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Physio-psychosocial and Metabolic Parameters of Obese Adolescents: Health-Promoting Lifestyle Education of Obesity Management

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Abstract

The aim of the study was to determine the effect of health-promoting lifestyle education on the physio-psychosocial and metabolic parameters of obese adolescents. This quasi-experimental study was conducted at a city center in Turkey through a pretest and a post-test (n = 73). Following the collection of the first assessment data from the study and control groups, an 8-week education program was applied to students in the study group. The study found that the BMI values and obesity-related risk factors of study group decreased, the means of the self-esteem scale and total ALS and sub-scale scores increased, and the pretest and post-test inter-group difference was significant (p < 0.05). The study found a decrease in cholesterol, LDL, Hb1Ac and Triglyceride levels in the study group and an increase in HDL levels. The study concluded that health-promoting lifestyle education for obese adolescents contributed to improving their physio-psychosocial and metabolic parameters.

Keywords Obesity · Physio-psychosocial parameters · Metabolic parameters · Health promotion · Management

Introduction

Obesity is a chronic health problem that draws attention day by day with its increasing prevalence and incidence rates, threats children and adolescents along with adults, is costly for both individual and national economies and a contemporary problem as with the disease risks (Limbers et al. 2008; Tascılar et al. 2010; Yigit 2011; Waters et al. 2011; Hales et al. 2017).

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The obesity rate in America between 2015 and 2016 was 18.5% in children and adolescents, 20.6% in the 12–19 age group, and 18.4% in the 6–11 age group (Hales et al. 2017). Occurrence frequency of obesity in Turkey is rapidly increasing. For example, the prevalence of obesity in children and adolescents between the years of 1990–1995 and 2011–2015 increased by 11.6 times, from 0.6 to 7.3% (Alper et al. 2018). Although obesity can occur at any age, it occurs more frequently in the first year of life, between the ages of five and six, and during puberty when physiologically fat storing is rapid. Obesity, which begins at an early age, becomes permanent during puberty and continues into adulthood (Hales et al. 2017; Alper et al. 2018).

The causes of obesity in children have multiple factors: biological (age, gender, etc.), environmental (education level, marital status, nutritional habits, psychological problems) and lifestyle (lack of physical activity, spending long times on computer and television, consumption of alcohol and smoking cigarette). These factors disturb the balance between energy intake and energy expenditure and can cause obesity (AACAP 2011).

Obesity negatively effects body systems and psychosocial status and causes various health problems, increases non-contagious disease rate, decreases an individual's life span and negatively affects quality of life (James et al. 2007;

Nogay and Köksal 2013; Khodaverdi et al. 2011; Degirmenci et al. 2015; Hales et al. 2017).

Taking the necessary measures to prevent obesity in childhood is crucial as obesity is related to short- and long-term diseases, affects the quality of life of individuals and shortens an individual's life span, all issues that are faced during adulthood (Demattia and Denney 2008; Yigit 2011; Piryani et al. 2016; Plummer 2007). Obesity is multifactorial and as such, lifestyle behaviors must be improved and maintained in order to manage the disease. Successful and cost-effective nonpharmacological methods are suggested for obesity treatment, but medical treatment should be sought if these methods fail (Yigit 2011; Erdim et al. 2014; Piryani et al. 2016). Medical staff who provide primary health services are rather effective with preventable health problems as they promote awareness about behavioral changes and encourage individuals to be responsible for their own health conditions. Nurses, who frequently have close and long-term relations with patients, play a key role in the maintenance and improvement of health, influencing their patients' healthy lifestyle behavior. Positive habits and lifestyles, which will prevent obesity, are significant factors for the maintenance of one's own health and at the same time for the development of a sense of responsibility for one's own health (Alıcı and Pınar 2008; Yigit 2011; Demattia and Denney 2008; Limbers et al. 2008).

Studies that investigate the effect of nonpharmacological treatment methods on the metabolic and psychological parameters of obese adolescents in Turkey are insufficient. As studies in this subject are significant to determine the causes and risk factors of obesity, which is a global problem, evidence that shows the power of independent functions of nursing on the control of risk factors related to obesity, which has a process that can be prevented especially with behavioral changes, should be compiled. As such, this study intends to determine the effect of health-promoting lifestyle education on physio-psychosocial and metabolic parameters and self-esteem of obese adolescents.

Methods

Study Design and Sampling

This quasi-experimental study was conducted between May 2017 and May 2018 at a city center in the Eastern Black Sea Region of Turkey and included a pretest and post-test. Two middle school's students were randomly chosen to comprise the study's population. In order not to affect the groups, the students from school A were assigned as control and the ones from school B were experimental group via drawing lot. A sample size of 72 students was obtained using the probability sampling method; however, the study sample

included 80 obese adolescent students considering the possible losses. The drawing lot method was used for a homogeneous selection of study and control groups of schools and the triple-blind method was used for the selection and assessment of the groups' results. This makes the participants be aware of which researchers give lectures, enter data and analysis.

The study included students, who do not have a mental or physical disability on a level that could affect exercising, do not have medication or in doctor control, and do not have any chronic diseases other than obesity, with BMI ≥ 95 percentile by BMI percentile curves, which were prepared in terms of age and gender.

Variables of the Study

The health-promoting lifestyle education for obese adolescents was an independent variable, while obesity-related risk factors for adolescents, health-promoting lifestyle characteristics, self-esteem, blood pressure and metabolic parameters were dependent variables in this study.

Data Collection Tools

This study used the Student Information Form, Obesity-Related Risk Factors Form, Adolescent Lifestyle Scale (ALS), Rosenberg Self-esteem Scale, Anthropometric Measurements/Blood Pressure and Metabolic Parameters Monitoring Form as data collection tools.

Student Information Form

The form, which was organized by the researcher in accordance with the related literature, includes questions about age and gender of students, income level and employment status of family, family type, number of children and occurrence of obesity in family.

Obesity-Related Risk Factors Form

This form was prepared based on the form that was developed by Yavuz and Hacıalioglu and comprises 13 questions regarding obesity-related risk factors, including nutritional habits, sedentary life and physical activity status (Yavuz and Hacıalioglu 2018).

Adolescent Lifestyle Scale (ALS)

The Turkish validity and reliability of the scale began to be developed by Pender and was completed by Ardıc in 2008 (Ardıc 2008). The scale is in the form of quartet (4) Likert-type for each item. Minimum 44 points and maximum 176 points can be obtained from the ALS. The Cronbach's alpha

was 0.90 for this study, and Cronbach's alpha values of sub-dimensions of the scale were found between 0.57 and 0.72

Rosenberg Self-esteem Scale

Turkish validity and reliability of the scale, which was developed by Rosenberg, was completed by Cuhadaroğlu (1986). The top 10 items of scale were used to assess self-esteem in accordance with the objective of the study. Total scores range between 0 and 30, and the obtained score ranging between 15 and 25 indicates sufficient self-esteem, while a score of 15 and lower indicates low self-esteem. Cronbach' alpha is 0.80 for this study.

Anthropometric Measurements/Blood Pressure and Metabolic Parameters Monitoring Form

The first, second and third part of the monitoring form includes anthropometric measurements (weight, height, body mass index, waist circumference), blood pressure (systolic and diastolic pressure), and metabolic pressure, respectively.

Blood Pressure

Blood pressure assessment was made in accordance with the percentile chart that was published by the American Academy of Pediatrics. The sphygmomanometer was calibrated in compliance with children's ages and used. Blood pressure was measured after 5 min of relaxation in an erect sitting position with cuff in proper size for children, two times with the right arm in a still and relaxed position, with 5-min breaks in between testing.

Body Mass Index (BMI)

The researcher used a digital weighing scale that measures weights between 0 and 150 kg, and a measuring tape (0.5 cm division on tape, rigid and can be immobilized on wall) that measures height between 0 and 150 cm, as measurement tools. Individuals took off their shoes for the height measurement and took off thick clothes off for the weight measurement. Individuals with BMI ≥ 95 percentile was classified as obese by BMI percentile curves, which were prepared according to the children's age and gender.

Waist Circumference

The participants' waist circumference was measured in the standing position, when the abdominal is in a normal, relaxed position, arms are lateral, and feet are horizontal with a 20–30 cm gap in between and after a slight expiration, with 150 cm tape. The measurement was made face-to-face

with the participant, on the center line between the bottom rib and the crystal (Iliac) bone with rigid tape.

Metabolic Parameters

Metabolic parameters consist of glycolysis hemoglobin (HbA1c), cholesterol, low-density lipoproteins (LDL) and high-density lipoproteins (HDL cholesterol), and thyroid-stimulating hormone (TSH) findings. Metabolic parameter measurements were obtained by directing individuals and their parents to health facilities.

Data Collection

The data were collected by researchers through face-to-face interviews. The "Student Information Form", "Adolescent Lifestyle Scale", and "Obesity Related Risk Factors Form" were applied to students of selected schools. The selected students' BMI was determined by taking anthropometric measurements. Students filled in the forms, which took approximately 15 min; taking measurements took approximately 10 min. Data were obtained from the obese adolescents with BMI ≥ 95 percentile, using the ''Blood Pressure, Anthropometric Measurements'' and ''Metabolic Parameters Form'' (Pretest). Blood pressure and anthropometric measurements were taken in accordance with standards by the researcher, and values were registered in forms. Related forms were sent to parents and they were asked to take their children to a health institution for metabolic parameters. Participants then delivered the resulting documents regarding metabolic parameters to the researcher.

After collecting the first assessment data from the study and control groups, an 8-week education program was applied once a week to students in the study group.

Education Program

The education program is focused on the improvement of healthy lifestyles to prevent obesity-related health problems, decrease of sedentary behaviors and increase of physical activity, healthy nutrition, interpersonal relations, benefits of healthy lifestyle on stress management and self-esteem. The 30 to 40-min lessons were given by the researcher in lecture rooms within in the scope of schools once per week for 8 weeks. No application was done to control group during this period. The data collection tools, except the information form, were applied to the study and control groups after 4 months, following the end of the study (Last Test, in the sixth month). The study was completed with data of study group n = 36 and control group n = 37 participants, as n:3 did not wish to participate in the study, n:2 did not wish to make metabolic measurements and n:2 did not deliver their results. After, the collection of final data, the

health-promoting lifestyle education, which was only given to study group during the study, was also given to students in the control group.

Statistical Analyses

Collected data were organized and assessed with the statistical package program, and descriptive tables and statistical analyses were created. Descriptive statistics including percentage for qualitative variables and mean and standard deviation for quantitative variables were used. McNemar test statistics for 2×2 dimensional tables on dependent (intra-group) comparisons and McNemar-Bowker test statistics for tables greater than 2 dimensional were used in the examination of the relation between qualitative variables. The study used Chi square test statistics to detect the differences between the study and control groups. During the analysis of the relationship between the quantitative variables, the intra-group comparison of the dependent variables was performed using the two dependent sampling t test when normality was achieved and the Wilcoxon test when normality was not achieved. To determine the inter-group differences, the two independent sampling t test was used when normality was achieved and the Mann–Whitney U test was used when normality was not achieved. Means (M) and standard deviation (SD) were given together (M ± SD); $p < 0.05$ was accepted as statistically significant.

Ethical Issues

Ethics Committee consent (KAEK 2017/01) and institution authorization were received to perform the study. The study objective and method were explained and a written study plan was given to students. Students and their parents completed written permission forms.

Results

This section presents findings of the statistical analyses done in accordance with the data collected from the pretest and post-test with the study and control groups.

The mean age of the obese students in the study was 12.26 ± 0.76 (11–13); 57.5% of them were female and 42.5% of them were male. 43.8% of participants' mothers had a high school education, while 41.1% of participants' fathers had a high school education. 79.5% of participants were in a nuclear family, 63.0% had a middle-income level, and 46.5% had an obese individual in their family.

Statistics regarding descriptive characteristics of the obese adolescents of the study and control groups is shown in Table 1. The study found no significant difference between obese students in the study and control groups in terms of sociodemographic characteristics ($p > 0.05$).

Intra-group comparisons of obese students in the study and control groups detected that BMI values, which were 29.70 ± 1.36 for the pretest, of students in the study group decreased after the health promoting education program completed (26.79 ± 1.56), and the difference between them was statistically significant ($p < 0.05$). The study found no statistically significant difference between the pretest and post-test BMI values of the control group ($p > 0.05$). The study found that weights and waist circumferences of students who did not take health improvement education increased. Although there was no difference between the BMI, weight and waist circumference of the study and control group participants before the education ($p > 0.05$), statistically significant difference was found between values that were collected after education (Table 2, $p > 0.05$).

The study found that in inter-group comparisons of obesity-related risk factors between study and control groups; While there were no statistical differences between pretest measurements, risk factors other than perception of weight, food consumption duration, and time spent watching TV decreased after the health promoting education program completed, and the difference between them was statistically significant (Table 3, $p < .05$). A statistical difference was found with food consumption duration before and after the education program of the study group, and a statistical difference was found with duration of physical exercises of the control group.

Table 4 shows that the metabolic variables measured at 6-month intervals of the control group demonstrated no differences in terms of measurements. As for the students in the study group, a decrease in the metabolic measurements, especially cholesterol, LDL, Hb1Ac and Triglyceride values, and an increase in HDL values were found.

The study found no statistical differences in pretest (35.6% normal, 19.2% prehypertension, 45.2% hypertension) and in post-test (37% normal, 31.5% prehypertension, 31.5% hypertension) blood pressure values between obese adolescents in the study and control groups ($X^2 = 5.924$, $p = 0.115$).

The study found that in intra-group comparisons of obese adolescent students in the study and control groups; pretest mean scores, which were taken from ALS and all sub-dimensions, of students in the study group increased after health promoting education and the difference between them was statistically significant ($p < 0.05$). The study detected that there was no statistical significance on the difference between pretest–posttest mean scores, which were taken from ALS and all sub-dimensions, of students in the control group ($p > 0.05$), and physical activity and relationships among individuals sub-dimensions' scale scores of control group decreased at the assessment, which was made 6 months later. The study found difference regarding

Table 1 Comparison of demographic characteristic of the obese adolescents in the study and control groups

Variables	Study n	Group (%)	Control n	Group (%)	Chi Square	p
Gender						
Female	21	58.3	21	56.8	0.019	0.892
Male	15	41.7	16	43.2		
Age						
11	7	19.4	7	18.9	0.170	0.918
12	12	33.3	14	37.8		
13	17	47.2	16	43.2		
Year						
5th grade	7	19.4	8	21.6	5.667	0.060
6th grade	9	25	18	48.6		
7th grade	20	55.6	11	29.7		
Family income status						
1500 and lower	1	2.8	1	2.7	0.433	0.805
1600–3000	24	66.7	22	59.5		
3000 and higher	11	30.6	14	37.8		
Family type						
Nucleus	29	80.6	29	78.4	0.86	0.03
Extended	7	19.4	7	18.9		
Other	0	0	1	2.7		
Mother's educational status						
Literate	2	5.6	0	0	4.52	0.399
Primary school	5	13.9	6	16.2		
Middle school	8	22.2	11	29.7		
High school	18	50	14	37.8		
University	3	8.3	6	16.2		
Father's educational status						
Primary school	6	16.7	2	5.4	4.587	0.205
Middle school	12	33.3	8	21.6		
High school	12	33.3	18	48.6		
University	6	16.7	9	24.3		
Mother's employment status						
Employed	17	47.2	20	54.1	0.341	0.559
Unemployed	19	52.8	17	45.9		
Number of children in the family						
1	6	16.7	12	32.4	5.169	0.270
2	15	41.7	15	40.5		
3 or more	15	41.7	10	27		
Presence of obese individuals in the family						
No obese	24	66.7	15	40.5	5.243	0.073
Mother	6	16.7	9	24.3		
Father	6	16.7	13	35.1		

subscales of ALS after education between study and control groups (Table 5, p < 0.05), while there found no differences before study (p > 0.05).

The study found that in intra-group and inter-group comparisons regarding the self-esteem scale's pretest and post-test mean scores, self-esteem scores of the study group (16 ± 2.55) and control group (16 ± 3.34) were the same before the education program, and self-esteem scores of the study group increased after the education program, and the difference between them was statistically significant (Z: − 4.75, p: 0.000). The study found no difference with the self-esteem scores of the control group (Z: 1.293, p: 0.196).

Table 2 Intra-group and inter-group comparisons of anthropometric measurements of obese adolescents in the study and control groups based on pretest and post-test measurements

	Study Pretest X ± SD	Group Posttest X ± SD	Control Pretest X ± SD	Group Post-test X ± SD	Intra Pretest	Group Post-test
BMI	29.70 ± 1.36	26.79 ± 1.56	29.97 ± 1.41	29.83 ± 1.26	− 0.27**	− 3.04**
Inter-group difference	2.91**	p:0.000*	0.14**	p: 0.436	p: 0.412	p: 0.000*
Body weight	72.58 ± 6.60	67.60 ± 6.61	72.44 ± 7.53	74.35 ± 6.49	0.14**	− 6.75**
Inter-group difference	4.98**	p: 0.000*	− 1.91**	p: 0.000*	p: 0.933	p: 0.000*
Waist circumference	91.31 ± 6.76	88.14 ± 6.31	90.68 ± 7.53	92.57 ± 7.73	0.63**	− 4.43**
Inter-group difference	3.17**	p: 0.000*	− 1.89**	p: 0.000*	p: 0.708	p: 0.009*

T test statistics (intra-group dependent, inter-group independent) were used

It is statistically significant at *%5 significance level

**The difference between means

Discussion

The prevention of obesity, a chronic disease that occurs in childhood, should commence in early childhood to prevent adult obesity and various chronic diseases (Waters et al. 2011; Demattia and Denney 2008; Alper et al. 2018). The most significant step to be taken in obesity management is to change one's lifestyle. Healthy life programs for obesity management should be formed based on study data. This study was conducted to detect the effect of health-promoting lifestyle education on physio-psychosocial and metabolic parameters of obese adolescents.

The study's findings showed that the health-promoting lifestyle education was effective with decreasing the BMI of obese adolescents in the study group during the 6-month monitoring period. When the literature was reviewed, various studies were found to involve lifestyle changes for weight control in obesity management (Waters et al. 2011).

Nemet et al. (2011) (diet, activity, behavioral therapy), Beery et al. (weight management education program), Munsch et al. (Munsch et al. 2003) (lifestyle change program), Whestone et al. (2012) (physical activity and healthy nutrition education), Spiegel and Foulk (2006) (nutrition physical activity education), Brown et al. (2018) (lifestyle intervention), Lansen et al. (2011) (intervention based on behavioral and ecological models oriented at sportive activities), James et al. (2007) (healthy nutrition promoting program), Johnston et al. (2010) (school-founded intervention), Alıcı and Pınar (2008) (diet and physical exercise education), and Yavuz and Hacıalioglu (2018) (healthy lifestyle education) found in their studies that whatever the education duration and the method was, BMI values significantly decreased after education. The findings of these studies are parallel with results of domestic and foreign studies. Puberty is a period in which physical appearance is significant, along with physiological and psychological rapid development, and it is necessary to use this situation as an opportunity for obesity management.

An individual's physiological growth and development are present in puberty, and physiologically increasing fatty tissue along with the effect of various factors (sedentary lifestyle, nutrition, changes in regular sleep routine, psychological fluctuations etc.) may increase susceptibility to being overweight and obese. It is necessary to take obesity-related risk factors into consideration for obesity management. Children require help to understand that obesity results from their lifestyle choices (Yigit 2011).

The study found that obesity-related risk factors' pretest measurements of the study group decreased after education when an intra-group comparison of obesity related risk factors was made. The inter-group difference was statistically significant (Table 3).

Spiegel and Foulk (2006) determined that fruit and vegetable consumption and physical activity levels of students increased with school-founded education. Whestone et al. (2012) detected that fruit-vegetable consumption increased with the physical activity and healthy nutrition education, though there was no significant increase in physical activity. Nemet et al. (2011) found that education given to obese children causes a significant increase in diet and nutrition information, and activity information and practice level. Munsch et al. (2003) identified that the lifestyle change program on obesity management was significant in terms of maintenance of weight, controlling eating behavior, and being pleased with one's body appearance. Yavuz and Hacıalioglu (2018) found positively significant differences between the variables of obesity-related risk factors including nutrition habits, sedentary lifestyle duration and physical activity habits after health promoting education in their study. This study showed that obesity-related risk factors of adolescents could be controlled with education. It is rather significant to shift daily nutrition habits in a healthy direction, increase physical activity, acquire other healthy lifestyle habits and increase the rate of people who adopted healthy lifestyle.

Obesity during childhood is known to affect metabolic parameters and lead to chronic diseases. Type 2 diabetes

Table 3 Intra-group and inter-group comparisons of obesity-related risk factors of obese adolescents in the study and control groups based on pre-test and post-test measurements

Obesity-related risk	Study Pretest %	Group Posttest %	Inter x	Group p	Control Pretest %	Group Posttest %	Inter x	Group p	Intra Pretest x	Group p	Posttest x	p
How the adolescent views his/her weight?												
Overweight	19.4	19.4	1.343	0.719	24.3	24.3	0.143	0.86	0.395	0.821	0.731	0.694
Medium weight	58.3	63.9			51.4	54.1						
Normal weight	22.2	16.7			24.3	21.6						
Number of daily meals?												
1–2 meals	44.4	25.0	–	–	51.4	59.5	–	–	1.487	0.475	9.391	0.009*
3–5 meals	55.6	72.2			45.9	40.5						
6 meals or more	0	2.8			2.7	0						
Skipping meals/having snacks between meals												
Never	11.1	50	–	–	10.8	5.4	1.167	0.558	1.272	0.529	20.790	0.000*
Sometimes	72.2	50			81.8	81.1						
Always	16.7	0			8.1	13.5						
Having snack after												
Never	25	61.1	–	–	35.1	32.4	–	–	3.403	0.182	6.031	0.019*
Sometimes	61.1	38.9			62.2	67.6						
Always	13.9	0			2.7	0						
Having snack after waking up from nocturnal												
Never	55.6	86.1	–	–	70.3	56.8	–	–	1.769	0.413	7.673	0.006*
Sometimes	41.7	13.9			27	43.2						
Always	2.8	0			2.7	0						
Eating speed												
Fast	22.2	2.8	7.200	0.027*	21.6	18.9	2	0.572	0.209	0.901	5.635	0.060
Medium	66.7	88.9			70.3	78.4						
Slow	11.1	8.3			8.1	2.7						
Sitting at the dinner table for a long time												
Never	16.7	38.9	–	–	24.3	38.9	3.143	0.370	1.892	0.388	9.380	0.009*
Sometimes	69.4	61.1			70.3	67.6						
Always	13.9	0			5.4	16.2						
State of doing activity while eating												
Never	16.7	36.1	–	–	18.9	13.5	4.667	0.198	2.116	0.347	10.627	0.005*
Sometimes	52.8	63.9			64.9	67.6						
Always	30.6	0			16.2	18.9						
Frequency of fast food consumed in one week												
Once	38.9	69.4	–	–	54.1	27	6.333	0.096	1.823	0.402	14.653	0.001*
Twice	55.6	30.6			43.2	62.2						
Three times or more	5.6	0			2.7	10.8						
State of overeating under stress												
Never	30.6	47.2	–	–	37.8	27	2	0.368	0.756	0.685	7.022	0.030*
Sometimes	63.9	52.8			54.1	59.5						
Always	5.6	0			8.1	13.5						
Time/day spent in front of computer/TV												
None	5.6	8.3	1.286	0.733	2.7	2.7	0.200	0.905	1.284	0.526	1.122	0.571
About an hour	63.9	69.4			75.2	73						
More than 2 h	30.6	22.2			21.6	24.3						
Sport activity frequency/week												
None	19.4	0	–	–	13.5	5.4	1.286	0.526	0.491	0.782	6.148	0.046*

Table 3 (continued)

Obesity-related risk	Study Pretest	Group Posttest	Inter	Group	Control Pretest	Group Posttest	Inter	Group	Intra Pretest	Group	Posttest	
	%	%	x	p	%	%	x	p	x	p	x	p
2–3 times a week	66.7	61.1			70.3	78.4						
3–5 times a week	13.9	38.9			16.2	16.2						
Time/week spent on sports activities												
None	19.4	0	–	–	10.8	5.4	17	0.009*	3.131	0.372	8.929	0.030*
Less than an hour	33.3	33.3			21.6	59.5						
1–2 h	30.6	41.7			43.2	27						
2 h or more	16.7	25			24.3	8.1						

Intra-group McNemar–Bowker test and inter-group Chi square test statistics were used

It is statistically significant at *%5 significance level

mellitus, cardiovascular disorders and metabolic syndrome frequencies in children increase in parallel with obesity, and significant health problems occur if metabolic parameters are not under control. Metabolic parameters of obese adolescents in both the study and control groups are found to be higher than recommended reference values in the preliminary rating. The study found a decrease in cholesterol, LDL, Hb1Ac and Triglyceride levels of the study group and an increase in HDL levels (Table 4).

A positive correlation between the increase of BMI and waist circumference, and total cholesterol, LDL, Hb1Ac and Triglyceride levels, and a negative correlation between HDL cholesterol levels were found on various studies in the literature. Sur et al. (2005) detected in their study that obese children had higher levels of triglyceride and lower levels of HDL cholesterol values, and their cardiovascular disease and hypertension occurrence frequency increased. Nogay and Koksal (2013) found that systolic and diastolic blood pressure, waist circumference, blood triglyceride, glycolysis and insulin levels of obese adolescents were significantly higher than groups who had lower BMI values. Ayvaz et al. (2011) confirmed that the BMI and ALT values of obese children with metabolic syndrome were higher, and a negative correlation between BMI, waist-thigh circumferences and waist/thigh rate, and HDL cholesterol existed. Another study detected that there is a meaningful positive correlation between BMI, waist circumference and thigh circumference, and cholesterol, triglyceride (Yucel and Toprak 2016).

Carrel et al. (2005) found that students who were registered for physical activity classes, experienced body fat losses, increased cardiovascular compliance, and whose hunger insulin levels increased were higher than control group. Johnston et al. (2010) found in their study on school-founded intervention on obese children that it was beneficial in terms of total cholesterol and triglyceride for the study group. The finding of our study is parallel with domestic and foreign

results that show losing weight for obese individuals not only positively affects obesity parameters but also affects metabolic values. Also, adolescents being confronted with their metabolic values is thought to be effective on obesity management.

Obesity is closely related to a lack of healthy lifestyle and its sub-dimensions, and nutrition, physical activity and psychological factors constitute risk factors for obesity. When the pretest and post-test ALS scale mean scores of obese adolescents in the study and control groups were reviewed, it was documented that the difference between the pretest and post-test mean scores on ALS and its all sub-dimensions of the study group was statistically significant (Table 5).

The study found improvements to healthy lifestyles of adolescents aged between 12 and 18, to whom web-based weight management program, which was designed in accordance with health promotion model, was applied (Sousa et al. 2014). A similar study determined that the weight management program education on obese children aged between 7 and 17 increased the mean score of the healthy lifestyle scale and maximum differentiation was seen in the physical activity sub-dimension of the scale (Berry et al. 2007). Yavuz and Hacıalioglu (2018) stated in their study that giving education, based on the health promotion model, affected the ALS scale and its sub-dimensions considerably. Results of this study also showed that health-promoting lifestyle education increased healthy lifestyle behaviors of students and promoted the notion that puberty is an opportunity to develop positive attitudes.

For adolescents, their physical appearance is one of the most significant matters. Physical appearances of adolescents are related to their self-esteem, coping with problems and positive mood. Self-esteem is formed by an individual's thoughts regarding his/her appearance, affects one's quality of life, and contributes to the social life of the individual (Isıklar 2012; Kernis 2005).

Table 4 Intra-Group and inter-group comparisons of metabolic parameters of obese adolescents in the study and control groups based on the pretest and post-test mean scores

	Study Pretest X±SD	Group Post-test X±SD	Inter Mean difference	Group p	Control Pretest X±SD	Group Post-test X±SD	Inter Mean difference	Group p	Group Intra Pretest Mean difference	p	Group Post-test Mean difference	p
Cholesterol	170.33±31.75	129.56±24.40	40.78	0.000*	169.08±31.72	165.05±28.90	4.03	0.289	1.25	0,867	−35.50	0.000*
LDL	96.29±30.26	81.24±14.72	15.04	0.000*	101.35±27.37	106.95±28.50	−5.60	0.070	−5.06	0.456	−25.70	0.000*
TSH	50.5±11.42	55.72±8.03	−5.22	0.002*	2.69±1.13	2.90±1.22	−0.22	0.166	3.53	0.195	8.02	0.000*
	Median (min–max)	Median (min–max)	Z	p	Median (min–max)	Median (min–max)	Z	p	Z	p	Z	p
Systolic	120 (100–150)	119 (94–156)	−1.573	0.116	120 (100–140)	120 (95–140)	−1.460	0.144	−0.992	0.321	−1.288	0.198
Diastolic	75 (60–98)	72.5 (56–92)	−2.598	0.009*	75 (60–90)	75 (60–90)	−0.603	0.547	0.145	0.885	−1.176	0.240
Pulse	94 (73–128)	94 (67–138)	−0.055	0.956	94 (68–108)	95 (64–115)	−0.424	0.671	−0.265	0.791	−0.110	0.912
Hb1Ac	5.2 (4.6–6.9)	4.6 (4–5.4)	−5.138	0.000*	5.2 (4.43–7.10)	5.21 (4.6–6.8)	−0.425	0.671	0.105	0.916	−5.031	0.000*
Triglyceride	98.5 (41–251)	78.5 (33–154)	−4.738	0.000*	99 (35–247)	105 (54–204)	−0.151	0.88	−0.436	0.663	−3.521	0.000*
HDL	2.92 (1.09–5.9)	2.8 (0.8–7.7)	−0.652	0.514	45 (34–92)	48 (35.7–69)	−0.985	0.325	−1.578	0.115	−0.265	0.791

T test statistics (intra-group dependent, inter-group independent) and intra-group Wilcoxon test statistics, inter-group Mann–Whitney U test statistics were used

It is statistically significant at *%5 significance level

Various studies show a decrease in self-esteem with an increase in BMI (Tram and Cole 2000; Kernis 2005; Degirmenci et al. 2015), and it was found that the self-esteem mean score of both obese adolescent groups were low. Isiklar (2012) found that the mean score of the self-esteem of normal weight adolescents (27.54) was significantly higher than those of obese adolescents (17.40). Other studies show the effectiveness of lifestyle adjustments on psychological parameters in parallel with the findings of this study. Studies showed that education, which includes diet and exercise regimes oriented at losing and maintaining weight in obese individuals, was effective for depression (Hession et al. 2006; Foster et al. 2004), body image (Foster et al. 2004) and self-esteem (Alıcı and Pınar 2008; Foster et al. 2004). The study found that the self-esteem scores of the study group increased significantly with health-promoting lifestyle education. The self-esteem of adolescents should be strengthened to ensure their healthy psychological developments.

As a result of adopting a healthy life style, obesity-related physio-psychosocial metabolic parameters could be controlled and obesity management could be successful.

Conclusion

The study concluded that health-promoting lifestyle education for obese adolescents helped to improve their anthropometric, metabolic and psychological parameters. Education given during puberty affects behaviors in a positive way. Trainings given during adolescence have a short term effect on behaviors, which needs revising regarding continuity. This paper evaluates the findings just after the training, which is a restriction to be emphasized for a long term evaluation. It is thought that the effect of health training for obese adolescents on metabolic parameters via cohort type studies.

As protection of physical, social and psychological health of obese children is significant for the early detection and management of obesity to prevent complications. Health-promoting lifestyle to be influenced on individual plays a key role at this point. Obese adolescent should be supported in order to build self-awareness, to identify realistic goals and to realize these goals.

Behavioral changes should be multi-directional for the planning of initiatives orientated at the prevention of obesity. It should be planned not only focused on risky individuals but also with the assessment of environmental and physical factors, and systematic applications in educational institutions that would affect them. On the other hand, planning of any changes in behaviors towards preventing obesity should be hand in hand with obese adolescent, parents and health professional. This means that the focus should not only be the obese individual at risk, but

Table 5 Intra-group and inter-group comparisons of ALS scale and sub-dimensions based on pre-test and ost-test averages of study group and control group comprising obese adolescents

ALS scale and sub-dimensions	Study group			Control group				
	X ± SD	Inter-group comparison Mean difference	Pre-post-test p	X ± SD	Inter-group comparison Mean difference	Pre-post test p	Intra-group comparison Mean difference	Pre-post test p
Health responsibility								
Pretest	16.39 ± 2.70	− 3.22	0.000*	16.81 ± 3.25	0.54	0.221	− 0.42	0.548
Post-test	19.61 ± 2.73			16.27 ± 2.50			3.34	0.000*
Physical activity								
Pretest	15.22 ± 2.14	− 2.33	0.001*	15.27 ± 2.09	1.03	0.026*	− 0.05	0.923
Post-test	17.56 ± 3.16			14.24 ± 3.01			3.31	0.000*
Diet								
Pretest	16.14 ± 2.14	− 6.56	0.000*	16.46 ± 1.74	− 0.65	0.160	− 0.32	0.484
Post-test	22.69 ± 2.81			17.11 ± 2.35			5.56	0.000*
Positive outlook on life								
Pretest	16.03 ± 2.26	− 4.14	0.000*	16.27 ± 1.81	0.22	0.605	− 0.24	0.614
Post-test	20.17 ± 2.88			16.05 ± 2.52			4.11	0.000*
Interpersonal relations								
Pretest	16.99 ± 2.22	− 1.72	0.002*	18.14 ± 2.42	1.16	0.032*	− 0.39	0.481
Post-test	19.47 ± 2.70			16.97 ± 2.28			2.5	0.000*
Stress management								
Pretest	15.75 ± 2.05	− 3.39	0.000*	15.70 ± 1.94	0.46	0.322	0.05	0.920
Post-test	19.14 ± 2.73			15.24 ± 2.45			3.9	0.000*
Spiritual health								
Pretest	16.0 ± 2.88	− 1.89	0.001*	17.0 ± 2.94	0.78	0.241	− 1	0.147
Post-test	17.89 ± 2.85			16.22 ± 3.33			1.67	0.000*
ALS scale total								
Pretest	113.28 ± 10.68	− 23.25	0.000*	115.65 ± 11.41	3.54	0.105	− 2.37	0.363
Post-test	136.53 ± 15.14			112.11 ± 13.31			24.42	0.000*

T test statistics (intra-group dependent, inter-group independent) were us

It is statistically significant at *%5 significance level

also environmental factors, physiological and behavioral factors and systematic attempts in educational institutions should also be considered.

Health education, which is given in schools with an aim to prevent obesity, should be achieved using an integrated approach, in cooperation with parents and school health-care professionals.

Compliance with Ethical Standards

Conflict of interest The authors declare that there is no conflict of interest.

Ethical Approval Ethics Committee consent (KAEK 2017/01) received to perform the study.

References

AACAP-American Academy of Child and Adolescent Psychiatry. (2011). Obesity in Children and Teens, Facts for Families No: 79. Retrieved from http://www.aacap.org/AACAP/Families/Youth/FactsforFamilies/FactsforFamiliesPages/ObesityinChildrenandTeens79.aspx.

Alıcı, M., & Pınar, R. (2008). Evaluation of the effectiveness of education given to obese patients. *Journal of Research and Development in Nursing, 2,* 32–47.

Alper, E., Ercan, I., & Uncu, Y. (2018). A Meta-analysis and an evaluation of trends in obesity prevalence among children and adolescents in Turkey: 1990 through 2015. *Journal of Clinical Research in Pediatric Endocrinology, 10*(1), 59–67.

Ardıc, A. (2008). Healthy life style behaviors of adolescents. Health Sciences Institute, Public Health Nursing Department. Master thesis, İstanbul: Istanbul University.

Ayvaz, D. N. C., Nisancı Kılınc, F., Pac, F. A., & Cakal, E. (2011). Anthropometric measurements and body composition analysis of obese adolescents with and without metabolic syndrome. *Turkish Journal of Medical Sciences, 41*(2), 267–274.

Berry, D., Mary, S., Gail, M., & Margaret, G. (2007). An intervention for multiethnic obese parents and overweight children. *Applied Nursing Research, 2,* 63–71.

Brown, E. C., Buchan, D. S., Drignei, D., Wyatt, F. B., Kilgore, L., Cavana, J., et al. (2018). Primary school children's health behaviors, attitudes, and body mass ındex after a 10-week lifestyle ıntervention with follow-up. *Frontiers in Pediatrics, 6,* 137. https://doi.org/10.3389/fped.2018.00137.

Carrel, A. L., Clark, R. R., Peterson, S. E., Nemeth, B. A., Sullivan, J., & Allen, Db. (2005). Improvement of fitness, body composition, and insulin sensitivity in overweight children in a school-based exercise program: A randomized controlled study. *Archives of Pediatrics and Adolescent Medicine, 159*(10), 963–968.

Cuhadaroglu, F. (1986). Respect for self in adolescents. Hacettepe University, Faculty of Medicine, Department of Psychiatry, Unpublished master thesis, Ankara.

Degirmenci, T., Kalkan-Oguzhanoglu, N., Sözeri-Varma, G., Ozdel, O., & Fenkci, S. (2015). Psychological symptoms in obesity and related factors. *Archives of Neuropsychiatry, 52,* 42–46. https://doi.org/10.5152/npa.2015.6904.

Demattia, L., & Denney, S. L. (2008). Childhood obesity prevention: Successful community-based efforts. *The Annals of the American Academy of Political and Social Science, 615*(1), 83–99.

Erdim, L., Ergun, A., & Kuguoglu, S. (2014). The role of nurses in the prevention and management of obesity in children. *Journal of Health Science and Profession, 1*(2), 115–126.

Foster, G. D., Phelan, S., Wadden, T. A., Gill, D., Ermold, J., & Didie, E. (2004). Promoting more modest weight losses: A pilot study. *Obesity Research, 12,* 1271–1277.

Hales, C. M., Carroll, M. D., Fryar, C. D., Ogden, C. L. (2017). Prevalence of obesity among adults and youth: United States, 2015–2016. *NCHS Data Brief.* No. 288.

Hession, M., Rolland, C., Tuya, C., Wise, A., Murray, S., Pirie, I., et al. (2006). Weight physical activity, and general health changes after 3 and 6 months of dietary interventions. *Obesity Reviews, 7*(2), 307.

Isıklar, A. (2012). An investigation of the quality of life and self-esteem levels in adolescents with regard to the variables of gender and obesity. *Fırat University Journal of Social Science, 22*(2), 84–92.

James, J., Thomas, P., & Kerr, D. (2007). Preventing childhood obesity: Two year follow-up results from the Christchurch obesity prevention programme in schools (CHOPPS). *BMJ, 335,* 762. https://doi.org/10.1136/bmj.39342.571806.55.

Johnston, C. A., Tyler, C., Mcfarlin, B. K., Poston, W., Haddock, C. K., Reeves, R. S., et al. (2010). Effects of a school-based weight maintenance program for Mexican-American children: Results at 2 years. *Obesity, 18*(3), 542–547.

Kernis, M. H. (2005). Measuring self-esteem in context: The importance of stability of self-esteem in psychological functioning. *Journal of Personality, 73*(6), 1569–1605.

Khodaverdi, F., Alhani, F., Kazemnejad, A., & Khodaverdi, Z. (2011). The relationship between obesity and quality of life in school children. *Iranian Journal of Public Health, 40*(2), 96–101.

Lansen, W., Borsboom, G., Meima, A., Zwanenburg, V. J., Marcenbach, J. P., Raat, H., et al. (2011). Effectiveness of a primary school-based intervention to reduce overweight. *International Journal of Peadiatric Obesity, 6*(2–2), e70–e77.

Limbers, C. A., Turner, E. A., & Varni, J. W. (2008). Promoting healthy lifestyles: Behavior modification and motivational interviewing in the treatment of childhood obesity. *Journal of Clinical Lipidology., 2*(3), 169–178. https://doi.org/10.1016/j.jacl.2008.03.003.

Munsch, S., Biedert, E., & Keller, U. (2003). Evaluation of a lifestyle change programme for the treatment of obesity in general practice. *Swiss Medical Weekly, 133,* 148–154.

Nemet, D., Geva, D., Pantanowitz, M., Igbaria, N., Meckel, Y., & Eliakim, A. (2011). Health promotion intervention in Arab- Israeli kindergarten children. *Journal of Pediatric Endocrinology and Metabolism, 24,* 1001–1007.

Nogay, N. H., & Köksal, G. (2013). Metabolic syndrome and other metabolic features in children. *Electronic Journal of Vocational Colleges, 4,* 171–177.

Piryani, S., Baral, K. P., Pradhan, B., Poudyal, A. K., & Piryani, R. M. (2016). Overweight and its associated risk factors among urban school adolescents in Nepal: A cross-sectional study. *British Medical Journal Open, 6*(5), e010335.

Plummer, M. (2007). The Nurses role in the prevention of childhood obesity. *Nursing* 211: Research Final Version, Fall 2007. Retrieved July 8, 2009, from http://nurs211f07nurses-role-in-prevention-of-childhood.html.

Sousa, P., Fonseca, H., Gaspar, P., et al. (2014). Internet-based intervention programme for obese adolescents and their families (Next Step): Research protocol of a controlled trial. *Journal of Advanced Nursing, 170*(4), 904–914. **PMID: 24020828**.

Spiegel, S. A., & Foulk, D. (2006). Reducing overweight through a multidisciplinary school-based intervention. *Obesity (silver spring), 14*(1), 88–96.

Sur, H., Kolotourou, M., Dimitriou, M., Kocaoglu, B., Keskin, Y., Hayran, O., et al. (2005). Biochemical and behavioral indices related to BMI in schoolchildren in urban Turkey. *Preventive Medicine, 41*(4), 614–621.

Tascılar, M. E., Hacıhamdioglu, B., Soyarslan, M., & Abacı, A. (2010). The prevalence of metabolic syndrome and frequency of cardiovascular risk factors in obese children. *Gülhane Medical Journal, 52,* 32–35.

Tram, J. M., & Cole, D. A. (2000). Self-perceived competence and the relation between life events and depressive symptoms in adolescence: Mediator or moderator? *Journal of Abnormal Psychology, 109,* 753–760.

Waters, E., de Silva-Sanigorski, A., Burford, B. J., Brown, T., Campbell, K. J., Gao, Y., et al. (2011). Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews, 12,* CD001871. https://doi.org/10.1002/14651858.cd001871.pub3.

Whestone, L. M., Kolasa, K. M., & Collier, D. N. (2012). Participation in community-originated interventions is associated with positive changes in weight status and health behaviors in youth. *American Journal of Health Promotion: AJHP, 27*(1), 10–16.

Yavuz, A. Y., & Hacıalioglu, N. (2018). The effect of training provided for obese adolescents based on Health Promotion Model on their healthy lifestyle behaviors and life quality. *Progress in Nutrition, 20*(1), 146–160. https://doi.org/10.23751/pn.v20i1.6301.

Yigit, R. (2011). Nurse's role in the management of childhood obesity. *Journal of Research and Development in Nursing, 1,* 71–80.

Yucel, B. B., & Toprak, D. (2016). Evaluation of anthropometric and biochemical parameters in obese children between 6-16 years. *Ankara Medical Journal, 16*(1), 27–40.