamstring, quadriceps muscle strength and H / Q ratio (*p*> .05, Table 3).

Table 3.
Comparison of the group's body composition, laxity, balance, proprioception, and muscle strength

	20-39 age (n=25) (21m, 4f) (x±SD)	**40-65 age (n=19) (15m, 4f) (x±SD)**	***p***	**T**	**Effect size (d)**
Whole body fat ratio (%)	20.16± 8.28	25.92± 5.71	**.013***	-2.596	**0.80**
Trunk fat ratio (%)	20.68± 8.13	26.80± 4.74	**.003***	-3.124	**0.91**
Trunk muscle mass (kg)	32.84± 5.19	33.67± 4.17	.559	-.590	0.17
Dominant leg fat ratio (%)	18.95± 9.45	30.64± 36.32	**.038***	-1.546	**0.44**
Dominant leg muscle mass (kg)	10.35± 1.60	10.57± 0.66	.510	-0.612	1.40
BMI	25.51±4.24	28.21±2.95	**.022**	-2.378	0.73
Knee laxity (mm)	5.51± 1.19	5.17± 1.20	.357	0.932	0.28
APSI (stability index)	0.87± 0.49	1.30± 0.53	**.001***	-2.788	**0.84**
MLSI (stability index)	0.48±0.27	0.67± 0.27	**.008***	-2.227	**0.70**
OSI (stability index)	1.06± 0.58	1.40± 0.47	**.011***	-2.052	**0.64**
Knee proprioception (º)	3.86± 2.77	3.78± 3.38	.291	0.083	0.02
Quadriceps concentric PT/BW (N /kg)	161.40± 55.28	151.98±36.86	0,525	0.641	0.20
Hamstring concentric PT/BW (N/kg)	83.60± 33.24	77.02± 25.64	0,479	0.715	0.22
H/Q ratio (%)	0.52±0.12	0.50±0.11	0,632	0.483	0.17

* *p*<.05, APSI: Anterior-Posterior Stability İndex, MLSI: Medio-Lateral Stability Index, OSI: Overall Stability İndex, PT/BW: Peak torque/body weight, H / Q ratio: Hamstring /Quadriceps Ratio

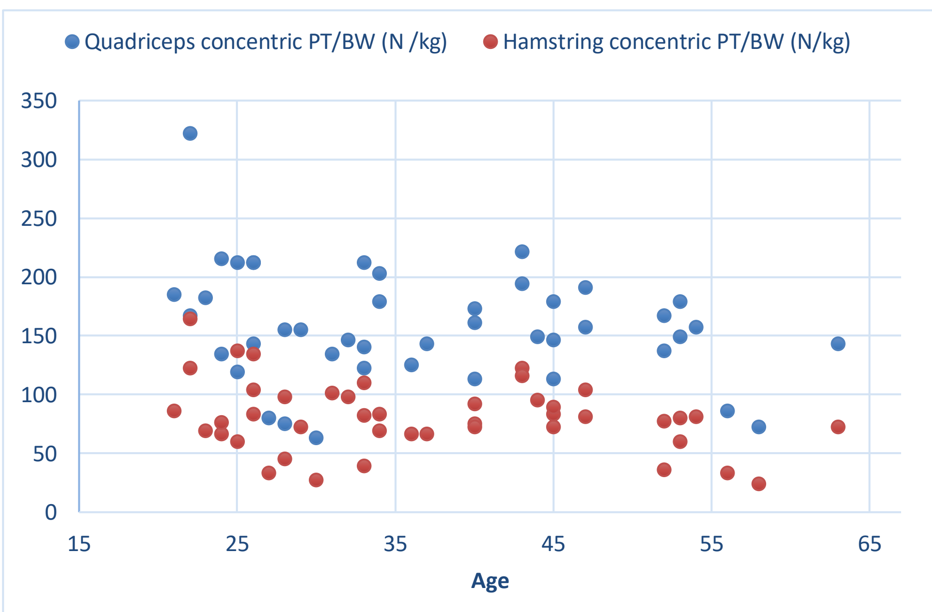

Figure 1. Distribution of changes in concentric muscle strength with age

The graph above shows the distribution of isokinetic quadriceps and hamstring muscle strength with age. (Figure 1)

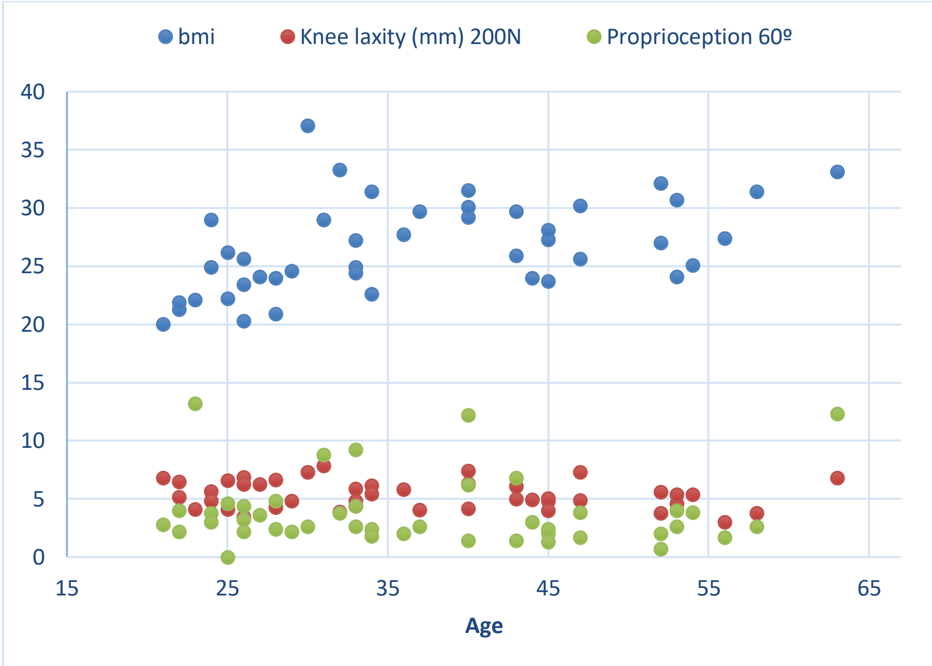

Figure 2. Distribution of changes in BMI, knee laxity and proprioception with age

The graph above shows the distribution of BMI, knee laxity (mm) 200N, and proprioception 60^{0} with age. (Figure 2)

Discussion

This study compared body composition, laxity, balance, proprioception, and muscle strength in healthy individuals of different age groups. It was determined that participants between the ages of 40-65 had deterioration in body composition and balance compared to the younger group.

Body composition is considered a health-related physical fitness parameter among the physical fitness parameters. Following up on body composition is imperative because it is associated with many metabolic diseases. Since it is not practical to determine body fat clinically, the normal aging process and high body weight may cause the rising incidence of obesity with aging and the corresponding low quality of life (Banks et al., 2006). Supportively, it was observed in our study that the BMI values of individuals between the ages of 40-65 were higher than those between the ages of 20-39. However, BMI may not be a sufficient parameter in body composition evaluations. There is also evidence that abdominal obesity is more critical in physical health outcomes than BMI values(Vogelzangs et al., 2008).

The aging process leads to significant changes in body composition. While fat distribution is generally more balanced at a young age, fat tissue shifts to the abdominal region as age progresses (Zamboni et al., 2014). This situation becomes more pronounced in women during the postmenopausal period and in men with the decrease in testosterone levels (JafariNasabian et al., 2017). In addition, the decrease in basal metabolic rate and decreased physical activity also contribute to the increase in body fat percentage. In addition, it has been previously shown that abdominal obesity is associated with mortality. Our study found that the body fat percentages, trunk fat ratio especially the total body and dominant leg fat ratio, of individuals in the 40-65 age group were higher than those in the 20-40 age group. The dominant leg fat percentage increase may be associated with decreased leg muscle mass and increased adipose tissue with age (Koster et.al., 2011) Decreased physical activity levels and the replacement of muscle mass with adipose tissue generally explain this. Also, a 1% increase in fat percentage was observed in men throughout life, and an increase in fat mass was observed in women until the age of 60-70, after which it decreased (Kuk et al., 2009). These results show that changes in body fat ratio with aging are related to factors such as sedentary lifestyle, changes in eating habits and decreased metabolic rate (Arterburn et al., 2004).

Physiological knee laxity, defining the natural knee laxity of symptomatic and non-traumatic individuals, is complex due to the knee joint's various anatomical features. Combined anterior and rotational laxity measurements enable the characterization of knee laxity profiles in healthy individuals. As a result of the hypermobility caused by the decrease in the width of the collagen tissue and the increase in the irregular fiber ratio, the tendency to traumatic lesions increases, and the tone of the body's elastic tissue decreases(Russek, 2000). Unstable joints are accompanied by loss of strength in soft tissues, laxity, loss of proprioception, a tendency to injury, and immobility due to pain(Maillard & Murray, 2003). It has been observed that knee laxity decreases after 55 in men and women. As we age, increasing stiffness in the knee ligaments is thought to cause this condition(Zyroul et al., 2014). Our study found no significant difference in laxity values in different age groups. The reason may be the extensive age range in the groups and the small number of cases above 55, where the difference began to occur.

Muscle strength and function impairment are inevitable consequences of normal aging. It may be associated with an increased risk of falls, hip fractures, loss of bone mineral density, functional limitations, and restrictions in participation in the activity. Naturally, losses in muscle strength cause a decrease in functional capacity and an increased risk of possible injury(Zhang & Buhr, 2002). Kim et al. stated that there are significant differences between young and middle-aged individuals when muscle strength is normalized in the isokinetic system. Flexor muscles are weaker in middle-aged individuals than extensor muscles(Kim et al., 2010). However, no statistically significant difference was found in the peak torques of the dominant side extensor and flexor muscles between the two groups. However, the strength values of the individuals in the 40-65 age group were lower than the other group. It was also observed that the H / Q ratio was similar in both groups. It is suggested that the H / Q ratio should be more than 0.6 when measured at a speed of 60º / sec in the isokinetic system(Kocahan et al., 2018). However, it was found that the H / Q ratios of the individuals in both groups were lower than the normative values. Therefore, giving exercises to normalize the H / Q ratio in both groups is essential in reducing the risk of injury. The consistently low results across both age groups relative to their respective norms may stem from the sedentary lifestyles prevalent among younger individuals.

Proprioception is the ability to perceive the position, movement, and sense of the force of joints in the organism. Neuromuscular control of the lower extremity may change with increasing age and possible loss of proprioception due to impaired joint biomechanics. This situation may cause imbalance and a higher risk of falling. Appropriate physical activity can slow the age-related decline in proprioception (Ferlinc et al., 2019). Advanced age causes a decrease in proprioception at both the central and peripheral levels. A study comparing young and old individuals has shown that proprioception is reduced in older individuals compared to young people(Petrella et al., 1997). There was no significant difference in proprioception between the two groups, which we can describe as young and middle-aged, in our study. This study exclusively assessed individuals under 65, omitting those aged 65 and older whose physical fitness parameters typically become more pronounced. This exclusion might account for the observed outcomes.

The literature has extensively evaluated the effect of age-related changes in sensorimotor function on increased postural sway (Peterka, 2002). Factors associated with increased release include decreased lower limb calf muscle strength, decreased peripheral sensation, poor vision, and slow reaction time (Hughes et al., 1996). It has been reported that the relationship between vestibular function and postural sway is relatively less than other factors. Although it is unclear how much one input can compensate for the loss of another, there is some evidence that peripheral sensation is the most important sensory system in regulating standing balance in older adults(Lord & St George, 2003). Therefore, having problems in postural stability is one indicator of sensory loss and general loss of function. As a result of our study, it was observed that individuals between the ages of 40 and 65 had worse static balance than those between the ages of 20 and 39. Although studies in the literature show that the balance is impaired in elderly individuals, it was found that there are disturbances in static balance in middle-aged individuals compared to younger individuals. Balance differences can be seen in this age group, and exercises that improve balance should be given to older people and middle-aged individuals to prevent falls and injuries.

The common conclusion in research on the elderly is that cognitive-motor reactions often slow as people age. Therefore, a reduction in postural stability may be significantly influenced by increased slowness in processing information from the vestibular, ocular, and somatosensory systems. Specifically, keeping an upright posture in dynamic settings seems primarily dependent on diminishing strength, balance, and coordination (Skelton & Dinan-Young, 2008). With age and inactivity, these unconscious processes (balance and coordination) may not integrate as well or as quickly as they did when the person was younger. Individuals who became sedentary in their 30s and 40s have worse responses to physical activity and balance training than individuals who became sedentary in their retirement years (Teasdale et al., 1991). Teasdale et al. stated that postural stability decreases as part of the normal aging process. Our study found a deterioration in balance parameters with age, similar to Teasdale's results.

Many studies have indicated that BMI has a linear relationship with age. However, few studies have examined period effects for age-stratified groups and how BMI distribution changes in different age strata. The increasing rightward skewness of the BMI distribution in high-income countries is well documented (Hayes et al., 2015). Our study also confirms that BMI increases with age.

The essential limitations of our study are that elderly individuals over 65 were not included in the study and that a comparison between genders could not be made due to the insufficient number of cases. Additionally, one of the limitations of our study is that women's menopausal status was not questioned, and we were unable to assess the physical fitness characteristics of flexibility and agility. Studies conducted so far investigating physical fitness with age have focused on one or two of these parameters. However, the fact that we did not investigate other parameters except flexibility and agility, as well as proprioception and laxity, is one of the strengths of our study.

Our research results showed that body composition and balance deteriorate after age 40. According to Paige et al., problems occurring in physical fitness parameters can typically be repaired or compensated for, but the capacity for plasticity and repair is also affected by age (Paige, 1992).

Individuals over 40 who apply to clinics should be given balance and coordination exercises and activity recommendations that will reduce fat content. In future studies, it is vital to investigate interventions for losses (balance and body composition) in individuals over 40.

Conclusion and Recommendations

In this study, healthy individuals in a broad age group were evaluated, and expected performance levels were determined as the therapeutic target of the disease. At the same time, muscle strength, joint position sense, and laxity, which affect the balance between all age groups and genders, were determined. Thus, the following decades collected data for healthier development and healthy aging. While aging, body composition, and balance deterioration were observed in this study. It is crucial to be aware of these changes in body composition and balance and encourage this group to participate in physical activity and exercise. More comprehensive studies that include elderly individuals over 65 and examine the interrelationships of parameters are needed.

Etik Komite Onayı: Bu çalışma için etik komite onayı Gazi Üniversitesi'nden (Tarih: 09 Aralık 2013, Karar No: 241) alınmıştır.
Katılımcı Onamı: Çalışmaya katılan tüm katılımcılardan yazılı onam alınmıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir-EA, NAG, NK; Tasarım-EA, NK, NAG; Denetleme-NK, NAG; Kaynaklar-EA, ÇMG; Veri Toplanması ve/veya İşlenmesi: iEA, SSK, ÇMG, GÇ, AZ; Analiz ve/ veya Yorum-ÇMG, EAP, SSK, GÇ; Literatür Taraması-ÇMG, GÇ, AZ, SSK,E AP; Yazıyı Yazan-EA, NK, NAG; Eleştirel İnceleme-NK, NAG
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmiştir.
Finansal Destek: Yazarlar, bu çalışma için finansal destek almadığını beyan etmiştir.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gazi University (Date: December 09, 2013, Decision Number: 241).
Informed Consent: Written consent was obtained from all the participants.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept –EA, NAG, NK; Design-EA, NK, NAG; Supervision-NK, NAG; Resources-EA, ÇMG; Data Collection and/or Processing-EA, SSK, ÇMG, GÇ, AZ; Analysis and/or Interpretation-ÇMG, EAP, SSK, GÇ; Literature Search- ÇMG, GÇ, AZ, SSK, EA; Writing Manuscript- EA, NK, NAG; Critical Review- NK, NAG; Other-
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: We would like to thank Gazi University Scientific Research Project Unit for its contribution.

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