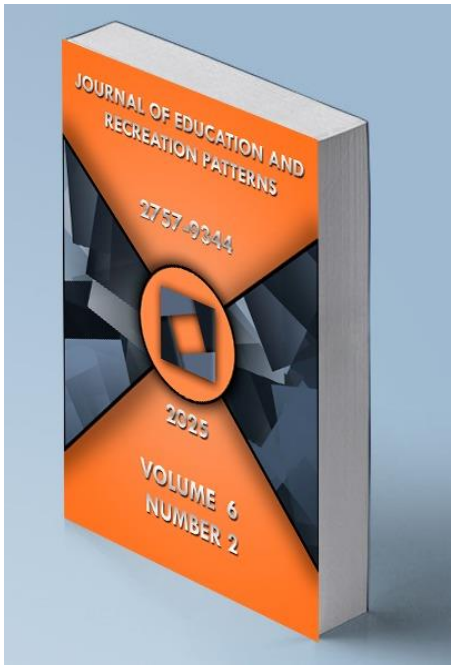

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Relationships Between Weight Status, Physical Activity, Nutritional Behaviors, and Life Satisfaction in Middle School Students

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Relationships Between Weight Status, Physical Activity, Nutritional Behaviors, and Life Satisfaction in Middle School Students

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ABSTRACT

The aim of this study was to examine the relationships among weight status, physical activity, nutritional habits, and life satisfaction in middle school students. The study was conducted with a sample of 216 students (96 male and 120 female) attending public middle schools. Data was collected using a personal information form, the Physical Activity Questionnaire for Older Children (PAQ-C), the Nutritional Behavior Scale, and the Satisfaction with Life Scale for Children. In addition, objective physical activity data were obtained using Polar Ignite® smartwatches, which participants wore continuously for only a 48-hour monitoring period. Statistical analyses included independent samples t-tests, one-way analysis of variance (ANOVA), chi-square tests, and Pearson correlation analyses. The results indicated that 61.1% of the participants were classified as normal weight, while 23.1% were overweight and 11.1% were obese. Male participants exhibited significantly higher Body Mass Index (BMI) values than female participants ($p<0.05$). No significant gender differences were observed in physical activity levels, life satisfaction, or nutritional habits ($p>0.05$). However, 11-year-old students demonstrated significantly higher physical activity levels and healthier nutritional habits than students aged 12 and 13 years. Correlation analyses revealed positive and significant associations between physical activity and life satisfaction, as well as between physical activity and nutritional habits ($p<0.01$). No significant association was found between life satisfaction and nutritional habits ($p>0.05$). In conclusion, promoting sustained physical activity and healthy nutrition during early adolescence may support both physical health and psychosocial well-being among middle school students overall effectively.

Keywords: Nutrional Behaviors, Obesity, Physical Activity.

INTRODUCTION

Childhood obesity has become a major global health concern and has increased dramatically over the years (Kimin et al., 2022). Obesity generally reflects an energy imbalance resulting from excessive energy intake due to unhealthy nutrition habits, combined with physical inactivity and a sedentary lifestyle. The World Health Organization (WHO) defines obesity as an abnormal or excessive accumulation of fat that may impair health (WHO, 2021). According to data from the World Obesity Federation (2024), in 2020 there were 435 million overweight or obese children worldwide, and this number is expected to reach 770 million by 2035.

Childhood obesity is a significant problem that negatively affects both physical and psychosocial development and often persists in adulthood if not addressed early. Research indicates that individuals who are obese during childhood tend to remain obese in adulthood (Galle et al., 2022). Although obesity is a multifactorial condition with genetic, environmental, behavioral, and socioeconomic roots, it is closely associated with dietary behaviors and reduced physical activity (Samakidou et al., 2023). Currently, children engage in physical activity levels far below the recommended guidelines (WHO, 2021). In addition, unhealthy dietary behaviors such as frequent consumption of high-calorie and low-nutrient foods, poor breakfast habits, meal skipping, and excessive portion sizes contribute to an increased risk of obesity (Liberali et al., 2020; Liu et al., 2018).

The body, especially during adolescence, strongly defends its fat stores, and lifestyle modifications alone are often insufficient to treat obesity (Kelly, 2023). The presence of obesity during adolescence increases lifelong mortality risk due to cardiovascular diseases and type 2 diabetes mellitus (Twig et al., 2016). The adverse effects of obesity are not limited to physical health; it is also known to negatively affect children's psychological and social well-being. Obese children may experience difficulties in social interactions with their peers, which can lower their life satisfaction (Baile et al., 2020; Shen & Kogan, 2021). Life satisfaction is defined as an individual's evaluation of their own life based on personal criteria and is considered a significant indicator of children's overall psychosocial well-being (Wadsworth & Pendergast, 2014).

A pronounced decline in life satisfaction has been observed during adolescence (Proctor, Linley, & Maltby, 2009). In this context, numerous studies have focused on identifying the factors underlying decreases in physical activity levels and life satisfaction among adolescent male students and female students. Evidence indicates that factors such as increased screen time (Matin et al., 2017), rising levels of sedentary behavior (Parker et al., 2021), and intensified academic demands (Yoo, Kahng, & Kim, 2017) are associated with reductions in physical activity, which coincide with declines in life satisfaction during adolescence. Current evidence further suggests that physical activity may be meaningfully related to adolescents' subjective well-being through its regulatory role in both positive and negative affect (Gao et al., 2025). Moreover, active participation in leisure-time activities may contribute to higher life satisfaction by providing physical, social, and psychological benefits, reducing sedentary behavior, enhancing social interaction, and ultimately improving overall quality of life (Ekinci, Tercan, & Kaya, 2025).

Concurrently, dietary habits, such as the consumption of healthy foods (like fruits and vegetables), healthy eating behaviors (like eating breakfast regularly), and unhealthy food intake (like sugar-sweetened and carbonated beverages), may be closely linked to subjective health perception, an important aspect of children's health and well-being (Holder, 2019; Veenhoven, 2021). From a developmental perspective, regular and balanced nutrition during childhood and early adolescence is linked to key determinants of life satisfaction, such as

academic performance, emotional stability, and social interactions. This suggests that the association between nutritional behaviors and life satisfaction may be shaped through both biological mechanisms (e.g., energy balance and neurotransmitter functioning) and psychosocial pathways (e.g., self-efficacy, daily routines, and family support). In contrast, findings regarding the relationship between unhealthy food consumption and psychological outcomes are inconsistent. A common belief holds that unhealthy foods may provide temporary mood enhancement (Wahl et al., 2017). Some limited evidence supports this assumption, suggesting that the consumption of carbonated beverages may reduce feelings of unhappiness among children (Chang & Nayga, 2010). Conversely, other studies indicate that excessive consumption of junk food and sugar-rich products may adversely affect children's mental health and lead to lower life satisfaction in the long term (Waters et al., 2019; García-Hermoso et al., 2022).

Healthy lifestyle behaviors are known to form during the early stages of life and influence habits in adulthood. Behaviors acquired during childhood can lead to important health consequences later in life, such as an increased risk of obesity. This is crucial for raising physically and psychologically healthy generations (Kimin et al., 2022; Stok et al., 2018; Scaglioni et al., 2018). Therefore, regular monitoring of overweight and obesity conditions among children and adolescents is necessary (Zhang et al., 2024).

Although childhood obesity is closely linked to physical activity, nutritional behaviors, and psychological well-being, existing research has rarely examined these dimensions simultaneously using both objective and subjective assessment methods in middle school populations. To date, most studies have relied predominantly on self-reported measures of physical activity and lifestyle behaviors, which may be vulnerable to recall bias and subjective interpretation. In this context, the present study adopts a multidimensional framework that integrates smartwatch-based objective measurements of physical activity with self-reported assessments of nutritional behaviors and life satisfaction. By concurrently examining objectively measured body mass index (BMI) and physical activity alongside subjective lifestyle and psychosocial indicators, this study aims to provide novel evidence on how different measurement approaches relate to obesity-associated risk factors among middle school.

METHOD

Research Model

This study employed quantitative research design using the general survey model. The survey model aims to describe a situation that existed in the past or currently exists as it is, and to identify relationships between variables (Karasar, 2012).

Study Group

The study sample consisted of 216 secondary school students attending public schools in Aksaray province. A power analysis was conducted using G*Power 3.1 software to determine the sample size of the study. In the analysis, the effect size was determined as 0.3, the significance level (α) as 0.05 and the test power (1-β) as 0.95, and in this direction, it was determined that it would be sufficient to conduct the study with a minimum of 142 participants. In order to prevent possible data loss, 216 participants were included in the study. The demographic characteristics of the participants in the study are presented in Table 1.

Table 1

Descriptive Statistics of Participants

Variables	Group	n	%
Gender	Male	96	44.4
	Female	120	55.6
Age	11 years	98	45.4
	12 years	68	31.5
	13 years	50	23.1

Table 1 shows that the study sample consisted of 96 male students (44.4%) and 120 female students (55.6%). Regarding age, 98 students (45.4%) were in the 11 years, 68 (31.5%) 12 years and 50 (23.1%) 13 years.

Data Collection Instruments

The data collection instruments used in this study are described below.

Personal Information Form: A form developed by the researchers was used to collect demographic information about the participants (gender, age, economic status).

Physical Activity Questionnaire for Children (PAQ-C): The Physical Activity Questionnaire for Children (PAQ-C), developed by Kowalski et al. (1997) and adapted into Turkish by Erdim et al. (2019), was used to assess students' physical activity levels. The content validity coefficient of the scale was reported as 0.95, and the Cronbach's alpha reliability coefficient was 0.77.

Nutritional Behavior Scale: The Nutritional Behavior Scale developed by Edmundson et al. (1996) and adapted into Turkish by Öztürk and Erdoğan (2010) was used to assess students' dietary habits. The scale consists of 14 items, with scores ranging from -14 to +14, where higher scores indicate healthier nutritional behaviors. The Cronbach's alpha coefficient of the scale was found to be 0.68.

Satisfaction with Life Scale for Children: The Satisfaction with Life Scale, developed by Diener et al. (1985) and adapted into Turkish by Dağlı and Baysal (2016), is a single-dimensional instrument consisting of five items. Cronbach's alpha reliability coefficient of the scale was 0.87.

Determination of Body Mass Index (BMI): Following the completion of the questionnaires, anthropometric measurements were conducted. Prior to weighing, the electronic scale was calibrated, and students were measured in light clothing and without shoes. A portable stadiometer was used for height measurements. Students stood with feet together, and the head was positioned in the Frankfort horizontal plane. The intersection point of the ruler with the vertical plane was recorded. Body Mass Index (BMI) was calculated and classified according to the Centers for Disease Control and Prevention (CDC) reference values as follows: BMI < 5th percentile = underweight; 5th–84th percentile = normal weight; 85th–94th percentile = overweight; and ≥95th percentile = obese (National Center for Health Statistics, 2000).

Daily Step Count Measurement: To determine the participants' daily physical activity levels, Polar Ignite® (Finland) smartwatches were used. Students were instructed to wear the devices continuously for 48 hours.

Procedure for Data Collection

The study was approved by the Aksaray University Human Research Ethics Committee (Date: 21.10.2021; Protocol No: 2021/09-01). Following ethical approval, permissions were obtained from school administrations, and written informed consent was collected from parents. Questionnaire data were gathered from voluntary participants in classroom settings. Subsequently, all participants received training on how to use smartwatches. The devices were distributed, and participants were instructed not to remove them for 48 hours. After the measurement period, the watches were collected, and the recorded data were transferred to electronic format for analysis.

Data Analysis

All collected data were entered into a computer and analyzed using SPSS 22.0 program. Initially, normality assumptions were tested. Skewness and kurtosis values were found to be within the ±1.5 range recommended by Tabachnick and Fidell (2007), indicating that the data were normally distributed. Therefore, parametric tests were employed in subsequent analyses. Participants' demographic characteristics and nutrition/sleep habits were summarized using frequency and percentage distributions. Independent samples t-tests, chi-square and one-way ANOVA were used to examine differences between groups, and Scheffe post-hoc test was applied when significant differences were detected. Pearson correlation analysis was conducted to determine relationships between variables. All statistical analyses were performed at a 95% confidence level, and a significance level of $p<0.05$ was adopted throughout the study.

FINDINGS

This section presents the results of the statistical analyses conducted to examine differences and relationships among the study variables.

Table 2

Distribution of Participants' Mean Daily Step Counts

Number of steps per day	Male		Female		Total	
	Mean	Sd	Mean	Sd	Mean	Sd
Day 1	9104.1	631.51	8611.7	773.73	8319.9	687.64
Day 2	9272.4	813.15	8836.9	935.52	8324.9	993.71
Total	9188.3	722.35	8723,8	854.63	8322.9	840.68

Male n=96, Female n=120, total n=216

As shown in Table 2, the participants' mean daily step count over the two-day monitoring period was 8,322.9 steps/day. The mean step count on the first day was 8,319.9 steps/day, while on the second day it was 8,324.9 steps/day. According to gender, the average total daily step count was 9,188.3 steps/day for male students and 8,723.8 steps/day for female students.

Table 3

Frequency and Percentage Distribution of Students' Physical Activity Levels

Gender	Low PA Level	Normal PA Level	High PA Level
Male	18 (18.8%)	54 (56.2%)	24 (25%)
Female	28 (23.8%)	56 (46.2%)	36 (30%)
Total	46(21.3%)	110 (50.8%)	60 (27.9%)

Male n=96, Female n=120, total n=216

As shown in Table 3, 21.3% (n=46) of the students exhibited low levels of physical activity, 50.8% (n=110) demonstrated moderate levels, and 27.9% (n=60) showed high levels of physical activity. When analyzed by gender, 18.8% (n=18) of male students had low, 56.2% (n=54) had moderate, and 25.0% (n=24) had high levels of physical activity. Among female students, 23.8% (n=28) had low, 46.2% (n=56) had moderate, and 30.0% (n=36) had high levels of physical activity participation.

Table 4

Frequency and Percentage Distribution of Students' Life Satisfaction Levels

Gender	Low	Normal	High
Male	26 (27.1%)	26 (27.1%)	44 (45.8%)
Female	42 (35.0%)	28 (23.3%)	50 (41.7%)
Total	68 (31.5%)	54 (25%)	94(43.5%)

Male n=96, Female n=120, total n=216

According to Table 4, it is observed that 31.5% (n=68) of the students had a low level of life satisfaction, 25% (n=54) had a moderate level, and 43.5% (n=94) had a high level of life satisfaction. In terms of gender, 27.1% (n=26) of male students had low, 27.1% (n=26) had moderate, and 45.8% (n=44) had high levels of life satisfaction. Among female students, 35% (n=42) had low, 23.3% (n=28) had moderate, and 41.7% (n=50) had high levels of life satisfaction.

Table 5

Distribution of Body Mass Index (BMI) Categories by Gender and Results of the Chi-square Test

Body Mass Index (BMI)	Gender n (%)		Total	p
	Male	Female		
Underweight	6 (6.3%)	4 (3.3%)	10 (4.6%)	**0.001***
Normal weight	42 (43.8%)	90 (75%)	132 (61,1%)	
Overweight	30 (31.3%)	20 (16.7%)	50 (23.1%)	
Obese	18 (18.8%)	6 (5%)	24 (11.2%)	

Table 5 presents the results of the chi-square test examining the association between gender and BMI categories. The analysis revealed a statistically significant association between gender and BMI ($p<0.05$).

Table 6

Changes in Physical Activity, Life Satisfaction and Nutritional Behavior by Gender

Variable	Gender	n	Mean	Sd	t	P
Physical Activity	Male	96	3.53	0.75	0.463	0.644
	Female	120	3.49	0.65		
Life Satisfaction	Male	96	17.67	4.93	1.125	0.262
	Female	120	16.83	5.76		
Nutrition Behavior	Male	96	0.53	4.11	1.140	0.255
	Female	120	-0.18	4.92		

As shown in Table 6, no statistically significant differences were detected between male and female students in physical activity, life satisfaction, or nutrition behavior scores ($p>0.05$).

Table 7

Changes in Physical Activity, Life Satisfaction, and Nutritional Behavior by Age

Variable	Age	n	Mean	Sd	F	p	Difference
Physical Activity	(1) 11 years	98	3.73	0.64	14.31	**0.000***	1 > 2 > 3
	(2) 12 years	68	3.46	0.64			
	(3) 13 years	50	3.13	0.69			
Life Satisfaction	(1) 11 years	98	16.96	5.20	1.95	0.145	
	(2) 12 years	68	18.21	5.78			
	(3) 13 years	50	16.32	5.19			
Nutrition Behavior	(1) 11 years	98	1.35	4.92	6.62	**0.002***	1 > 2 > 3
	(2) 12 years	68	-0.87	4.01			
	(3) 13 years	50	-0.88	4.08			

**(p<0.05)*

As shown in Table 7, a statistically significant difference was observed among the age groups in terms of physical activity levels (F=14.31, p<0.05). The findings indicate that 11-year-old students demonstrated higher physical activity levels than 12- and 13-year-old students, and that 12-year-old students also exhibited higher levels than 13-year-olds. Regarding life satisfaction, no statistically significant differences were found among the age groups (F=1.95, p>0.05). In terms of nutrition behavior, 11-year-old students had significantly higher nutrition behavior scores than 12- and 13-year-old students (F=6.62, p<0.05).

Table 8

Changes in Physical Activity, Life Satisfaction, and Nutritional Behavior Levels by Economic Status

Variable	Group	n	Mean	Sd	F	p	Difference
Physical Activity	(1) Low	27	3.32	0.83	3.700	**0.026***	1<3
	(2) Medium	153	3.48	0.67			
	(3) High	36	3.77	0.64			
Life Satisfaction	(1) Low	27	12.85	6.67	11.086	**0.000***	1<3
	(2) Medium	153	17.72	4.97			
	(3) High	36	18.28	4.77			
Nutritional Behavior	(1) Low	27	1.04	4.16	0.661	0.517	
	(2) Medium	153	-0.05	4.69			
	(3) High	36	0.25	4.43			

**(p<0.05)*

As presented in Table 8, differences were observed in participants' physical activity, life satisfaction, and nutritional behavior scale scores. A statistically significant difference was found among the groups in terms of physical activity levels (F=3.700, p<0.05). Individuals with high economic status exhibited significantly higher levels of physical activity compared to those with low economic status. Regarding life satisfaction, participants with moderate and high economic status demonstrated significantly higher levels of life satisfaction than those with low economic status (F=11.086, p<0.05). However, no statistically significant differences were found among the groups in terms of nutritional behavior scores (F=0.661, p>0.05).

Table 9

Changes in Physical Activity, Life Satisfaction, and Nutritional Behavior Levels According to Body Mass Index

Variable	Group	n	Mean	Sd	F	p	Difference
Physical Activity	(1) Underweight	10	3.96	0.62	2.047	0.108	
	(2) Normal weight	132	3.53	0.71			
	(3) Overweight	50	3.40	0.64			
	(4) Obese	24	3.39	0.68			
Life Satisfaction	(1) Underweight	10	3.80	0.91	1.262	0.288	
	(2) Normal weight	132	3.42	1.04			
	(3) Overweight	50	3.57	1.15			
	(4) Obese	24	3.13	1.14			
Nutritional Behavior	(1) Underweight	10	-0.71	0.16	0.369	0.775	
	(2) Normal weight	132	0.12	0.32			
	(3) Overweight	50	-0.02	0.36			
	(4) Obese	24	0.05	0.32			

Table 9 compares the mean scores of physical activity, life satisfaction, and nutritional behavior according to the participants' body mass index (BMI). The findings revealed no statistically significant difference between BMI groups in terms of physical activity, life satisfaction, and nutritional behavior scores ($p>0.05$).

Table 10

The Relationship Between Physical Activity, Life Satisfaction, and Nutritional Behavior

Variables	1	2	3
1. Physical Activity	1		
2. Life Satisfaction	0.202*	1	
3. Nutritional Behavior	0.183*	0.043	1

**(p<0.05).*

Table 10 presents the correlations among physical activity, life satisfaction, and nutritional behavior scores. The results indicate a positive and significant correlation between physical activity and life satisfaction ($r=0.202$), suggesting that individuals with higher levels of physical activity tend to report greater overall life satisfaction. Similarly, a positive and significant correlation was observed between physical activity and nutritional behavior ($r=0.183$). However, no significant correlation was found between life satisfaction and nutritional behavior ($r=0.043$).

DISCUSSION

This study aimed to provide data that could contribute to the development of preventive strategies promoting healthy lifestyle behaviors during childhood by examining the relationships among key factors that may influence the risk of childhood obesity—namely, body mass index (BMI), physical activity level, life satisfaction, and nutritional behaviors.

The findings of the present study revealed that middle school students took an average of

8,322 steps per day as measured by smart watches. This result suggests that the participants were generally physically active. According to Tudor-Locke et al. (2011), children should achieve at least 6,000 steps per day at moderate to vigorous intensity to meet the recommended physical activity guidelines. In this context, the participants in the present study exceeded the recommended daily step count, indicating satisfactory levels of physical activity. Furthermore, consistent with previous research, male students were found to take more steps than female students. However, it should be noted that in the present study, smartwatches were worn for a 48-hour period.

The results of this study showed that 21.3% of students had low, 50.8% had moderate, and 27.9% had high levels of physical activity. Although male students exhibited higher levels of physical activity, this difference was not statistically significant. These results are consistent with some studies in the literature (Marufoğlu & Kutlutürk, 2021; Al-Zandee & Ünlü, 2019), but contrast with others reporting gender differences in physical activity levels (Hazar et al., 2017). Such discrepancies across studies may be attributed to variations in sample characteristics, environmental factors, or the type and intensity of physical activities examined.

Similarly, 27.1% reported low, 50.8% moderate, and 27.9% high levels of life satisfaction. life satisfaction scores did not differ significantly by gender. Regarding life satisfaction, previous research has produced mixed findings with respect to gender. Chen et al. (2024) found no significant gender difference in life satisfaction among children, although they noted a slight tendency favoring male students. In contrast, several studies have reported that female students scored significantly lower than male students (Goldbeck et al., 2007; Kaye-Tzadok et al., 2017; Newland et al., 2019). Similarly, research focusing on adolescents has shown that females tend to report lower life satisfaction levels (Llosada-Gistau et al., 2015; Tomyn et al., 2015).

Another finding of the present study was that male students exhibited higher healthy nutritional behavior scores than female students; however, this difference was not statistically significant. This finding reflects the inconsistency in the existing literature regarding gender-related differences in nutritional behaviors. For example, Mizia et al. (2021) reported that men's diets were characterized by a significantly higher prevalence of adverse health-related dietary characteristics compared with those of women. Conversely, Kuzay (2024) demonstrated that female students possessed higher levels of nutritional knowledge than male students. In a similar vein, Kartal et al. (2019) found no significant gender differences in nutritional knowledge, while reporting higher mean scores for healthy eating behavior, exercise behavior, and meal regularity among male students. These findings suggest that nutritional knowledge does not necessarily translate into healthier dietary behaviors and that gender-related differences in nutrition-related behaviors may be influenced by cultural, environmental, and psychosocial factors.

Another finding of the study was that the majority of participants were classified as normal weight (61.1%), followed by overweight (23.1%), obese (11.1%), and underweight (4.6%)Gender-based analyses revealed significantly higher BMI values among male students compared with female students. This finding aligns with several previous studies reporting higher BMI levels in male children and adolescents (Alkan et al., 2022; Giralt et al., 2011; Hassapidou et al., 2017; Jia et al., 2017; Preston et al., 2015). Similarly, Chang et al. (2024) observed greater BMI increases among boys, while Chang (2022) reported higher BMI levels in males and suggested that insufficient physical activity may be more strongly associated with BMI in boys than in girls. Conversely, Kautiainen et al. (2005) reported higher BMI values among girls, underscoring the heterogeneity of findings across populations and study contexts. Although boys in the present study exhibited higher levels of physical activity than girls, this did not correspond to lower BMI values; instead, boys demonstrated higher mean BMI scores.

This discrepancy suggests that gender differences in BMI may not be attributable to physical activity alone. Rather, these differences may reflect the combined influence of biological maturation, hormonal regulation, and behavioral factors. In support of this interpretation, Zhang et al. (2022) reported significant associations between BMI and sex hormones, leptin, and irisin in children and adolescents, indicating that sex-specific hormonal processes may contribute to divergent body composition patterns between boys and girls.

The findings of the present study indicated that 11-year-old students had higher physical activity levels compared to 12- and 13-year-old students, and 12-year-olds were more active than 13-year-olds. Consistent with these results, Pate et al. (2022) reported a decline in physical activity with increasing age. In terms of nutritional behavior, 11-year-old students also scored higher than those in older age groups, suggesting that as age increases, children may experience a deterioration in nutrition habits. Prior studies have shown that the frequency of unhealthy food consumption increases, and regular nutrition habits decrease during the transition to adolescence (Mazur & Małkowska-Szkutnik, 2018; Myszkowska-Ryciak et al., 2019; Kolanowski, Ługowska & Trafialek, 2022). Therefore, the lower nutritional behavior scores observed among 12- and 13-year-old students in this study may be associated with the higher prevalence of unhealthy eating and meal-skipping tendencies reported in the literature.

Although 11-year-old students demonstrated more favorable physical activity and nutritional behavior scores, no significant differences in life satisfaction were observed across age groups. Contrary to our findings, Aymerich et al. (2021) reported that life satisfaction levels were significantly higher during childhood compared to pre-adolescence and adolescence, showing a decline with age. Similarly, Newland et al. (2019) emphasized that age is one of the strongest predictors of life satisfaction, with older children reporting lower levels. Life satisfaction, however, is influenced not only by age but also by various contextual factors such as family support, peer relationships, school environment, and psychological resilience. Supporting this, Zaborskis et al. (2022) found that family support and socioeconomic status significantly affected life satisfaction among adolescents aged 11–15. Therefore, the lack of significant differences in life satisfaction across age groups in our study may be attributable to similar levels of social support, family structure, or school environments among participants.

In terms of socioeconomic status, a significant difference was observed in physical activity levels, with participants from higher economic backgrounds demonstrating substantially greater engagement in physical activity than those from lower economic backgrounds. This finding is consistent with previous research indicating that higher socioeconomic status positively influences physical activity among children and adolescents (Ke et al., 2022; Ziegeldorf et al., 2024). Greater physical activity levels among children from more affluent families may be attributed to improved access to recreational facilities, stronger family support, broader socioeconomic resources, and more favorable environmental conditions.

Similarly, life satisfaction was significantly higher among participants from moderate and high economic backgrounds compared to those from low economic backgrounds. The literature consistently supports the view that socioeconomic status affects life satisfaction both directly and indirectly through mechanisms such as stress, parental support, educational opportunities, health, and social capital (Niu et al., 2024; Horanicova, 2022; Davisson, 2025). Accordingly, the positive association between economic status and life satisfaction observed in this study is consistent with well-established findings in previous research.

However, nutritional behavior scores did not differ significantly across economic groups. The literature on this issue remains inconclusive. Some studies have reported that children from higher socioeconomic backgrounds consume less healthy foods (Al Sabbah et al., 2007; Zaborskis et al., 2012; Morgan et al., 2021), while others have reported the opposite (Zaborskis

et al., 2021; Lazzeri et al., 2014; Voráčová et al., 2016). Gautam et al. (2023) found that children and adolescents from low socioeconomic backgrounds were more likely to engage in unhealthy eating behaviors. These mixed findings indicate that nutritional behaviors are shaped by multiple mediating variables such as parental modeling, school environment, and food accessibility. Accordingly, our findings suggest that the influence of economic status on nutritional behavior may vary depending on contextual factors, measurement methods, and the presence of intermediary variables.

When physical activity levels were analyzed according to Body Mass Index (BMI), no significant difference was found. In contrast, Kawalec et al. (2024) reported that insufficient physical activity was more pronounced among overweight and obese youth and highlighted the role of psychosocial factors such as low motivation and decreased physical self-efficacy in hindering active participation. Similarly, no significant differences were observed in life satisfaction or nutritional behavior scores across BMI groups. This finding is consistent with previous research indicating that subjective well-being and life satisfaction are not solely determined by body weight status, but are instead shaped by broader psychosocial, environmental, and cultural factors (Proctor et al., 2009). Likewise, nutritional behaviors have been shown to vary considerably within BMI categories, suggesting that dietary patterns are influenced more by contextual factors such as food environment, socioeconomic status, and nutrition knowledge than by BMI alone (Larson & Story, 2013).

A positive and significant relationship was found between physical activity and life satisfaction, indicating that individuals with higher levels of physical activity tend to report greater overall life satisfaction. This finding is consistent with the literature suggesting that physical activity during adolescence contributes not only to physiological but also to psychosocial well-being (Chmelík et al., 2023; Nie et al., 2025). Moreover, Nie et al. (2025) demonstrated that physical activity indirectly enhances life satisfaction through improvements in body esteem and emotional regulation.

A positive and significant correlation was also observed between physical activity and nutritional behavior, suggesting that more physically active students tend to adopt healthier dietary patterns. This result aligns with previous research indicating that healthy dietary behaviors are significantly associated with higher levels of physical activity (Chaireti et al., 2025; Fernandes et al., 2023). Engagement in physical activity may enhance students' health awareness, fostering a reciprocal reinforcement between dietary habits and movement-related behaviors.

Finally, no significant association was observed between life satisfaction and nutritional behavior in the present study. This finding suggests that nutritional behaviors may not be directly associated with levels of life satisfaction within the studied sample. The absence of a significant relationship may indicate that the link between these variables is shaped by other contextual or mediating factors. In this regard, although Chen et al. (2024) reported that regular breakfast consumption and higher fruit and vegetable intake were associated with greater life satisfaction, they also noted that such associations may differ according to age, cultural context, intrinsic motivation, and other psychosocial determinants.

Conclusion

The present study examined the relationships among body mass index (BMI), physical activity, life satisfaction, and nutritional behaviors in children. Overall, participants demonstrated moderate levels of BMI, physical activity, and life satisfaction. Findings indicated that male students engaged in higher levels of physical activity compared to females, while both physical activity and healthy nutritional behaviors declined with increasing age. Furthermore, students from higher socioeconomic backgrounds exhibited significantly greater

physical activity and life satisfaction scores. Also, positive associations were observed between physical activity, life satisfaction, and dietary behaviors.

Recommendations

Based on the findings of the present study, several recommendations can be proposed. First, given the positive associations observed between physical activity, life satisfaction, and healthy nutritional behaviors, interventions targeting childhood obesity prevention should adopt an integrated approach that simultaneously promotes physical activity, psychosocial well-being, and healthy eating habits. School-based programs, in particular, may play a critical role in fostering these interrelated behaviors at an early age. Second, the observed decline in physical activity and healthy nutritional behaviors with increasing age highlights the importance of sustaining healthy lifestyle practices during the transition from childhood to early adolescence. Age-appropriate and engaging physical activity opportunities should be developed to maintain participation, especially among older children. Third, the differences identified according to socioeconomic status underscore the need for policies and community-based initiatives that reduce socioeconomic disparities in access to physical activity opportunities and resources supporting well-being. Enhancing access to safe recreational spaces, organized sports, and school-supported physical activity programs may contribute to more equitable health outcomes.

Fourth, although male students demonstrated higher levels of physical activity, gender-sensitive strategies should be considered to encourage physical activity participation among girls, addressing potential social, environmental, and motivational barriers.

Finally, future research should employ longitudinal designs to better understand the developmental trajectories and directional relationships among BMI, physical activity, life satisfaction, and nutritional behaviors. The use of extended objective measurements and more comprehensive assessments of dietary behavior may further strengthen the evidence base and support the development of effective preventive strategies

Limitations

This study has several limitations that should be acknowledged. First, the study employed a relatively small sample drawn from a single region, which may limit the generalizability of the results. Second, the cross-sectional design precludes causal inferences regarding the observed relationships. Additionally, the reliance on self-reported measures of physical activity, life satisfaction, and nutritional behaviors may not fully reflect participants' actual behaviors or attitudes. The assessment of daily step counts over only two days may also fail to capture habitual physical activity accurately. Furthermore, the short duration of physical activity measurement (48 hours) represents an important methodological limitation. The assessment of economic status lacked objective criteria and relied partly on subjective evaluation, which may have introduced reporting bias. Finally, as data collected in October, potential seasonal effects on physical activity and related behaviors cannot be ruled out.

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Author(s)' statements on ethics and conflict of interest

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