# ÜNİVERSİTE ÖĞRENCİLERİNİN FİZİKSEL AKTİVİTELERİ, BESLENME ALIŞKANLIKLARI VE VÜCUT KOMPOZİSYONLARI ARASINDAKİ İLİŞKİNİN ARAŞTIRILMASI[1]

Ramiz ARABACI[2]
Salih ERDEN[2]
Nimet HAŞIL KORKMAZ[2]
Cemali ÇANKAYA[2]
Faruk KORKMAZ[2]

## ÖZET

Bu araştırmanın amacı üniversite öğrencilerinin fiziksel aktivitelerini adımsayar ile belirlemek ve fiziksel aktivite ile vücut kompozisyonu ve enerji tüketimi arasındaki ilişkisini incelemektir. Araştırmaya toplam 1113 kadın ve erkek üniversite öğrencisi katıldı. Deneklerin fiziksel aktiviteleri günlük adım sayısının adımsayar (Yamax PW610) ile ölçülmesi yöntemi uygulandı. Vücut kompozisyonu belirlenmesinde Bioimpedance yöntemi kullanıldı (Tanita BC-418MA). Araştırmaya katılan kadın ve erkek üniversite öğrencilerinin ortalama günlük adım sayıları sırasıyla 8020±3117 adım/gün ve 8652±3258 adım/gün olarak belirlendi. Kadın ve erkek üniversite öğrencilerinin sırasıyla günlük adım sayısı ile VKİ (r = -.115 ve -.129), SağBYY (r = -.110 ve -.131) ve SolBYY (r = -.119 ve -.103), arasında istatistiksel olarak negatif anlamlı ilişki bulunmaktadır. Günlük adım sayısı ile Enerji Tüketimi (r = .026 ve .022) arasında ise istatistiksel olarak anlamlı ilişki bulunmamaktadır. Sonuç olarak, üniversite öğrencilerinin fiziksel aktivite seviyeleri yetersiz ve erkek öğrencilerinin günlük adım sayıları kadınlara göre daha yüksek olduğu. Ayrıca günlük adım sayısı ile vücut yağ yüzdesi arasında negatif ilişki bulunmaktadır.

**Anahtar sözcükler:** yürüyüş, vücut kompozisyonu, enerji tüketimi, adımsayar

# RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, NUTRITION HABITS AND BODY COMPOSITION OF UNIVERSITY STUDENTS

## ABSTRACT

The aim of the present study was to determine the physical activity levels of university students with a pedometer and investigate into the relationship between the physical activity and body composition and energy intake. A total of 1113 female and male university students participated in the present study. Pedometer determining the number of daily step was used to assess physical activity of subjects (Yamax PW610). Body composition was analyzed by bioelectrical impedance method (Tanita BC-418MA). Mean±SD number of daily steps of female and male students were found 8020±3117 steps/day and 8652±3258 steps/day, respectively. Between female and male subjects there was inversely correlation between the number of daily steps and BMI (r = -.115 and -.129), right leg fat percentage (r = -.110 and -.131), left leg fat percentage (r = -.119 and -.103) ($p<0.05$). There was not significantly correlation between the number of daily steps and energy consumption of subjects. As a result,it can be said that university students' physical activity levels are insufficient, daily step number of the males was higher than the female subjects. In addition, there was a negative relation between the daily number of steps and body fat percentage.

**Key words:** ambulatory activity, body composition, energy consumption, pedometer

[1] Uludağ Üniversitesi, Bilimsel Araştırma Projeleri Komisyonu tarafından desteklenmiştir.

[2] Uludağ Üniversitesi, Eğitim Fakültesi, Beden Eğitimi ve Spor Bölümü

## INTRODUCTION

University students' lack of physical activity is accepted as an important public health problem. Physical activity decreases during the period of adolescence. This might continue during the period of adulthood as well (5, 18). It is emphasized that, especially after students enter and graduate from university, there occurs an important decrease in their physical activities (15). There are reports indicating that 50% of university students are not at suggested physical activity level (12, 16). Physical inactivity places among the most important reasons for the increase in the number of obese people. In adition, in many studies made, there is a close relationship between obesity and cardiovascular diseases, diabetes, osteoporosis, some cancer types, mental problems and many health problems (2, 9, 13). Increasing physical activity has a positive effect on obesity and for this reason there are a lot of studies emphasizing its treatment effect together with preventive effect on the above-mentioned illnesses (20, 30, 31). Despite all these, human being continues the sedentary life style depending on technological advancements and even the amount of time spent by sitting is gradually increasing. As a result, increase in the number of illnesses caused by physical inactivity contributes to health expenditures as well (29, 31, 32). In a study by the Ministry of Health, it was explained that only 3.5% of the population in Turkey do regular physical exercise, that is, moderately intensive exercise done at least 30 minutes a day and 3 days a week (28). The results of another survey made in five different regions of our country on a total of 11481 subjects indicate that 20% of the participants were inactive and 16% did less, that is insufficient, physical activities (27).

Physical activity is defined as body movements created by skeleton muscles and increasing energy consumption (6). In the science of exercise, there are some methods determining physical activity. These methods fall into three groups. In the first group, there are direct methods using physiological parameters such as double-labeled water method and calorimeter. The second group includes objective methods such as accelerometer, pedometers, heart-beat rate monitors (polar watch) and direct observation. The third group covers subjective methods and techniques such as questionnaires, telephone and face-to-face interviews. The physical activity measurement methods included in these three groups have both advantages and disadvantages (26, 39, 41). However, in recent years, the method of measurement of physical activity through a pedometer has been used in many research studies due to its ease of use, being cheap, ability to measure many subjects at a time, giving objective results and ease of evaluation. Depending on the high validity and reliability of newly-produced pedometers, its use in scientific area is gradually increasing. Not only do pedometers measure daily step number but it can also calculate walking time, duration and amount of energy spent (1, 3, 17, 33, 36, 37, 40).

In many research studies, the relationship between physical activity and body composition has been investigated. When we look at the results of those studies, we see especially a significant negative relationship between physical activity and body fat percentage. Although some methods determining body fat percentage are available, the Bioimpedance (BIA) method is preferred due to its being easy, practical and reliable. In this method, body composition analyzers are used (11, 14, 34). General health rules include importantly not only physical activity and body composition but also eating habits and especially calorie intake. To have a healthy and well-proportioned body, it is necessary to increase physical activity and pay attention to energy intake.

It is thought that there are factors which might affect physical activity as well. One of these can be said to be smoking. We do not know if there are any studies investigating that there is a relationship between the habit of physical activity and genetic factors. It is known that left-handedness is determined by heredity and genetic factors are important. In studies made in different cultures, societies and

regions, it has been determined that left-handedness is between 5% and 25.9%. This prevalence shows differences from region to region and from culture to culture (19, 21, 22).

The habit of not doing exercise and/or physical inactivity acquired during university years might continue lifelong. For this reason, physical activity level should be determined during university years and again changes in physical activity habits during these years are of importance. Moreover, determining factors affecting physical activity is extremely important as well. Therefore, the aim of the present study is to determine the physical activity levels of university students with the use of pedometer and investigate into the relationship between physical activity and body composition and energy consumption.

## MATERIAL AND METHOD

**Study Group**: The present study was carried out between the years of 2009-2011 at Uludag University. The research study was supported by Uludag University, Scientific Research Projects Unit (Project No: 2009/48). A total of 1113 female and male healthy university students participated in the study. The descriptive characteristics of the participant students are shown in Table 1. All the students participated in the study voluntarily and prior to the applications' each student was informed about the experimental procedure and read and signed the "Informed Consent Form' in accordance with the Helsinki Declaration (42).

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**Table 1. Descriptive characteristics of subjects**

| | Age (year) | Height (cm) | Weight (kg) | BMI ($kg/m^2$) | BMR ($kcal/day^{-1}$) |
|---|---|---|---|---|---|
| **Female (n=539)** | 21.7±1.5 | 166.5±5.5* | 57.4±8.5* | 20.8±2.5* | 1511±325* |
| **Male (n=574)** | 22.3±1.9 | 177.4±5.7 | 72.1±9.4 | 23.1±1.9 | 1865±314 |

BMI: Body mass index
BMR: Basal metabolite rate
* There is statistically significant difference ($p<0.05$).

**Experimental Procedure:** First of all, the height and body composition measurements of the volunteers participating in the study were made. In the determination of body composition was used the method of Bioelectrical impedance analysis (Tanita BC-418MA, Tanita Europe B.V. Hoogoorddreef 56E1101 BE Amsterdam, Holland). The total body weight, fat percentage, fat amount, fatless weight and total body liquid of the subjects were determined. This device determines the fat percentage and weights of the right– left arm, right-left leg and body and calculates the body mass index (BMI). Moreover, the measurement of height was made with the Soehnle Professional height-meter (Order Number 5003.01.001, Soehnle Professional GmbHg Co. KG). In the determination of the physical activity levels of the volunteers, the method of measurement of daily step number was used with the pedometer. The daily number of steps of the volunteers was measured with a YAMAX PW610 pedometer (Yamasa Tokei Keiki Co., Ltd., Japan). This device has been used in many research studies before and reliable results have been obtained (7, 25). YAMAX PW610 pedometer not only determines the number of steps taken but also distance and amount of energy spent on walking. The volunteers measured the number of their steps by putting the pedometer in their pockets after getting up. The volunteer carried the pedometer without taking it out of his/her pocket during the day and recorded the total number of steps, distance taken and amount of energy spent before going to bed. The 7-day values of the volunteers were taken. The volunteers were warned about leading their normal life styles. To determine the nutrition habits of the students, nutrition forms were prepared. The nutrition form was arranged for 7 days and divided into sections where each meal can be written and the students were made to record the foods they take during 7 days. The students were

informed about how to fill in the forms and a sample form was shown. The subjects were made to write every piece of food which they took at every meal and these forms were entered the BEBİS 6 package program (BEBIS 6, Pacific Company, Istanbul, Turkey) and by determining the students' daily food intakes, each participant's daily average energy amount were determined as well.

**Statistical analysis:** The evaluation of the obtained data was made through SPSS 17 program for Windows (SPSS, Inc, Chicago, IL). The differences between the female and the male students were determined with the Independent Samples T test. In the comparison of the daily step numbers of the subjects according to the BMI groups, the One-Way ANOVA test was employed. To determine the relationship between daily number of steps and the other variables, the Pearson's correlation coefficient test was used. For the statistical significance, the $p<0.05$ value was accepted.

## RESULTS

In Figure 1, the daily step numbers of the female and male university students participating in our study; in Figure 2, the number of steps according to BMI groups; in Figures 3 and 4, the weekday and weekend number of steps of the female and male university students respectively are shown. In Table 2, some body composition characteristics of the female and male university students; in Table 3, the relationship between the daily number of steps and body compositions and energy consumptions; in Table 4, the daily number of steps, walking distance, energy spent by walking and some body composition characteristics according to smoking behaviours; in Table 5, the daily number of steps, walking distance, energy spent by walking and some body composition characteristics according to the left-handedness of the participants are shown.

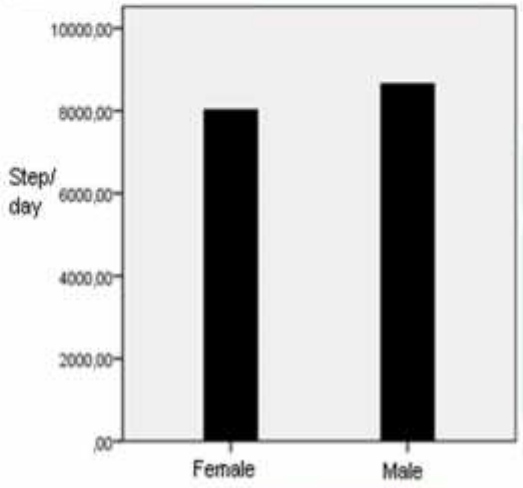


**Figure 1. Daily number of steps according to gender**

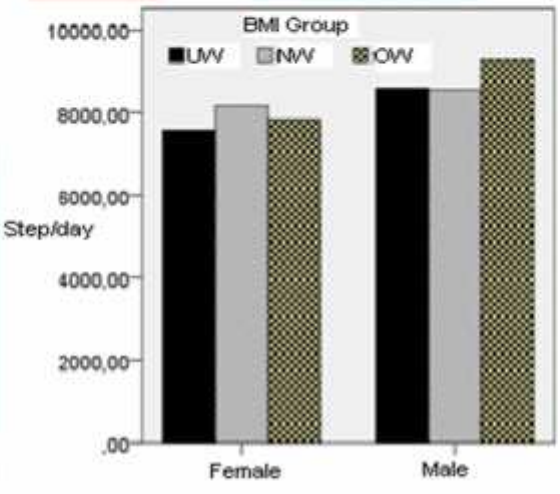


**Figure 2. Number of steps according to BMI groups**
(UW: underweight, NW: normal weight, OW: overweight)

As seen in Figure 1, the average daily number of steps of the female and male university students participating in our study were determined to be 8020±3117 steps/day and 8652±3258 steps/day respectively. It was determined that there was a statistically significant difference between both group's daily number of steps ($t=2.561$; $p<0.05$). As seen in Figure 2, it was determined that there was not a statistically significant difference between the daily number of female university student participants (underweight 7558±2756 steps/day; normal weight 8175±3301 steps/day, overweight 7843±2064 steps/day, $F=0.609$, $p>0.05$) and the the male university student partcipants (underweight 8587±1963 steps/day; normal weight 8547±3132 steps/day, overweight 9279±4202 steps/day, $F=0.515$, $p>0.05$) according to the BMI groups.

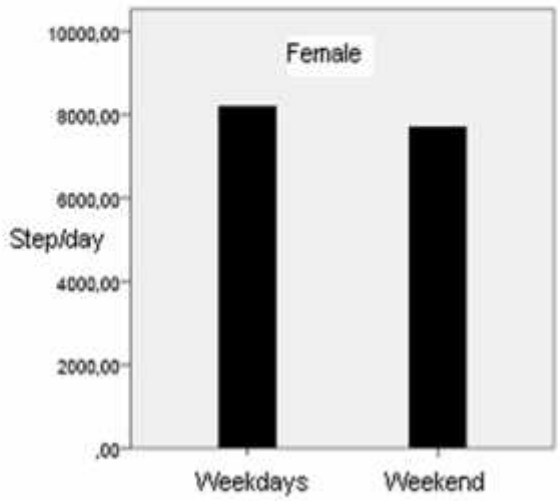


**Figure 3. Weekday and weekend number of steps (females)**

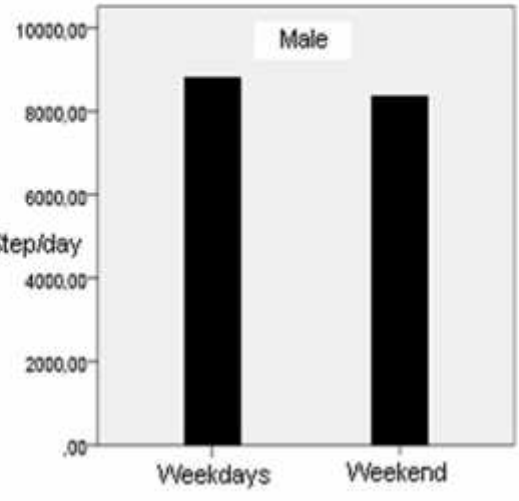


**Figure 4. Weekday and weekend number of steps (males)**

As seen in Figure 3, no statistically significant difference was determined between the female students' weekday (8197±3592 steps/day) and weekend (7707±3486 step/day) daily number of steps (t=1.694, p>0.05). As seen in Figure 3, no statistically significant difference was determined between the male students' weekday (8813±3754 steps/day) and weekend (8376±3496 steps/day) daily number of steps (t=1.469, p>0.05), either.

**Table 2. Body Composition Components of Subjects**

| | Fat% (%) | FM (kg) | FFM (kg) | TBW (kg) | RLF % | LLF % |
|---|---|---|---|---|---|---|
| **Female** | 20.3±6.8* | 12.1±5.3* | 45.3±5.6* | 34.8±5.5* | 25.8±7.1* | 26.1±6.4* |
| **Male** | 11.3±6.1 | 8.1±5.1 | 64±8.5 | 46.7±6.8 | 10.9±6 | 11.9±4,8 |

*Fat%: Total body fat percentage*
*FM: Fat Mass*
*RLF%: Right Leg Fat percentage*
*TBW: Total body water*
*FFM: Free fat mass*
*LLF%:* Left Leg Fat percentage
** There is statistically significant difference (p<0.05)*

As seen in Table 2, for the female and the male university students, the fat percentages were determined as 20.3±6.8 and 11.3±6.1, the FM as 12.1±5.3 kg and 8.1±5.1 kg, the FBWs as 45.3±5.6 kg and 64±8.5 kg, the TBW as 34.8±5.5 kg and 46.7±6.8 kg, the RLF% percentages as 25.8±7.1 and 10.9±6 and the LLF% as 26.1±6.4 and 11.9±4,8 respectively (p<0.05).

**Table 3. Relationship between subjects' daily number of steps and body compositions and energy consumptions.**

| Step/day | BMI | Fat % | RLF % | LLF % | RAF % | LAF % | TF % | Energy Consumption |
|---|---|---|---|---|---|---|---|---|
| **Female** | -.115* | -.055 | -.110* | -.119* | -,035 | -,022 | -,065 | .026 |
| **Male** | -.129 | -.069 | -.131 | -.103* | -.052 | -,041 | -.054 | .022 |

*BMI: Body Mass Index*
*Fat%: Total body fat percentage*
*RLF%: Right Leg Fat percentage*
** There is statistically significant difference (p<0.05).*
*LLF%:* Left Leg Fat percentage
*RAF%: Right Arm Fat percentage*
*LAF%: Left Arm Fat percentage*
TF%: Trunk Fat Percentage

As seen in Table 3, there is a statistically significant negative relationship between the daily number of steps of the female and the male university students and the BMI groups (r = -.115 and -.129), the RLF% (r = -.110 and -.131), the LLF% (r = -.119 and -.103) respectively (p<0.05). There is not a statistically significant relationship between the daily number of steps of the female and the male university students and the RAF% (r = -.035 and -.052), the LAF% (r = -.022 and -.041), the TF% (r = -.065 and -.054) and Energy Consumption (r = .026 and .022) respectively (p>0.05).

**Table 4. Daily step number, walking distance, energy consumption by walking and some body composition characteristics of the subjects according to smoking status**

| Variable | Female | | Male | | Total | |
|---|---|---|---|---|---|---|
| **Smoking** | **No (n=367)** | **Yes (n=172)** | **No (n=408)** | **Yes (n=167)** | **No (n=775)** | **Yes (n=339)** |
| Age (year) | 20.9±1.7 | 21.3±1.5 | 22.2±1.9 | 21.8±2.2 | 21.6±1.9 | 21.5±1.8 |
| Height (cm) | 166.7±5.7 | 167.4±6.3 | 176.8±6.1 | 176.4±5.6 | 171.7±7.8 | 171.5±7.4 |
| Weight (kg) | 57.4±8.4 | 58.2±7.9 | 70.6±8.6 | 71±9.3 | 63.9±10.8 | 64.2±10.7 |
| BMI (kg/m$^2$) | 20.5±3 | 20.8±2.8 | 22.5±2.6 | 22.8±2.5 | 21.5±3 | 21.7±2.8 |
| BMR (kcal) | 1410±164 | 1407±125 | 1870±191 | 1835±202 | 290.9±18.5 | 270.3±26.3 |
| Fat% | 19.4±6.4 | 20.6±6.8 | 9.7±5.3 | 11.9±6.8* | 14.7±7.7 | 16.6±8* |
| Step/day | 8357±3355 | 7275±2371* | 8776±3313 | 8345±3131 | 8562±3334 | 777,±2787* |
| Walking distancce (m/day) | 6451±3554 | 5571±3572 | 6079±2967 | 6661±4231 | 6269±3.3 | 6076±3.9 |
| ECW (kcal) | 314±134 | 281±142 | 343.5±164 | 322.4±136 | 328.6±150 | 300±140 |

*BMI: Body mass index* *Fat%: Body fat percentage*
*BMR: Basal metabolite rate* *ECW: Energy consumption by walking*
** There is statistically significant difference (p<0.05).*

As seen in Table 4, the daily number of steps of non-smoking and smoking female university students were determined as 8357±3355 steps/day and 7275±2371 steps/day (p<0.05), the ECW as 314±134 kcal and 281±142 kcal (p>0.05), the BMR as 1410±164 kcal and 1407±125 kcal (p>0.05), the BMI as 20.5±3 kg/m$^2$ and 20.8±2.8 kg/m$^2$ (p>0.05), respectively. The daily number of steps of non-smoker and smoker male university students were determined as 8776±3313 steps/day and 8345±3131 steps/day (p>0.05), the YCW as 343.5±164 kcal and 322.4±136 kcal (p>0.05), the BMR as 1870±191kcal and 1835±202kcal (p>0.05), the BMI as 22.5±2.6kg/m$^2$ and 22.8±2.5 kg/m$^2$ (p>0.05), respectively.

**Table 5. Daily step number, walking distance, energy consumption by walking and some body composition characteristics of the subjects according to their left-handedness**

| Variable | Female | | Male | | Total | |
|---|---|---|---|---|---|---|
| **Left-Handed** | **No (n=469)** | **Yes (n=70)** | **No (n=431)** | **Yes (n=104)** | **No (n=940)** | **Yes (n=174)** |
| Age (year) | 21.1±1.6 | 21.2±1.8 | 21.9±1.9 | 22.6±2.6 | 21.5±1.8 | 21.9±2.3 |
| Height (cm) | 166.9±5.8 | 166.6±6.7 | 176.7±6 | 176.6±5.5 | 171.5±7.6 | 172.2±7.9 |
| Weight (kg) | 57.8±8.2 | 57±8.2 | 70.5±8.3 | 71.8±10.9 | 63.7±10.4 | 65.2±12.2 |
| BMI (kg/m$^2$) | 20.6±2.9 | 20.7±3.1 | 22.5±2.4 | 22.9±3.4 | 21.5±2.8 | 21.9±3.4 |
| BMR (kcal) | 1420±152 | 1409±158 | 1857±189 | 1871±219 | 1619±281 | 1666±301 |
| Fat% | 20.1±6.3 | 18.2±8 | 10.3±5.8 | 10.6±6.3 | 15.5±7.8 | 14.1±8 |
| Step/day | 8053±3129 | 7803±3088 | 8877±3353 | 7605±2568 | 8438±3257 | 7693±2785* |
| Walking distancce (m/day) | 6190±3245 | 6096±5.4 | 6249±3159 | 6240±4317 | 6217±3200 | 6175±4758 |
| ECW (kcal) | 305±139 | 293±123 | 350±161 | 278.3±115 | 326±151 | 285±118 |

*BMI: Body mass index* *Fat%: Body fat percentage*
*BMR: Basal metabolite rate* *ECW: Energy consumption by walking*
** There is statistically significant difference (p<0.05).*

As seen in Table 5, the right-handed and the left-handed female students' daily number of steps were determined as 8053±3129 steps/day and 7803±3088 steps/day ($p<0.05$), the ECW as 305±139 kcal and 293±123 kcal ($p>0.05$), the BMR as 1420±152 kcal and 1409±158 kcal ($p>0.05$), the BMI as 20.6±2.9 kg/m$^2$ and 20.7±3.1kg/m$^2$ ($p>0.05$) respectively. The right-handed and the left-handed male students' daily number of steps were found as 8877±3353 steps/day and 7605±2568 steps/day ($p>0.05$), the ECW as 350±161kcal and 278.3±115 kcal ($p>0.05$), the BMR as 1857±189 kcal and 1871±219 kcal ($p>0.05$), the BMI as 22.5±2.4 kg/m$^2$ and 22.9±3.4 kg/m$^2$ ($p>0.05$) respectively (Table 5).

## DISCUSSION AND CONCLUSION

The aim of the present study was to determine university students' physical activities with the help of pedometer and investigate into the relationship between physical activity and body compositions and energy consumption. In present study, the average daily step numbers of the female and the male students were found to be 8020±3117 step/day and 8652±3258 step/day respectively. It was determined that although there was not a statistically significant difference between the daily step numbers of both groups, the male students took 600 more steps a day on the average. Hatano (1997) suggests that healthy adults should take 10000 steps a day in order to reach sufficient physical activity level (10). Tudor-Locke and Bassett (2004) identified 5 groups for adults with respect to daily step number. These are <5000 steps/day sedentary group, 5000 – 7499 steps/day low activity group, 7500-9999 steps/day a little bit active group, 10000-12499 steps/day active group and 12500 and over steps/day high activity group (35). In their study, Behrens and Dinger (2003) determined university students' daily step numbers as 11.473 ± 2.978 steps/day (4). According to the results of this study, we can say that the physical activity levels of the university students participating in our study were not sufficient.

There are a few studies investigating into weekday and weekend physical activity levels (4, 8, 27, 38). Also, because of different methods applied in those studies, it is rather difficult to compare and interpret results. In our study, both the male and the female university students' weekday average daily number of steps were found to be higher when compared to weekend ones, but it was determined that there was not a statistically significant difference. We can say that the results obtained in our study with respect to the weekday and weekend daily number of steps support those obtained from previous studies.

According to the BMI groups, no significant difference was found between the daily numbers of steps of the male and the female university students participating in our study. In previous studies, according to BMI groups, the daily numbers of steps of the subjects included in the normal group were determined to be higher when compared to those in the overweight group (28, 34). According to the BMI groups in our study, we can interpret the result that no significant difference was found in the daily numbers of steps and this result does not support those obtained from previous studies as resulting from the fact that the sample group of our study is composed of university students.

There is a statistically significant negative relationship between the numbers of steps of the participating female and male students and BMI, RLF% and LLF% ($p<0.05$). There is no statistically significant relationship between the female and male university students' daily numbers of steps and RAF%, LAF%, BF% and energy consumption ($p>0.05$). In their study, Rowlands et al. (1999), too, found a negative relationship between fat percentage and number of steps (24). Moreover, Tudor-Locke et al. found similar results in their study as well (34).

When the non-smoker and smoker university students' daily number of steps and ECW were compared, it was found that both the non-smoker female and the male students'

daily number of steps and ECW were higher when compared to the smoker ones. However, it was determined that the BMH and BMI of the non-smoking and smoking students were similar. The daily number of steps, ECW, BMR and BMI of both right-handed and left-handed female and male university students were found to be similar.

As a conclusion, it can be stated that the physical activity levels of university students are insufficient. It was also found that the number of daily steps of the male students was higher than that of daily steps of the female students. Besides, it can be stated that smoking has a negative effect on physical activity. Moreover, there is a negative relationship between daily step number and body fat composition. What's more, it can be stated that left-handedness was not among the factors affecting physical activity.

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