Original Article

Determination of Secondary School Students' Attitudes Towards Improving Heart Health, Nutrition and Exercise Behaviors

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Abstract
Aim: The aim of this study is to determine adolescents' attitudes towards promoting heart health and nutrition-exercise behaviours and to examine the relationship between attitudes towards promoting heart health and nutrition-exercise behaviours.
Methods: This is a cross-sectional study. Data were collected from 351 adolescents. Descriptive Information Form, Heart Health Attitude Scale for Children and Nutrition-Exercise Behaviour Scale were used for data collection. Data were analyzed using descriptive statistics, independent sample t test, One Way ANOVA, Kruskall Wallis analysis, Mann-Whitney U test and Pearson correlation.
Results: Of the adolescents, 7.7% were obese and 38.7% practiced regular sports. It was observed that 91.2% of adolescents had moderate attitudes towards improving heart health. Better and statistically significant heart health attitudes were found in those who were in the eighth grade, whose parents had 8 years of education or less, whose parents did not work, and those who did regular sports ($p<0.05$). We observed that adolescents who perceived themselves to be obese had worse heart health attitudes compared to those who perceived themselves to be of normal weight. The healthy eating-exercise behavior score was higher and statistically significant ($p<0.05$) in sixth graders, males, those whose fathers were employed, those who did sports regularly, those who perceived their weight to be normal, those with a BMI between the 15th and 85th percentile and those with a waist-to-height ratio <5. There was a statistically significant relationship between parental education level and employment status and unhealthy diet-exercise behavior ($p<0.05$). There was a significant negative correlation between adolescents' heart health attitude scores and healthy eating-exercise behavior scores ($r=-0.136$, $p<0.05$).
Conclusions: The present study revealed that adolescents' attitudes towards heart health promotion and nutrition-exercise behaviors were at a moderate level and that there was a relationship between heart health attitudes and healthy nutrition-exercise behaviors in adolescents.

Keywords: adolescent, cardiovascular diseases, eating behavior, exercise, school nurse.

Introduction

Cardiovascular diseases are one of the leading causes of death in the world (Civek & Akman 2022; Dogru et al., 2021; Steinberger et al., 2016) and a major public health problem of the 21st century (Yang et al., 2024). Although cardiovascular diseases are mostly diagnosed in adulthood, many risk criteria associated with morbidity and mortality develop from childhood (Garbers et al., 2018; Jackson et al., 2018; Pool et al., 2021). The American Heart Association has defined seven cardiovascular health factors to have ideal cardiovascular health in adolescents and children. The seven cardiovascular health criteria include the domains four of which are based on such lifestyle factors as diet, exercise, body mass index (BMI) and smoking; three of which are based on such health factors as fasting blood glucose, total cholesterol and blood pressure (Lloyd-Jones et al., 2010; Steinberger et al., 2016). These risk factors should be sought in childhood and continuously monitored in adulthood (Minossi & Pellanda, 2015).

Nutrition-exercise behavior is among the most important modifiable risk factors in

promoting healthy life and preventing chronic diseases (McNamara et al., 2021), protecting and improving physical and mental health, and improving quality of life (Guthold et al., 2020). Non-communicable diseases such as cardiovascular diseases, diabetes, hypertension, stroke, some cancers and non-communicable diseases such as cardiovascular diseases, diabetes, hypertension, stroke, some cancers with overweight and obesity caused by unhealthy diet and insufficient physical activity pose a risk for health in the future (WHO, 2022). In addition, dietary habits directly affect multiple cardiovascular risk factors such as hypertension, obesity, dyslipidemia and hyperglycemia (Steinberger et al., 2016). Considering that nutrition and exercise behaviors are directly related to the development of cardiovascular diseases (Karakul et al., 2023), achieving positive changes in these habits will positively affect health outcomes.

Adolescence is a time when unhealthy behaviors that can affect cardiovascular health can occur (Nasaescu et al., 2020). Adolescents face cardiovascular risks as a result of rapid socioeconomic improvement and lifestyle changes (Liu, 2022). Failure to maintain cardiovascular health in children and adolescents may lead to an increase in cardiovascular disease among the adult population in the future. Many studies have shown that children and adolescents are physically inactive (Merlo et al., 2020), have unhealthy eating habits (Ozkan & Calisir, 2019) and smoke (Jacobs et al., 2022). Unhealthy diet, physical inactivity, and harmful use of tobacco and alcohol are behavioral risk factors leading to cardiovascular diseases (Jacobs et al., 2022). In terms of preventing cardiovascular diseases, creating healthy lifestyles in childhood is more effective than changing unhealthy behaviors in adulthood (Liu, 2022). Given the evidence that the development of cardiovascular disease is determined early in life (Laitinen et al., 2012), the cardiovascular disease status in children and adolescents is potentially alarming and therefore important to understand (Liu, 2022). Determining adolescents' attitudes towards promoting heart health and dietary exercise behaviors and taking preventive measures in this direction are necessary for a healthy society. This study was conducted to determine adolescents' attitudes towards promoting heart health and nutrition-exercise behaviors and to examine the relationship between attitudes towards promoting heart health and nutrition-exercise behaviors.

Research questions

1. What are the levels of heart health attitude and utrition-exercise behavior of adolescents?
2. Do the levels of heart health attitude and nutrition-exercise behavior differ according to sociodemographic characteristics of adolescents?
3. Do heart health attitude and nutrition-exercise behavior level differ according to anthropometric and blood pressure measurements of adolescents?
4. Is there a relationship between adolescents' heart health attitude and nutrition-exercise behaviors?

Methods

Design and sample of study: This study is cross-sectional. The study was conducted in three central districts of a city in Turkey. These districts were the three most populated districts of the city (TUIK, 2021). A secondary school with the highest number of students was selected from each district. The population of the study consisted of 2504 students studying in grades 6-8 in these three schools. The sample size was calculated as 334 with a 95% confidence interval using a sampling method with a known population. In order to increase the power of the study, the sample size was increased by 10% and 367 students were reached. Sixteen students who did not want to have anthropometric measurements were excluded from the study and the study was completed with 351 students. The number of students from each school and class was determined by stratified sampling (School A=179, School B=101, School C=71). The number of participants was randomly selected from each stratum at the level of representation in the population. Inclusion criteria were: (1) studying in the sixth, seventh and eighth grades and (2) parental consent. Exclusion criteria were: (1) studying in the fifth grade, (2) having visual-hearing impairment, and (3) having any neuropsychiatric disease.

Variables of the study: The dependent variable of the study was heart health attitude and nutrition-exercise behavior level. The independent variables of the study were age, gender, grade level, parental education level, parental employment status, regular exercise status, perceived weight, Body Mass Index (BMI), brain-to-height ratio, and blood pressure.

$$n = \frac{N \cdot t^2 \cdot p \cdot q}{d^2.(N-1) + t^2 \cdot p \cdot q} = \frac{2504 \cdot (1.96)^2 \cdot (0.5) \cdot (0.5)}{(0.05)^2 \cdot (2504-1) + (1.96)^2 \cdot (0.5) \cdot (0.5)} = 334$$

Instruments

Descriptive Information Form: It is a form including socio-demographic and health-disease characteristics developed by the researchers based on the literature (Andueza et al., 2022., Partida et al., 2018., Seker et al., 2023). In addition to this form, students' height, body weight, waist circumference, blood pressure and BMI values were recorded.

Heart Health Attitude Scale for Children (HHAS): It was developed by Celik (2017) to measure the heart health attitudes of school-age children aged 10-15 years in relation to nutrition, exercise, sedentary life, smoking, self-love and stress. The scale consists of 28 items and six factors in 4-point Likert type. A minimum score of 28 and a maximum score of 112 can be obtained from the scale. A score between 28-55 indicates a “good level” of attitude towards heart health, a score between 56-83 indicates a “moderate level”, and a score between 84-112 indicates a “low level”. The higher the score, the higher the negative attitude towards heart health. The total Cronbach's Alpha reliability coefficient of the original scale was found to be 0.83 (Celik, 2017).

Nutrition-Exercise Behavior Scale (NEBS): It was developed by Yurt (2008) to determine healthy eating, exercise and weight loss intentions of children aged 12-14 years. The scale consists of 45 items and 4 sub-factors in 5-point Likert type. Psychological (dependent) eating behavior, healthy eating-exercise behavior, unhealthy eating-exercise behavior and meal pattern are the sub-factors of the scale. A score between 11-55 can be obtained from the psychological eating behavior sub-dimension and an increase in scores indicates that there is dependent eating behavior. The score distribution of the healthy eating-exercise behavior sub-dimension varies between 14-70 and higher scores indicate healthy eating-exercise behavior. The unhealthy eating-exercise behavior sub-dimension score ranged between 14-70, with higher scores suggesting unhealthy eating-exercise behavior. Scores between 6-30 can be obtained from the meal pattern sub-dimension and a higher score indicates a good meal pattern. The total Cronbach's Alpha coefficient of the scale was found to be 0.85 (Yurt, 2008).

Data collection: The data were collected by the researchers between February and April 2024 in the classroom environment based on face-to-face self-report. Before collecting the data, appropriate days and hours were determined with the opinion of the school administration. After the students were informed about the study, the Informed Voluntary Consent Form was sent to the parents in a sealed envelope. The next day, the envelopes were given to the researcher by the adolescents. Data collection forms were applied to the students whose parents' permission was obtained. One of the researchers went to the classrooms with the teachers and informed the students about the research and written permission was obtained from the students. The instruments were distributed to the students and filled in under the supervision of the researcher. Data collection took approximately 30-35 minutes. The researcher asked the adolescents the question “Do you do sports regularly?”. If the adolescent participated in any organized sport with moderate to vigorous intensity for more than 4 hours per week in the three months preceding the study, he/she was considered to be a regular exerciser (Fernandes et al., 2008). Moderate and vigorous exercises were explained to the adolescents by the researcher. Physical education classes were not included in this study because they were infrequent (usually only once a week) and involved low-intensity physical activities. Height, body weight, waist circumference, blood pressure, BMI and waist-to-height ratio were measured in the classroom of the student who returned the questionnaire. The WHO AnthroPlus program from the WHO website was used to calculate BMI percentile values of adolescents. The percentile values were evaluated according to BMI percentiles

(http://www.who.int/growthref/tools/en/).
BMI parameters determined according to age and gender, <5th percentile was considered "very underweight", 5-15th percentile "underweight", 15-85th percentile "normal", 85-95th percentile "overweight" and >95th percentile "obese" (WHO, 2006). Weight was measured on a portable digital scale with a sensitivity of 0.1 kg after the students' shoes were removed, leaving only their uniforms. Height was measured without shoes, with heels together, shoulders relaxed, arms at the side, using a height meter with a sensitivity of 0.01 m. When waist circumference was measured, the point where the lowest rib and the midaxillary line crossed the iliac crest was marked. During the measurement, the participant was asked to exhale and waist circumference was measured in cm with an inflexible tape measure based on the imaginary line passing through this point. Blood pressure was measured on the right arm and at the level of the heart with a sphygmomanometer suitable for the 12-14 age group after the participants rested. The stethoscope was placed in the brachial artery. Two more measurements were taken for the first student with high blood pressure. Then, the average of three measurements was taken and classified (Goknar & Caliskan, 2020). Blood pressure was classified according to the values in the European Society of Hypertension Guideline (2016). Considering the age and gender of the participants; <90th percentile was defined as "normal", 90-95th percentile or values less than 90th percentile but exceeding 120/80 mmHg were defined as "prehypertension", and 95-99th percentile + 5 mmHg was defined as "stage I hypertension" (Flynn et al., 2017, Basaran and Demir, 2021).

Statistical analysis: IBM SPSS Statistics for Windows, Version 25.0 was used for data analysis. Number, percentage, mean and standard deviation were used as descriptive statistical methods to evaluate the data. The conformity of the data to normal distribution was evaluated using Kolmogorov-Smirnov test and Q-Q plot graphs. Independent Sample T test and One Way ANOVA were used for normally distributed data. Data that did not show normal distribution were analyzed with Kruskall-Wallis *H* test and Mann Whitney *U* tests. Pearson Correlation analysis was applied to evaluate the relationship between the scales. The significance level was accepted as $p < 0.05$.

Ethical procedures: The study was conducted in accordance with the Helsinki Declaration of Human Rights. This study was approved by the Selcuk University Faculty of Nursing Non-Interventional Clinical Research Ethics Committee (Decision No: 2023/61, Decision Date: September 29, 2023). The study was approved by the Provincial Directorate of National Education. Written informed consent was obtained from the students and their parents participating in the study. Written institutional permission was obtained from the Provincial Directorate of National Education for data collection. An Informed Voluntary Consent Form was added to the beginning of the questionnaire form, which the students were asked to read. Written informed consent was then obtained from those who volunteered to participate in the study. The principles of "confidentiality" and "respect for autonomy" were followed. Written informed consent was also obtained from the parents of the students before data collection. Permission to use the scales to be used in the study was obtained from the scale owners via e-mail. There was no obligation for participation in the study. Their participation was completely voluntary. No incentive payment was made to the individuals participating in the study.

Results

The mean age of the students was 13.03 years (SD=0.83); 35.3% were seventh grade students and 60.7% were female. 38.7% of the students practiced regular sports and 69.5% perceived their weight as normal. 91.2% of the adolescents had moderate attitudes about heart health. In addition, 63.5% of the adolescents were of normal weight and 86.6% had a head-to-height ratio < 0.5. Blood pressure was measured as normal in 81.8% of the adolescents (Table 1). The mean total score of the adolescents' HHAS is 71.62±7.89. The mean score of the nutrition sub-dimension of the HHAS is 15.44±4.64. The mean score of the exercise sub-dimension is 11.90±4.42. The mean score of the sedentary life subscale is 9.55±3.14. The mean score of the smoking subscale is 12.86±3.53. The mean score of the self-love

sub-dimension is 8.67±3.32. The mean score of the stress sub-dimension is 9.87±3.43. The mean score of the NEBS psychological (addictive) eating behavior sub-dimension of adolescents is 39.17±9.24. The mean score of the healthy eating-exercise behavior sub-dimension is 47.84±10.68. The mean score of the unhealthy eating-exercise behavior subscale is 49.88±8.58. The mean score of the meal pattern subscale was 21.27±5.01 (Table 2).

Table 3 shows the distribution of total and subscale mean scores according to sociodemographic and anthropometric characteristics and blood pressure values of adolescents. A statistically significant difference was found between the grade level and the mean total score of the HHAS ($p < 0.001$). Eighth grade adolescents had better heart health attitudes than sixth and seventh grade adolescents. A statistically significant difference was found between maternal and paternal education and the mean total score of the HHAS ($p < 0.05$). Adolescents whose parents had lower education levels had better attitudes towards improving heart health. It was found that there was a statistically significant difference between parental employment status and the mean total score of the HHAS ($p < 0.05$). Adolescents whose parents were not working had better attitudes towards promoting heart health. It was found that there was a statistically significant difference ($p < 0.05$) between doing regular sports and the mean total score of the HHAS, and adolescents who do regular sports have better attitudes towards heart health. There was a statistically significant difference between perceived weight status and the mean total score of the HHAS ($p < 0.05$) and adolescents who perceived themselves as obese had worse heart health attitudes compared to those who perceived themselves as normal weight (Table 3).

Table 1. Sociodemographic, anthropometric characteristics and blood pressure values of the participants

Variables	**$\bar{X} \pm SD$***	**Min.-Max.**
	13.03 ± 0.83	12-14
	n	**%**
Class		
6th grade	112	31.9
7th grade	124	35.3
8th grade	115	32.8
Gender		
Female	213	60.7
Male	138	39.3
Mother education		
8 years and below	188	53.6
Over 8 years	163	46.4
Father education		
8 years and below	138	39.3
Over 8 years	213	60.7
Mother's employment status		
Not working	270	76.9
Working	81	23.1
Father's employment status		
Not working	13	3.7
Working	338	96.3
Regular exercise status		
Yes	136	38.7
No	215	61.3

Perceived weight status		
Weak	62	17.7
Normal	244	69.5
Overweight	40	11.4
Obese	5	1.4
Heart health attitude level		
Good	9	2.6
Middle	320	91.2
High	22	6.3
BMI		
Very weak	25	7.2
Weak	37	10.5
Normal	223	63.5
Overweight	39	11.1
Obese	27	7.7
Waist-to-height ratio		
<0.5	304	86.6
≥0.5	47	13.4
Blood pressure		
Normal	287	81.8
High blood pressure	48	13.7
Stage I hypertension	16	4.6

X̄: Arithmetic average, SD: Standart Deviation

Table 2. Mean score and minimum–maximum values of the scales

Variables	X̄ ± SD	Min.-Max.
HHAS		
Total	71.62±7.89	43–91
Nutrition	15.44±4.64	7–28
Exercise	11.90±4.42	5–20
Sedentary life	9.55±3.14	4–16
Cigarette	12.86±3.53	4–16
Self-love	8.67±3.32	4–16
Stress	9.87±3.43	4–16
NEBS		
Psychological (addictive) eating behavior	39.17±9.24	11-55
Healthy eating-exercise behavior	47.84±10.68	14-70
Unhealthy diet-exercise behavior	49.88±8.58	24-66
Meal pattern	21.27±5.01	6-30

X̄: Arithmetic average, SD: Standart Deviation

It was found that there was a statistically significant difference between the grade level and the healthy eating-exercise behavior and meal pattern sub-dimensions of NEBS ($p < 0.05$). Sixth grade students had higher healthy eating-exercise behavior and meal pattern scores than eighth grade students. It was found that there was a statistically significant difference between gender and healthy eating-exercise behavior and meal pattern sub-dimension mean score ($p < 0.05$). Male students had higher healthy eating-exercise behavior and meal pattern scores than female students. It was found that there was a

statistically significant difference between maternal education and the mean score of unhealthy eating-exercise behavior ($p < 0.05$). Adolescents whose mothers had lower education levels had higher unhealthy eating-exercise behavior scores. It was found that there was a statistically significant difference between the mean scores of psychological eating behavior and unhealthy eating-exercise behavior and father's education level ($p < 0.05$). Adolescents whose fathers had lower education levels had higher scores in dependent eating behavior and unhealthy eating-exercise behavior. There was a statistically significant difference between maternal employment status and unhealthy eating-exercise behavior and meal pattern sub-dimensions ($p < 0.05$). It was determined that unhealthy eating-exercise behavior and meal pattern scores of adolescents whose mothers were not working were higher. There was a statistically significant difference between father's employment status and healthy eating-exercise behavior, unhealthy eating-exercise behavior and meal pattern sub-dimensions ($p < 0.05$). Adolescents whose fathers were employed had higher healthy eating-exercise behavior and meal pattern scores, while adolescents whose fathers were not employed had higher unhealthy eating-exercise behavior scores. There was a statistically significant difference between the mean scores of healthy eating-exercise behavior and meal pattern subscales and the status of doing regular sports ($p < 0.05$). The healthy eating-exercise behavior and meal pattern of adolescents who do regular sports are better than those who do not do regular sports. There was a statistically significant difference between perceived weight status and mean scores of psychological eating behavior and healthy eating-exercise behavior ($p < 0.05$). Adolescents who thought they were normal weight had higher psychological eating behavior scores than adolescents who thought they were overweight. In addition, adolescents who thought they were obese had worse healthy eating-exercise behaviors than adolescents who thought they were normal weight (Table 3).

In addition, a statistically significant difference was found between BMI value and the mean scores of healthy eating-exercise behavior and meal pattern sub-dimensions ($p < 0.05$). The mean scores of healthy eating-exercise behavior of obese adolescents were lower than those of normal weight, and the mean scores of meal pattern were lower than those of lean adolescents. A statistically significant difference was found between waist-height ratio and meal pattern subscale mean scores ($p < 0.05$). The mean scores of adolescents with a waist-to-height ratio <5 were higher than those with a waist-to-height ratio ≥5. In addition, no significant correlation was found between the blood pressure value and the total HHAS and the sub-dimensions of the NBES ($p > 0.05$) (Table 3).

In this study, we examined the associations between the HHAS and NEBS and presented the results in Table 4. There was a weak negative and significant relationship between the psychological eating behavior subscale of the NEBS and the smoking subscale of the HHAS ($r = -0.265$, $p < 0.001$). There was a negative correlation between the healthy eating-exercise behavior subscale of the NEBS and the total score ($r = -0.136$, $p < 0.05$), exercise subscale ($r = -0.191$, $p < 0.001$), sedentary life subscale ($r = -0.109$, $p < 0.05$) and smoking subscale ($r = -0.130$, $p < 0.05$), and a weak positive correlation between the nutrition subscale ($r = 0.170$, $p < 0.05$). There was a positive correlation between the unhealthy diet-exercise behavior sub-dimension of the NEBS and the exercise sub-dimension ($r = 0.137$, $p < 0.05$) and self-love sub-dimension ($r = 0.139$, $p < 0.05$) of the HHAS, and a weak negative correlation between the smoking sub-dimension ($r = -0.258$, $p < 0.001$) (Table 4).

Discussion

In the current study, we examined the relationship between adolescents' attitudes towards improving heart health and their nutrition-exercise behaviors. Consistent with previous national studies, adolescents' attitudes towards improving heart health (Topan et al., 2023) and nutrition-exercise behaviors (Depboylu, 2019; Elmas et al., 2024; Hendekci & Aydin Avci, 2020) were at a moderate level, and there was a relationship between students' attitudes towards improving heart health and healthy nutrition-exercise behaviors.

Little is known about awareness of cardiovascular disease during adolescence and early young adulthood (Gooding et al., 2020). Establishing healthy lifestyles in childhood and adolescence is more effective in preventing cardiovascular disease than changing unhealthy behaviors in adulthood (Liu, 2022). In this study, we found that adolescents' attitudes toward improving heart health were at a moderate level. In the study conducted by Topan et al. (2023), the majority of adolescents were reported to have moderate attitudes toward heart health. However, there are studies that show that the attitude of adolescents towards improving heart health is at a low level (Binay et al., 2016; Karakul et al., 2023) or at a high level (Unsal, 2022). Studies in the literature show that there are different results regarding adolescents' attitudes toward heart health. This difference between studies may have been influenced by the individual characteristics of the sample group, health perceptions, and behaviors.

Lifestyle changes are the first step in minimizing the risk of cardiovascular disease in individuals and society. Dietary and physical activity behaviors are important parameters for healthy growth and development and heart health in adolescents (Taleb and Itani, 2021; Topan et al., 2023; Ruiz et al., 2019). A healthy diet can reduce cardiovascular risk and increase longevity through its antioxidant and anti-inflammatory properties, while exercise improves cardiovascular fitness, increases bone mass, and improves mental health (Moradell et al., 2023). In this study, the dietary and physical activity behaviors of adolescents were found to be moderate. The same results were reported in previous studies conducted on adolescents as in this study (Depboylu, 2019, Elmas et al., 2024; Hendekci & Aydin Avci, 2020). Unhealthy diet and insufficient physical activity are important factors in the development of chronic diseases such as cardiovascular disease, obesity, diabetes, and cancer (CDC, 2024). Therefore, early adoption of healthy lifestyle behaviors, such as healthy eating and physical activity, is important to protect and improve adolescent health. School-aged children and adolescents are expected to take responsibility for and manage health behaviors that promote heart health.

A better understanding of the relationship between heart health attitudes and health behaviors is very important for adolescents to minimize the risk of cardiovascular disease (Kaplan-Laco & Aytekin-Ozdemir, 2023). A healthy diet can reduce the risk of heart disease and improve overall health. In the current study, we found a significant relationship between adolescents' attitudes toward improving heart health and healthy eating and physical activity behaviors. It was found that as healthy eating and exercise behaviors increased, their attitudes toward heart health also increased positively. It has been stated in the literature that age-appropriate healthy nutrition-exercise behaviors are effective in preventing the development of chronic diseases in adulthood (Corkins et al., 2016). In the study conducted by Karakul et al. (2023), it was reported that children with low attitudes toward participating in physical activity also had low attitudes toward improving heart health. Most modifiable risk factors for cardiovascular disease develop because of poor habits and attitudes acquired during childhood (Yang et al., 2024). Adolescents maintain the health behaviors and habits they acquire during adolescence throughout their lives. Therefore, it is believed that adolescents should improve their attitudes toward heart health by increasing their healthy eating and physical activity behaviors. Therefore, appropriate educational programs that promote the principles of healthy eating and physical activity among school children should be developed. Studies in this area can help to better design health policies and school health programs. Obesity is an important public health problem because of its strong association with atherosclerosis and coronary heart disease and its impact on quality of life. In the current study, the majority of adolescents (69.5%) considered themselves to be of normal weight, while only 1.4% considered themselves to be obese. However, as a result of anthropometric measurements, we found that 7.7% of the adolescents were obese. In support of our study results, the general prevalence of obesity in children and adolescents was found to be 8.5% in the study by Zhang et al. (2024). The study by Eray et al (2022) reported that 5.9% of adolescents were obese and 12.7% were overweight.

Table 3. Total and subscale mean scores according to sociodemographic and anthropometric characteristics and blood pressure values of the participants

Variables	HHAS		NEBS							
			Psychological (addictive) eating behavior		Healthy eating-exercise behavior		Unhealthy diet-exercise behavior		Meal pattern	
	X̄ ± SD	Test, p value	X̄ ± SD	Test, p value	X̄ ± SD	Test, p value	X̄ ± SD	Test, p value	X̄ ± SD	Test, p value
Class										
6th grade[a]	73.78±7.83	F=8.218	40.66±9.92	F=2.816	49.75±11.97	F=5.287	49.94±9.65	F=1.423	22.25±5.19	F=5.244
7th grade[b]	71.52±7.82	p=0.000**	39.13±8.89	p=0.061	48.45±10.27	p=0.005*	50.75±8.15	p=0.242	21.43±5.10	p=0.006*
8th grade[c]	69.62±7.53		37.76±8.75		45.33±9.30		48.88±7.88		20.14±4.54	
	c<a,b				a>c				a>c	
Gender										
Female	72.03±8.19	t=1.220	38.90±9.20	t=-0.674	46.59±10.70	t=-2.765	49.47±8.64	t=-1.116	20.77±5.24	t=-2.320
Male	70.98±7.38	p=0.223	39.58±9.31	p=0.501	49.78±10.39	p=0.006*	50.52±8.49	p=0.265	22.04±4.56	p=0.021*
Mother education										
8 years and below	70.66±7.70	t=-2.462	40.06±8.96	t=1.957	47.87±10.64	t=0.044	51.06±8.75	t=2.786	20.97±5.07	t=-1.218
Over 8 years	72.73±7.98	p=0.014*	38.14±9.46	p=0.051	47.82±10.76	p=0.965	48.52±8.21	p=0.006*	21.62±4.94	p=0.224
Father education										
8 years and below	70.57±8.39	t=-2.017	41.02±9.11	t=3.063	48.60±11.17	t=1.073	51.43±8.97	t=2.744	21.15±5.49	t=-3.373
Over 8 years	72.30±7.49	p=0.044*	37.97±9.14	p=0.002*	47.35±10.35	p=0.284	48.88±8.19	p=0.006*	21.35±4.69	p=0.710
Mother's employment status										
Not working	70.95±7.91	t=-2.944	39.66±9.39	t=1.817	48.42±10.61	t=1.841	50.63±8.63	t=3.010	21.61±4.97	t=2.313
Working	73.86±7.45	p=0.003*	37.54±8.57	p=0.070	45.93±10.74	p=0.066	47.39±7.98	p=0.003*	20.14±5.01	p=0.022*
Father's employment status										
Not working	67.38±10.45	t=-2.266	42.15±8.94	t=1.492	35.92±8.11	t=-3.878	54.00±6.80	t=2.061	18.30±6.40	t=-1.997
Working	72.24±7.36	p=0.024*	38.24±9.21	p=0.137	47.52±10.62	p=0.000**	49.01±8.57	p=0.040*	21.22±5.07	p=0.047*
Regular exercise status										
Yes	70.02±8.03	t=-3.045	38.93±9.02	t=-0.386	49.33±10.33	t=2.077	49.03±8.64	t=-1.476	21.97±5.19	t=2.071
No	72.63±7.65	p=0.003*	39.32±9.39	p=0.699	46.91±10.81	p=0.039*	50.42±8.53	p=0.141	20.83±4.86	p=0.039*
Perceived weight status										
Weak[a]	69.09±9.16	F= 3.340	38.24±9.11	F= 4.434	47.08±9.62	F= 3.901	48.53±9.06	F= 1.312	20.85±5.29	F= 0.907
Normal[b]	72.04±7.64	p= 0.020*	40.11±8.77	p=0.004*	48.83±10.61	p=0.009*	50.43±8.54	p=0.270	21.51±4.84	p=0.438
Overweight[c]	72.30±6.46		34.65±10.50		44.30±11.03		48.42±7.75		20.82±5.50	
Obese[d]	77.20±7.52		40.80±13.06		37.60±14.67		51.80±10.47		18.60±6.14	
	d>b		b>c		b>d					
BMI										
Very weak[a]	73.04±7.24	F= 1.260	38.96±9.24	F= 1.366	49.08±10.35	F= 3.128	47.84±10.56	F= 1.744	21.92±3.93	F= 3.277
Weak[b]	69.45±8.86	p= 0.286	36.56±9.47	p=0.245	48.40±8.79	p=0.015*	47.10±9.66	p=0.140	22.59±4.67	p=0.012*
Normal[c]	71.93±7.83		39.94±8.97		48.75±11.01		50.46±8.57		21.51±5.17	
Overweight[d]	70.46±7.25		38.30±9.41		45.43±11.08		50.87±6.76		20.02±4.70	
Obese[e]	72.37±8.25		37.81±10.58		41.96±7.83		49.37±6.83		18.74±4.57	
					e<c				e<b	
Waist-to-height ratio										
<0.5	71.50±8.01	t=-0.708	39.26±9.29	t=0.494	48.18±10.744	t=1.512	49.84±8.74	t=-0.288	21.48±5.06	t=2.008
≥0.5	72.38±7.08	p=0.480	38.55±8.98	p=0.621	45.65±10.08	p=0.131	50.17±7.61	p=0.808	19.91±4.48	p=0.045*
Blood pressure										
Normal	71.68±7.69	F=0.595	38.79±9.43	t=1.440	47.35±10.75	t=1.723	49.49±8.70	t=1.624	21.48±5.06	t=2.008
High blood pressure	71.95±8.64	p=0.552	41.18±7.75	p=0.238	50.31±9.64	p=0.180	51.52±7.34	p=0.199	19.91±4.48	p=0.045*
Stage I hypertension	69.56±9.30		39.93±9.43		49.25±11.84		51.93±9.49			

t: Independent Sample t test, F: One-Way Anova test X̄: Arithmetic average, SD: Standart Deviation

*$p < 0.05$, **$p < 0.001$

Table 4. Correlation analysis of total and sub-dimension scores of participants' heart health attitudes and nutrition-exercise behaviors

HHAS	NEBS			
	Psychological (addictive) eating behavior	**Healthy eating-exercise behavior**	**Unhealthy diet-exercise behavior**	**Meal pattern**
Total	*r* = -0.072 *p* = 0.180	*r* = -0.136 *p* = 0.011*	*r* = -0.040 *p* = 0.457	*r* = 0.030 *p* = 0.578
Nutrition	*r* = 0.080 *p* = 0.137	*r* = 0.170 *p* = 0.001*	*r* = 0.056 *p* = 0.293	**r** = 0.077 *p* = 0.150
Exercise	*r* = 0.092 *p* = 0.087	*r* = -0.191 *p* = 0.000**	*r* = 0.137 *p* = 0.010*	*r* = -0.049 *p* = 0.362
Sedentary life	*r* = -0.061 *p* = 0.257	*r* = -0.109 *p* = 0.041*	*r* = -0.043 *p* = 0.420	*r* = -0.061 *p* = 0.257
Cigarette	*r* = -0.265 *p* = 0.000**	*r* = -0.130 *p* = 0.014*	*r* = -0.258 *p* = 0.000**	*r* = 0.031 *p* = 0.557
Self-love	*r* = 0.074 *p* = 0.168	*r* = -0.062 *p* = 0.248	*r* = 0.139 *p* = 0.009*	*r* = -0.066 *p* = 0.216
Stress	*r* = 0.083 *p* = 0.119	*r* = 0.033 *p* = 0.541	*r* = 0.052 *p* = 0.333	r = 0.027 p = 0.620

r; Pearson correlation analysis, **p* < 0.05, ***p* < 0.001

More worryingly, the increasing rate of childhood obesity in developing countries is >30% higher than in developed countries (Ng et al., 2014). In Turkey, the rate of obesity among individuals aged 15 years and older was 21.1% in 2019 and 20.2% in 2022 (TUIK, 2023). These findings emphasize the importance of early diagnosis and treatment of overweight and its metabolic consequences in this at-risk group. School nurses should monitor the growth and development of children and adolescents through school-based screening and provide the necessary guidance.

The increasing trend of obesity among adolescents has been attributed to unhealthy food consumption patterns and low physical activity levels (Nader et al., 2018; Naja et al., 2020). In the current study, we observed that adolescents who perceived themselves as obese had poorer attitudes toward heart health and poorer healthy eating and physical activity behaviors compared to those who perceived themselves as normal weight. Similarly, according to the BMI values obtained as a result of the measurements, we observed that obese adolescents had lower scores for healthy eating and exercise behaviors than normal weight adolescents. What makes this observation critical is that adolescence is a period of life when eating behaviors and food preferences are established, and these often extend into adulthood (Taleb and Itani, 2021). The study conducted by Lim et al. (2021) shows that participants with higher BMI have higher perceived susceptibility to cardiovascular disease. Fan and Jin (2015) examined eating and weight loss behaviors of adolescents according to their weight perceptions, and found that males who defined themselves as overweight had less physical activity and were less likely to exercise. Cengiz et al

(2022) reported that individuals with eating disorders avoided physical activity. Adolescence provides a unique opportunity to establish healthy eating behaviors that can prevent obesity and related health problems later in life (Sacco et al., 2017; Taleb and Itani, 2021), thereby affecting adult health and quality of life.

Physical activity is an independent modifiable risk factor for cardiovascular disease (Panahian et al., 2023). In the current study, we observed that 38.7% of the adolescents were regular exercisers. Our data showed that adolescents who exercise regularly have better heart health attitudes and healthy diet and exercise behaviors than those who do not exercise regularly. A study of more than 47,000 children and adolescents in Europe found that two-thirds of children and adolescents were not physically active enough and only one-third were physically active enough (Steene-Johannesse et al., 2020). The study by Yang et al. (2024) found that almost all students had a positive attitude toward the importance of physical activity in preventing cardiovascular disease. In addition, studies have reported that adolescents who exercise regularly have better attitudes toward heart health (Akil & Top, 2023; Hansen & Tierney, 2022; Karakul et al., 2023). With the development of technology, the sedentary time of adolescents, such as watching television, using cell phones, and surfing the Internet, has increased and outdoor activities have decreased. In addition, the inactivity of adolescents can be attributed to the need to study to prepare for high school exams and the lack of encouragement from school administrators or families to participate in sports activities. An inactive lifestyle increases the risk of obesity and cardiovascular disease in adolescents (Liu et al., 2020). However, the American Academy of Pediatrics recommends 60 minutes or more of physical activity per day for children ages 6 to 17 (Lobelo et al., 2020). Promoting physical activity and reducing sedentary behavior are strategies for preventing cardiovascular disease. Increased efforts to promote physical activity in adolescents are needed to improve the health of the future adult population. In this context, families should be informed that physical activity and sports are effective in improving heart health, and participation in school-based or club-based physical activities should be increased.

In the current study, it was found that there are socio-demographic characteristics such as gender, grade level, parental education, and employment status, as well as factors related to healthy lifestyle behaviors that influence heart health attitudes and dietary and physical activity behaviors among adolescents. We found that male students had higher dietary and physical activity scores than female students. Previous studies in adolescents reported that male students had higher dietary and physical activity scores than female students (Aykut et al., 2021; Nagy-Pénzes et al., 2020). In the study conducted by Karagozoglu and Ilhan (2024), female adolescents were found to have lower levels of dietary and physical activity behaviors than male participants. In the study conducted by Leal et al. (2019), sugar consumption, insufficient physical activity, and experience with alcoholic beverages, which are defined as risky behaviors in terms of cardiovascular health, were reported to be higher in girls. However, the evidence on the relationship between gender and dietary and physical activity behaviors is mixed. In the study conducted by Erdogan et al. (2024), it was reported that female students had a healthier diet in terms of dietary behavior. In addition, there are studies that report that there is no relationship between gender and diet (Ayer & Ergin 2021). This difference may be due to the cultural backgrounds of the regions where the studies were conducted and the roles assigned to gender.

There are studies in the literature reporting that adolescents' grade level (Bebis et al., 2015; Karacam, 2023), parental education (Depboylu, 2019; Peeters & Blake, 2016; Ruiz et al., 2019) and employment status (Worku et al., 2022) are significantly associated with heart health attitudes and nutrition-exercise behaviors. In this study, we found that grade level, parental education and employment status affect both heart health attitudes and nutrition-exercise behaviors. While eighth-grade students had better heart health attitudes, their nutrition-exercise behaviors were found to be worse. Similarly, previous studies reported that scores on nutrition and exercise behaviors decrease as grade level increases (Bebis et al. 2015,

Karacam, 2023). This may be due to the fact that high school entrance exams are held in the last grade of middle school and students tend to consume unhealthy foods and live a sedentary life due to the intense exam tempo. In addition, independence and friend circles may negatively affect nutritional attitudes as age increases. In the current study, adolescents whose mothers and fathers have lower levels of education were found to have better attitudes towards improving heart health. In addition, a decrease in the level of education of the mother and father was associated with an increase in the unhealthy nutrition-exercise behavior score. In the study conducted by Depboylu (2019), both exercise and physical activity attitudes of adolescents whose mothers have a university education or higher were found to be more negative. It is thought that this situation may be related to various characteristics of the sample group that were not addressed in this study. In another study, it was found that the high level of education of the mother has an effect on the nutritional habits of adolescents; while it negatively affects the fruit consumption of adolescents, it reduces tea consumption and increases the rate of eating 3 meals a day (Akman et al., 2012). In fact, considering that the level of knowledge increases as the level of education increases, it can be thought that the high level of education of the mother should have a positive effect on the nutrition of children. However, it is thought that the decrease in the time spent on home life and children with the entry of women into business life may negatively affect the nutritional levels of children.

In the current study, adolescents whose mothers and fathers were not working had better heart health attitudes, while unhealthy nutrition-exercise behavior scores were higher. In the study conducted by Worku et al (2022), it was found that high school adolescents with self-employed and civil servant mothers were more likely to be overweight and obese than adolescents with housewife mothers. The decrease in time spent on housework and childcare, along with the increase in mothers' participation in business life, may negatively affect children's nutritional patterns. This situation shows that the balance between work life and housework also plays an important role in children's healthy eating habits.

Conclusion: The present study found that adolescents' attitudes toward improving heart health and their dietary and physical activity behaviors were at a moderate level, and that there was a relationship between adolescents' attitudes toward improving heart health and healthy dietary and physical activity behaviors. Incorporating positive health practices into school curricula to help adolescents develop positive heart health attitudes and adopt healthy dietary and physical activity behaviors from an early age may help improve the perception of cardiovascular disease in the next generation and create better attitudes.

Limitations of the study: It is important to mention some limitations of this study. First, sociodemographic characteristics and some behavioral factors (such as regular exercise) were based on self-report. In the Turkish validity and reliability study, it was found that the Nutrition-Exercise-Behaviors Scale can be used in the 12-14 age range. For this reason, fifth grade students who were planned to be included in the study were not included in this study due to their age group. In addition, although the study was conducted in three different schools, it was limited to a single city. Nevertheless, the fact that the sample was taken from various schools, that many factors affecting both heart health attitudes and nutrition-exercise behaviors in adolescents were investigated, and that anthropometric and blood pressure measurements were made constitute the strengths of the study.

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