

Influential factors in the consumption of non-recommended foods among education undergraduate students

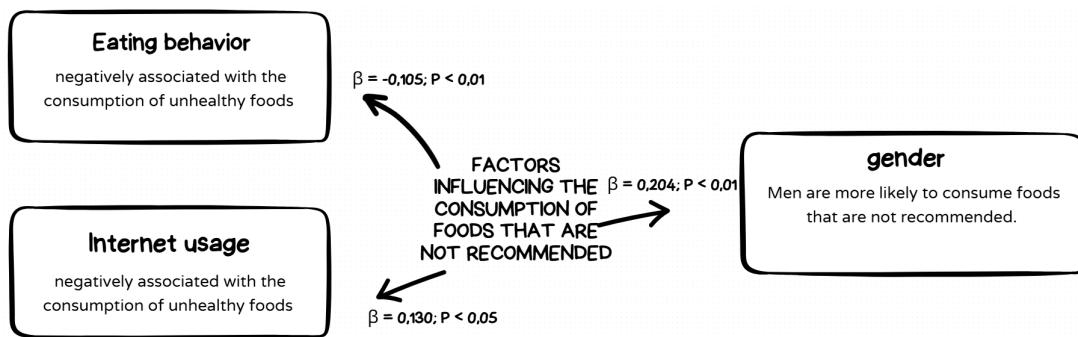
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Highlights

- Regression analysis identified that eating behavior, internet use, and gender significantly influence the consumption of non-recommended foods.
- The findings of this study highlight dietary practices and the online environment as key determinants of eating behavior among university students.
- This study provides evidence to inform the design of interventions aimed at promoting healthy habits among young people.

Graphical Abstract



Abstract

This study addresses the concerning global problem of low physical activity among adolescents, which affects approximately 80% of this population and generates a substantial economic burden on public health systems. The aim was to assess how dietary habits, physical activity, and excessive internet use predict the consumption of non-recommended foods among undergraduate students from the Faculty of Education Sciences at the Universidad Nacional del Altiplano de Puno. Using a quantitative, non-experimental, and explanatory design, data were collected from 563 students through a validated questionnaire with a Cronbach's alpha of 0.92. Data were analyzed using multiple linear regression and Pearson's correlation, identifying three significant variables influencing the consumption of non-recommended foods: eating behavior ($\beta = -0.105$; $p < 0.001$), internet use ($\beta = 0.130$; $p < 0.05$), and gender ($\beta = 0.204$; $p < 0.01$). These findings demonstrate that healthy dietary practices, the digital environment, and gender differences play a crucial role in eating behavior. In conclusion, the results suggest that, to promote healthy eating and reduce the consumption of non-recommended products, it is essential to develop comprehensive strategies that include improving dietary habits, regulating the time spent and content consumed on the internet, and considering gender differences, in order to optimize the effectiveness of interventions among the university population, thereby contributing to the prevention of diet-related diseases and the promotion of public health.

Keywords: Physical Activity. Non-Recommended Foods. Processed Foods. Social Media. Obesity.

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INTRODUCTION

The consumption of non-recommended foods among university students is a growing problem that affects both health and academic performance. According to the World Health Organization, more than 2.5 billion adults aged over 18 years are overweight or obese¹. Among students, demanding schedules and limited budgets often lead them to choose quick and low-nutritional-value options, such as processed foods, sugary snacks, and fast food². This situation is exacerbated by the widespread availability of unhealthy options on university campuses and by peer influence. In addition, constant stress and lack of time to prepare balanced meals further contribute to these inadequate dietary choices.

As a consequence, students may experience difficulties such as weight gain, persistent fatigue, and reduced concentration, conditions that directly affect academic performance. To overcome this challenge, it is essential to adopt a comprehensive approach that not only educates students about the importance of healthy eating habits but also facilitates access to nutritious meals and creates support networks that encourage more conscious and beneficial choices³. At the same time, evidence has shown that the consumption of unhealthy foods is closely associated with excessive internet use, particularly among young people, adding an additional layer of complexity to this problem.

Excessive internet use among university students has been associated with a significant increase in the consumption of non-recommended foods, such as fast food and snacks high in fats and sugars, thereby compromising diet quality. Several studies have demonstrated that individuals with high internet dependence tend to adopt unhealthy eating habits, including skipping regular meals and increased consumption of processed foods and sugar-sweetened beverages, factors that raise the risk of developing metabolic and nutritional disorders^{4,5}. This phenomenon is explained by constant exposure to promotions of unhealthy products on digital platforms and by the sedentary lifestyle associated with prolonged internet use⁶. Moreover, the ease of ordering food online encourages the intake of quick and calorie-dense options, while reduced physical activity resulting from sedentary behavior further increases the risk of obesity⁷ and related health problems⁸. To address this issue, it is essential to implement educational strategies aimed at promoting healthy eating habits and balanced lifestyles, integrating physical activity with responsible internet use.

According to the National Institute of Health

(INS) of Peru⁹, 42.4% of young people and 23.9% of Peruvian adolescents are overweight or obese. This concerning situation is mainly due to low levels of physical activity and poor dietary habits. The lack of regular exercise, combined with a diet rich in processed foods and high in sugars and fats, significantly contributes to this public health problem⁷. This alarming condition requires immediate attention. It is crucial to promote healthier lifestyles by encouraging regular physical activity and balanced nutrition from an early age in order to counteract these trends^{10,11}.

A UNICEF specialist in Peru recommends maintaining a balanced approach to diet, which includes adequate water intake, reduced consumption of fried foods, and the regular incorporation of physical activity¹². These healthy habits are essential for the development and overall well-being of the population. On the streets of the Villa El Salvador district in Lima, Peru, a fast-food vendor provided valuable insight into the popularity and convenience of these foods among consumers: "Fast-food dishes are in high demand due to their quick preparation and service. For example, I sell between 70 and 80 portions of broaster chicken per day"¹³. This account reflects an everyday reality that clearly contrasts with established nutritional recommendations, highlighting the urgent need to promote greater awareness of the importance of healthy eating within the university community. Evidence indicates that many students exhibit inadequate dietary habits, such as high consumption of fast food, snacks rich in fats and sugars, and frequent omission of main meals, which negatively affects their physical and mental health¹⁴. It is essential to consider that individuals should move away from the consumption of sugar-sweetened beverages, sweets, and fatty foods and move toward greater intake of water, fruits, and vegetables¹⁵. Changes in dietary habits may be influenced by factors such as the availability of food options, cultural and traditional influences, and the availability of time and financial resources^{16,17}.

A recent study revealed that university students in Puno exhibit a predominantly moderate level of physical activity. However, a significant proportion of these students maintain a sedentary lifestyle, devoting much of their free time to home-based entertainment activities, such as watching television or using electronic devices. This insufficient level of physical activity is reflected in their dietary habits, in which, although the consumption of different food groups is moderately adequate, a concerning

tendency toward excessive intake of foods high in sugars and refined carbohydrates is observed. Study data indicate that 45.7% of students present mild overweight, 15.2% moderate overweight, 6% are in a pre-obesity condition, and 3.2% present class I obesity. These results highlight the urgent need to implement interventions that promote

healthy lifestyle habits among university students in this region¹⁸. Therefore, this study aimed to assess whether dietary habits, physical activity, and excessive internet use are predictors of the consumption of non-recommended foods among undergraduate students of the Faculty of Education Sciences at the Universidad Nacional del Altiplano de Puno.

METHODOLOGY

This research was conducted at the Professional School of Secondary Education of the Faculty of Education Sciences (FCEDUC) of the Universidad Nacional del Altiplano de Puno (UNAP), Peru, between May and November 2024. The study followed a cross-sectional design with a descriptive-explanatory approach. A total of 563 students participated in the research, representing 42.39% of the total enrolled student population. Participants were regular students, with a mean age of 21.02 ± 2.613 years,

of whom 293 were women (52.0%) and 270 were men (48.0%). Most students (51.2%) were under 21 years of age, reflecting early entry into university education. The university students from the Professional School of Secondary Education who participated in this study were enrolled in four academic programs: Social Sciences (CCSS); Science, Technology, and Environment (CTA); Language, Literature, Psychology, and Philosophy (LLPF); and Mathematics, Physics, Computing, and Informatics (MFCI) (Table 1).

Table 1 - Characteristics of university students from the Faculty of Education in 2024.

Sociodemographic variables	$\bar{x} \pm SD$	N	%
Age	21.02 ± 2.613		
< 21 years		288	51.2
21–25 years		239	42.5
> 25 years		36	6.4
Internet use			
< 3 hours per day		108	19.2
3–4 hours per day		219	38.9
> 4 hours per day		236	41.9
Gender			
Female		293	52.0
Male		270	48.0
Academic program			
CCSS		177	31.4
CTA		134	23.8
LLPF		149	26.5
MFCI		103	18.3

The students were recruited during their classes at the Faculty of Education, which allowed the objectives of the study to be explained in detail. In addition, written informed consent was obtained, ensuring that participation was voluntary and confidential. The importance of answering all questionnaire items

fully and honestly was emphasized, highlighting that the responses would be relevant for future decision-making and actions. Participants were assured that the data collected would be treated with strict confidentiality and used exclusively for research purposes. Furthermore, the potential benefits that



the study results could bring to the community of the Professional School of Secondary Education of FCEDUC at UNAP were clearly communicated. The researchers developed questions to assess sociodemographic variables, considering their respective levels of measurement, including age (in years, later categorized as < 21 years; 21–25 years; and > 25 years), education specialty programs (CCSS; CTA; LLPF; and MFCI), gender (female/male), and age (in years).

To assess dietary habits, the consumption of recommended and non-recommended foods, the frequency and companionship during food consumption, as well as physical activity, the dietary habits and physical activity questionnaire used in this research was applied¹⁹. This instrument consists of four sections. Section 1 includes six questions focused on the frequency and quantity of consumption of recommended foods, such as vegetables, fruits, water, milk, and dairy products. Section 2 comprises nine questions related to the frequency and quantity of consumption of non-recommended foods, including products such as ham, sausage, fast food, chocolates, hamburgers, salchipapas, bottled beverages, and alcoholic drinks. Section 3 includes twelve

questions addressing companionship, frequency, and location of meals. Finally, Section 4 consists of four questions related to physical activity; although this section is not directly part of dietary habits, its simultaneous assessment is considered relevant due to the close relationship between these behaviors, addressing the performance and duration of physical activity, sports practice, and lifestyle. The internal consistency of the instrument was high, with a Cronbach's alpha of 0.92, ensuring the reliability of the measures obtained. This structure enables a comprehensive analysis of participants' dietary and physical activity behaviors, facilitating the identification of patterns and priority areas for intervention.

To assess the correlation between dietary habits, consumption of non-recommended foods, and the influence of social networks and peers on this consumption, Pearson's correlation was used. Additionally, multiple regression analysis was performed to determine whether age, internet use, gender, eating behavior, physical activity, and consumption of recommended foods were predictors of non-recommended food consumption. All analyses were conducted using IBM SPSS software, version 25, adopting a significance level of $p < 0.05$.

RESULTS

Table 2 - Correlation between the consumption of recommended and non-recommended foods among university students of the Faculty of Education in 2024.

	(1)	(2)	(3)	(4)
Physical activity (1)	–	0.036	-0.050	-0.004
Consumption of recommended foods (2)		–	-0.203**	0.358**
Consumption of non-recommended foods (3)			–	-0.155**
Eating behavior (4)				–

**Correlation is significant at the 0.01 level (two-tailed).

The data obtained reveal a significant relationship between the intake of healthy foods and eating behavior among pedagogy students. Statistical analysis demonstrates a moderate correlation ($r = 0.358$; $p < 0.01$), indicating that students who more frequently consume recommended foods, such as fruits, vegetables, and other healthy products, tend to adopt more balanced eating behaviors. Conversely, frequent consumption of non-recommended

foods, such as ultra-processed products, sugary snacks, and fast foods, is associated with less healthy nutritional patterns (Table 2). A relevant finding is that physical activity showed no significant association with either the consumption of non-recommended foods or overall eating behavior, suggesting the need for further investigation into other behavioral or environmental factors that may influence these patterns.

Table 3 - Multiple linear regression analysis model predicting the consumption of non-recommended foods among university students of the Faculty of Education in 2024.

Model	Unstandardized coefficients		Standardized coefficients			95.0% Confidence interval for B	
	B	Std. Error	Beta	t	Sig.	Lower limit	Upper limit
Age	-0.649	0.335	-0.079	-1.934	0.054	-1.308	,010
Internet use	0.868	0.272	0.130	3.185	0.002	0.333	1,403
Gender	2.048	0.412	0.204	4.973	0.000	1.239	2,857
Eating behavior	-0.070	0.029	-0.105	-2.424	0.016	-0.127	-,013
Physical activity	-0.023	0.020	-0.048	-1.187	0.236	-0.062	,015

a. Dependent variable: Consumption of non-recommended foods.

The results of the multiple linear regression analysis reveal that the model explains 34.1% of the variability in the consumption of non-recommended foods, demonstrating a moderate predictive capacity for this behavior ($R^2 = 0.341$). The negative coefficient for eating behavior ($\beta = -0.105$; $p < 0.001$) indicates that healthier habits are associated with lower consumption of these products, reinforcing the importance of healthy dietary practices in reducing the intake of non-recommended foods.

Conversely, the positive coefficient for internet use ($\beta = 0.130$; $p < 0.05$) suggests that spending more time online is associated with increased consumption of unhealthy foods, possibly due to the influence of digital advertising and related sedentary lifestyles. Finally, the influence of gender ($\beta = 0.204$; $p < 0.001$) indicates that men show a greater tendency to consume non-recommended foods compared to women, reflecting potential sociocultural and behavioral differences.

DISCUSSION

This study adds evidence to the existing literature by presenting similar results that confirm the negative association between healthier eating behavior and the consumption of unhealthy products^{2,8,10,20}, as well as the association between healthy food consumption and internet use^{4,21,22,23}. The negative coefficient found in the analysis ($\beta = -0.105$; $p < 0.001$) provides scientific confirmation that better dietary habits are strongly associated with lower consumption of non-recommended foods. This finding reinforces the theory that maintaining a balanced diet rich in fruits, vegetables, water, and fresh foods acts as a protective factor against excessive intake of processed products high in saturated fats, sugars, and sodium, which are associated with an increased risk of non-communicable chronic diseases such as obesity, diabetes, and cardiovascular diseases^{24,25}. Therefore, promoting healthy dietary practices is essential to modify harmful consumption behaviors and improve public health at the population level¹⁴.

The finding of a positive relationship between internet use and the consumption of unhealthy foods has profound theoretical implications for understanding eating behavior in the digital era^{26,27}. From a theoretical perspective, this result reinforces

the concept that the digital environment acts as a social determinant of health, in which constant exposure to advertising for ultra-processed foods through social networks and digital platforms directly influences individuals' dietary decisions. Furthermore, the sedentary lifestyle associated with prolonged internet use contributes to the normalization and increase in the consumption of unhealthy products, generating a cycle that is difficult to break and that compromises nutritional quality and overall health^{26,28}. These results highlight the urgent need to implement regulatory policies that limit digital advertising of unhealthy foods, especially advertising targeted at young and vulnerable populations. In addition, the promotion of education and digital literacy programs is essential to empower users to identify and resist these commercial influences²³.

The finding that gender significantly influences the consumption of non-recommended foods, with men showing a greater tendency toward this behavior, has important theoretical implications. This result reflects sociocultural and behavioral differences that shape food choices, in which social roles, gender norms, and perceptions of health may influence the predisposition to consume less

healthy foods^{29,30}. Theoretically, this suggests that eating behaviors depend not only on individual factors but are also modulated by specific social and cultural contexts that vary according to gender, an essential aspect for understanding inequalities in

nutritional health³¹. From a practical perspective, these gender differences indicate that interventions aimed at promoting healthy eating habits should be sensitive to the particularities and needs of men and women^{20,32}.

CONCLUSIONS

The findings of this study confirm the significant influence of healthy dietary habits in reducing the consumption of non-recommended foods, highlighting the fundamental importance of promoting balanced dietary practices to improve the nutritional health of the population. The negative association evidenced by the β coefficient indicates that interventions aimed at improving eating behaviors may constitute an effective strategy to minimize the intake of processed products rich in fats, sugars, and sodium, thereby contributing to the prevention of diet-related non-communicable chronic diseases.

The evidence demonstrates that prolonged internet use significantly contributes to increased consumption of unhealthy foods, mainly due to constant exposure to digital advertising of ultra-processed products. This phenomenon represents an important public health challenge, as the influence of digital media and the associated sedentary lifestyle foster a cycle that encourages unfavorable

eating habits, compromises nutritional quality, and increases the risk of chronic diseases. Therefore, it is imperative to implement regulatory policies that limit the advertising of these products on digital platforms, especially those directed at young and vulnerable populations.

This study highlights the significant influence of individual, contextual, and sociocultural factors on the consumption of non-recommended foods, emphasizing that healthy dietary habits, internet use, and gender differences play a central role in shaping dietary patterns. The evidence indicates that promoting appropriate dietary practices can reduce the intake of unhealthy products, while prolonged online time and exposure to digital advertising increase their consumption, particularly among men. This knowledge is essential for the development of effective educational interventions and public policies that consider the complexity of these determinants and seek to improve nutritional health through a multidimensional approach.

CRediT author statement

Conceptualization: Vallejo, NKP; Miranda, PSY; Mendizabal, BKS; Betancur, HNC. Methodology: Mendizabal, BKS; Betancur, HNC. Validation: Vallejo, NKP; Miranda, PSY. Statistical analysis: Mendizabal, BKS; Betancur, HNC. Formal analysis: Vallejo, NKP; Miranda, PSY. Investigation: Vallejo, NKP; Miranda, PSY; Mendizabal, BKS; Betancur, HNC. Resources: Mendizabal, BKS; Betancur, HNC. Writing – original draft: Mendizabal, BKS; Betancur, HNC. Writing – review & editing: Vallejo, NKP; Miranda, PSY; Mendizabal, BKS; Betancur, HNC. Visualization: Vallejo, NKP; Miranda, PSY. Project administration: Vallejo, NKP; Miranda, PSY.

All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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