University Students' Transtheoretical Model-Based Sedentary Behaviors, Physical Activity Levels and Related Factors

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ABSTRACT

Objective: The aim of the study was to determine university students' sedentary behaviors based on the Transtheoretical Model (TTM), physical activity levels (PAL) and related factors.

Methods: The study was carried out using a descriptive design with 504 students at a university in Istanbul. Data were collected using the socio-demographic characteristics diagnostic form, the Transtheoretical Model Sedentary Behavior Scales (TTM-SBS) and the International Physical Activity Questionnaire short form (IPAQ-SF). Kruskal-Wallis analysis of variance, Mann-Whitney-U test and Chi-Square test were used for statistical analysis and significance level $p < .05$ was accepted.

Results: While 18.9% of the students midly obese or obese, 81% of them did not participate in regular physical exercise. The majority of females were in the sedentary behaviors change preparation stage (29.4%) and the majority of males (29.1%) were in the action stage ($p < .05$). Sedentary behavior change pros perception score was above average, while cons perception and self-efficacy scores were below average. According to IPAQ-SF, 31.3% of the students were low active, 45.7% were moderate active, 23.0% were high active, and 18.2% had a sitting time of eight hours or more per day. Women were found moderate active, whereas men, workers and smokers were very active ($p < .05$).

Conclusions: Males, underweight, first-grade students, those with no family history of physical activity, and those without a mentor were found to be more resistant to sedentary behavior change.

Keywords: Transtheoretical Model, sedentary behavior, university students, physical activity, assessment

1. INTRODUCTION

The university period is the time when students strive to adapt to academic studies, career planning, a competitive environment, and an independent new lifestyle. During this adaptation process, students may adopt unhealthy lifestyle behaviors for various reasons (smoking, drinking alcohol, consuming fast food, etc.) (1). In particular, sedentary behaviors increase during this period and physical activity levels of many university students gradually decrease after high school (2). In various studies, it has been reported that more than 50% of university students adopt a sedentary behavior (3). The World Health Organization (WHO) reports that 34.3% of university students are not involved in any physical activity (men 25%, women 43%), and 32.5% of those who are involved do it less than three times a week (15.8% once a week, 16.7% two-three times a month) (5). Many studies have also reported that the sitting time of university

students is at least 6.73 hours/day and at most over 9 hours/day (1-4). However, WHO suggests that young people should engage in moderate to vigorous-intensity aerobic physical activity for at least 60 minutes a day, as well as activities that strengthen muscles and bones at least three days a week (5). Physical activity at the specified intensity supports the development of physical, mental and social health in young people (1,6).

Sedentary behavior is defined as any activity that leads to energy consumption of 1.5 MET (Metabolic Equivalent) or less in the awake, lying, or sitting position (26). Sedentary behavior in young individuals is associated with a decrease in cardiometabolic fitness level, an increase in body fat and Body Mass Index (BMI) values, sleep quality, cognitive health (academic performance, motivation, self-confidence, etc.),

mental health (depression, stress, etc.) (1,7). Moreover, sedentary behavior is the fourth leading risk factor for death worldwide (5). Inadequate physical activity levels increase the risk of cancer, heart disease, stroke and diabetes by 20-30%, and shorten life span by 3-5 years. Therefore, there is a need to determine students' sedentary behaviors and physical activity levels with valid and reliable measurement tools (2,8-10). Assessing the current situation is necessary and crucial in terms of shedding light on the solution of the problem.

In the literature, one of the models used to alter behaviors in sedentary individuals is the Transtheoretical Model (TTM). In TTM, behavior change is defined as a gradual, continuous, and dynamic process. The key feature that differentiates this model from other behavior change models is its assertion that behavior change is a process (2). The main components of the TTM are the stages of change: precontemplation, contemplation, preparation, action, and maintenance. Additionally, the processes of change, decision-making (the pros and cons of change), and self-efficacy (the individual's belief in their ability to maintain health behaviors despite challenging environments) are other components that constitute the model (23). The model includes behavior-specific scales that are developed to measure change, which are sensitive, valid, and reliable. The effectiveness of the model has been proven in changing numerous unhealthy behaviors, such as smoking cessation and alcohol reduction, as well as in promoting healthy behaviors like increasing physical activity (9-12). The TTM has been validated by the development of scales for sedentary behaviors, demonstrating its validity and reliability in measuring behavior change.

The International Physical Activity Questionnaire Short Form (IPAQ-SF) was developed by the WHO to assess individuals' physical activity levels. The questionnaire measures the type, duration, and intensity of physical activities performed by individuals over the past 7 days (26). Diagnosing students' physical activity levels using the IPAQ-SF and sedentary behaviors using the TTM will guide the development of intervention/change programs (2,10,13,14). Therefore, this study was conducted to identify university students' TTM-based sedentary behaviors, physical activity levels, and related factors.

1.1. Research questions:

- What is the Transtheoretical Model Sedentary Behavior (TTM-SB) score?

- What is the International Physical Activity Questionnaire-short form (IPAQ-SF) scale score?

- What are the variables affecting the TTM-SB score?

- What are the variables affecting IPAQ-SF?

- Is there a relationship between the TTM-SB and IPAQ-SF scores?

2. METHODS

2.1. Research Design

The study was conducted with a descriptive and correlational design.

2.2. Place and Date of the Study

The study was conducted between October and December 2021 with students enrolled in the health program of a vocational school of a foundation university in Istanbul.

2.3. Selection Criteria

Students who were between the ages of 18-25, who voluntarily agreed to participate in the study and who completed the data collection forms correctly and completely were included.

2.4. Research Population and Sample

The research population consisted of a total of 657 students studying in five departments of vocational school health programs. The entire population was included in the research without using the sampling method. 638 of 657 students completed the data collection tools. A control question was added to all scales to check that students carefully read and answered the data collection forms. After 134 forms, which incorrectly answered the control questions in the data collection tools, were removed from the sample, and the study was completed with 504 students. In this research, in the Operating Room Services program, all 127 students (100%); in the Anesthesia program, 127 out of 145 students (87.5%); in the Oral and Dental Health program, 77 out of 103 students (75%); in the Medical Imaging Techniques program, 47 out of 133 students (35%); and in the First and Emergency Aid program, 126 out of 149 students (85%) participated. For a sample size of 504 participants, a post hoc power analysis yielded a value of 0.999. This result indicates that the sample size enhances the accuracy and reliability of the test.

2.5. Data Collection Method

According to the literature, the survey questions were converted into an electronic format via Google Forms (2,8,10,14). Students were invited to participate by receiving information about the research, ethics committee and institutional approval, the informed consent form, and the data collection form link through class representatives. Students experiencing issues with the survey were monitored and assisted by class representatives and researchers.

2.6. Data Collection Tools

2.6.1. Socio-Demographic Characteristics Diagnostic Form

The form consists of 11 closed-ended questions that are about students' socio-demographic characteristics, physical activity and lifestyle behaviors (2,8,10,14). Students were asked to write down their body weight (kg) and height (cm) values by measuring them themselves. Height and weight measurements are based on student statements. Body mass index (BMI) was calculated by the researchers. Body mass index (BMI) categories were determined as underweight below 18.5, normal weight 18.5-24.99, Overweigh 25.00-29.99 and, Obese 30 and above according to WHO (15).

2.6.2. Transtheoretical Model Sedentary Behavior Scales (TTM-SBS)

It was developed by Han et al. (8) and its Turkish validity and reliability study was performed by Tok (10) with young people aged. The scale consists of four different sections: stages of change, change process, decision-making and self-efficacy scales (8,10).

Sedentary Behavior Stages of Change (SB-SOC-1 and SB-SOC-2): The questionnaire reflects the individual's attitude, intention and behavior towards change. SB-SOC-1 inquires the status of doing enough physical activity every day as yes or no. SB-SOC-2 evaluates the stage of behavior change in five stages: precontemplation, contemplation, preparation, action and maintenance (2,10).

TTM Sedentary Behavior Self-Efficacy Scale (SB-SES): The scale consists of six items including self-confidence in quitting sedentary behavior. It is a five-point Likert type (1: Do not trust at all, 5: Trust completely). Cronbach alpha values are 0.75 (10). In this study, Cronbach Alpha reliability coefficient was determined as 0.836. High scores are an indicator of high self-efficacy.

TTM Sedentary Behavior-Decisional Balance Scale (SY-DBS): The decision-making scale consists of two scales measuring the pros and cons of behavior change. It is a five-point Likert type (1: Not at all important, 5: Extremely important). The "pros of behavior change" subscale includes six items (questions 1, 3, 5, 7, 9, and 11) and measures the perceived benefits of modifying sedentary behavior. The "cons of behavior change" subscale consists of six items (questions 2, 4, 6, 8, 10, and 12) and evaluates the perceived drawbacks of changing sedentary behavior. Cronbach's alpha values are 0.87 and 0.73, respectively (10). In this study, Cronbach's alpha values were determined as 0.828 and 0.500, respectively. High scores indicate high perceptions of pros and cons.

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

The International Physical Activity Questionnaire (IPAQ) was developed by a group of scientists formed by the World Health Organization (WHO) and other international health organizations in 1998 (26). The questionnaire was adapted to Turkish and its reliability and validity were performed by Öztürk (13). The short form consists of seven questions to determine the average daily time spent sitting, walking, moderate and vigorous action action in the last seven days. The scoring is calculated as "MET-minutes/week" by multiplying the days, minutes and Metabolic Equivalent (MET) value of physical activities (13). IPAQ-SF is categorized according to total MET scores. 599 METs and below is low active level, 600 METs-3000 METs is moderate active level, 3001 METs and above is high active level.

2.7. Research Variables

Dependent variables of the study are SB-SOC-I and II, SD-SES score, SB-decision making, pros perception and cons perception mean scores, physical activity MET score and categories (low active, moderate active, high active) according to IPAQ-SF, and sitting times.

The Independent Variables of the study are socio-demographic characteristics such as age, gender, employment status and BMI categories and variables that may affect physical activity status.

2.8. Data analysis

Statistical analyses were performed using IBM SPSS 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp) package program. Descriptive data were presented using frequency, percentage and mean scores. The normal distribution of the data was tested with the One-Sample Kolmogorov-Smirnov Test and it was found that the data were not normally distributed. Independent variables and mean scale scores were tested by Kruskal Wallis Analysis of Variance, Mann Whitney-U test and Post-hoc Games Howell test. The data indicated by counts were evaluated by Chi-Square test. Statistical significance level was accepted as p < .05.

2.9. Ethical considerations

For the use of the scales, permission was obtained via e-mail from Tok. Before running the study, ethical permission (09.2021.713) was obtained from the clinical research ethics committee of the medical faculty of the university. This research was derived from pre-test data collected before the interventional study. Institutional permission (E-61952817.044.21669/21143) from the university where the study was conducted, and informed consent was obtained from the students prior to data collection.

3. RESULTS

Socio-demographic characteristics are shown in Table 1. The average age of the students is 20.03 ± 2.09 years, with 82.9% being female. The average BMI is 22.05 ± 3.95, and 65.3% have the normal range. Among the participants, 45.6% are first-grade students, and 74.4% are not employed. The smoking rate is 29.4%, and the alcohol consumption rate is 16.3%. Additionally, 64.3% spend more than 3 hours daily on their phones, while 75.4% use computers and televisions for less than 1 hour. The most common barriers to physical activity among students are lack of time (54.6%), the high expensive of gyms (29%), and the lack of suitable environments for physical activity (27%) (Table 1).

Table 1. Socio-demographic characteristics of the students (n= 504)

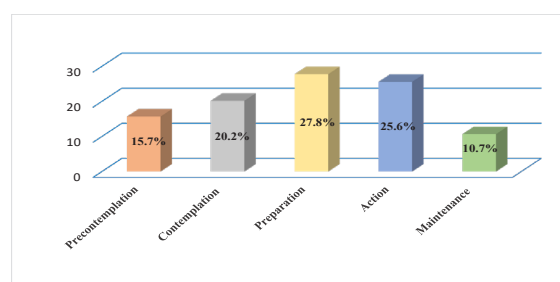| Variables		n	%
Age group	17-20 years old	372	73.8
	21-24 years old	114	22.6
	25 years and above	18	3.6
Gender	Female	418	82.9
	Male	86	17.1
BMI	Underweight (< 18.5)	80	15.9
	Normal (18.5-24.99)	329	65.3
	Overweight (25.00-29.99)	78	15.5
	Obese (30 and over)	17	3.4
Grade	1st grade	230	45.6
	2st grade	274	54.4
Employment status	Yes	129	25.6
	No	375	74.4
Smoking	Yes	148	*29.4
Alcohol consumption	Yes	82	*16.3
Time spent on the phone per day	1 hour ↓	14	2.8
	1 hour – 3 hours ↓	166	32.9
	3 hour – 5 fours ↓	217	43.1
	5 hours ↑	107	21.2
Daily time spent with computers, televisions	1 hour ↓	380	75.4
	1 hour – 3 hours ↓	86	17.1
	3 hour – 5 hours ↓	21	4.2
	5 hours ↑	17	3.4
PA Barriers	Lack of time*	275	54.6
	Not needing*	103	20.4
	Lack of suitable environment*	136	27.0
	No incentive*	85	16.9
	Expensive gyms*	146	29.0
	Friends not doing PA*	85	16.9
	Family not doing PA*	49	9.7

PA: Physical activity. Percentage of those answering yes.*

According to the TTM-SB-SOC-1, 81.0% of the students stated that they did not do enough physical activity almost every day (Figure 1).
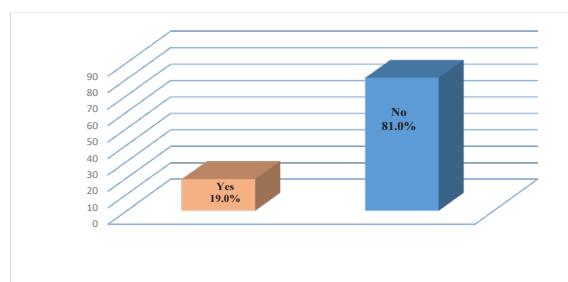
Figure 1. TTM SB-SOC-1-Doing regular physical activity every day

According to the TTM-SB-SOC-2, the majority of students were found to be in the preparation stage (27.8%) of changing sedentary behaviors (Figure 2).

Figure 2. TTM-SB-SOC-2-sedantery behaviors

Table 2 shows the comparison of variables with the Transtheoretical Model (TTM) stages of change for sedentary behavior. According to TTM SB-SOC-1, 83.0% of women, 69.8% of men, 94.1% of individuals with obesity, 86.5% of first-grade students, and 86.1% of those spending 3 hours or more on their phones did not engage in regular physical activity (p < .05). According to TTM SB-SOC-2, 29.4% of women and 29.1% of men were in the preparation stage, while 26.1% of first-grade students and 29.6% of second-grade students were in the contemplation and preparation stages, respectively. 31.0% of employed students and 28.3% of those who spent less than 3 hours on the phone were in the action stage; 29.6% of unemployed students and 29.9% of those who spent more than 3 hours on the phone were in the preparation stage (p < .05) (Table 2).

The comparison of the mean TTM-SBS scores of the students in terms of some variables is shown in Table 3. The study found that women (21.38±5.35), individuals with obesity (24.94 ± 5.37), second-grade students (23.38 ± 4.94), those without an environment conducive to physical activity (23.61 ± 4.88), and those with family members who engage in physical activity (23.95 ± 4.73) had higher scores on the pros of sedentary behavior change (SB-DBS-P) (p < .05). Additionally, first-grade students (16.38 ± 3.45) and individuals without family members leading physical activity (16.68 ± 3.65) had higher scores on the cons of sedentary behavior change (SB-DBS-C) (p < .05). Second-grade students (17.19 ± 5.15) and those with family members who engage in physical activity exhibited higher self-efficacy levels (p < .05) (Table 3).

Table 2. Comparison of variables and Transtheoretical Model sedentary behaviors change stages 1-2

Variables		TTM SB-SOC (1)		TTM SB-SOC (2)				
		Yes	No	PC	CO	PR	AC	MA
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Gender	Female	71 (17.0)	347 (83.0)	69 (16.5)	88 (21.1)	**123 (29.4)**	104 (24.9)	34 (8.1)
	Male	26 (30.2)	60 (69.8)	10 (11.6)	14 (16.3)	17 (19.8)	**25 (29.1)**	20 (23.3)
	Statistics	x^2= 8.053; p = .005		x^2= 19.99; p = .001				
BMI	Underweight	8 (10.0)	72 (90.0)	16 (20.0)	20 (25.0)	25 (31.3)	15 (18.8)	4 (5)
	Normal	66 (20.1)	263 (79.9)	52 (15.8)	64 (19.5)	83 (25.2)	88 (26.7)	42 (12.8)
	Overweigh	22 (28.2)	56 (71.8)	10 (12.8)	13 (16.7)	25 (32.1)	22 (28.2)	8 (10.3)
	Obese	1 (5.9)	16 (94.1)	1 (5.9)	5 (29.4)	7 (41.2)	4 (23.5)	0 (0.0)
	Statistics	x^2= 10.523; p = .015		x^2= 14.77; p = .254				
Grade	1st grade	**31 (13.5)**	199 (86.5)	42 (18.3)	**60 (26.1)**	59 (25.7)	52 (22.6)	17 (7.4)
	2nd grade	**66 (24.1)**	208 (75.9)	37 (13.5)	42 (15.3)	**81 (29.6)**	77 (28.1)	37 (13.5)
	Statistics	x^2=9.056; p = .003		x^2= 15.48; p = .004				
Employment status	Yes	32 (24.8)	97 (75.2)	15 (11.6)	20 (15.5)	29 (22.5)	**40 (31.0)**	25 (19.4)
	No	65 (17.3)	310 (82.7)	64 (17.1)	82 (21.9)	**111 (29.6)**	89 (23.7)	29 (7.7)
	Statistics	x^2= 3.449; p = .063		x^2= 19.62; p = .001				
Smoking	Yes	32 (21.6)	116 (78.4)	19 (12.8)	32 (21.6)	37 (25)	41 (27.7)	19 (12.8)
	No	65 (18.3)	291 (81.7)	60 (16.9)	70 (19.7)	103 (28.9)	88 (24.7)	35 (9.8)
	Statistics	x^2= 0.761; p = .383		x^2= 3.10; p = .541				
Time spent on the phone per day	0-3h↓	52 (28.9)	128 (71.1)	22 (12.2)	35 (19.4)	43 (23.9)	**51 (28.3)**	29 (16.1)
	3 hours ↑	45 (13.9)	279 (86.1)	57(17.6)	67 (20.7)	**97 (29.9)**	78 (24.1)	25 (7.7)
	Statistics	x^2= 16.752 ; p = .000		x^2= 12.17; p = .016				

x^2= chi-square; Transtheoretical Model (TTM); Sedentary Behavior (SB); Stages of Change (SOC); PC= Precontemplation, CO= Contemplation, PR=Preparariton, AC=Action, MA= Maintenance

Table 3. Comparison of Transtheoretical Model sedentary behavior scales mean scores in terms of some variables

Variables		SB-DBS-P Total Score	SB-DBS-C Total Score	SY-SES Total Score
		Mean ± SD	Mean ± SD	Mean ± SD
Gender	Female	22.60 ± 5.24	15.82 ± 3.89	16.38 ± 5.05
	Male	21.38 ±5.35	16.33 ± 3.33	17.40 ± 5.77
Statistics		z=2.01; p=.04	z=1.26; p = .21	z=1.41; p = .16
BMI	*Underweight[a]	21.68 ± 4.69	16.50 ± 3.88	16.97 ± 4.85
	Normal[b]	22.52 ± 5.42	15.74 ± 3.73	16.39 ± 5.14
	Overweigh[c]	22.05 ± 5.06	16.25 ± 3.99	16.78 ± 5.75
	Obese[d]	24.94 ± 5.37	14.88 ± 3.80	16.82 ± 5.02
Statistics		x^2=8.90; p=.03 a<c<b<d	x^2=6.01; p=.11	x^2=1.22; p=.74
Grade	1st grade	21.22 ± 5.42	16.38 ± 3.45	15.80 ± 5.13
	2nd grade	23.38 ± 4.94	15.52 ± 4.04	17.19 ± 5.15
Statistics		z=4.60; p=.00	z=2.39; p=.01	z=3.01; p=.00
Suitable environment for PA	Yes	21.94 ± 5.35	15.80 ± 3.90	16.61 ± 5.36
	No	23.61 ± 4.88	16.20 ± 3.53	16.41 ± 4.70
Statistics		z=3.16; p=.00	z=0.77; p=.43	z=0.25; p=.79
Person leading PA	Yes	22.04 ± 5.33	15.75 ± 3.82	16.76 ± 5.22
	No	24.16 ± 4.64	16.68 ± 3.65	15.57 ± 4.93
Statistics		z=3.30; p=.00	z=2.06; p=.03	z=1.49; p=.13
PA structure of the family	Yes	23.95 ± 4.73	16.20 ± 4.35	17.79 ± 4.80
	No	22.23 ± 5.30	15.88 ± 3.74	15.42 ± 5.28
Statistics		z=2.20; p=.02	z=0.10; p=.91	z=2.73; p=.00

*z=Mann-Whitney U, Kwx²= Kruskal Wallis chi-square test. SB: Sedentary Behavior; S: Scale; SB-DBS: Sedentary Behavior – Decision Making Scale; P: Pros Perception; C: Cons Perception. SB-SES: Sedentary Behavior – Self-efficacy Scale. PA: Physical activity.

Table 4 shows the students' total walking MET Score and total moderate-intensity and vigorous-intensity MET scores according to the IPAQ-SF. According to the IPAQ-SF, 77.0% of the students were low and moderate active, with the highest score in walking. 18.2% of students had a sitting time of eight hours or more per day (Table 4).

In IPAQ-SF, a statistically significant difference was found between PAL and mean scores of SB-SOC-1, SB-SOC-2 and SB-DBS-P (p < .05), (Table 6).

Table 4. According to IPAQ-SF, students' MET scores, physical activity levels, sitting times and Moderate-Intenstiy PA performance

According to the IPAQ-SF;		Mean ± SD	Min-max
Total Walking MET Score		1924.88 ±3396.39	0–18018
Total Moderate-intensity MET Score		511.11±1980.17	0-21840
Total Vigorous-intensity MET Score		1178.14±4727.90	0-43680
Variables		n	%
PAL	Low active	158	31.3
	Moderate active	230	45.7
	High active	116	23.0
Sitting (n=438)	5 mins – 1 hour ↓	124	28.3
	1 hour – 4 hours ↓	132	30.1
	4 hours – 8 hours ↓	102	23.3
	8 hours – 12 hours ↓	37	8.4
	12 hours ↑	43	9.8
Currently engage in moderate-intensity PA	Yes	229	52.3
	No	209	47.7
Intention to increase participation in moderate-intensity PA in the next six months	Yes	360	82.2
	No	78	17.8
Currently doing regular moderate-intensity PA	Yes	165	37.7
	No	273	62.3
Regular moderate-intensity participation in PA for the last six months	Yes	142	32.4
	No	296	67.6
Moderate-intensity regular PA for at least three months in the past	Yes	274	62.6
	No	164	37.4

*Percentage of those who answered yes; IPAQ-SF; International Physical Activity Questionnaire; PA; Physical Activity; PAL:Physical Activity Level.

There was statistically significant difference between gender, employment status, smoking, and not feeling the need for PA and IPAQ-SF PAL (p < .05), (Table 5).

Table 5. Comparison of IPAQ-SF physical activity levels of students in terms of some variables (n=504)

Variables		**Physical Activity Levels (IPAQ-SF)**			
		Low active	Moderate active	High active	Statistics
		n (%)	n (%)	n (%)	x^2/p
Gender	Female	77 (18.4)	246 (58.9)	95 (22.7)	**18.70; p = .000**
	Male	11 (12.8)	36 (41.9)	39.0 (45.3)	
BMI	Underweight	14 (17.5)	48 (60.0)	18 (22.5)	3.10; p = .796
	Normal	57 (17.3)	185 (56.2)	87 (26.4)	
	Overweigh	15 (19.2)	38 (48.7)	25 (32.1)	
	Obese	2 (11.8)	11 (64.7)	4 (23.5)	
Grade	1st grade	39 (17)	136 (59.1)	55 (23.9)	1.96; p= .375
	2nd grade	49 (17.9)	146 (53.3)	79 (28.8)	
Employment	Yes	13 (10.1)	59 (45.7)	57 (44.2)	**28.84; p= .000**
	No	75 (20)	223 (59.5)	77 (20.5)	
Smoking	Yes	22 (14.9)	75 (50.7)	51 (34.5)	**6.73; p= .034**
	No	66 (18.5)	207 (58.1)	83 (23.3)	
Time spent on the phone per day	0-3 hours↓	31 (17.2)	98 (54.4)	51 (28.3)	0.44; p= .801
	3 hours ↑	57 (17.6)	184 (56.8)	83 (25.6)	
PA Barriers	Lack of time*	46 (17.8)	145 (52.7)	81 (29.5)	3.04; p= .219
	Not needing*	17 (16.5)	70 (68.0)	16 (15.5)	**9.35; p= .009**
	Lack of suitable environment*	20 (14.7)	82 (60.3)	34 (25.0)	1.61; p= .446
	No incentive*	16 (18.8)	47 (55.3)	22 (25.9)	0.13; p= .934
	Expensive gyms*	30 (20.5)	80 (54.8)	36 (24.7)	1.45; p= .482
	Friends not doing PA*	17 (20.0)	50 (58.8)	18 (21.2)	1.65; p= .437
	Family not doing PA*	10 (20.4)	29 (59.2)	10 (20.4)	1.15; p= .562

*Percentage of those who said yes; x^2= Pearson Chi-Square; PA: Physical Activity; PAL: Physical Activity Level.

Table 6. *According to the IPAQ-SF physical activity levels of the students, the mean scores of the Transtheoretical Model Sedentary Behaviors scales*

TTM-SB-SOC Low active n (%)		Physical Activity Level (IPAQ-SF)			x^2 /p
		Moderate active	High active		
		n (%)	n (%)		
SB-SOC (1)	Yes	6 (6.2)	47 (48.5)	44 (45.4)	25.87/p=.00
	No	82 (20.1)	235 (57.7)	90 (22.1)	
SB-SOC (2)	PC	17 (21,5)	51 (64.6)	11 (13.9)	41.73/p=.00
	CO	23 (22.5)	61 (59.8)	18 (17.6)	
	PR	23 (16.4)	85 (60.7)	32 (22.9)	
	AC	21 (16.3)	66 (51.2)	42 (32.6)	
	MA	4 (7.4)	19 (35.2)	31 (57.4)	
TTM-SBS sub-dimensions		Mean (±SD)	Mean (±SD)	Mean(±SD)	kwx^2 /p
SB-DBS	P	20.48(5.81)*	23.35 (4.74)	23.10 (4.84)	8.65/p= .01
	C	16.17 (3.56)	15.70 (3.95)	16.00 (3.82)	0.69/p= .70
SB-SES		14.42 (4.67)	17.66 (5.05)	17.23 (5.33)	5.35/p= .06

x^2= Pearson Chi-Square, kwx2= Kruskal Wallis Chi-Square. *= Mann-Whitney U test, TTM: Transteoretik Model; SB: Sedentary Behavior; S: Scale; SOC: Stages of Change; PC= Precontemplation, CO=Contemplation, PR=Preparation, AC=Action, MA= Maintenance. SB-DBS-Sedentary Behavior-Decisional Balance Scale; P: Pros; C: Cons. SB-SES; Sedentary Behavior Self-Efficacy Scale.**

4. DISCUSSION

The study aimed to determine university students' TTM-based sedentary behaviors (SB), physical activity levels (PAL), and related factors. The results indicated that the majority of students (81%) were not engaging in sufficient physical activity (PA), with 27.8% being in the preparation stage of behavior change for SB. According to the IPAQ-SF, the majority of students (77%) were classified as moderate or low active, spending an average of 4 hours and 24 minutes per day sitting. Time constraints, the high expensive of gyms and absence of a suitable environment for PA were identified as the top three barriers. Additionally, higher perceptions of the pros of SB change were found among women, individuals with obesity, second-grade students, those without a suitable environment for PA, and those whose families do not engage in PA. Conversely, first – grade students and those without a PA leader had higher perceived cons of SB change. Second-grade students and those with family members who engage in PA had higher self-efficacy scores.

This study findings show that the PA of university students may seriously affect their health status in the future. In this study, 81% of students were not engaging in regular PA. These findings are similar to the results of literatüre studies (2,7,10,14). For example, a study conducted in the United States reported that approximately 80% of adolescents do not engage in sufficient PA and 20% are low active (17). Similarly, another study conducted in Turkey found that approximately 82% of students did not meet PA recommendations and exhibited SB for an average of nine hours or more (16). These results suggest that school staff and parents should devote

more effort and resources to encourage young people to engage in PA.

This study showed that the majority of students were at the preparation stage (27.8%) for sedentary behavir change. Kim and Lee (14) reported that 66.7% of the students were in the preparation stage. A study conducted with Macedonian students determined that 43.50% were in the precontemplation stage (11). A study conducted in Turkey determined that 32.4% of students were in the preparation stage (10). These results show that students do not have enough motivation and self-confidence to start exercising.

In this study, it was found that women were mostly in the preparation stage (29.4%) and men were in the action stage (29.1%). In contrast to these findings, Han et al. (2) reported that 33.6% of male students and 49.5% of female students were in the preparation stage. Elezim et al. (11) found that 29.1% of men and 52.9% of women were in the precontemplation stage. Therefore, it is recommended that gender differences be taken into account when creating PA programs.

In this study, women had higher scores on the perceived pros of SB change (22.60 ± 5.24) compared to men, but lower scores on the perceived cons of SB change (15.82 ± 3.89) and self-efficacy (16.38 ± 5.05). In parallel with our research findings, some studies in the literature found that women's SB-behavior change pros and men's cons scores were higher (2,18,19). For example, Tok (10) found that women had higher scores on the perceived pros of sedentary behavior change compared to men, while their scores on perceived cons and self-efficacy were lower. These findings suggest that women are more aware of the cons of SB than men. However, it suggests that women may require additional support to adopt a more active behaviors and enhance their self-efficacy.

In this study, self-efficacy were found to be higher in second-grade students (17.19 ± 5.15) and students whose families engaged in PA (17.79 ± 4.80) (p < .05). Similarly, Elezim et al. (11) reported that individuals receiving social support from their families had higher levels of self-efficacy compared to those who did not. Therefore, it is suggested that priority should be given to developing self-efficacy in first-grade students and those whose families do not engage in physical activity.

In this study, students had higher scores for walking MET (1924.88 ± 3396.39), moderate-intensity MET score (511.11 ± 1980.17), and total vigorous-intensity MET score (1178.14 ± 4727.90). Similar to our results, the literature has determined that university students prefer walking more (2,3). Studies evaluating the physical activity levels (PAL) of students according to gender revealed that women mostly preferred walking and moderate-intensity PA, while men preferred very vigorous PA (3). This may be because women and men have different physical performance levels. A study by Tergerson and King (29) reported that women perceive PA as leisure time exercise to maintain physical fitness, reduce stress, increase self-confidence, and/or promote weight loss. The

study reported that men, on the other hand, perceived PA as competitive sports to improve their strength and for peer acceptance (21). It is important that students are encouraged, regardless of their motivation, to engage in PA and continue to do so as they transition from adolescence to adulthood.

This study found that the average sitting time of students in a day was 4 hours and 24 minutes. The literature reports that university students spend at least 6.5 hours and at most 9 hours a day sitting (1-4,14). These results indicate that students have a significant level of sedentary behavior and suggest that support is needed to reduce their sitting time.

This study found 45.7% of the students to be moderate active. In most of the research with the IPAQ-SF, university students have been found to be moderate active (26). Another study found that 51.4% of university students were classified as low active, 28.2% as moderate active, and 20.4% as high active (17). Alkhawaldeh et al. (22) also reported that 51.9% of students were low or moderate active (sedentary). A study conducted in China found that 48% of nursing students and 38% of medical students were high active (25). Similarly, a study in Brazil reported that 55% of undergraduate students were high active (27), while a study in Saudi Arabia found that only 42% of health college students were high active (28). Studies conducted with students studying in health departments have also indicated that PA is the least paid attention among healthy lifestyle behaviors (3,20).

According to the IPAQ-SF, 58.9% of women were classified as moderate active, while 45.3% of men were found to be high active. Awadalla et al. (28) reported that 43.7% of men and 41.2% of women were low or moderate active. Research examining physical activity levels has often found that women are generally classified as moderate active at higher rates (4,14,16). The higher levels of moderate activity among women may be related to social and cultural factors.

This study found a significant difference between TTM-SB-SOC 1 and 2 and IPAQ-SF levels. According to TTM-SB-SOC-2, those in the maintenance phase were found to be high active, while others were found to be moderate active. Studies with similar results have shown that individuals with low PAL are more likely to stay behind in change stages and are less motivated to take action (14,23). Elezim et al. (11) stated that SB has direct and indirect effects on PAL. Some contrary research results indicate that SB and PAL are independent of each other and that individuals may be active but exhibit SB (24). Therefore, it may be recommended to determine students' motivations for SB and plan interventions accordingly.

5. CONCLUSION

According to the results of the study, it is recommended that university health professionals assess students' physical activity levels, sedentary behaviors, and Body Mass Index (BMI). It is recommended to motivate students to engage in physical activity. For those preparing to change their sedentary behaviors, it is suggested to provide counseling and educational programs aimed at promoting action, encouraging physical activity, and increasing self-efficacy. Additionally, forming walking groups could help students enhance their preferred walking activities, and using step count tracking programs with rewards could be beneficial. Based on the research results, planning educational and counseling interventions to support and guide individuals and communities in changing sedentary behaviors is also advised.

This study was conducted with students enrolled in health programs at a vocational school within a university. Therefore, the results are generalizable only to students in health programs at this specific vocational school. A limitation of the study is that the students' height and weight measurements were based on self-reports. Future research on the Transtheoretical Model and its main constructs could explore the relationships and/or variations of this model or its key components across different age groups (e.g., adults and elderly) and occupational groups (e.g., clerks, workers, managers). Additionally, longitudinal and experimental studies could be conducted to better assess the impact of the Transtheoretical Model's main constructs on physical activity behavior.

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