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The impact of health promotion training on university students' health perceptions, healthy lifestyle behaviors, and risky behaviors

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Introduction: University period is a critical developmental stage in which health-related behaviors that will be effective throughout life are acquired. This study aims to evaluate the effect of health promotion education given to university students on health perception, health behaviors and risky behaviors, to investigate the impact of the demographic characteristics of the participants on these three variables, and to investigate the potential relationship between the three variables.

Methods: It is a quasi-experimental study using a pre-post test design. This study was conducted with 179 students. The Health Perception Scale, the Healthy Lifestyle Behaviors Scale, and the Risky Behaviors Scale were used to collect the data. A 7-week training program was implemented, and the post-training evaluation was made after 3 months. Percentage, mean, standard deviation, Mann-Whitney U, Kruskal-Wallis, Wilcoxon analysis, and Spearman Correlation analysis were used to analyze the data.

Results: After health promotion training, it was determined that health perception and healthy lifestyle behaviors increased and risky behaviors decreased. A significant negative relationship was found between health perception after training and antisocial behavior, suicidal tendencies and dropping out of school. A significant negative relationship was found between healthy lifestyle habits and antisocial behavior, suicidal tendencies and school dropout. A positive significant relationship was determined between health perception and healthy lifestyle behaviors. The results of this study provide evidence of the effectiveness of training interventions in improving healthy lifestyle behaviors and health perception and reducing risky behaviors.

Discussion: The results support the planning of training programs to promote health on campuses. It also shows the effectiveness of training programs in preventing antisocial behavior, suicidal tendencies and school dropout.

KEYWORDS

healthy, lifestyle, smoking, suicide, antisocial behavior

Introduction

The university years are a critical developmental period in which the individual develops the autonomy to leave home and make decisions, and gain health behaviors that will be effective throughout their life (Nawsherwan et al., 2021) and can lead to unhealthy outcomes for students (Nawsherwan et al., 2021; Guedes et al., 2024). University students are at risk of developing unhealthy lifestyle habits such as poor diet and lack of physical activity

due to various factors such as financial conditions, academic pressures, lack of social support, forming new friendships, managing money (Marendić et al., 2024; Almoraie et al., 2024). Young adults attending higher education institutions living away from home are more likely to experience adverse changes in their eating habits (Palamutoglu et al., 2024), gain weight (Wilson et al., 2024; Du et al., 2023), become more physically inactive (Winpenny et al., 2020), experience higher levels of depression, anxiety and stress (Brett et al., 2023; Worsley et al., 2021). The university years are considered a period in which students tend to have unhealthy lifestyle behaviors and high rates of health-related risk factors (Whatnall et al., 2019). During this period, interventions are needed to gain positive health behaviors and reduce risky health behaviors, but intervention studies in this direction are limited (Hutchesson et al., 2022; Pfledderer et al., 2022).

Healthy lifestyle habits are those that people manage and incorporate into their everyday lives to improve their health (Zeng et al., 2021). According to the health promotion model, physical activity, stress management, nutrition, health responsibility, interpersonal relationships, and spiritual development are healthy lifestyle behaviors (Walker et al., 1987). Physical inactivity is a significant risk factor for, diabetes, dementia, coronary heart disease, stroke, and cancer (such as breast, colon) (Sivanantham et al., 2021; Friedenreich et al., 2021; Katzmarzyk et al., 2022). Most university students are not physically active (Brown et al., 2024; Amiri et al., 2019), and during their university years, there is a noticeable drop in the frequency of physical activity and exercise (Alkhateeb et al., 2019), which may continue in the following years (Kallio et al., 2020). Stress can damage all body systems, causing significant health problems (Zafar et al., 2021). Stress is a risk factor for chronic diseases such as cardiovascular disease (O'Connor et al., 2021), and type 1 diabetes (Ramani et al., 2020). Stress affects young individuals, particularly in college (Lian and Wallace, 2020; Islam et al., 2022). In general, university students do not eat regularly, skip breakfast and meals, (Alshdifat et al., 2024), prefer fast food (Ramesh et al., 2021), consume little daily fruit and vegetables, and have an imbalanced diet (Abdelhafez et al., 2020). Children and adolescents are more likely to be overweight or obese, and this trend persists throughout adulthood as a result of unhealthy diets (Woo et al., 2020; Ruiz et al., 2019). In addition to being overweight/obese, being underweight is also a common problem (Phelps et al., 2024). Health responsibility encourages healthy behaviors (e.g., exercise weight control) (Tabrizi et al., 2024). Studies show that university students' health responsibility levels are generally low (Musić et al., 2021; Al-Momani, 2021; Hwang and Oh, 2020). People with strong and healthy interpersonal relationships tend to be healthier (Intiful et al., 2021). Healthy interpersonal relationships strengthen social support, promote good nutrition, increase physical activity, improve coping with adversity and stress, enhance personal development and control, and mediate health promotion (Xiang et al., 2024; Liu and Sun, 2023; Cao et al., 2023; Kim et al., 2021). In addition, interpersonal relationships at school effect the prevalence of suicidal ideation, school adaptation, smoking and school dropout (Baalman et al., 2024; Nakano et al., 2022; Zhang et al., 2021; Karletsos et al., 2021; McCoy et al., 2020). Spiritual health has positive effects on physical, social, psychological health as well as other positive health outcomes such as health-related quality of life, coping skills, alleviating pain, ensuring a good attitude during traumatic situations or upsetting occurrences, less addiction or suicidal behaviors (Badnava et al., 2024; Maazallahi et al., 2021; Bożek et al., 2020; Mathad et al., 2019). A study found that the spiritual development of students was at a moderate level

(Feizi et al., 2020). As previously indicated, students should be developed in physical activity, stress management, nutrition, health responsibility, interpersonal interactions, and spiritual growth during a challenging time like university. The other variable in the study, health perception, is defined as health-related feelings, thoughts, beliefs, expectations and prejudices that enable focusing on health, protecting, maintaining and improving health (Sinan et al., 2024; Oral and Cetinkaya, 2020; Souto et al., 2018). Protecting and promoting health requires a positive attitude toward health (Hwang and Oh, 2020). It is argued that a mutual interaction exists between health perception and health behaviors (de-Mateo-Silleras et al., 2019; Tunc et al., 2021). Healthy eating (Toral et al., 2021) and improved physical activity (de-Mateo-Silleras et al., 2019) have a positive effect on health perception, and health perception has a positive impact on sport participation (Lee et al., 2020). Health perception is reported to be low or moderate among university students (Tunc et al., 2021; Oral and Cetinkaya, 2020; de-Mateo-Silleras et al., 2019). To improve students' perceptions of health inside the institution, it is crucial to spread educational initiatives.

Health-risk behaviors include those that jeopardize life, endanger health, raise the possibility of adverse physical, psychological, and social outcomes, and keep children from developing into mature, self-reliant individuals. Such behaviors may occur in the form of violence, tobacco, alcohol and substance use, suicidal tendency, school dropout, risky sexual intercourse, and negative eating habits (Shekari et al., 2020). The literature has citations that antisocial behaviors such as violence, aggression, crime (Younas et al., 2023; Ganson et al., 2022; Ye et al., 2022); smoking, alcohol, drug use (Sharareh et al., 2020; Htet et al., 2020; Shegute and Wasihun, 2021); suicidal tendency (Kaggwa et al., 2022); school dropout (Pmar, 2020) is at a high level (Shekari et al., 2020) among university students who make up a large part of the young population.

Antisocial behaviors, one of the risky behaviors, are behaviors that do not comply with socially accepted values and moral norms (Adams and Millie, 2021). It starts in early adolescence, peaks in late adolescence or early adulthood, and decreases in later life (van de Groep et al., 2023). Ongoing antisocial behavior can cause physical, occupational, educational, and mental health problems (Canino et al., 2022). As one of the risky behaviors, smoking causes chronic obstructive pulmonary disease (COPD), and chronic diseases such as cancer and heart disease (CDC, 2021). Worldwide tobacco use causes more than 7 million deaths annually (WHO, 2022). Although attempts to reduce smoking are effective, the rate of smoking among university students is high, and the university years are a critical time to start smoking (Barrington-Trimis et al., 2020; Samara et al., 2020). The prevalence of smoking among students ranges from 6.8 to 40% (Telayneh et al., 2021; Ahmed et al., 2020; Hassan et al., 2019). In a study, it was found that 30 per cent of university students were smokers, and smokers had significantly higher absenteeism rates and more academic warnings than non-smokers (Alqahtani et al., 2023). To prevent smoking initiation and support cessation, it is crucial to integrate smoking into health education, especially in higher education institutions.

Another risky behavior is suicidality, a worldwide public health issue (Haase et al., 2022). Suicide attempt is widespread among university students (Kaggwa et al., 2022; Owusu-Ansah et al., 2020; Mamun et al., 2020). Suicide is the fourth leading cause of death among 15–29-year-olds (WHO, 2023). Lifestyle behaviors such as smoking, alcohol use, and sedentary life are effective in increasing the risk of suicide (Kim et al., 2023; Berardelli et al., 2018).

The tendency for university dropout can also be considered a risky behavior and a significant global problem in developed and developing countries (Aldahmashi et al., 2021). It is a challenging situation that causes economic losses due to its consequences on the individual, family, and society (Sosu and Pheunpha, 2019; Niyogisubizo et al., 2022). School dropout is associated with health risk behaviors like smoking/alcohol, and drug use (Heradstveit et al., 2024; Hjarnaa et al., 2023; Ajith et al., 2022), being overweight/obese (Diaz-Serrano and Stoyanova, 2023) and stress (Pascoe et al., 2020), difficulties in coping with problems, bullying incidents (Cimene et al., 2023). Youth who drop out of school are more likely to experience socio-emotional difficulties, become delinquent, and engage in criminal behavior (Khurram et al., 2023). Planning educational interventions to reduce the risk of dropping out is necessary.

After all these considerations, it is crucial for college students majoring in health-related fields to adopt healthy lifestyle practices, cut back on risky behavior, and enhance their positive perceptions of their health to be healthy individuals and role models for society.

The main aim of this study is to evaluate the effect of health promotion training given to university students on health perception, health behaviors and risky behaviors. The sub-objectives assess how the three variables are related to demographic characteristics and determine the relationship between health perception, health behaviors and risky behaviors.

Methods

Research design

The study is a quasi-experimental research conducted using group pre test -post test to evaluate the effect of the health promotion education program given to university students on healthy lifestyle behaviors, health perception and risky behaviors (de Vocht et al., 2021). The study population consisted of 251 first-year university students enrolled in the vocational school of health services and receiving associate degree education in health-related departments (anesthesia, first and emergency aid, medical laboratory and elderly care) in 2020. To reach the maximum sample size, when the incidence of the event was taken as 50%, the sample size for the study was calculated as 153 for $p:0.50$, $t:0.05$, $d:0.05$. The calculation process was performed using Raosoft Sample Size Calculation Program. The study was completed with 179 students who attended the training regularly, completed the questionnaires, and voluntarily agreed to participate. Research hypotheses.

H1: There is a significant difference between socio-demographic variables and healthy lifestyle behaviors.

H2: There is a significant difference between socio-demographic variables and health perception.

H3: There is a substantial difference between socio-demographic variables and risky behaviors.

H4: Health promotion training increases healthy lifestyle behaviors.

H5: Health promotion training increases health perception.

H6: Health promotion training reduces risky behaviors.

H7: There is a relationship between health perception and healthy lifestyle behaviors.

H8: There is a relationship between health perception and risky behaviors.

H9: There is a relationship between healthy lifestyle behaviors and risky behaviors.

Data collection process

Data were collected using personal information form and scales. All students were invited to the study. The purpose of the study was explained to the students face to face, and it was demonstrated that participation in the study was voluntary and anonymous. The verbal consent of the students who volunteered to participate in the study was obtained and the personal information form and scales were shared. The data were collected by distributing the forms under observation in the classroom environment and asking the students to fill them out.

Data collection tools

The data were collected using “The Personal Information Form”, “The Health Perception Scale”, “The Healthy Lifestyle Behaviors II” and “The Risky Behaviors Scale”.

The researchers developed the Personal Information Form; which consists of seven questions about gender, age, department, graduation, employment status, height, and weight (Annex I). *The “Health Perception Scale (HPS)”*; devised by Diamond et al. (2007), is a five-point Likert-type instrument designed initially in English (Diamond et al., 2007). The reliability and validity of its Turkish version were validated by Kadioğlu and Yıldız (2012). The scale encompasses 15 items segmented into four sub-dimensions. Items 1, 5, 9, 10, 11, and 14 are positively framed, while items 2, 3, 4, 6, 7, 8, 12, 13, and 15 are constructed negatively. Positive items are scored as: “Strongly agree = 5,” “Agree = 4,” “Neutral = 3,” “Disagree = 2,” and “Strongly disagree = 1.” Negative items, on the other hand, are scored in reverse. The potential score on the scale spans from a minimum of 15 to a maximum of 75.

The scale delineates four sub-dimensions: “Control Center,” “Self-Awareness,” “Certainty,” and “Importance of Health.” The “Control Center” dimension is gauged by items 2, 3, 4, 12, and 13; the “Certainty” dimension by items 6, 7, 8 and 15; the “Importance of Health” dimension by items 1, 9 and 11; and the “Self-Awareness” dimension by items 5, 10 and 14. The Cronbach Alpha reliability coefficient of the scale was previously reported as 0.77 (Kadioğlu and Yıldız, 2012). In this study, the total Cronbach α values of the scale were determined as 0.70 (Annex II).

The “Healthy Lifestyle Behaviors II (HLBS-II)”; The HLBS-II, developed by Walker et al. (1987), was revised by Walker and Hill-Polerecky (1996) and called “Healthy Lifestyle Behaviors II” (Walker and Hill-Polerecky, 1996). The reliability and validity of its Turkish version were validated by Bahar et al. (2008). The HLBS-II consists of

52 items and six sub-dimensions. Subdimensions are: 1. Spiritual development, 2. Health responsibility, 3. Physical activity, 4. Nutrition, 5. Interpersonal relations, and 6. Stress management. The “Health responsibility” dimension is gauged by items 3, 9, 15, 21, 27, 33, 39, 45 and 51; the “Physical activity,” dimension by items 4, 10, 16, 22, 28, 34, 40 and 46; the “Nutrition” dimension by items 2, 8, 14, 20, 26, 32, 38, 44 and 50; the “Interpersonal relations, dimension by items 1, 7, 13, 19, 25, 31, 37, 43, and 49; the “Stress management” dimension by items 5, 11, 17, 23, 29, 35, 41, and 47 and the “Spiritual development” dimension by items 6, 12, 18, 24, 30, 36, 42, 48, and 52. The overall score of the scale gives the score for healthy lifestyle behaviors. It is a 4-point Likert type scale. The lowest and the highest scores for the whole scale are 52 and 208. The Cronbach Alpha reliability coefficient of the scale was previously reported as 0.92 (Bahar et al., 2008). In this study, the total Cronbach α values of the scale were determined to be 0.90 (Annex III). The “Risky Behaviors Scale (RBS)”; The scale was developed by Genctanırım (2014) to evaluate the Risky Behaviors of university students, and validity and reliability studies were conducted. It is a 5-point Likert-type scale with 60 items. It has seven sub-dimensions, including antisocial behaviors, alcohol, smoking, suicidal tendency, eating habits, school dropout, and drug use. The “Antisocial behaviors” dimension is gauged by items (1.–10.); the “Alcohol,” dimension by items (11.–19.); the “Smoking” dimension by items (20.–27.); the “Suicidal tendency,” dimension by items (28.–39.); the “Eating habits” dimension by items (40.–47.); the “School dropout” dimension by items (48.–51.); and the “Drug use” dimension by items (52.–60.). Since the dimensions of the scale are not related to each other, the total score of the scale is not calculated, and high scores indicate a high-risk level in that dimension. In this study, antisocial behaviors, smoking, suicidal tendency, and school dropout sub-dimensions were evaluated. The Cronbach Alpha reliability coefficient of the scale was previously reported to be between 0.64 and 0.92 (Genctanırım, 2014). In this study, the Cronbach α values of the sub-dimensions were found to be 0.79 for antisocial behaviors, 0.92 for smoking, 0.94 for suicidal tendency, and 0.63 for school dropout (Annex IV).

Intervention

The students were divided into four groups (anesthesia, first and emergency aid, medical laboratory and elderly care) according to the programs they studied at the university and the same training program was applied at different times. The intervention program was used for each group on a different day, in three sessions once a week for 7 weeks. The health perception scale evaluate students’ health perception before starting the training program, healthy lifestyle behaviors scale to assessed health behaviors, and the risky behavior scale was applied as a pre-test to evaluate the risky behaviors. In the training program, PowerPoint presentation, which is a computer-aided teaching program that strengthens the student’s learning processes and develops thinking skills such as analysis and synthesis, enhancing recall and interactive learning approach were used in coordination (Dewi et al., 2024; Twizeyimana et al., 2021). In interactive learning, the question-answer method, which is a method of making students think, drawing attention to important points and helping students find the answers, and the discussion method were used to direct students to think about a subject, to explain points that

were not well understood and to reinforce previously given information (Bala et al., 2024; Verma et al., 2021; Tuma, 2021). In this training program, the following training topics were created, focusing on developing a positive health perception in the individual, regular physical activity/exercise, adequate and balanced nutrition, developing positive interpersonal relationships, effectively coping with stress and raising awareness about the harms of smoking. Three months after the training program was completed, post-test data were collected to evaluate the effectiveness of the training.

Training program; 1st week: The concept, dimensions, and determinants of health, health protection and health, 2nd week: Healthy lifestyle behaviors, 3rd week: Physical activity\exercise, 4th week: Nutrition, 5th week: Interpersonal relationships and social support, 6th week: Stress management, 7th week: Smoking.

Data analysis

SPSS 22 package program was used for statistical analyses of the data, and descriptive data were expressed as percentages, mean and standard deviation. Mann–Whitney U, Kruskal–Wallis, and Wilcoxon analyses were used to statistically analyze of quantitative data. Spearman correlation analysis was used to evaluate the relationship between variables. The significance value was accepted as $p < 0.05$. In the correlation analysis, 0–0.19 was considered as no correlation, 0.20–0.39 as a weak correlation, 0.40–0.69 as a moderate correlation, 0.70–0.89 as a strong correlation, 0.90–1.00 as a robust correlation. The significance value was taken as $p < 0.05$ (Alpar, 2016).

Ethical considerations

This study was approved by the Non-Interventional Clinical Research Ethics Committee of the Faculty of Medicine of the XX-XX-XX University (Approval no. 40465587-102.01-96).

Results

Of the students in the study, 85.5% were women, and 14.5% were men with a mean age of 20.10 ± 1.78 years. 30.7, 29.6, 26.8, and 12.8% of the students were in the Anesthesia Technician, First and Emergency Aid, Medical Laboratory, and Elderly Care Departments, respectively. 78.8% were vocational high school graduates, 2.8% were working, and 30.7% smoked. 28.2% of those who smoked were women, and 46.2% were men. The mean BMI of the students was 21.62 ± 2.98 , 12.3% were overweight, 1.1% were obese, and 14.5% were underweight. The rates of being overweight/obese and underweight were 10.5–15.7% in women and 7.7–30.8% in men.

The pre-training and post-training mean scores of the Health Perception Scale (HPS) were 52.98 ± 5.96 and 54.96 ± 6.51 , respectively. The pre-training and post-training mean scores of the healthy lifestyle scale were 127.87 ± 17.95 and 142.12 ± 22.63 , respectively. The mean scores of the students on the Health Perception Scale, Healthy Lifestyle Scale and its sub-dimensions, and Risky Behaviors Scale are shown in Table 1.

No significant difference was found in the HPS total score and subscales according to gender, department and BMI ($p = 0.386$,

TABLE 1 Pre-post training health perception scale, risky behaviors scale, and healthy lifestyle behaviors scale scores ($N = 179$).

The Health Perception Scale Subdimensions	Pre-training			Post-training		
	n	$X \pm SD$	Min–Max	n	$X \pm SD$	Min–Max
Health Perception Scale Total	179	52.84 \pm 5.96	36–75	179	54.96 \pm 6.51	40–75
Center of control	179	17.28 \pm 3.43	7–25	179	17.87 \pm 3.47	7–25
Certainly	179	12.78 \pm 3.02	4–20	179	13.46 \pm 3.14	4–20
Importance of health	179	11.53 \pm 1.81	5–15	179	11.74 \pm 1.86	6–15
Self-awareness	179	11.39 \pm 1.89	3–15	179	11.89 \pm 1.90	6–15

The Healthy Lifestyle Behaviors Scale Subdimensions	n	$X \pm SD$	Min–Max	n	$X \pm SD$	Min–Max
	The Healthy Lifestyle Behaviors Scale Total	179	127.87 \pm 17.95	92–198	179	142.12 \pm 22.63
Health responsibility	179	19.92 \pm 4.56	9–34	179	23.24 \pm 5.09	12–35
Physical activity	179	16.44 \pm 4.54	8–31	179	19.87 \pm 4.84	8–32
Nutrition	179	19.53 \pm 4.05	10–33	179	22.49 \pm 4.53	14–34
Spiritual Development	179	26.82 \pm 4.01	16–36	179	28.02 \pm 4.54	13–36
Interpersonal relationships	179	25.74 \pm 4.09	15–36	179	26.91 \pm 4.31	14–36
Stress management	179	19.42 \pm 3.54	10–29	179	21.60 \pm 3.57	13–32

Risky Behaviors Scale Subdimensions	n	$X \pm SD$	Min–Max	n	$X \pm SD$	Min–Max
	Antisocial behaviors	179	17.60 \pm 5.46	10–43	179	16.31 \pm 5.11
Smoking	179	14.80 \pm 8.08	8–40	179	13.62 \pm 7.46	8–38
Suicidal tendency	179	23.82 \pm 10.27	12–58	179	20.90 \pm 6.68	12–55
School dropout	179	8.34 \pm 3.44	4–18	179	7.73 \pm 3.42	4–17

$p = 0.415$, $p = 0.265$) (Table 2). There were no significant differences in the Healthy Lifestyle Behaviors scale (HLBS) and its sub-dimensions according to the department, type of high school, and BMI ($p > 0.005$). Gender created a significant difference in terms of the physical activity and interpersonal relationships sub-dimensions of the HLBS and total score, which was found to be higher in men ($p < 0.001$, $p = 0.014$, $p = 0.014$) (Table 2). After the training, there was a significant difference in physical activity in men ($RM = 113.15$) than women ($RM = 86.07$) ($MWU = 1387.0$, $z = -2.470$, $p = 0.014$). Gender made a significant difference in the sub-dimensions of smoking and school dropout on the risky behaviors scale and was found to be higher in men ($p < 0.001$, $p = 0.003$). School dropout was significantly higher in Medical Laboratory and Elderly Care departments than in the First and Emergency Aid departments ($p = 0.035$) Smoking was found to be significantly higher in overweight students than in underweight students ($p = 0.047$) (Table 2). In the analysis of the risky behaviors scale after the training, antisocial behaviors ($MWU = 1372.0$, $p = 0.011$), smoking ($MWU = 1016.5$, $p < 0.0001$), and school dropout ($MWU = 1501.0$, $p = 0.044$) dimensions were significantly higher in men Smoking was found to be significantly higher in overweight ($RM = 111.82$) than in underweight ($RM = 66.25$) students ($X^2 = 10.085$, $p = 0.018$).

The health perception scale score of the students increased significantly after the training ($p < 0.001$). The comparison of the HPS scores before and after the training is shown in Table 3.

After the training, it was found that 138 students increased their HLBS scores and the difference between the pre-and-post intervention scores was significant ($p < 0.001$). The effect of the training on the HLBS created a substantial difference in total and all sub-dimensions ($p < 0.001$), and the rank sums of the difference scores had an increasing effect on the total and sub-dimension scores of the HLBS (Table 3).

The effect of the training on the RBS was examined, and a significant difference was detected between the pre-and post-training scores in the sub-dimensions of antisocial behavior, smoking, suicidal tendency, and school dropout ($p < 0.001$, $p < 0.001$, $p < 0.001$, $p < 0.001$, $p = 0.005$). Considering the rank sums of the difference scores, it can be said that the training effectively reduced antisocial behavior, smoking, suicidal tendencies, and school dropout scores (Table 4).

In the study, the change in the total and subscale scores of the students after the training was evaluated. If the change in the scores of HPS and HLBS scales after the training was in the direction of increase, it was accepted that the training had a positive effect on the students. In the risky behaviors scale, if there was a decrease in the score after the training, it was accepted as a positive effect. After the training, the percentage of students whose scores increased on the HPS scale was 61.5 and 77.1% in the HLBS total. In the risky behaviors scale, the rate of students whose risk decreased was 57.5% for antisocial behavior, 52% for smoking, 58.1% for suicide and 50.3%

TABLE 2 Evaluation of the healthy lifestyle behaviors scale and its subdimensions and risky behaviors scale subdimensions according to sociodemographic characteristics (N = 179).

Independent variables		Health perception scale total	Center of control	Certainly	Importance of health	Self-awareness
		X ± SS	Rank mean	X ± SS	Rank mean	Rank mean
Gender	Women	53.14 ± 5.69	91.82	12.78 ± 3.02	90.11	91.16
	Men	52.04 ± 7.42	79.29	12.81 ± 3.06	89.35	83.17
		t = 0.868	U = 1710.5	t = -0.047	U = 1972.0	U = 1811.5
		p = 0.386	p = 0.252	p = 0.963	p = 0.944	p = 0.460
Department	Anesthesia	52.16 ± 6.53	83.62	12.42 ± 3.41	80.45	98.15
	First and emergency aid	53.40 ± 4.73	94.01	13.02 ± 2.80	92.73	80.84
	Medical laboratory	52.81 ± 6.87	93.59	12.73 ± 2.88	90.75	88.08
	Elderly care	54.30 ± 5.02	88.52	13.22 ± 2.86	105.00	95.63
		F = 0.818	KWX ² = 1.415	F = 0.535	KWX ² = 4.097	KWX ² = 3.460
		p = 0.415	p = 0.702	p = 0.659	p = 0.251	p = 0.326
BMI	Underweight	51.62 ± 7.27	83.58	13.04 ± 2.62	85.81	70.29
	Normal	53.38 ± 5.92	90.24	12.78 ± 3.21	94.25	94.42
	Overweight	52.77 ± 4.20	98.39	12.68 ± 2.24	74.89	89.05
	Obese	47.00 ± 1.41	65.50	10.50 ± 2.12	36.75	71.50
		F = 1.335	KWX ² = 1.440	F = 0.447	KWX ² = 5.203	KWX ² = 5.124
		p = 0.265	p = 0.696	p = 0.720	p = 0.158	p = 0.163

Independent variables		The Healthy Lifestyle Behaviors Scale						
		Health responsibility	Physical activity	Nutrition	Spiritual development	Interpersonal relationships	Stress management	HLBS scale total
		Rank mean	Rank mean	Rank mean	Rank mean	Rank mean	Rank mean	Rank mean
Gender	Women	89.27	83.10	87.81	86.89	86.08	88.77	86.09
	Men	94.29	130.62	102.90	108.29	113.10	97.25	113.00
	MWU	1877.50	933.00	1653.50	1513.50	1388.50	1800.50	1391.00
	p	0.647	<0.001	0.168	0.051	0.014	0.438	0.014
Department	Anesthesia	92.47	91.85	86.50	91.94	84.02	92.41	89.46
	First and emergency aid	87.09	94.87	95.67	96.32	92.73	90.28	93.60
	Medical laboratory	84.13	83.86	84.10	76.92	87.97	87.33	81.05
	Elderly care	103.04	87.15	97.61	98.11	102.26	89.15	101.65
	KWX ²	2.382	1.288	2.018	4.517	2.256	0.256	2.858
	p	0.497	0.732	0.569	0.211	0.521	0.968	0.414
BMI	Underweight	93.15	80.71	73.83	82.40	87.56	86.75	84.42
	Normal	91.91	93.01	93.34	92.14	90.31	92.15	92.83
	Overweight	80.57	83.16	91.27	90.14	95.02	81.70	83.84
	Obese	29.25	92.00	70.50	49.00	46.50	85.00	47.75
	KWX ²	3.775	1.666	3.393	2.044	1.689	0.914	2.328
	p	0.287	0.645	0.335	0.563	0.639	0.822	0.507

(Continued)

TABLE 2 (Continued)

Independent variables		Risky Behaviors Scale			
		Antisocial behaviors	Smoking	Suicidal tendency	School dropout
		Rank mean	Rank mean	Rank mean	Rank mean
Gender	Women	87.30	83.81	90.82	85.35
	Men	105.90	126.42	85.17	117.38
	MWU	1575.50	1042.00	1863.50	1277.00
	<i>p</i>	0.090	0.000	0.607	0.003
Department	Anesthesia	86.65	96.30	91.93	82.41
	First and emergency aid	80.02	88.16	85.25	79.45
	Medical laboratory	98.77	89.34	95.96	102.20
	Elderly care	102.70	80.54	83.91	107.00
	KWX ²	4.891	1.676	1.478	8.600
	<i>p</i>	0.173	0.642	0.687	0.035
BMI	Underweight	77.81	68.04	106.15	77.15
	Normal	92.59	91.67	86.09	91.85
	Overweight	90.00	108.14	96.16	98.50
	Obese	81.50	68.25	64.50	44.25
	KWX ²	1.826	7.958	4.067	3.954
	<i>p</i>	0.609	0.047	0.254	0.266

for school dropout. The percentages of positive change in the total and sub-dimensions of the scale after the training are shown in Table 5.

In the pre-training Spearman correlation analysis, a weak positive correlation was found between BMI and smoking ($r = 0.214$, $p = 0.004$), a weak positive correlation between HPS and HLBS ($r = 0.398$, $p < 0.001$), and weak negative correlations between the subdimensions of antisocial behavior, suicidal tendency, and school dropout in RBS ($r = -0.263$, $p < 0.001$; $r = -0.308$, $p < 0.001$, $r = -0.197$, $p = 0.008$). There were weak significant negative correlations between HLBS and RBS sub-dimensions of antisocial behavior, suicidal tendency, and school dropout ($r = -0.219$, $p = 0.003$; $r = -0.381$, $p = 0.000$; $r = -0.229$, $p = 0.002$). A positive, weak, or moderately significant relationship was found between the subdimensions of the RBS. The post-training correlation analysis is shown in Table 6.

Discussion

Most research in the literature examining university students' healthy lifestyles is descriptive studies. It is reported that the healthy lifestyles of university or college students studying in health-related departments are moderate (Ajrash and Al-Abedi, 2024; Alothman et al., 2024; Baykal et al., 2022; Fashafsheh et al., 2021; Gilan et al., 2021). Likewise, this study found healthy lifestyle behaviors to be moderate. Various studies show that university students should adopt healthy lifestyles, which requires intervention studies. Encouraging positive results were found in intervention studies conducted to improve a healthy lifestyle with education (Masini et al., 2024; Ricci et al., 2022; Solhi et al., 2020; Liu et al., 2019). Our study

observed a significant increase in healthy lifestyle behaviors after the training intervention. The HLBS scale's physical activity sub-dimension showed a substantial gender difference in the overall score, with men scoring higher, consistent with the literature (McCarthy and Warne, 2022; Mayo et al., 2020).

A study with university students found that 47.6% sat for at least 8 h daily (Edelmann et al., 2022). The prevalence of physically inactive university students ranges from 14.5 to 77.6% (Verma et al., 2022; Ndupu et al., 2023; Santana et al., 2023; Edelmann et al., 2022). Studies emphasized that there was a significant decrease in the rate of physical activity at university compared to previous school years (Wilson et al., 2021; Senarath et al., 2021; Alkhateeb et al., 2019), and that decrease continues in the following years (Kallio et al., 2020; MKID et al., 2021). A significant number of students studying in health-related departments such as physiotherapy, health, medicine, dentistry, nursing, and paramedic were not physically active, which is parallel with this study (Eymirli et al., 2024; Dmitruk and Hoľub, 2024; Schramlová et al., 2024; Alhammad et al., 2023; Cavus et al., 2020). Students studying in health departments had the lowest physical activity score among the the HLBS sub-dimensions (Gilan et al., 2021; Ghorabi et al., 2021). The significant increase in physical activity rate after the training provided in this study is similar to other studies (Casimiro-Andújar et al., 2023; Sharry and Timmins, 2016). However, the intensity of the education programs, such as theoretical, clinical, and field visits, may be why this rise was not at the expected level. Time is reported to be an inhibiting factor (Brown et al., 2024; Alhammad et al., 2023), and physical activity is seen as a leisure time activity without being integrated into daily life.

Many studies have emphasized that young adults experience stress, especially during their university years (), and perceived stress

TABLE 3 Comparison of the pre-and post-training HPS, HLBS total and subdimension scores ($N = 179$).

	<i>n</i>	Pre-training	Post-training	Difference	<i>t</i>	<i>p</i>
HPS	179	52.84 ± 5.96	54.96 ± 6.51	-1.978 ± 6.26	-4.227	<0.001
HLBS total score post-test- pre-test	<i>n</i>	Mean rank	Rank total	<i>z</i>	<i>p</i>	
Negative Rank	35	52.90	1851.50	-8.602	<0.001	
Positive Rank	138	96.65	13199.50			
Equal	6	-	-			
Health responsibility Post-test- pre-test						
Negative Rank	30	58.32	1749.50	-8.005	<0.001	
Positive Rank	130	85.62	11130.50			
Equal	19	-	-			
Physical activity Post-test- pre-test						
Negative Rank	33	45.94	1516.00	-8.805	<0.001	
Positive Rank	134	99.37	12512.00			
Equal	12	-	-			
Nutrition Post-test- pre-test						
Negative Rank	34	56.60	1924.50	-8.030	<0.001	
Positive Rank	131	88.95	770.50			
Equal	14	-	-			
Spiritual Development Post-test-pre-test						
Negative Rank	55	68.42	3763.00	-3.888	<0.001	
Positive Rank	98	81.82	8018.00			
Equal	26	-	-			
Interpersonal relationships Post-test- pre-test						
Negative Rank	62	75.22	4663.50	-3.668	<0.001	
Positive Rank	104	88.44	9197.50			
Equal	13	-	-			
Stress management Post-test- pre-test						
Negative Rank	38	59.84	2274.00	-7.125	<0.001	
Positive Rank	122	86.93	10606.00			
Equal	19	-	-			

HPS, The Health Perception Scale; HLBS, The Healthy Lifestyle Behaviors.

is at a high level in most university students (Kamruzzaman et al., 2024; Alkhaldeh et al., 2023; Amanvermez et al., 2023). Among the causes of stress in university students, there are generally academic concerns, balancing work and life, health, living away from home, relationships with their environment, personal life, economic problems, and concerns about the future (Khademian et al., 2021; Karyotaki et al., 2020). In this study, the level of stress management was low but increased after the training. Similarly, the literature shows that a stress management program is an effective strategy to help students exposed to stress (Gulnar et al., 2024; Akman et al., 2022; Hsu and Goldsmith, 2021). Therefore, it is recommended that stress management programs be implemented at universities.

University students generally do not have regular and balanced eating habits, compliance with the Mediterranean diet is low, do not eat breakfast regularly, consume insufficient fruits and vegetables, consume fried foods, and prefer high-fat, high-sugar, and

high-calorie foods like fast food (Puente-Hidalgo et al., 2024; Bayomy et al., 2024; Benaich et al., 2021). Poor eating habits acquired during this period increase the risk of overweight/obesity and chronic diseases (Haider et al., 2024; Mahfouz et al., 2024; Manchester, 2020). The overweight/obesity rates of university students vary between 17.7 and 27.8% (Pitil and Ghazali, 2022; Ilić et al., 2024; Rotich et al., 2023). In health science students, being overweight/obese ranged between 34.4 and 40.0%, higher than the general university population (Makkawy et al., 2021; Rabanales-Sotos et al., 2020). This may be due to living alone, academic stress, high theoretical/clinical course hours (Almoraie et al., 2024; Ramón-Arhués et al., 2021). In this study, the rate of being overweight/obese (13.4%) was lower than in other studies. This is thought to be because, similar to other studies (Muscogiuri et al., 2024; McCarthy and Warne, 2022; Kim and Shin, 2020), the rate of being overweight/obese in female students (10.5%) was lower than in male students (30.8%) and the fact that the number

TABLE 4 Comparison of students' pre-and post-training RBS scores (N = 179).

Antisocial behaviors post-test- pre-test	n	Mean rank	Rank total	z	p
Negative Rank	103	78.99	8136.00	-3.573	<0.001
Positive Rank	53	77.55	4110.00		
Equal	23	-	-		
Smoking Post-test- pre-test					
Negative Rank	93	69.87	6498.00	-3.839	<0.001
Positive Rank	44	67.16	2955.00		
Equal	42	-	-		
Suicidal tendency Post-test- pre-test					
Negative Rank	104	90.97	9461.00	-4.086	<0.001
Positive Rank	62	70.97	4400.00		
Equal	13	-	-		
School dropout Post-test- pre-test					
Negative Rank	90	77.40	6966.50	-2.803	0.005
Positive Rank	58	70.00	4060.00		
Equal	31	-	-		

TABLE 5 Positive change in scale scores after training percentage of students (n = 179).

	n	%
The Health Perception Scale Subdimensions		
Health Perception Scale Total	110	61.5
Center of control	89	49.7
Certainly	93	52.0
Importance of health	82	45.8
Self-awareness	179	100
The Healthy Lifestyle Behaviors Scale Subdimensions		
The Healthy Lifestyle Behaviors Scale Total	138	77.1
Health responsibility	130	72.6
Physical activity	134	74.9
Nutrition	131	73.2
Spiritual Development	98	54.7
Interpersonal relationships	104	58.1
Stress management	122	68.2
Risky Behaviors Scale Subdimensions		
Antisocial behaviors	103	57.5
Smoking	93	52.0
Suicidal tendency	104	58.1
School dropout	90	50.3

of female students participating in the study (85.5%) was higher than that of males.

Like being overweight/obese, being underweight is a significant nutritional problem for university students. In this study, the rate of

being underweight in students was found to be 14.5%. The literature supports this study and shows that the underweight rate of students is between 4.6 and 27.1% (Ghazawy et al., 2022; Ndong'u et al., 2024; Nagashima et al., 2024; Ahmad et al., 2023; Irfan et al., 2019). Women are at greater risk of being underweight than men due to biological, socioeconomic and cultural factors (Joh et al., 2024; Ikoona et al., 2023; Zhang et al., 2019). Similarly, in this study, the rate of being underweight was higher in women (15.7%) than in men (7.7%). This may be due to women students' negative body image perception (Murofushi et al., 2023; Radwan et al., 2019). These results reveal the importance of organizing health promotion programs on campuses to highlight healthy body weight in students.

Our study demonstrated that students had low scores in the nutrition sub-dimension of the HLBS. Studies support this finding and show that students' level of compliance with recommendations regarding healthy eating habits is insufficient (Castro-Cuesta et al., 2023; Sánchez-Ojeda et al., 2022; Assaf et al., 2019; Almutairi et al., 2018). Most students who study in health-related fields do not adhere to a strict diet, do not view their food choices as healthy, and wish to pay more attention to their health (Assaf et al., 2019). There was a statistically significant increase in the nutrition score after the health promotion training given to the students. Similar to this study, previous studies have found that nutritional training provided to university students was influential in developing healthy eating habits (López-Moreno et al., 2023). Luszczynska and Haynes (2009) explained that interventions designed to increase fruit and vegetable consumption among health-related department students can be effective. In light of these data, it can be said that students need training interventions to gain healthy eating habits.

In this study, students' mean health responsibility scores were evaluated at a low level, which is consistent with the results of other studies (Musić et al., 2021; Al-Momani, 2021; Hwang and Oh, 2020; Almutairi et al., 2018). This may be because individuals at this age are generally healthy and, therefore, do not consider it necessary to pay

TABLE 6 Post-training correlation analysis of the sub-dimensions of the HPS, HLBS, RBS ($N = 179$).

		BMI	HPS total score	HLBS total score	Antisocial behavior	Smoking	Suicidal tendency	School dropout
Age	r	0.037	-0.014	0.007	-0.002	-0.130	0.082	0.017
	p	0.621	0.850	0.923	0.977	0.083	0.276	0.819
BMI	r		-0.066	-0.015	0.099	0.214	0.000	0.016
	p	1	0.381	0.839	0.186	0.004	>0.999	0.833
HPS total score	r		1	0.398	-0.263	-0.076	-0.308	-0.197
	p			0.000	0.000	0.312	0.000	0.008
HLBS total score	r			1	-0.219	-0.113	-0.381	-0.229
	p				0.003	0.132	0.000	0.002

HLBS, The Healthy Lifestyle Behaviors; BMI, Body Mass Index; HPS, The Health Perception Scale.

attention to health responsibility. However, students should learn health responsibility throughout the university years, both for health and as health professionals after graduation, serving role models for people and directing them toward healthy practices. Health practitioners may be less inclined than others to advise their patients to adopt good living habits if they do not participate in healthy lifestyle behaviors (Egger et al., 2017; Belfrage et al., 2018). In this study, students' health responsibilities increased significantly after the training. Consistent with the results of this study, in previous studies, training interventions improved students' health responsibility (Solhi et al., 2020; Coban et al., 2017).

Positive interpersonal connections boost social and interpersonal support, help people deal with challenges and stress, help them obtain positive life experiences, and encourage personal growth, all of which contribute to health improvement (Dinis et al., 2019; Young et al., 2019). The current study's results revealed that the students had a moderate level of interpersonal relations and that the health promotion training significantly increased the interpersonal relationship level of the students.

The highest mean scores of the students were found to be in spiritual growth, which is consistent with previous studies (Al-Momani, 2021; Fashafsheh et al., 2021). Studies emphasize a relationship between spiritual well-being, health habits, psychological discomfort, anger, sadness, and other unpleasant emotions (Božek et al., 2020; Leung and Pong, 2021). At the same time, the literature emphasizes that there is a relationship between spirituality and smoking cessation and that it has a protective role against participation in antisocial behaviors and suicidal behaviors (Azmi et al., 2021; Okwudili et al., 2020; Andrade et al., 2020). However, despite this study's high level of spiritual well-being, no relationship was found between spiritual well-being and health perception and risky behaviors. A positive perception of health is essential for health promotion (Hwang and Oh, 2020). Research on university students has shown that students have low (Oral and Cetinkaya, 2020) and moderate health perception (Tunc et al., 2021). In our study, the students had a moderate level of health perception, but it increased significantly after health promotion training, parallel with the literature (Erenoglu et al., 2019; Cass et al., 2021). Health perception scores and health behaviors affect each other (Tunc et al., 2021; Toral et al., 2021; de-Mateo-Silleras et al., 2019). This research confirms

previous research and shows a link between healthy lifestyle choices and beliefs about one's health.

Research shows that both the tendency to show antisocial behavior (aggression, violence, bullying) and exposure to antisocial behaviors is significantly prevalent (Frías Armenta and Corral-Frías, 2021; Grant et al., 2016; Jeffrey et al., 2022). Therefore, effective intervention strategies are also necessary for the prevention of antisocial behaviors (Villafuerte-Díaz et al., 2024; Martínez-Otero and Gaeta, 2022; Davletbaeva et al., 2021). In this study, there was a significant decrease in students' antisocial behaviors after health promotion training, and a significant negative relationship was found between health perception and healthy lifestyle behaviors and antisocial behavior after the training. Our findings suggest that healthy lifestyle activities and improved post-training health perception may help university students experience less antisocial behavior. Similar to the literature, our results indicate that antisocial behavior is associated with suicidal behavior (McCloskey and Ammerman, 2018) and school dropout (Vadivel et al., 2023; Gubbels et al., 2019) and revealed a relationship between antisocial behavior and smoking (Weiss et al., 2019).

Although tobacco control is considered the most important goal for public health, and many control policies have been implemented to combat smoking, it remains the most significant preventable cause of disease and premature death (Dai et al., 2022; Bafunno et al., 2020). The university period is risky in terms of starting/continuing smoking due to exposure to peers who smoke and social, emotional, and educational challenges (Alkhalaf et al., 2021; Ahmed et al., 2020). The prevalence of smoking among university students ranges from 17 to 32.6% (Samara et al., 2020; Habbash et al., 2023; Oguz et al., 2018; Sinnathamby et al., 2023; Ahmed et al., 2020). Similar to the literature, smoking was found to be 30.7% in this study. Men smoking is significantly higher than women smoking (Telayneh et al., 2021). Smoking prevalence among university students worldwide, including students studying in health-related fields, is alarming. It was found that smoking decreased significantly after training. Prospective healthcare workers should be encouraged to have healthy attitudes regarding smoking and quitting since they will eventually be community leaders and role models for lowering the smoking rate.

Suicidal tendency is reported to be high among university students (Kabir et al., 2024; Kabbash et al., 2023; Crispim et al.,

2021; Wu et al., 2021). Suicidal tendencies in our study were at a low level and significantly decreased with the healthy lifestyle behaviors training like another relevant study (Engin et al., 2012). Modifiable health risk factors like a sedentary lifestyle (Li et al., 2021; Silva et al., 2020), skipping breakfast, drinking carbonated drinks (Michael et al., 2020; Berg et al., 2020), smoking drinks (Berardelli et al., 2018; Dasagi et al., 2021; Waters et al., 2021), and poor health perception (Isaac et al., 2018) are associated with suicidal behaviors (Zhan et al., 2024; Kim and Seo, 2023). In this study, a significant negative relationship was found between healthy lifestyle behaviors and health perception and suicidality, and a significant positive relationship was found between smoking and suicidal tendency.

Similar to earlier research on the subject, our study found that male students had a greater probability of dropping out of school (Zengin, 2021), which may be because, in traditional societies, the male gender is supported to behave more independently and freely. A significant positive relationship was found between school dropout and antisocial behaviors, smoking, and suicidal tendencies, and a significant negative relationship was found between health perception and healthy lifestyle behaviors in our study. In similar studies, dropouts were more likely to encounter individual negative behaviors (arrest, illegal substance use, poor health) than graduates (Dennison, 2022; Bae, 2020; Valkov, 2018; Lansford et al., 2016) and had a higher risk of smoking (Desai et al., 2019). Other studies show that obesity (Lanza and Huang, 2015), smoking (Svansdottir et al., 2015), alcohol use (Hjarnaa et al., 2023; Fernández-Suárez et al., 2016), anti-social behavior/cognitions, criminal behavior (Ward et al., 2021; Gubbels et al., 2019), violence (Montes and Mendes, 2021) and exposure to bullying (Bernardo et al., 2020) are risk factors for school dropout.

Limitations

This study included only students from the vocational school of health services, which is not representative of the higher education population. The results obtained after the training provide data on the effect of short-term training. Planning new studies that require follow-up to understand the long-term impact is recommended. The fact that the data of this study were obtained through students' self-reports can also be considered a limitation.

Conclusion

Although it is often believed that students studying in health departments exhibit good lifestyle habits, including taking charge of their health, eating a sufficient and balanced diet, exercising frequently, and managing stress efficiently, research reveals that this is not always the case. In this study, students studying health were found to have a relatively weak health-promoting lifestyle. Deficient scores were found in physical activity, stress management, nutrition, and health responsibility subdimensions. In addition, women were in the risk group for physical activity, interpersonal relationships, and healthy lifestyle behaviors. The health perception of the students was found to be at a moderate level. In terms of risky behaviors, it was found that students were more likely than average to engage in antisocial behaviors, smoking, suicidal tendencies, and school dropout. Men students were

more likely than women students to engage in these risky behaviors, and overweight students were more likely to smoke. These findings indicate that students need special attention to health-promoting behaviors. The results of this study provide evidence for the effectiveness of educational interventions in reducing risky behaviors while promoting healthy lifestyle habits and improving health perception.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Non-Interventional Clinical Research Ethics Committee of the Faculty of Medicine of the Recep Tayyip Erdoğan University (Approval no. 40465587-102.01-96). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

BK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. AG: Conceptualization, Data curation, Formal analysis, Methodology, Writing review & editing. BG: Methodology, Writing review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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