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RESEARCHING REGULAR EXERCISE ACTIVITIES WITH REGARD TO MEDICAL PROFILES AND RISK FACTORS: A RESEARCH ON ISTANBUL TECHNICAL UNIVERSITY (ITU)

ABSTRACT
This research aims to examine medical profiles and risk factors of female and male students receiving education at different department of the university. ITU students constitute the research population. ECG, pulse, body mass index, blood values, urine values, and spirometric measures were carried out on both groups included in sample group; and those students included in risk group. As a result, the data obtained were taken under control by doctors serving at the medico-social facility of our university. In examination of blood values, cholesterol levels of those groups doing regular exercise or not doing any exercise were found to be significantly higher compared to those doing exercise. In the same direction, body fat levels of the groups were different on a significant level. No considerable finding was detected in urine values gathered.
Keywords: Blood Values, Body Mass Index, Cholesterol, Spirometer, Urine Values

DÜZENLİ EGZERSİZ FAALİYETLERİNİN SAĞLIK PROFİLLERİ VE RİSK FAKTÖRLERİ AÇISINDAN ARAŞTIRILMASI: İTÜ ÖĞRENCİLERİ ÜZERİNE BİR ARAŞTIRMA

ÖZ
Bu araştırmada, üniversitenin farklı bölümlerinde öğrenim gören kız ve erkek öğrencilerin sağlık profilleri ve risk faktörlerinin incelenmesi amaçlanmıştır. Örneklem grubunda yer alan her grubun EKG, nabız, vücut kitle indeksi, kan değerleri, idrar değerleri, spirometrik ölçümleri yapılmış, elde edilen veriler neticesinde risk grubuna giren öğrencilerimiz üniversitemizin mediko sosyal merkezinde bulunan doktorlar tarafından kontrol altına alınmıştır. Kan değerleri incelendiğinde düzensiz egzersiz yapan ve yapmayan grupların kolesterol düzeyleri spor yapanlara göre anlamlı düzeyde yüksek çıkmıştır. Aynı doğrultuda grupların vücut yağ düzeyleri anlamlı düzeyde farklıdır. Alınan idrar değerlerinde kayda değer bir bulguya rastlanmamıştır.
Anahtar Kelimeler: Kan Değerleri, Vücut Kitle İndeksi, Kolesterol, Spirometre, İdrar Değerleri

1. INTRODUCTION

World Health Organization in its report titled "Global Strategy on Diet, Physical Activity and Health" indicated that it should be one of the medical priorities of society to do regular exercise (WHO). Therefore, it is necessary to support sport activities in each unit of the society. Also, the effects of sport on risk factors over health should be presented to society in a clear way. Universities possess not only an effective sample cluster in sense of measuring effect of regular sport activities on medical risk factors, but also a capacity to lead the society to sport for the reason that they are both institutions shaping societies, and bear intellectuality which adopts regular sport activities as a principle for life philosophy. In this context, this study was performed on ITU students doing regular exercise, doing irregular exercise and not doing any exercise.

Studies performed in literature have determined that physical activities increase life quality when done after medical screenings and under the control of experts, and emphasized that they reduce risk factors in musculoskeletal system diseases, coronary heart diseases, hypertension, diabetes, osteoporosis, obesity and colon cancer (Darren et al. 2006, Marcus and Forsyth. 2009). On the other hand, coronary artery diseases are the leading most important medical problems in our day, and take the first place among causes of death and ailment almost all over the world (Karadag et al, 2007). CVD (Cardiovascular Disease) rates have been found to be on increase in recent years in researches related to exercising persons. These multiple risk factors were at lower rates for low-density exercises, whereas they were found to be high for high-density exercises. Risk factors were indicated to be in relation to total cholesterol, HDL, triglyceride, systolic BP and body fat percentage rates (Froberg and Andersen, 2005, Singh et al 2008). Undiagnosed rheumatic heart diseases and heart valve diseases may cause sudden deaths during processes requiring intense energy expense such as exercise, and these disorders may come up with contracting coronaries during sports. Medical problems (muscle, nerve, digestion, heart, hyponatremia) were indicated to appear following training and matches taking intense and long time in researched conducted on long-distance runners.

It is specified that sudden deaths occur not only in sports requiring long-term effort such as marathon, but also in low-tempo and short-term sports such as jogging. It was clarified in studies conducted that cases of death were related to Coronary Artery Disorder (CAD) (Thompson, 2005). Hypertension is a very common problem in our country. Increase in body weight is generally directly proportionate to blood pressure. At least 1/3-2/3 of hypertensive patients are obese (King, Wofford, 2000). Hypertension rate of youth population in our country is 12 percent and this rate is at a level that cannot be disregarded. One of the reasons to have such little awareness on hypertension is that blood pressure is not measured sufficiently. Besides, not offering treatment and not changing lifestyles (nutrition, exercise, sport and avoiding stress) play an important role.

2. RESEARCH SIGNIFICANCE

One observes that sport and exercise activities are the most commonly preferred ones among social activities in examination of daily lives of ITU students. Nevertheless, sport activities performed as social activities in an insensible way technically and scientifically prevent one from benefiting sport activities effectively. Technical and

scientific awareness in sport covers all entire dangers sport pose, and drawbacks in the sense of health of trainings performed without routine checks, and knowledge of those persons related to physical activities on their exercise capacities. Especially, efforts towards regular exercise by students during school term could be more dangerous when sufficient checks are absent. Sport activities' reaching dangerous dimensions is directly proportionate to increasing medical risk factors, and has confronted us as a commonly studied subject in literature.

3. EXPERIMENTAL METHOD-PROCESS; ANALYTICAL STUDY SUBJECT

This research was performed with the purpose of medical evaluation of student groups doing regular exercise, doing irregular exercise and not doing any exercise, determined as sedentary, in company with experts within a predetermined schedule for three days a week for 8 weeks, and presentation of risk factors possible to emerge. Included in the research, the group doing regular exercise consists of 20 male and 11 female students, the group doing irregular exercise 22 male and 11 female students, and the group not doing any exercise (sedentary) 21 male and 9 female students. Measurements related to body composition of the subjects were performed at Istanbul Technical University Performance Analysis laboratory, and their blood lipid tests at Istanbul Technical University Directorate of Health, Culture and Sport Office medico-social biochemistry laboratories. Research was performed on a voluntary basis for all students included in the research, and all measurements and tests applied were carried out two times with one-week intervals. Measurements, and normal values used to carry out analysis are provided in Table 1.

Table 1. Measurements carried out to gather data, and their normal values: Data obtained is evaluated using SPSS 21 statistics software. Kolmogorov-Smirnov and Shapire-Wilk tests were applied for normal distribution check on all the data, and Kruskal Wallis non-parametric test was applied to examine differences between groups as all the statistical results obtained are p<0.05.

4. FINDINGS AND DISCUSSIONS

The study analyzed 3 different groups consisting of 30 people exercising, 31 people not exercising, and 33 people exercising irregularly. A sample consisting of 75 percent male, 24 percent female individuals was used in analysis. *Table 2. Average of age and sport age for groups:* As shown in table 2, average age for the exercising group was 21, irregular exercising group 19, and not exercising group 21. Kolmogorov-Smimov and Shapire-Wilk tests were applied to test assumption of normality before initiating analyses and to examine group differences by blood values. Stating that normal distribution was not provided, H1 hypothesis was accepted as it was p<0,05 for all variables. Therefore, non-parametric methods will be used for this group of data. Table 3 and Table 4 reveal that there is no significant difference at p=0.05 significance level found among groups for any blood value and normal distribution was not provided as it was p<0.05 in examination of distribution of biochemistry data. Therefore, non-parametric tests will be used. There were significant differences at the level of glucose, triglyceride, cholesterol, HDL, LDL, VLDL, and CKNAC values found among groups according to the data from biochemistry laboratory (p=0.05).

Table 3. Krusakal wallis test results for blood values
Table 4. Kruskal wallis test results for biochemistry data

There were significant differences at the level of glucose, triglyceride, cholesterol, HDL, LDL, VLDL, and CKNAC values found among
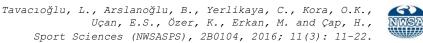
groups according to the data from biochemistry laboratory, which is indicated in table 5 (p=0.05). According to the values specified in table 6 and table 7, normal distribution was not provided as it was p<0.05 for all distribution tests for BMI variables. Non-parametric methods will be used. Significant difference was found among groups in weight, muscle weight, fat weight, fat free weight, BMI, and BMR values was (p=0.05). Normal distribution was not provided for as it was p<0.05 in distribution test for spirometer values. Non-parametric methods will be used. Difference was found at 0.05 significance level in all parameters for each group as shown in tables 8 and 9.

 Table 5. Basic statistical indicators for groups
 Table 6. Krusakal Wallis test results for BMI values
 Table 7. Basic statistical indicators for BMI groups
 Table 8. Kruskal Wallis results for spirometer values
 Table 9. Spirometer basic group statistics

5. CONCLUSION AND RECOMMENDATIONS

This research was conducted on students with a group age range of 20±1, selected among ITU students, as stated above, on a voluntary basis. Groups constituting the research were divided into three as those doing active exercise for 3 days a week in company of a gymnast regularly, those doing irregular exercise without following any certain schedule, and those not doing any exercise. Information forms of students to determine their demographic properties were obtained in the first place, and then their ecg, spirometer, blood, urine, and body mass index measurements were carried out. Even though there are differences found in values as a result of blood measurements carried out, among groups doing exercise regularly, doing exercise irregularly, and not doing any exercise in consequence of the findings gathered, these differences do not bear any statistical significance. Koc, Saritas, and Buyukipekci (2010) found significant statistical difference in blood levels among these two groups. In their study titled comparison of blood hematologic levels of athletes and the sedentary. Owiredu, Amidu, Gockah-Adapoe, Ephraim (2011) came up with similar results in the study they conducted.

Exercise applied at sufficient intensity and scheduled in a regular way has the effect of reducing triglyceride and LDL levels, and increasing HDL levels (Couillard et al 2001). There were significant differences at the level of glucose, triglyceride, cholesterol, HDL, LDL, VLDL, and CKNAC values found among groups according to the data from biochemistry laboratory in consequence of this study conducted. While the regularly exercising group has the lowest levels of glucose, triglyceride, cholesterol, LDL, and CKNAC, it was also found to have the highest levels of HDL and VLDL. Findings reached for these values resulting from the study support the literature. Nevertheless, as stated by Schmitz, Schreiner, Jacobs (2001), physical activity in some studies was indicated to remain limited in increasing HDL level, and reducing LDL and triglyceride level. In this study conducted, it was concluded that the exercising group had statistically the highest muscle weight, lowest fat weight and BMI. Yuksek (2012), in his study titled comparison of physical fitness levels of exercising and not exercising older male cases, failed to find a statistically significant difference in body mass index among exercising and not exercising groups. Wingfield, McNamara, Janicke, Graziano (2011), in their conducted study, concluded that there was a correlation between body mass index and physical activity. Oxygen required by muscles shows increase as a result of physical exercises, and this corresponding increased requirement reveals physiological

fitness of respiratory system (GOZU, LIMAN, KAN, 1998). Statistically significant differences were found as a result of spirometric tests conducted for three groups included in the study. In line with this, Alpay, Altug, Hazar (2007), in their study titled evaluation by comparison of some respiratory and circulatory parameters of students playing for primary school teams within the age group of 11-13 to other students not exercising, detected that students playing for primary school teams had higher FVC levels. Cakmakci, Cinar, Boyali (2009), in their study titled "Effect of camp period on some respiratory parameters in female taekwondo competitors, found a statistical increase between respiratory values of female taekwondo competitors" prior to European championship camp, and those after four-week camp period. Bicer, Peker, Savucu (2005). In their study titled effect of scheduled regular walking on some blood limits in female patients suffering from single heart atherosclerosis, specified that it might be concluded that exercise reduced cardiovascular risk factor. Nevertheless, what needs to be primarily done in order to ensure positive outcome from exercise are to determine in consequence of proper tests that there is no drawback for a person to do exercise under a doctor's control, and then follow an exercise program to be formed by a gymnast. Arrhythmia was detected in 2 students in the group exercising irregularly in ecg results obtained within the scope of this study conducted. Those students were directed to a specialist physician, and taken under control since this constitutes a major risk factor in medical conditions of persons during exercise. No remarkable difference was detected as a result of urine results obtained.

Table 1. Measurements carried out to gather data and their normal values

Analysis	Parameters	Normal Parameters (N.P)	
		Woman	Man
Blood Analysis	Cholesterol (mg/dl)	50<N.P<200	50<N.P<200
	Triglycerides (mg/dl)	35<N.P<170	35<N.P<170
	HDL (mg/dl)	33<N.P<87	30<N.P<65
	LDL (mg/dl)	5<N.P130	5<N.P<130
	VLDL (mg/dl)	0<N.P<30	0<N.P<30
Cardiological Analysis	Blood Pressure	N.P<130 N.P<85	N.P<130 N.P<85
	Pulse	60<N.P<100	60<N.P<100
	ECG	N/A	N/A
Anthropometric Analysis	Weight (BMI)	18.5^* height^2 <N.D<25* height^2	18.5* height^2<N.P<25* height^2
	Muscle weight	F(N.P.Weight)	F(N.P.Weight)
	Body fat weight	F(N.P.Weight)	F(N.P.Weight)
	Total body water	F(N.P.Weight)	F(N.P.Weight)
	Lean Weight	F(N.P.Weight)	F(N.P.Weight)
	Body Mass Index (BMI)	18.5<N.P<25	18.5<N.P<25
	Body Fat Percentage (BFP)	18<N.P<28	10<N.P<20
	Waist to Hip Ratio (WHR)	0.70<N.P<0.80	0.75<N.P<0.85
	Basal Metabolic Rate (BMR)	Harris Benedict Formula	Harris Benedict Formula

Table 2. Average of age and sport age for groups

	Group	N	Mean	Std.Deviation	Std. Error Mean
Age	Exercising	31	21	1.79904	
	Not Exercising	30	21	1.75643	.32068
	Irregular	33	19	1.6977	.32645
Age of Sport	Exercising	31	10	1.33924	.24054
	Not Exercising	30	–	–	–
	Irregular	33	11	1.55662	.26884

Table 3. Krusakal Wallis test results for blood values

	Group	N	Mean	P
WBC	Exercising	31	50.50	
	Not Exercising	30	47.37	0.121
	Irregular	33	44.80	
RBC	Exercising	31	47.40	
	Not Exercising	30	39.10	0.310
	Irregular	33	55.23	
HGB	Exercising	31	45.39	
	Not Exercising	30	36.05	0.172
	Irregular	33	59.89	
HCT	Exercising	31	47.21	
	Not Exercising	30	34.95	0.141
	Irregular	33	59.17	
MCV	Exercising	31	46.16	
	Not Exercising	30	37.37	0.980
	Irregular	33	57.97	
MCH	Exercising	31	45.06	
	Not Exercising	30	40.40	0.102
	Irregular	33	56.24	
MCHC	Exercising	31	48.19	
	Not Exercising	30	44.23	0.084
	Irregular	33	49.82	
PLT	Exercising	31	51.87	
	Not Exercising	30	50.95	0.211
	Irregular	33	40.26	
MPV	Exercising	31	45.63	
	Not Exercising	30	49.33	0.092
	Irregular	33	47.59	
RDW	Exercising	31	44.87	
	Not Exercising	30	56.83	0.076
	Irregular	33	41.48	
%LYM	Exercising	31	45.95	
	Not Exercising	30	45.68	0.225
	Irregular	33	60.61	
%MON	Exercising	31	38.76	
	Not Exercising	30	55.68	0.196
	Irregular	33	48.27	
%GRA	Exercising	31	50.82	
	Not Exercising	30	47.08	0.137
	Irregular	33	44.76	
#LYM	Exercising	31	49.31	
	Not Exercising	30	47.90	0.091
	Irregular	33	45.44	
#MON	Exercising	31	44.53	
	Not Exercising	30	51.73	0.140
	Irregular	33	46.44	
#GRA	Exercising	31	51.73	
	Not Exercising	30	47.58	0.203
	Irregular	33	43.45	
PCT	Exercising	31	51.15	
	Not Exercising	30	51.38	0.082
	Irregular	33	40.55	
PDW	Exercising	31	47.53	
	Not Exercising	30	52.97	0.077
	Irregular	33	42.50	

Table 4. Kruskal Wallis test results for biochemistry data

	Group	N	Mean	P	Source of Difference
Glocose	Exercising	31	46.19	0.000*	N.exercising
	Not Exercising	30	54.92		
	Irregular	33	53.20		
Al.Phosphatase	Exercising	31	42.63	0.135	-
	Not Exercising	30	47.33		
	Irregular	33	42.23		
Triglyceride	Exercising	31	37.73	0.001*	N.exercising
	Not Exercising	30	57.53		
	Irregular	33	53.35		
Cholesterol	Exercising	31	48,42	0.036*	N.exercising
	Not Exercising	30	54,74		
	Irregular	33	49.26		
HDL	Exercising	31	54.79	0.000*	Exercising
	Not Exercising	30	40.72		
	Irregular	33	46.82		
LDL	Exercising	31	46,17	0.001*	N.exercising
	Not Exercising	30	56.78		
	Irregular	33	49,94		
VLDL	Exercising	31	56.76	0.001*	Exercising
	Not Exercising	30	38.30		
	Irregular	33	51.56		
CKNAC	Exercising	31	32.77	0.000*	N.exercising
	Not Exercising	30	39.55		
	Irregular	33	37.47		
CRP	Exercising	31	35.60	0.119	-
	Not Exercising	30	37.00		
	Irregular	33	38.02		

Table 5. Basic statistical indicators for groups

	Group	N	Mean	Std. Deviation	Std. Error Mean
Glocose	Exercising	31	79.1613	9.00036	1.61651
	Not Exercising	30	85.9667	10.38063	1.89524
	Irregular	33	85.4848	8.67511	1.51014
Al.Phosphatase	Exercising	31	173.8710	63.45641	11.39711
	Not Exercising	30	191.4000	58.39143	10.66077
	Irregular	33	199.5455	52.91685	9.21164
Triglyceride	Exercising	31	66.56,67	31.55038	5.76028
	Not Exercising	30	98.7742	34.33532	6.16680
	Irregular	33	95.6667	45.84462	7.98052
Cholesterol	Exercising	31	152.7742	28.82789	5.17764
	Not Exercising	30	156.7333	26.17966	4.77973
	Irregular	33	155.7879	25.10572	4.37035
HDL	Exercising	31	50.0323	12.98585	2.33233
	Not Exercising	30	44.7667	14.84096	2.70958
	Irregular	33	48.0303	13.51038	2.35185
LDL	Exercising	31	87.2903	20.84097	3.74315
	Not Exercising	30	98.2600	18.10469	3.30545
	Irregular	33	90.3030	16.95119	2.95082
VLDL	Exercising	31	15.5097	7.11465	1.27783
	Not Exercising	30	13.3133	6.31008	1.15206
	Irregular	33	14.3818	7.81431	1.36030
CKNAC	Exercising	31	232.9355	431.87228	77.56655
	Not Exercising	30	342.9667	458.82552	83.76970
	Irregular	33	314.2121	216.07967	37.61464
CRP	Exercising	31	1.1232	.71025	.12756
	Not Exercising	30	1.5800	1.45825	.26624
	Irregular	33	1.2697	1.15501	.20106

Table 6. Krusakal Wallis test results for BMI values

	Group	N	Mean Rank	P
Height	Exercising	31	62.29	0.001*
	Not Exercising	30	55.28	
	Irregular	33	54.71	
Weight	Exercising	31	37.65	0.011*
	Not Exercising	30	48.78	
	Irregular	33	55.59	
Muscle Weight	Exercising	31	54.26	0.023*
	Not Exercising	30	47.11	
	Irregular	33	50.62	
Fat Weight	Exercising	31	45.35	0.000*
	Not Exercising	30	53.37	
	Irregular	31	54.98	
Body Fluid	Exercising	31	54.98	0.224
	Not Exercising	30	51.47	
	Irregular	33	55.65	
Lean Weight	Exercising	31	87.2903	0.002*
	Not Exercising	30	98.2600	
	Irregular	33	90.3030	
BMI	Exercising	31	15.5097	0.000*
	Not Exercising	30	13.3133	
	Irregular	33	14.3818	
PBF	Exercising	31	232.9355	0.091
	Not Exercising	30	342.9667	
	Irregular	33	314.2121	
WHR	Exercising	31	1.1232	0.187
	Not Exercising	30	1.5800	
	Irregular	33	1.2697	
BMR	Exercising	31	44.85	0.000*
	Not Exercising	30	55.27	
	Irregular	33	52.02	
Target Muscle	Exercising	31	60.50	0.000*
	Not Exercising	30	44.08	
	Irregular	33	38.39	
Target Fat	Exercising	31	43.98	0.000*
	Not Exercising	30	46.28	
	Irregular	33	51.91	

Table 7. Basic statistical indicators for BMI groups

	Group	N	Mean Rank	Std. Deviation	Std. Error Mean
Height	Exercising	31	177.8485	7.88639	1.37284
	Not Exercising	30	178.4000	11.67550	2.13164
	Irregular	33	169.5161	9.12824	1.63948
Weight	Exercising	31	75.5182	13.00441	2.26378
	Not Exercising	30	70.9467	19.54653	3.56869
	Irregular	33	66.2000	12.06767	2.16742
Muscle Weight	Exercising	31	35.9515	6.22260	1.08321
	Not Exercising	30	33.3467	9.84023	1.79657
	Irregular	33	39.1677	7.28109	1.30772
Fat Weight	Exercising	31	12.3636	6.08414	1.05911
	Not Exercising	30	12.1267	6.19716	1.13144
	Irregular	33	10.7981	4.51904	.81164
Body Fluid	Exercising	31	45.3879	7.65477	1.33252
	Not Exercising	30	43.0367	12.23025	2.23293
	Irregular	33	48.0742	8.63462	1.55082
Lean Weight	Exercising	31	63.1545	10.34112	1.80016
	Not Exercising	30	58.9200	16.83114	3.07293
	Irregular	33	52.0129	11.84479	2.12739
BMI	Exercising	31	25.7697	2.73124	.47545
	Not Exercising	30	23.0933	2.88623	.52695
	Irregular	33	20.0548	2.62537	.47153
PBF	Exercising	31	16.1182	6.08782	1.05975
	Not Exercising	30	17.5933	7.64099	1.39505
	Irregular	33	21.9355	6.52378	1.17171

WHR	Exercising	31	.8361	.03412	.00594
	Not Exercising	30	.8293	.03695	.00675
	Irregular	33	.8206	.04472	.00803
BMR	Exercising	31	1734.27	223.40858	38.89044
	Not Exercising	30	1672.70	289.42728	52.84195
	Irregular	33	1494.41	256.36859	46.04516
Target Muscle	Exercising	31	.9030	2.41706	.42076
	Not Exercising	30	1.0683	2.25230	.41121
	Irregular	33	2.0161	2.34735	.42160
Target Fat	Exercising	31	-2.2576	4.70306	.81870
	Not Exercising	30	-.8467	4.79178	.87486
	Irregular	33	-2.9968	3.60523	.64752

Tablo 8. Krusakal Wallis results for spirometer values

	Group	N	Mean Rank	P
MVV pre	Exercising	31	45.21	
	Not Exercising	30	24.83	0.000*
	Irregular	33	22.98	
MVV test	Exercising	31	64.24	
	Not Exercising	30	14.78	0.002*
	Irregular	33	23.94	
MVV%	Exercising	31	53.11	
	Not Exercising	30	21.18	0.000*
	Irregular	33	25.55	
FVC pre	Exercising	31	64.24	
	Not Exercising	30	19.97	0.000*
	Irregular	33	29.23	
FVC test	Exercising	31	65.34	
	Not Exercising	30	12.98	0.001*
	Irregular	33	24.55	
FVC%	Exercising	31	55.18	
	Not Exercising	30	13.93	0.022*
	Irregular	33	22.92	
FEV pre	Exercising	31	64.61	
	Not Exercising	30	19.22	0.000*
	Irregular	33	29.56	
FEV test	Exercising	31	74.27	
	Not Exercising	30	22.95	0.000*
	Irregular	33	25.58	
FEV%	Exercising	31	77.24	
	Not Exercising	30	23.78	0.000*
	Irregular	33	25.12	
FEF_FVC pre	Exercising	31	73.56	
	Not Exercising	30	32.70	0.011*
	Irregular	33	37.38	
FEF_FVC test	Exercising	31	78.03	
	Not Exercising	30	34.37	0.012*
	Irregular	33	40.76	
FEF_FVC%	Exercising	31	60.79	
	Not Exercising	30	28.32	0.020*
	Irregular	33	33.67	
FEF 25-75 pre	Exercising	31	65.66	
	Not Exercising	30	37.25	0.000*
	Irregular	33	30.36	
FEF 25-75 test	Exercising	31	65.56	0.000*
	Not Exercising	30	32.72	
	Irregular	33	34.58	
FEF 25-75%	Exercising	31	66.32	0.000*
	Not Exercising	30	31.98	
	Irregular	33	34.53	

Table 9. Spirometer basic group statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
MVV (Pred)	Exercising	31	154.8645	19.76004	3.54901
	Not Exercising	30	142.3867	21.99130	4.01504
	Irregular	33	144.8061	18.95809	3.30018
MVV(Test)	Exercising	31	113.8645	39.91206	7.16842
	Not Exercising	30	91.3367	44.86683	8.19152
	Irregular	33	92.9879	38.93469	6.77766
MVV(%Pred)	Exercising	31	95.7516	20.30978	3.64774
	Not Exercising	30	75.6367	25.57388	4.66913
	Irregular	33	67.3606	20.56968	3.58072
FVC(Pred)	Exercising	31	9.6481	.91178	.16376
	Not Exercising	30	5.0993	.88446	.16148
	Irregular	33	4.4730	.86460	.15051
FVC(Test)	Exercising	31	7.2568	1.31338	.23589
	Not Exercising	30	4.7337	1.26849	.23159
	Irregular	33	4.1988	1.38833	.24168
FVC(%Pred)	Exercising	31	102.9161	13.20639	2.37194
	Not Exercising	30	83.5100	16.42039	2.99794
	Irregular	33	86.9909	14.24455	2.47966
FEV(Pred)	Exercising	31	9.9071	.77656	.13947
	Not Exercising	30	4.2894	.64550	.11785
	Irregular	33	3.7842	.75725	.13182
FEV(Test)	Exercising	31	8.9726	1.09238	.19620
	Not Exercising	30	4.3227	1.12105	.20467
	Irregular	33	4.0133	1.04205	.18140
FEV(%Pred)	Exercising	31	105.1258	17.09376	3.07013
	Not Exercising	30	95.6067	14.45125	2.63842
	Irregular	33	97.5939	16.10184	2.80297
FEV-FVC (pred)	Exercising	31	93.2290	1.63996	.29455
	Not Exercising	30	84.8400	2.03971	.37240
	Irregular	33	82.9455	1.99657	.34756
FEV-FVC(Test)	Exercising	31	94.4355	13.26591	2.38263
	Not Exercising	30	88.1100	10.24228	1.86998
	Irregular	33	82.0364	11.63244	2.02495
FEV-FVC(%Pred)	Exercising	31	108.8710	14.01259	2.51674
	Not Exercising	30	92.3067	11.47146	2.09439
	Irregular	33	90.9818	11.41475	1.98705
FEF25-75(Pred)	Exercising	31	8.9235	.48823	.08769
	Not Exercising	30	5.3413	1.27972	.23364
	Irregular	33	4.8567	.46994	.08181
FEF25-75(Test)	Exercising	31	7.7665	1.75755	.31566
	Not Exercising	30	5.2190	1.49488	.27293
	Irregular	33	4.7115	1.56509	.27245
FEF25-75(%Pred)	Exercising	31	105.0968	32.92669	5.91381
	Not Exercising	30	99.9700	26.49062	4.83650
	Irregular	33	93.3273	29.47397	5.13076
FEF25-75(Test)	Exercising	31	7.7665	1.75755	.31566
	Not Exercising	30	5.2190	1.49488	.27293
	Irregular	33	4.7115	1.56509	.27245
FEF25-75(%Pred)	Exercising	31	105.0968	32.92669	5.91381
	Not Exercising	30	99.9700	26.49062	4.83650
	Irregular	33	93.3273	29.47397	5.13076

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