

Research Article

Eating Habits and School Performance in Students of Primary Education

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Abstract

Background: Maintaining a proper diet is crucial, particularly for children undergoing the critical phases of growth and development.

Objective: This study aims to investigate the association between eating habits and academic performance among students in Primary Education.

Methods: The research adopts a descriptive-correlational approach with a cross-sectional design, utilizing a sample comprising 427 students (242 boys and 185 girls) in the sixth year of Primary Education. The instrument used is a self-developed ad hoc questionnaire, encompassing dietary habits, food choices at school and home throughout a typical week (including breakfast, lunch, snack, and dinner), and academic performance assessed by the student's tutor.

Results: Significant associations were observed between academic performance and the consumption of pasta, fruit, and meat ($P=0.00$), as well as pastries and fish ($P<0.05$). Students with a preference for these foods tend to exhibit higher academic performance. However, no significant correlations were identified for "vegetables", and there were no discernible associations between food groups and academic performance based on gender or body mass index (BMI).

Conclusion: Individuals displaying proper eating habits, such as consuming five daily meals, avoiding food wastage, and incorporating pasta, fruit, and meat into their diet, demonstrate commendable academic performance.

Keywords: academic performance, nutrition, feeding behavior, child

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1 INTRODUCTION

Schoolchildren often spend a considerable amount of

time in school canteens, with many parents opting for this arrangement due to various reasons such as convenience,

cost-effectiveness, or work-related constraints, as parents may find it challenging to prepare healthy meals and may resort to substituting them with pre-cooked or fried foods. Consequently, it becomes imperative to cultivate habits at home that increasingly promote the consumption of nutritious foods. According to López and Nájera^[1], childhood is the ideal time for instilling good eating habits, and the school canteen can and should contribute to this educational function.

Both educational institutions and the family environment bear the responsibility of ensuring that children develop appropriate eating habits. The COVID-19 pandemic has heightened the need to examine the effect of Food Safety in school cafeterias, as lifestyle patterns of food consumption, production, and distribution were disrupted on a global scale^[2]. The legal framework governing school canteens is outlined in the MEC Order of October 24, 1992, which regulates these facilities. Regarding the regulatory aspects of Spanish canteens, legislation pertaining to collective canteens is applied with respect to hygiene and the distribution of prepared meals^[3].

On the contrary, Román's dining room guide^[4] provides insights into the composition and variety of school menus and their models. A healthful menu within the school environment should incorporate, as a foundation for the first course or as a complement to the second, items from two primary groups: vegetables or potatoes, pasta, rice, legumes, corn, etc. The second course should feature a rotation of meat, fish, and eggs, accompanied by one of the aforementioned side dishes. Dessert should consist of a piece of fruit, and as an additional component, one may include a dairy product such as a glass of milk or yogurt.

A study conducted by ALADINO (Food, Physical Activity, Child Development, and Obesity)^[5] shows that the obesity rate in our country is 17.3%. Notably, the prevalence of excess weight remains high, albeit showing a decreasing trend since 2011 and stabilizing since 2015 among schoolchildren aged 6 to 9 in Spain. This reduction is primarily attributed to the decrease in overweight cases. Conversely, diagnoses of low weight and malnutrition can have adverse effects on school performance^[6]. On the other hand, Azcona^[7] identifies that the causes of childhood obesity are directly related to foods rich in fat (pastries, hamburgers, sausages, French fries, prepared desserts, etc.). Table 1 indicates the structure of a nutritious menu applicable to any school setting.

Regarding other cultural contexts, notable achievements and improved dietary patterns are observed among children from less economically disadvantaged sectors^[8]. Academic success was significantly associated with breakfast and midday meals, particularly for children ($P < 0.05$).

The present study was conducted in schools in Alicante (Spain), where the school menus are rooted in the Mediterranean Diet (MD). The MD's core values emphasize the variety and quality of fresh, locally sourced products, which, when coupled with physical exercise, constitute a globally recognized and admired healthy lifestyle. Gender and lower adherence to the MD were found to be associated with lower academic performance, explaining up to 14% of its variance according to regression analysis^[9]. Furthermore, adolescents with a lower body mass index (BMI) and female gender demonstrated higher levels of academic performance. Another study^[10] suggests a certain contradiction concerning the BMI's role in determining a person's health status; subjects with greater adherence to the MD exhibited higher BMI values. On the other hand, a variable distancing individual from adherence to the MD is the consumption of unhealthy foods, often driven by factors like easy access, low cost, or the pleasure derived from their consumption. An additional consideration is the potential confounding variable of each subject's purchasing power, as this may vary among individuals in the study.

Another important factor linked to dietary habits in studies is the physical exercise of the population. The relationship between food, children's movement, and other factors involves intricate interactions. In a separate study^[11], there was no conclusive evidence indicating a beneficial effect of physical activity interventions combined with healthy lifestyle education on average performance in school-taught subjects, mathematics, or reading performance^[11]. There was a moderate difference in average performance noted in school-taught subjects, favoring interventions aimed at enhancing the school food environment compared to standard practices, particularly in obese adolescents, but not in those who were overweight.

In the context of obesity treatment or prevention programs, school- and community-based physical activity interventions may offer specific benefits to the executive functions of children with obesity or overweight. Additionally, school-based dietary interventions may benefit overall improvements in school performance among children with obesity^[11].

In examining school performance, various studies have explored its connection with factors such as the practice of physical exercise^[12,13] or psychological aspects such as motivation^[14,15]. Regarding the interplay between school performance and nutrition, a study^[16] indicates that intellectual capacity may be affected by the nutritional quality of the diet. Research on the significance of nutrition and academic performance suggests that students who skip breakfast tend to make more mistakes in problem-solving exercises. Breakfast

Table 1. Ideal Structure of a Healthy Menu. Based on the Guide for School Canteens in Ávila et al. (2008)

| First | Second | Garnish | Dessert | Complement |
|--------------------------------------------|----------------------|--------------------------------------------|---------|------------|
| Vegetables | Meat or fish or eggs | Potatoes, paste, rice, legumes, corn, etc. | Fruit | Dairy |
| Potatoes, paste, rice, legumes, corn, etc. | Meat or fish or eggs | Vegetables | Fruit | Dairy |

Table 2. Descriptive Statistics for the Variables Age, Weight, and Height

| | Mean | Maximum | Minimum | Standard Deviation |
|--------|-------|---------|---------|--------------------|
| Age | 11.29 | 12.00 | 11.00 | 0.46 |
| Weight | 42.58 | 73.00 | 30.00 | 9.31 |
| Height | 1.52 | 1.66 | 1.34 | 0.07 |

is thought to elevate the glucose index in the blood, activating a brain transmitter called acetylcholine, which is linked to memory^[16]. Substances that inhibit the production of this transmitter are believed to impair the ability to remember new information. Vitamin B1, found in cereal-based foods such as wholemeal or enriched bread, is a key contributor to acetylcholine production. The inclusion of cereals and fruit in breakfast not only improves school performance but also aids in preventing childhood obesity, according to the study.

Conversely, in another study^[17], findings indicated a correlation between the quality of breakfast and grades, with the average grade increasing as the quality of breakfast improved. Additionally, in a separate study^[18] unhealthy eating behaviors in childhood raised concerns about the potential impact of an unbalanced and inadequate diet on unfavorable growth outcomes. However, the detailed investigation of the association between negative eating behaviors and nutritional status remains limited^[18]. Furthermore, replacing packed school lunches with a nutrient-dense diet, along with nutrition education, did not result in improved mathematics and reading performance^[11].

The objective of the current study is to establish the relationship between eating habits (specifically, the number of meals consumed per day and whether or not food is left on the plate) and school performance.

2 MATERIALS AND METHODS

This research adopts a descriptive-correlational design with a cross-sectional approach, wherein all variables are assessed simultaneously^[19]. The population under consideration comprises 427 students (242 boys and 185 girls) enrolled in sixth-grade classes at four public schools in the province of Alicante. Table 2 provides an overview of the descriptive statistics pertaining to the study sample.

Regarding the procedure, the researcher initiated contact with the educational centers and collaborated with teachers to distribute the questionnaires during class time. Informed consent was provided to students via internal mail from the center, and participants were intentionally selected based on the inclusion criterion of belonging to different primary education groups with whom the researcher had established contact with the teachers. The exclusion criterion was the absence of consent from the parents of students who did not sign the consent form.

The instrument used is an ad hoc self-made questionnaire. The questionnaire encompassed variables such as food-related illnesses (based on the school health card), inquiries about eating habits, a breakdown of food consumption during a typical week (including breakfast, lunch, snack, and dinner), and school performance (evaluated based on the grades provided by the students' tutors). Each questionnaire required the tutor to assign a grade to the respective student, considering the average grades obtained in all subjects over the last 2 quarters. The grading scale ranged from 5 to 10, with categories defined as follows: Less than 5 indicating "Low Yield", between 5 and 6 representing "Medium Performance", between 6 and 8 denoting "Good Performance", and between 8 and 10 signifying "Very Good Performance". This grading system aligns with Nuñez et al.^[6] definition of school performance as the evaluation of knowledge acquired in the educational field resulting from an academic training experience.

The questionnaire underwent validation by 7 experts judge who evaluated each item for writing and spelling (fair, good, or excellent), quality and presentation (bad, good, or very good), and adequacy (badly appropriate, appropriate, and very appropriate). Students were given a week to complete the questionnaire, during which they documented their weekly food intake in the school canteen via a Google Docs form. Descriptive results related to the students' nutrition / performance were obtained using the SPSS program through personalized tables. Statistical tests, including Chi-square, were employed to determine the normality of categorical variables (meals eaten per day, leaving food on the plate, intake of 5 daily meals, frequency of snack intake, frequency of fruit intake, pastries, fruit, meat, fish, and pasta). Categorical variables such as "vegetables",

Table 3. Student Responses to Questions Related to Their Eating Habits

| Questions | Categories | Total (n) | Girls | | Boys | | P |
|--------------------------------------------------------|--------------------------|-----------|-------|------|------|------|-------|
| | | | n | % | n | % | |
| Do you eat breakfast every morning on a regular basis? | Daily | 193 | 107 | 57.9 | 86 | 35.5 | 0.003 |
| | 3 or more times per week | 38 | 26 | 14 | 12 | 5 | |
| | 1-2 times a week | 94 | 35 | 18.9 | 59 | 24.4 | |
| How often do you have snacks apart from regular meals? | sporadically | 102 | 17 | 9.2 | 85 | 35.1 | >0.05 |
| | Daily | 82 | 27 | 14.6 | 55 | 22.7 | |
| | 3 or more times per week | 172 | 93 | 50.2 | 79 | 32.7 | |
| How often do you eat fruit? | 1-2 times a week | 51 | 23 | 12.5 | 28 | 11.5 | >0.05 |
| | sporadically | 122 | 42 | 22.7 | 80 | 33.1 | |
| | Daily | 74 | 37 | 20 | 37 | 15.3 | |
| Do you eat 5 meals a day on a regular basis? | 3 or more times per week | 126 | 60 | 32.4 | 66 | 27.3 | >0.05 |
| | 1-2 times a week | 157 | 64 | 34.6 | 93 | 38.4 | |
| | sporadically | 70 | 24 | 13 | 46 | 19 | |
| Do you usually leave food on your plate? | Yes | 151 | 93 | 50.2 | 58 | 24 | >0.05 |
| | No | 276 | 92 | 49.8 | 184 | 76 | |
| Do you usually leave food on your plate? | Yes | 112 | 70 | 37.8 | 42 | 17.3 | >0.05 |
| | No | 315 | 115 | 62.2 | 200 | 82.7 | |

“yield” and “gender” exhibited non-normal distribution ($P>0.05$); thus non-parametric tests were applied. To assess the normality of scalar variables, the Chi-square test and the Kolmogorov-Smirnov statistical test were employed for categorical variables. After the application of the Chi-square statistical test, data distribution was considered normal ($P<0.05$) for categorical variables such as meals per day, leaving food on the plate, pastries, fruits, meat, fish, and pasta. Conversely, “vegetables” ($P=0.165$), “yield” ($P=0.605$) and “gender” ($P=0.881$) demonstrated non-normal distribution ($P>0.05$), leading to the use of non-parametric statistical tests. Furthermore, the Kolmogorov-Smirnov statistical test indicated normality for the “Age variable” ($P<0.05$). However, data distribution was considered non-normal ($P>0.05$) for the variables “Weight” and “BMI” (BMI= “Weight” / “Height x Height”).

3 RESULTS

The survey revealed that children generally express a strong preference for pasta (97%), followed by fruit (94%), meat (78%), pastries (52%), fish (44%), and, least favored, vegetables (37%). The relatively lower importance assigned to vegetables and fish in children’s diets underscores the significance of encouraging their consumption during developmental stages. In terms of leaving food on their plate, 32% of students reported never doing so, while 49% admitted to occasionally leaving some food. Only 14% indicated almost always leaving food, and a mere 5% reported always leaving food on their plate. Regarding school performance among the 427 students, the distribution is as follows: 20% of children

exhibited low performance, 22.22% displayed average performance, 33.33% demonstrated good performance, and 24.44% showed very good performance.

On the other hand, a comparison of the eating habits of the students by gender was conducted (Table 3). The majority (64.6%) indicated that they did not consistently consume the recommended 5 daily meals, and 73.8% of the sample reported not leaving food on their plate.

Girls showed healthier eating habits compared to boys, particularly in terms of breakfast consumption and meal frequency. Significantly, 57.9% of the female students had breakfast daily, contrasting with 35.5% of their male counterparts ($P=0.003$). Regarding the frequency of daily meals, 50.2% of the girls adhered to the 5 daily meals, whereas only 24% of the boys did so.

Boys tended to consume fruit more sporadically compared to girls (19% vs. 13% respectively). Daily snacking outside of regular meals is more common among boys than girls (55% vs. 27% respectively). Additionally, girls tend to leave more food on their plates than boys (37.8% vs. 17.3% respectively).

In examining the relationship between school performance and eating habits (Table 4), the Chi-square test for inferential analysis of the categorical variables “student performance” and “number of meals per day” revealed a significant relationship ($P<0.05$) for the number of meals consumed per day. Specifically, students who consume 5 meals a day tend to exhibit higher school performance.

Table 4. Chi-square Test for the Relationship between School Performance with the Number of Meals Per Day and Whether Food is Usually Left on the Plate

| | 5 Meals a Day | Food is Usually Left on the Plate |
|----------|---------------|-----------------------------------|
| χ^2 | 33.844 | 21.578 |
| df | 3 | 3 |
| <i>P</i> | 0.000 | 0.000 |

Notes: df: degree freedom.

Table 5 presents the results of the Chi-square test examining the relationship between school performance and the variable “if food is usually left on the plate”. A significant relationship is evident ($P<0.05$), indicating that students who do not leave food on their plates tend to have higher school performance. Regarding the relationship between school performance and specific food items, as outlined in Table 4, significant relationships are observed for pasta, fruit, and meat ($P=0.00$) and for pastries and fish ($P<0.05$). In essence, students with a preference for these foods tend to exhibit higher school performance. However, no significant relationships were identified for “vegetables”, and no associations were found between food groups and school performance based on gender or BMI.

4 DISCUSSION AND CONCLUSION

The primary objective of this study was to explore the relationship between eating habits and school performance among primary education children. The findings of this research provide conclusive evidence that students who consume five meals a day and express a preference for meat, fruit, and fish tend to exhibit very good academic performance. In alignment with the results of an epidemiological study^[20] involving 322 children who utilized school canteens in Spain, where eating habits were assessed, it was found that 88% of children reported consuming breakfast daily. Additionally, 45% consumed some food in mid-morning, with sausage sandwiches (29%), pastries (27%), or cookies (15%) being more prevalent. Notably, vegetables and fish were among the least frequent food items on the menus, likely reflecting lower preferences among students, consistent with the present study’s findings. Moreover, 81% of children regularly had a snack, with sandwiches (65%), pastries (20%), bread with chocolate (20%), or yogurt and fruit (20%) being the predominant choices. In a similar vein, another study^[17] examining the relationship between breakfast quality and school performance concluded that the average grade increases with the improved joint quality of breakfast and lunch.

In a similar vein, the objective of another study conducted by Adole and Ware^[21] was to assess the association between breakfast eating habits and cognitive

Table 5. Chi-square Test for the Relationship between School Performance and Food Groups

| | Paste | Pastries | Fruit | Fish | Meat |
|----------|-------|----------|-------|-------|-------|
| χ^2 | 37.35 | 12.93 | 58.13 | 12.13 | 13.88 |
| df | 1 | 2 | 2 | 1 | 1 |
| <i>P</i> | 0.000 | 0.002 | 0.000 | 0.002 | 0.000 |

Notes: df: degree freedom.

performance among 211 adolescents (52% girls and 48% boys, with a mean age of 12.01±0.82 years). The study results revealed a significant association ($P<0.001$) between regular breakfast eating habits and pattern reasoning. Additionally, a different study^[22] evaluated the frequency of various dietary items (fruit, soft drinks, fast foods, instant noodles, sweets, vegetables, and milk) and the regularity of meal times (breakfast, lunch, and dinner) simultaneously over the last 7 days. The findings from this study^[22] indicated that frequent breakfast intakes (AOR=2.34, 95% confidence interval [CI]=2.20–2.48), along with the consumption of fruit (AOR=1.73, 95% CI=1.62–1.86), vegetables (AOR=1.48, 95% CI=1.37–1.61), and milk (AOR=1.35, 95% CI=1.28–1.43), were associated with high levels of school performance (each with $P<0.001$). In contrast, soft drinks (AOR=0.42, 95% CI=0.38–0.46), instant noodles (AOR=0.62, 95% CI=0.55–0.70), fast food (AOR=0.83, 95% CI=0.72–0.96), and sweets (AOR=0.86, 95% CI=0.80–0.93) showed a negative association with school performance (each with $P<0.001$). The study^[22] confirms, along with previous studies on school performance and eating habits^[17,21], that there is a positive association between a healthy intake during breakfast with school performance. Moreover, having breakfast and consuming fruits and milk demonstrated positive associations, while soft drinks, instant noodles, fast foods, and sweets were negatively correlated with school performance.

In the study^[23], poor overall school performance showed a positive association with unhealthy eating patterns, including high consumption of low-quality foods (e.g., sweets and chips) and low consumption of dairy and nutrient-dense foods (e.g., vegetables, fruits, meat, fish, and eggs). The results of the study^[23] indicated that children with a greater number of unhealthy eating patterns were more at risk of poor overall performance in school. Similarly, a review^[6] underscored that inappropriate eating habits lead to a lack of concentration, difficulties in socializing, and ultimately, poor academic performance. Furthermore, a study^[24] aimed to determine whether lifestyle habits could predict changes in cognitive control and academic performance in high school students, using a longitudinal approach with 187 seventh to ninth-grade students (mean age: 13.1±1.0 years) over a 3-year prospective study. Lifestyle habits, cognitive control, and academic performance were assessed annually during the study. Notably, eating habits and study time were

found to be correlated with academic performance only in male students.

Stress has also been linked to eating habits, as highlighted in another study^[25]. The findings indicated that students with mild stress levels showed a good eating pattern (55.8%), while those with moderate stress levels tended to have a poor diet (54.2%). Additionally, Santanu et al.^[25] emphasized that students engaged in sedentary physical activity have a 2.289 times higher chance of having an inadequate diet. In contrast, Putri et al.^[26] suggested that there is no significant correlation between eating habits and obesity. However, they found no correlation between physical activity and obesity. Similarly, Solikah^[27] reported no relationship between physical activity and nutritional status in students. Furthermore, the purchasing power of families has been identified as a factor related to food quality and, consequently, school performance. Santanu et al.^[25] observed that children's nutritional intake is associated with the education levels of both fathers and mothers. Another study^[28] involving high school students established a positive correlation between the family wealth score and the eating habits score with the students' success rate, highlighting the connection between school performance and the quality of eating habits.

In the present study, it was observed that students who did not leave food on their plates tended to have higher school performance. This aligns with the findings from the study conducted by Kwon^[18], where children who "ate small amounts" consumed less energy and micronutrients (excluding calcium intake). However, unhealthy behaviors related to "limited food variety" were significantly associated with differences in nutrient density for certain micronutrients. These results imply that unhealthy eating behaviors, such as consuming smaller amounts, leaving food on the plate, or having a limited variety of foods, are linked to variations in nutrient intake and unfavorable growth patterns in early childhood. Another study^[27] highlighted that students' diets were characterized by poor nutritional quality, primarily due to less varied eating habits. As pointed out by Nuñez et al.^[6] nutritional deficiencies can adversely affect the development of both physical and intellectual capacities in students.

Finally, in the present study, no relationships were found between eating habits and academic performance by gender or BMI. Similarly, in another study^[29], no significant relationship was found in adolescents between nutritional status based on BMI / age and height / age with school performance, nor between eating habits and school performance.

Regarding the study's limitations, despite the ad hoc questionnaire being validated by 7 experts judge for its formulation, quality, presentation, and adequacy, it lacks

reliability as it did not undergo a factor analysis process.

It is recommended that all educational institutions undertake activities to raise awareness among children, family members, and teachers about the importance of a proper diet and its significant influence on students' academic results. As emphasized by Ibarra et al.^[30], "those with correct eating habits exhibit better school performance, underscoring the importance of promoting healthy lifestyle habits within the school community". Optimizing nutritional routines and fostering healthy eating practices, both at school and in the family environment, is essential to prevent diseases. Education serves as the foundation for establishing eating habits, and consequently, re-education is the means to address eating pathologies. This approach helps children become familiar with the most suitable foods for each meal of the day (breakfast, lunch, lunch, snack, and dinner) from a young age. Disseminating the message that a healthy and balanced diet contributes to emotional and cognitive well-being is important. It is hoped that this study proves valuable for educators, health professionals, and cafeteria staff, both in service provision and in conducting further studies on the subject.

These findings hold potential significance for health and education professionals in making informed decisions related to promoting healthy eating practices in schools.

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Conflicts of Interest

The author declared no conflict of interest.

Author Contribution

Andreu JMP designed the experiment, supervised the work, performed the data analysis, drafted the manuscript and writing the article, read and approved its submission.

Abbreviation List

BMI, Body mass index
CI, Confidence interval
MD, Mediterranean diet

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