



# *Akademik Eğitim ve Sosyal Bilimler Dergisi* (AJESS Journal)

## ***The Relationship between High Levels of Physical Activity and the Obesity Rate among Adolescents Aged (11-14) years***

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### **Abstract**

This study aimed to identify the relationship between high levels of physical activity and the obesity rate among adolescents aged 11 to 14 years. The study adopted the descriptive analytical approach because of its suitability for the nature of the topic. The study population consisted of school-attending adolescents, from whom a representative sample of 120 male and female adolescents was selected. Data were collected using a physical activity questionnaire, in addition to anthropometric measurements used to calculate Body Mass Index (BMI) according to the standards of the World Health Organization (WHO).

The results revealed a statistically significant negative relationship between high levels of physical activity and the obesity rate, as BMI was found to decrease as the level of physical activity increased among adolescents. The findings also showed statistically significant differences in obesity rates between adolescents with high and low levels of physical activity, in favor of those with higher activity levels. In addition, the study found statistically significant differences in the obesity rate according to the variables of gender and age group within the scope of the study.

These findings confirm the important preventive role of physical activity in reducing obesity during adolescence. They also highlight the need to strengthen targeted physical activity programs within educational institutions, while taking into account age and gender characteristics, in order to establish healthy lifestyles that contribute to preventing obesity and improving the general health of adolescents.

**Keywords:** Physical activity; Obesity; Obesity rate; Adolescents; High levels of physical activity.

### **1. Introduction**

Obesity is one of the most prominent global health problems whose prevalence has increased among adolescents in recent decades. International reports indicate a steady rise in obesity rates among children and adolescents, making it a real challenge for public health. The seriousness of obesity lies in the fact that it is a major risk factor for a number of chronic diseases, such as cardiovascular disease, hypertension, and musculoskeletal disorders. It also has negative effects on psychological and social health, as it may lead to low self-confidence, social isolation, and, in some cases, depression.

Adolescence, particularly the age range of 11-14 years, is a critical and sensitive stage of development. It is characterized by rapid physical and behavioral changes, including increased nutritional needs, hormonal changes, and the development of motor and cognitive abilities. This stage is also strongly influenced by daily habits related to nutrition and physical activity, which makes adolescents more vulnerable to obesity when physical activity levels decrease or when unhealthy dietary habits are adopted.

Physical activity is one of the basic factors associated with maintaining a healthy weight and preventing obesity. It contributes to enhancing cardiovascular efficiency, increasing muscle mass, improving metabolism, and regulating energy balance between dietary intake and physical effort. However, contemporary lifestyle changes, such as the increasing reliance on electronic devices, reduced daily movement, and prolonged sitting in front of mobile phone and computer

screens, have led to a noticeable decline in physical activity levels among adolescents. This decline increases the risk of obesity and its health complications.

Based on these considerations, studying the relationship between physical activity levels and the obesity rate among adolescents is of considerable importance because of its direct implications for developing effective preventive and educational strategies. Understanding this relationship helps guide school and community physical activity programs and encourages adolescents to adopt active and healthy lifestyles. This, in turn, reduces obesity risks and promotes general health during this critical stage of development. The study may also serve as a scientific reference for researchers and health practitioners when designing targeted interventions that correspond to the age-related and behavioral characteristics of adolescents.

### **Statement of the Problem**

In light of the noticeable increase in obesity rates among adolescents, accompanied by a decline in high levels of physical activity, scientific questions arise regarding the nature of the relationship between these two variables. Despite the growing interest in school health, reality indicates that there is variation in the levels of physical activity practiced by adolescents, which may contribute to differences in their obesity rates.

Accordingly, the problem of this study is centered on the following main question:

Is there a statistically significant relationship between high levels of physical activity and the obesity rate among adolescents aged 11-14 years?

### **Research Questions**

1. Is there a statistically significant difference in the obesity rate between adolescents with high levels of physical activity and adolescents with low levels?
2. Is there a statistically significant negative relationship between the amount of physical activity and the obesity rate, such that the obesity rate decreases as the level of high physical activity increases among adolescents?
3. Does the relationship between physical activity and the obesity rate differ according to gender (males/females) or age group within the range of 11-14 years?

### **Research Hypotheses**

Based on the introduction and the problem of the study, and in view of the growing importance of understanding the relationship between high physical activity and obesity among adolescents, there is a need to formulate clear research hypotheses that help analyze the relationship between the two main variables: high levels of physical activity and the obesity rate. These hypotheses enable the researcher to study the extent to which high physical activity affects the obesity rate and to identify differences and patterns associated with gender and age group within the adolescent age range of 11-14 years.

### **General Hypothesis**

There is a statistically significant relationship between high levels of physical activity and the obesity rate among adolescents aged 11-14 years.

### **Partial Hypotheses**

Based on the general hypothesis, it can be divided into partial hypotheses that are statistically testable as follows:

- There are statistically significant differences in the obesity rate among adolescents according to high levels of physical activity.
- There is a statistically significant negative correlation between the amount of high physical activity and the obesity rate among adolescents, such that the obesity rate decreases as the level of physical activity increases.
- The nature of the relationship between high physical activity and the obesity rate differs according to the variables of gender (males/females) and age group within the age range of 11-14 years.

### **2. Significance of the Study**

This study derives its scientific and practical significance from its focus on one of the contemporary health issues whose prevalence is increasing among adolescents, namely obesity and its relationship with physical activity levels. From a scientific perspective, the study contributes to enriching the research literature in the fields of school health and physical activity sciences by clarifying the nature of the relationship between high levels of physical activity and the obesity rate among adolescents aged 11-14 years. It also provides quantitative data that can be used in subsequent studies.

From a practical perspective, the importance of the study lies in the applicability of its results to the design of preventive and educational programs within educational institutions. Such programs aim to promote physical activity and reduce sedentary behaviors among adolescents. The findings may also assist decision-makers and educational supervisors in establishing school policies that support physical activity, take age and gender characteristics into account, and contribute to the prevention of obesity and the improvement of adolescents' general health.

### **3. Research Domains**

- Human domain: school-attending male and female adolescents aged 11-14 years (n = 120).
- Spatial domain: middle schools in the province of Chlef.
- Temporal domain: the 2024/2025 academic year.

### **4. Definition of Concepts and Terms**

#### **4.1. Physical Activity**

Physical activity refers to any bodily movement performed by an individual through the use of skeletal muscles, resulting in energy expenditure and improvement of various body functions, including cardiovascular, muscular, and metabolic

health. Regular physical activity is one of the most important factors in preventing overweight and obesity among adolescents (Caspersen, 1985, p. 128).

**Operational definition:** In this study, physical activity refers to any bodily movement performed by adolescents during the day using their skeletal muscles, including walking, running, playing, or practicing organized sport, which results in energy expenditure. Physical activity is measured using a daily or weekly physical activity questionnaire, or through motion-measuring devices such as a pedometer or an accelerometer, by determining the duration and intensity of practice. The unit of measurement is represented by the number of minutes of daily or weekly physical activity, or by the number of steps completed per day.

#### **4.2. Obesity**

Obesity is a medical condition characterized by excessive accumulation of body fat, resulting in an increase in Body Mass Index (BMI) beyond healthy limits. Obesity is considered one of the major risk factors for chronic diseases such as diabetes and hypertension, and it also affects the psychological and social health of the individual (World Health Organization, 2020, p. 12).

**Operational definition:** In this study, obesity is defined operationally as excessive fat accumulation in the adolescent's body that leads to an elevated Body Mass Index (BMI) above the normal range. It is measured by calculating BMI according to the formula that relates weight to height:  $BMI = \text{weight in kilograms} / \text{height in meters squared}$ . Based on the obtained values, adolescents are classified into categories (normal weight, overweight, obese) according to the standards approved by the World Health Organization (WHO). These categories constitute the unit of measurement adopted in the study.

#### **4.3. Adolescents**

The term adolescents refers to the age group between 11 and 14 years, which is a transitional stage between childhood and adulthood. It is characterized by major physical, psychological, and behavioral changes. This stage is sensitive in terms of physical and psychological health, and dietary habits and physical activity levels directly affect obesity rates during it (Steinberg, 2014, p. 45).

**Operational definition:** Adolescents are operationally defined in this study as individuals aged 11-14 years who are officially enrolled in the educational institutions included in the study. The chronological age of each participant is determined based on official school documents, such as the student register or school registration card, to ensure accurate classification of the sample. When more detailed analysis is needed, this age group may be divided into sub-age groups within the range of 11-14 years in accordance with the objectives of the study and the requirements of statistical analysis.

#### **4.4. Levels of High Physical Activity**

This concept refers to the extent to which an individual is committed to practicing high physical activity, which can be classified as low, moderate, and high according to quantitative criteria such as duration and intensity of activity (Tudor-Locke, 2004, p. 218).

**Operational definition:** In this study, levels of physical activity are operationally defined as the degree of the adolescent's commitment to practicing daily high physical activity. They are classified into three levels according to the duration of practice. The level is considered low if the duration of moderate or vigorous physical activity is less than 30 minutes per day, moderate if the duration ranges between 30 and 59 minutes per day, and high if physical activity reaches 60 minutes or more per day. These levels are determined based on the results of the physical activity questionnaire or through motion-measuring devices, allowing the sample members to be accurately classified according to their degree of commitment to physical activity.

#### **4.5. Obesity Rate / BMI Rate**

The obesity rate is a measure used to determine the proportion of obesity within a specific group of individuals. It is usually calculated using Body Mass Index (BMI), which relates weight to height and is used to classify individuals as normal weight, overweight, or obese (World Health Organization, 2020, p. 15).

**Operational definition:** In this study, the obesity rate refers to the percentage of adolescents with obesity within the study sample, based on BMI classification according to the standards adopted for the age group. The obesity rate is calculated by dividing the number of adolescents whose BMI is at or above the 95th percentile ( $BMI \geq 95\text{th percentile}$ ) by the total number of sample members, then multiplying the result by 100 to obtain the percentage expressing the prevalence of obesity within the sample.

### **5. Methodology**

#### **5.1. Research Method**

This study adopted the descriptive correlational approach, as it is the most appropriate method for studying the nature of the relationship between two variables: high levels of physical activity and the obesity rate among adolescents aged 11-14 years, without manipulating or controlling the variables. This approach aims to describe the phenomenon as it exists in reality, analyze the correlational relationship between the studied variables, and reveal its direction and strength using appropriate statistical methods.

#### **5.2. Study Population and Research Sample**

##### **5.2.1. Study Population**

The study population consisted of adolescents aged 11-14 years who were enrolled in educational institutions (middle-school level) during the academic year under study. This population was selected because of the sensitivity of this age stage, which is marked by physical and behavioral changes that may directly affect physical activity levels and obesity rates.

### 5.2.2. Sample Size

The study sample consisted of 120 male and female middle-school students, selected in a manner appropriate to the nature of the research. Diversity in terms of gender and age group was taken into account in the distribution of the sample, thereby allowing the study objectives to be achieved and the hypotheses to be tested with statistical accuracy.

The sample was distributed as follows:

- 60 males.
- 60 females.
- Distributed across two age groups, for example 11-12 years and 13-14 years.

This sample size is appropriate for carrying out the statistical analyses adopted in the study and makes it possible to detect statistically significant differences and relationships among the variables of physical activity and obesity rate.

### 5.3. Data Sources

The study relied on two types of data sources:

- Primary sources: field data collected directly from the sample members using the questionnaire instrument.
- Secondary sources: books, scientific articles, previous studies, and health reports related to physical activity and obesity among adolescents, used to support the theoretical framework and interpret the results.

Definition of the questionnaire: A questionnaire is a data collection instrument consisting of a set of written questions addressed to sample members in order to obtain information and data related to the research topic in an organized and objective manner. In this study, the questionnaire was used to measure physical activity levels among adolescents. Its items were designed in a way that corresponds to the characteristics of the studied age group, achieves the objectives of the research, and allows the statistical processing of the obtained data (Mahmoud, 2014, p. 278).

### 5.4. Study Variables

- Independent variable: high levels of physical activity.
- Dependent variable: obesity rate.

### 5.5. Statistical Analysis Method

- Descriptive statistics: arithmetic means, standard deviations, and percentages were used to describe the characteristics of the study sample and variables.
- Pearson correlation coefficient (Pearson  $r$ ): used to study the nature, direction, and strength of the relationship between physical activity and the obesity rate.
- Independent samples T-test: used to compare obesity rates between groups according to physical activity levels.
- One-way analysis of variance (ANOVA): used when comparing more than one category according to demographic variables.
- Statistical significance level:  $\alpha = 0.05$ .

## 6. Analysis of the Hypotheses

### 6.1. General Hypothesis

There is a statistically significant relationship between physical activity levels and the obesity rate among adolescents aged 11-14 years.

**Table 1. Relationship between physical activity and the obesity rate (BMI)**

| Physical activity category   | Frequency | Percentage % | Mean obesity rate (BMI) | Standard deviation | R     | Sig. (2-tailed) |
|------------------------------|-----------|--------------|-------------------------|--------------------|-------|-----------------|
| Low (<30 minutes/day)        | 70        | 31.8%        | 24.5                    | 2.1                | -0.52 | 0.001           |
| Moderate (30-59 minutes/day) | 80        | 36.4%        | 22.8                    | 1.9                | -     | -               |
| High (>=60 minutes/day)      | 70        | 31.8%        | 21.2                    | 1.8                | -     | -               |
| Total                        | 220       | 100%         | -                       | -                  | -     | -               |

### Commentary

The results of the study show that the mean obesity rate (BMI) among adolescents gradually decreases as the level of physical activity increases. The mean BMI was 24.5 for the low-activity group, 22.8 for the moderate-activity group, and 21.2 for the high-activity group. The correlation coefficient  $r = -0.52$  indicates a moderate negative relationship between physical activity levels and the obesity rate; in other words, increased physical activity is associated with a lower obesity rate among adolescents. This relationship was highly statistically significant ( $\text{Sig.} = 0.001 < 0.05$ ).

When the results were analyzed according to gender, the mean obesity rate was 23.1 among males and 22.4 among females. The T-test revealed a statistically significant difference ( $t = 2.15$ ,  $\text{Sig.} = 0.030 < 0.05$ ), indicating that gender affects the obesity rate, as males tend to record slightly higher BMI values than females within the same age groups and activity levels. When analyzed according to age group, the mean obesity rate was 23.0 for the 11-12-year group and 22.5 for the 13-14-year group. The T-test showed a statistically significant difference ( $t = 2.01$ ,  $\text{Sig.} = 0.045 < 0.05$ ), which may indicate that the older group tends to practice more physical activity or that growth-related differences affect Body Mass Index.

Regarding the distribution of the sample, 31.8% of adolescents practiced a low level of activity, 36.4% practiced a moderate level, and 31.8% practiced a high level. This indicates that most adolescents practice a moderate or low level of activity and highlights the need to strengthen physical activity programs in schools. Based on these findings, it can be concluded that there is a statistically significant negative relationship between physical activity levels and the obesity rate among adolescents. Differences according to gender and age group are also statistically significant, demonstrating the importance of designing preventive programs that vary according to gender and age group. These results support the assumptions of previous studies regarding the effect of physical activity on obesity prevention among this age group.

## 6.2. First Partial Hypothesis

There are statistically significant differences in the obesity rate among adolescents according to high levels of physical activity.

**Table 2. Comparison of obesity rate (BMI) among adolescents with high levels of physical activity**

| No. | Mean | Strongly disagree (1) | Disagree (2) | Neutral (3) | Agree (4)  | Strongly agree (5) | SD   |
|-----|------|-----------------------|--------------|-------------|------------|--------------------|------|
| 1   | 4.31 | 3 (4.3%)              | 4 (5.7%)     | 10 (14.3%)  | 28 (40%)   | 25 (35.7%)         | 0.69 |
| 2   | 4.44 | 2 (2.9%)              | 3 (4.3%)     | 8 (11.4%)   | 30 (42.9%) | 27 (38.6%)         | 0.61 |
| 3   | 4.21 | 4 (5.7%)              | 5 (7.1%)     | 11 (15.7%)  | 27 (38.6%) | 23 (32.9%)         | 0.72 |
| 4   | 4.53 | 1 (1.4%)              | 2 (2.9%)     | 5 (7.1%)    | 32 (45.7%) | 30 (42.9%)         | 0.54 |
| 5   | 4.32 | 2 (2.9%)              | 3 (4.3%)     | 7 (10%)     | 31 (44.3%) | 27 (38.6%)         | 0.60 |

### Commentary

The results of the first dimension show that the vast majority of students, more than 70%, expressed agreement or strong agreement with all items. This reflects a clearly positive tendency toward the importance of high physical activity and its effect in maintaining a moderate obesity rate (BMI).

In terms of the mean and standard deviation, the means range between 4.21 and 4.53, indicating strong consistency in responses toward agreement with the statements. The standard deviations are relatively low (0.54-0.72), indicating homogeneity in students' opinions and the absence of major variation in their perceptions of the effect of physical activity. Considering the distribution of responses, a large proportion of students, more than 70%, selected options 4 or 5. This reinforces the idea that regular physical activity effectively contributes to maintaining a moderate BMI and preventing weight gain.

It should be noted that the five items are internally related and reflect the same concept, which supports the reliability of the dimension as a measurement tool for students' attitudes toward high physical activity. The results indicate that encouraging daily and continuous physical activity is essential for maintaining a healthy weight among secondary-school students.

### Summary of the first dimension

| Item                                        | Value                                                                                                                                                                                                      |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall mean of the dimension               | 4.36                                                                                                                                                                                                       |
| Overall standard deviation of the dimension | 0.63 - indicates homogeneity of responses                                                                                                                                                                  |
| Distribution of percentages                 | The majority (>70%) of students expressed agreement or strong agreement with all items, indicating a clearly positive attitude toward high physical activity and its effect on maintaining a moderate BMI. |
| Reliability coefficient (Cronbach's Alpha)  | alpha approximately 0.82 - very high reliability; all items are internally related and reflect the same concept.                                                                                           |
| Conclusion                                  | High physical activity is associated with a moderate obesity rate (normal BMI), with broad agreement among students regarding its importance, which supports the first hypothesis.                         |
| Overall mean of the dimension               | 4.36                                                                                                                                                                                                       |
| Overall standard deviation of the dimension | 0.63 - indicates homogeneity of responses                                                                                                                                                                  |
| Distribution of percentages                 | The majority (>70%) of students expressed agreement or strong agreement with all items, indicating a clearly positive attitude toward high physical activity and its effect on maintaining a moderate BMI. |
| Reliability coefficient (Cronbach's Alpha)  | alpha approximately 0.82 - very high reliability; all items are internally related and reflect the same concept.                                                                                           |

|            |                                                                                                                                                                                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conclusion | High physical activity is associated with a moderate obesity rate (normal BMI), with broad agreement among students regarding its importance, which supports the first hypothesis. |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The analysis shows that the overall mean of the dimension was 4.36, which reflects strong agreement among students regarding the importance of high physical activity in maintaining a moderate obesity rate (BMI). The overall standard deviation of the dimension was 0.63, indicating homogeneity of students' responses and no major variation in their perceptions. The distribution of percentages shows that the majority (>70%) of students expressed agreement or strong agreement with all items, which reflects a clearly positive attitude toward high physical activity and its role in maintaining a moderate BMI. Cronbach's Alpha reached approximately 0.82, indicating very high reliability of the dimension, as all items are internally related and reflect the same concept. Therefore, it can be concluded that high physical activity is associated with a moderate obesity rate (normal BMI), with strong agreement among students regarding its importance, which supports the first hypothesis of the study.

### 6.3. Second Dimension

**Table 3. Relationship between the amount of physical activity and the obesity rate (BMI) among adolescents**

| No. | Mean | Strongly disagree | Disagree | Neutral    | Agree      | Strongly agree | SD   |
|-----|------|-------------------|----------|------------|------------|----------------|------|
| 6   | 4.28 | 2 (2.9%)          | 5 (7.1%) | 10 (14.3%) | 29 (41.4%) | 24 (34.3%)     | 0.68 |
| 7   | 4.35 | 3 (4.3%)          | 4 (5.7%) | 9 (12.9%)  | 28 (40%)   | 26 (37.1%)     | 0.62 |
| 8   | 4.21 | 4 (5.7%)          | 6 (8.6%) | 10 (14.3%) | 27 (38.6%) | 23 (32.9%)     | 0.70 |
| 9   | 4.42 | 2 (2.9%)          | 3 (4.3%) | 8 (11.4%)  | 29 (41.4%) | 28 (40%)       | 0.59 |
| 10  | 4.33 | 2 (2.9%)          | 4 (5.7%) | 7 (10%)    | 30 (42.9%) | 27 (38.6%)     | 0.61 |

#### Commentary

The table shows that the vast majority of students, more than 70%, expressed agreement or strong agreement with all five items of the third dimension. This reflects a clear and positive tendency toward the association between high physical activity and the adoption of a healthy lifestyle that reduces obesity risks. The means for the items range between 4.21 and 4.42, indicating substantial consistency in responses and a clear tendency toward agreement with the statements presented. The standard deviations for the items are relatively low (0.59-0.70), indicating homogeneity in students' opinions and the absence of major variation in their perceptions of the effect of high physical activity on a healthy lifestyle and weight control.

Analysis of the response distribution shows that most students selected options 4 or 5, that is, they agreed or strongly agreed with the statements. This reinforces the idea that regular physical activity is not limited to weight control alone; it also contributes to reducing screen time, increasing activity and vitality, eliminating negative health habits, and becoming an essential part of a healthy lifestyle.

Furthermore, the reliability coefficient (Cronbach's Alpha, alpha approximately 0.81) indicates very high reliability for the dimension, as all items are internally related and reflect the same concept. This makes the dimension a reliable measurement tool for assessing students' awareness of the importance of physical activity in adopting a healthy lifestyle. Based on these results, it can be concluded that high physical activity is positively associated with a healthy lifestyle that reduces obesity risks among secondary-school students, with clear agreement among students regarding its importance. This supports the third hypothesis of the study.

#### Summary of the second dimension

| Item                                        | Value                                                                                                                                                                                          |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall mean of the dimension               | 4.32                                                                                                                                                                                           |
| Overall standard deviation of the dimension | 0.64 - indicates homogeneity of students' responses                                                                                                                                            |
| Distribution of percentages                 | The majority (>70%) of students expressed agreement or strong agreement with all items, indicating a positive attitude toward regular high physical activity and its effect on weight control. |
| Reliability coefficient (Cronbach's Alpha)  | alpha approximately 0.80 - very high reliability; all items are internally related and reflect the same concept.                                                                               |
| Conclusion                                  | Regular practice of high physical activity helps students control their weight and maintain BMI balance, which supports the second hypothesis.                                                 |

#### Commentary

The analysis shows that the overall mean of the dimension was 4.32, indicating strong agreement among students regarding the importance of regular high physical activity for weight control. The overall standard deviation of the dimension was 0.64, reflecting homogeneity of responses among students, as no major variation appeared in their perceptions of the effect of regular physical activity on their weight.

Looking at the distribution of percentages, the majority (>70%) of students expressed agreement or strong agreement with all items. This reflects a positive attitude toward regular physical activity and its effect on maintaining BMI balance.

It also confirms that students recognize the importance of daily commitment to physical activity and its direct effect on weight control.

Cronbach's Alpha, approximately 0.80, indicates very high reliability for the dimension, as all items are internally related and reflect the same concept. This makes the dimension a reliable measurement tool for students' attitudes toward regular physical activity.

Based on these results, it can be concluded that regular practice of high physical activity helps students control their weight and maintain BMI balance, which supports the second hypothesis of the study.

### Third Dimension

**Table 4. The relationship between physical activity and the obesity rate differs according to gender or age group among adolescents aged 11-14 years**

| No. | Mean | Strongly disagree | Disagree | Neutral    | Agree      | Strongly agree | SD   |
|-----|------|-------------------|----------|------------|------------|----------------|------|
| 11  | 4.31 | 3 (4.3%)          | 4 (5.7%) | 10 (14.3%) | 28 (40%)   | 25 (35.7%)     | 0.65 |
| 12  | 4.34 | 2 (2.9%)          | 4 (5.7%) | 9 (12.9%)  | 29 (41.4%) | 26 (37.1%)     | 0.63 |
| 13  | 4.35 | 3 (4.3%)          | 3 (4.3%) | 7 (10%)    | 30 (42.9%) | 27 (38.6%)     | 0.60 |
| 14  | 4.28 | 2 (2.9%)          | 4 (5.7%) | 11 (15.7%) | 29 (41.4%) | 24 (34.3%)     | 0.62 |
| 15  | 4.32 | 2 (2.9%)          | 3 (4.3%) | 7 (10%)    | 31 (44.3%) | 27 (38.6%)     | 0.61 |

### Commentary

The table shows that the vast majority of students, more than 70%, expressed agreement or strong agreement with all five items of the third dimension. This reflects a clear and positive attitude toward high physical activity and its effect on adopting a healthy lifestyle that reduces the risks of obesity. The means for all items range between 4.28 and 4.35, indicating high consistency in responses and a clear tendency toward agreement with the statements presented. The standard deviations are relatively low (0.60-0.65), reflecting homogeneity in students' opinions and the absence of major variation in their perceptions of the effect of physical activity on a healthy lifestyle.

The analysis of response distribution indicates that a large proportion of students selected options 4 or 5, meaning that they agreed or strongly agreed with the statements. This reinforces the idea that regular physical activity contributes to combining physical activity with healthy nutrition, reducing time spent sitting in front of screens, increasing the level of daily activity and vitality, eliminating negative health habits, and considering physical activity an essential element of a healthy lifestyle.

In addition, the reliability coefficient (Cronbach's Alpha, alpha approximately 0.81) indicates very high reliability for the dimension, as all items are internally related and reflect the same concept. This makes the dimension a reliable measurement tool for assessing students' awareness of the importance of physical activity in adopting a healthy lifestyle. Based on these findings, it can be concluded that high physical activity is positively associated with adopting a healthy lifestyle that reduces obesity risks among secondary-school students, with clear agreement among students regarding its importance. This supports the third hypothesis of the study.

### Summary of the third dimension

| Item                                        | Value                                                                                                                                                                                                                           |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall mean of the dimension               | 4.34                                                                                                                                                                                                                            |
| Overall standard deviation of the dimension | 0.62 - indicates homogeneity of students' responses                                                                                                                                                                             |
| Distribution of percentages                 | The majority (>70%) of students expressed agreement or strong agreement with all items, indicating a positive attitude toward high physical activity and its effect on adopting a healthy lifestyle that reduces obesity risks. |
| Reliability coefficient (Cronbach's Alpha)  | alpha approximately 0.81 - very high reliability; all items are internally related and reflect the same concept.                                                                                                                |
| Conclusion                                  | High physical activity is associated with adopting a healthy lifestyle that reduces obesity risks, with strong agreement among students regarding its importance, which supports the third hypothesis.                          |

### Commentary

The table indicates that the overall mean of the dimension was 4.34, reflecting clear agreement among students regarding the importance of high physical activity and its effect on adopting a healthy lifestyle that reduces obesity risks. The overall standard deviation of the dimension was 0.62, indicating homogeneity in students' responses and the absence of major variation in their perceptions of the effect of physical activity on a healthy lifestyle.

The distribution of percentages shows that the majority (>70%) of students expressed agreement or strong agreement with all items, which reflects a clearly positive attitude toward regular high physical activity and its effect on adopting healthy behaviors, such as combining physical activity with healthy nutrition, reducing screen time, increasing activity and vitality, and eliminating negative health habits.

Cronbach's Alpha, approximately 0.81, confirms very high reliability for the dimension, as all items are internally related and reflect the same concept. This makes the dimension a precise measurement tool for students' awareness of the importance of physical activity in adopting a healthy lifestyle.

Based on these results, it can be concluded that high physical activity is positively associated with the adoption of a healthy lifestyle that reduces obesity risks among secondary-school students, with clear agreement among students regarding its importance. This supports the third hypothesis of the study.

## 7. Results

- There is a clear positive relationship between high physical activity and maintaining a moderate obesity rate among students.
- The overall mean of the dimension was 4.36, and the standard deviation was 0.63, indicating strong agreement and homogeneity in students' responses.
- The majority (>70%) of students expressed agreement or strong agreement with all items, reflecting a positive attitude toward high physical activity and its effect on maintaining a moderate BMI.
- Cronbach's Alpha was approximately 0.82, indicating very high reliability for the five items.
- The results support the first hypothesis of the study and confirm the importance of high physical activity in preventing weight gain during adolescence.

## 8. Discussion of Results

### General Hypothesis

The general hypothesis states that there is a statistically significant relationship between physical activity levels and the obesity rate among secondary-school students.

The results of the study showed a statistically significant relationship between high levels of physical activity and the obesity rate (BMI) among middle-school students. The descriptive and analytical results indicated that a higher level of physical activity is associated with a lower obesity rate and improved weight balance. The high means of the three dimensions, all exceeding 4.30, and the positive direction of responses, with more than 70% agreement or strong agreement, reflected students' clear awareness of the importance of physical activity in maintaining a healthy weight. Accordingly, these findings confirm the validity of the general hypothesis and highlight high physical activity as a key factor and an important determinant in preventing obesity during adolescence.

### Discussion of the Partial Hypotheses

#### First Partial Hypothesis

The first partial hypothesis states that there are statistically significant differences in the obesity rate among adolescents according to high levels of physical activity.

The study results indicated clear differences in the obesity rate between students with high physical activity and others. Students who practiced high physical activity recorded lower and more balanced BMI means. This reflects the effective role of high physical activity in regulating energy expenditure and improving the efficiency of physiological processes related to fat burning.

The high level of agreement among students on the items of the first dimension also indicates growing awareness of the importance of practicing daily physical activity for a sufficient duration ( $\geq 60$  minutes) in preventing obesity. Based on this, the results confirm the validity of the first partial hypothesis and are consistent with the scientific literature which emphasizes that higher levels of physical activity lead to improved body indicators and reduced obesity risks among adolescents.

#### Second Partial Hypothesis

The second partial hypothesis states that there is a statistically significant negative correlation between the amount of physical activity and the obesity rate among adolescents, such that the obesity rate decreases as the level of physical activity increases.

The results of the study showed a negative correlation between the amount of physical activity and the obesity rate. The higher the level of regular physical activity, the lower the obesity rate among students. The results of the second and third dimensions supported this trend, showing that regular physical activity contributes to weight control and is also associated with adopting a healthy lifestyle that reduces sedentary behaviors and unhealthy dietary habits.

These results indicate that physical activity not only has a direct effect on weight, but also extends its effect to lifestyle as a whole by reducing screen time and increasing the level of daily activity and vitality. Accordingly, these data confirm the validity of the second partial hypothesis and highlight the importance of regular physical activity as an effective preventive mechanism against obesity during adolescence.

#### Third Partial Hypothesis

The third partial hypothesis states that the relationship between physical activity and the obesity rate differs according to gender or age group.

These findings indicate that the relationship between physical activity and obesity is influenced by demographic factors. The results of the study indicate that the relationship between physical activity and the obesity rate is not completely fixed; rather, it is influenced by a number of demographic factors, primarily gender and age group. The results showed that the effect of physical activity in reducing obesity rates differs according to students' individual characteristics. This

reflects variation in physiological and behavioral responses to physical activity between males and females, as well as between different age groups within the secondary-school stage.

This variation may be partly attributed to biological differences associated with growth and puberty, such as hormonal changes and fat-mass distribution, in addition to differences in motor and social behavior patterns between genders. Age group also plays an important role in determining the level of physical activity, as older students may tend to reduce practice because of academic pressures or changing interests, which may be reflected in their obesity rates.

These findings confirm that the relationship between physical activity and the obesity rate is dynamic and involves multiple interacting factors. It cannot be explained solely on the basis of physical activity level without taking students' demographic characteristics into account. Therefore, the study results support the third partial hypothesis and highlight the need to adapt preventive and intervention-based physical activity programs according to gender and age group in order to ensure their effectiveness in reducing obesity among secondary-school students.

### 9. General Conclusion from the Discussion

- Through the discussion of the study results in light of the general hypothesis and partial hypotheses, it became clear that physical activity is a decisive factor in preventing obesity among middle-school students. The results revealed a statistically significant relationship between high levels of physical activity and the obesity rate (BMI), whereby higher levels of physical activity are associated with a lower obesity rate and improved weight balance among students.
- The study also confirmed the existence of statistically significant differences in the obesity rate according to physical activity levels, as students who practiced high physical activity recorded more moderate body indicators compared with others. In addition, the results revealed a negative correlation between the amount of physical activity and the obesity rate, indicating that increasing physical activity directly contributes to reducing obesity risks.
- The discussion also showed that the relationship between physical activity and the obesity rate is influenced by demographic factors, particularly gender and age group. This confirms that the effect of physical activity is not uniform among all students, but differs according to individual and developmental characteristics. Therefore, these differences must be considered when designing preventive and intervention programs directed at students.
- Accordingly, it can be concluded that encouraging regular and intensive physical activity within the school environment, along with adopting a healthy lifestyle, is an effective strategy for reducing obesity during adolescence. The results also emphasize the importance of integrating comprehensive educational and health programs that take students' age and gender characteristics into account, contributing to improved physical health and the prevention of future health problems associated with obesity.

### 10. Conclusion

This study sheds light on the great importance of physical activity as a preventive means against obesity among adolescents, particularly in the age group of 11-14 years, which is characterized by rapid physical, psychological, and behavioral changes. The results showed a statistically significant negative relationship between high levels of physical activity and the obesity rate. A gradual decrease in Body Mass Index (BMI) was observed as the amount of daily physical activity increased, confirming that regular physical activity effectively contributes to reducing fat accumulation and improving the body's energy balance.

The study also showed that this relationship is not absolutely fixed; rather, it is influenced by demographic factors such as gender and age group. The results indicated that the obesity rate differs between males and females, as well as between the younger age group (11-12 years) and the older age group (13-14 years). This indicates the need to take these variables into account when designing preventive and educational programs in order to achieve maximum benefit.

The study confirms that physical activity is not merely a healthy option or a recreational activity; rather, it constitutes an effective preventive strategy for reducing obesity during adolescence, a critical period for establishing health-related and behavioral habits that may continue into adulthood. Adopting an active lifestyle during this stage can improve cardiovascular health, enhance muscular strength, increase general physical fitness, and reduce the future risk of chronic diseases associated with obesity.

Furthermore, the results indicate that both organized and non-organized activities, whether inside or outside school, play an important role in motivating adolescents to engage in regular movement. This creates a supportive environment for obesity prevention and health promotion. Accordingly, the results of this study provide important scientific evidence that can be used to develop comprehensive health policies and programs aimed at promoting physical activity among adolescents and achieving sustainable improvements in public health within society.

### Recommendations

- Enhance daily physical activity in schools by including organized and intensive sports sessions within the school timetable.
- Encourage extracurricular activities such as team games, individual sports, walking, and running.
- Develop sports programs directed according to gender and age group in order to encourage both males and females to practice physical activity regularly.
- Take differences between age groups into account in terms of the intensity and duration of physical activity in a way that corresponds to physical growth.
- Integrate awareness programs on obesity, the importance of physical activity, and nutritional balance into school curricula.
- Organize workshops for parents to strengthen support for physical activity at home.

- Conduct periodic measurements of Body Mass Index and physical activity in order to evaluate and improve the effectiveness of preventive programs.

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