Physical Activity and Nicotine Dependence among University Students

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RESUMEN

Introducción: el uso de sustancias ha sido identificado como uno de los principales problemas de salud debido a sus efectos negativos a corto, mediano y largo plazo. Entre las problemáticas observadas en la población universitaria destaca la disminución en la actividad física. **Objetivo:** analizar la relación entre la actividad física y el nivel de dependencia por la nicotina en estudiantes de la Universidad Mexiquense del Bicentenario. **Método:** estudio cuantitativo, descriptivo, transversal y correlacional. La muestra estuvo conformada por 250 estudiantes universitarios. Para la medición de las variables se utilizó el *Cuestionario Internacional de Actividad Física* (IPAQ) para evaluar los niveles de actividad física y el Test de Fagerström para medir el nivel de dependencia por la nicotina. **Resultados:** se identificó una correlación positiva y significativa entre la actividad física vigorosa y el nivel de dependencia por la nicotina (r^2 = .177; p = .031). **Discusión y conclusiones:** se identificó una relación positiva y significativa entre la actividad física vigorosa y el nivel de dependencia por la nicotina en estudiantes universitarios. Las mujeres inscritas en carreras del área de la salud mostraron mayor compromiso con el autocuidado y la adopción de conductas saludables, como la práctica regular de ejercicio.

Palabras clave: ejercicio físico, nicotina, estudiantes.

ABSTRACT

Introduction: substance use has been identified as one of the main public health problems due to its short, medium, and long-term negative effects. Among the problems observed in the university population, the decrease in physical activity stands out. **Objective:** to analyze the relationship between physical activity and the level of nicotine dependence in students at the Universidad Mexiquense del Bicentenario. **Method:** this was a quantitative, descriptive, cross-sectional, and correlational study. The sample consisted of 250 university students. To assess the variables, the International Physical Activity Questionnaire (IPAQ) was used to measure levels of physical activity, and the Fagerström Test for Nicotine Dependence was applied to evaluate the level of nicotine dependence. **Results:** a positive and significant correlation was identified between vigorous physical activity and the level of nicotine dependence (r^2 = .177; p = .031). **Discussion and conclusions:** a positive and statistically significant relationship was identified between vigorous physical activity and the level of nicotine dependence among university students. Female students enrolled in health-related programs demonstrated greater commitment to self-care and the adoption of healthy behaviors, such as regular exercise.

Keywords: physical exercise, nicotine, students.

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INTRODUCTION

Among the university population, substance use has been identified as one of the main health problems in the United States, particularly nicotine use, whether through combustible cigarettes or other tobacco products. This use is associated with a higher probability of developing physiological dependence, experiencing short-term withdrawal symptoms, and transitioning to the consumption of traditional tobacco products (Welsh et al., 2019). According to the World Health Organization [WHO] (2023), tobacco product consumption was 22.3% of the global population, with a prevalence of 36.7% in men and 7.8% in women.

This problem is exacerbated by considering that being a university student has been identified as a risk factor, more than a protective factor, for alcohol and tobacco use (Rodríguez et al., 2020). Likewise, it has been reported that 56.9% of university students do not engage in any physical activity (Chalapud-Narváez et al., 2020), which represents a significant risk behavior, given that sedentary lifestyles and physical inactivity have been significantly associated ($p < .05$) with the consumption of legal drugs such as tobacco products (Pulgar et al., 2019).

University students are a vulnerable population due to factors such as financial stress, loneliness, isolation, previous adverse experiences, and academic pressure (Campbell et al., 2022). Similar studies have used instruments such as the *International Physical Activity Questionnaire* (IPAQ) and the *Fagerström Test for Nicotine Dependence*, which have shown validity and consistency in assessing these variables in the university population. The purpose of this study was to analyze the relationship between physical activity and the level of nicotine dependence in university students at a public institution in the State of Mexico.

METHOD

Design

A quantitative, descriptive, cross-sectional, and correlational study was conducted to analyze the relationship between physical activity and the level of nicotine dependence in students at the Universidad Mexiquense del Bicentenario (Burns et al., 2013).

Participants

The universe consisted of 1,100 students studying degree programs in Architecture, Accounting, Mechanical Engineering, and Industrial Psychology.

The sample size was calculated using the formula for proportions in a finite population, with a confidence level of 95%, an expected proportion of 50%, and a margin of error of 5%. The calculation was performed using *Epidat* 4.2 software, resulting in a required sample size of 250 participants (Consellería de Sanidade et al., 2016).

Probability cluster sampling was used, considering academic groups organized by degree program and semester as selection units. The clusters were selected randomly, and the questionnaires were administered to all students present in the selected groups. The inclusion criteria were: being enrolled in one of the selected groups and attending classes during the application. Students who were absent, as well as those who submitted incomplete questionnaires or with missing information, were excluded to maintain data quality and consistency.

Instruments

Physical activity was assessed using the *International Physical Activity Questionnaire* (IPAQ), which estimates the frequency, duration, and intensity of activity performed during the last seven days. This questionnaire covers three main dimensions: vigorous physical activity, moderate physical activity, and walking, as well as a section on sedentary time.

The scores obtained allow participants to be classified according to their level of physical activity (low, moderate, or high). In terms of its psychometric properties, the IPAQ has moderate to near-perfect test-retest reliability, with intraclass correlation coefficients (ICC) ranging from .560 to .886, which supports its consistency in measuring physical activity in different contexts (Palma-Leal et al., 2022).

Nicotine dependence was assessed using the *Fagerström Test for Nicotine Dependence*, which consists of six items that measure the intensity of physical dependence on tobacco use. This test explores dimensions such as the number of cigarettes consumed daily, the time elapsed from when the person wakes up until they smoke their first cigarette, and the difficulty of abstaining from smoking in prohibited places, among others. It has been validated in the university population, showing acceptable internal consistency with Cronbach's alpha coefficients between .64 and .70 (Roa-Cubaque et al., 2016). In addition, a personal data form was administered that included age, sex, and degree program to characterize the participants.

Procedure

Data collection was carried out in classrooms, with prior authorization from the teaching staff. Each participant was informed verbally and in writing about the purpose of the study, the importance of their participation, and the anonymity of their responses.

The questionnaires were answered individually, at the beginning or end of the academic session, in a quiet environment, without interruptions, without time limits, and in the presence of the researcher to answer any questions.

Data Analysis

The data were captured and processed using the SPSS (*Statistical Package for the Social Sciences*) statistical package, version 21.0. The Kolmogorov-Smirnoff test with Lilliefors correction was applied, the result of which indicated the non-normality of the data ($p > .05$), and consequently non-parametric statistical tests were applied. Descriptive analyses were performed to characterize the sample, and the X^2 test was used to identify associations between sociodemographic variables and physical activity levels. Spearman's correlation coefficient was also used to analyze the relationship between physical activity levels and nicotine dependence. The level of statistical significance was set at $p < .05$.

Ethical Considerations

The research protocol was reviewed and approved by the academic board of the Bachelor of Nursing program and by the degree committee of the Universidad Mexiquense del Bicentenario (10-1304/25-82).

Official permission was also sought and obtained from the relevant unit, authorizing data collection.

Participation was anonymous and confidential, in compliance with the ethical principles of respect, beneficence, and justice established in national regulations and the Declaration of Helsinki.

RESULTS

The sample consisted of 250 university students, of whom 60.8% were female and 39.2% were male.

44.4% were between 18 and 19 years old, and 55.6% were over 20 years old. The proportion of students who had used tobacco at least once in their life was 59.6%. The participants' degree programs were: Industrial Psychology (44%), Accounting (25.2%), Mechanical Engineering (15.6%), and Architecture (15.2%). The distribution by semester was as follows: first semester 16%, third semester 31.6%, fifth semester 26.8%, seventh semester 12.4% and ninth semester 13.2%. (Table 1).

In relation to physical activity, there were no significant differences by age according to Pearson's chi-square test, $X^2_{(2,\ N = 250)} = 5.19$, $p = .075$. However, significant differences were identified by sex, $X^2_{(2,\ N = 250)} = 28.12$, $p < .001$, with female students reporting higher vigorous activity (23%) compared to male students (3.7%). In terms of moderate activity, female students recorded 12.6% compared to 6.3% for male students, and in terms of walking activity, the values were 25.3% for female students versus 28.6% for male students (Table 2).

Table 3 shows the descriptive statistics of the level of nicotine dependence in students that had ever used tobacco ($n = 149$). It was observed that 55% had very low dependence, 36.9% had low dependence, 4.7% had moderate dependence, and 3.4% had high dependence. No participant showed very high dependence (Table 3).

Table 1

Frequencies and percentages of sociodemographic and anthropometric characteristics of university students.

Physical Activity	*n*	*%*
Sex		
Female	152	60.8
Male	98	39.2
Age		
18 to 19 years old	11	44.4
Over 20 years old	138	55.6
Degree program		
Architecture	38	15.2
Accounting	63	25.2
Industrial Psychology	110	44
Mechanical Engineer	39	15.6

N*ote: n* = 250; % = Percentage.

Table 2

Frequencies, percentages, and chi-square results for the level of physical activity of university students by sex.

Physical Activity	*Female*		*Male*		X^2		
*n = 149**	*n*	*%*	*n*	*%*	*Value*	*df*	*p*
Vigorous	55	23.0	9	3.7			
Moderate	30	12.6	15	6.3	28.11	2	.001
Walking	60	25.3	68	28.6			
Total	145		92				

Note: f = Frequency; % = Percentage; X^2 = Pearson's Chi-square; *df* = degrees of freedom; *p* = Significance level.

Table 3

Frequencies and percentages of nicotine dependence among university students that have used tobacco at some point in their lives.

*Level of nicotine dependence n = 149**	*n*	*%*
Very low	82	55.0
Low	55	36.9
Moderate	7	4.7
High	5	3.4
Very high	0	0.0

Note: % = Percentage, the cut-off points for the Fagerström Test for Nicotine Dependence are: 0–2 = very low, 3–4 = low, 5 = moderate, 6–7 = high, and 8–10 = very high dependence, * participants that reported tobacco use (*n* = 149).

Table 4

Mean, Standard Deviation, and Spearman's Correlation Coefficient for physical activity and nicotine dependence level.

Variable	*n*	*M*	*SD*	*df*	*5*
1. Vigorous physical activity	248	1682.32	3020.47	147	.177*
2. Moderate physical activity	242	756.03	1310.84	145	.083
3. Walking	247	862.55	1289.91	147	.070
4. Overall physical activity score	237	3357.89	4343.70	142	.128
5. Level of nicotine dependence	149	2.1	1.79	147	1

Note: *n* = Sample, *M* = Mean, *SD* = Standard Deviation, *df* = degrees of freedom, * $p < .05$

To address the overall objective, Table 4 shows the correlation coefficients of the variables between physical activity and the level of nicotine dependence. A positive and statistically significant relationship (r^2 (147) = .177, p = .031) was found between vigorous physical activity and the level of nicotine dependence according to Spearman's correlation coefficient. No positive and statistically significant relationship (r^2 (142) = .128, $p > .05$) was observed between overall physical activity score and the level of nicotine dependence (Table 4).

DISCUSSION AND CONCLUSIONS

It was found that female university students reported higher levels of both vigorous and moderate physical activity, in contrast to male students, who more frequently engaged in walking activities. This result differs from a Brazilian population study where men showed higher levels of physical activity than women in moderate and vigorous intensity and in total recreational activity time (Azevedo et al., 2007).

Similarly, the WHO (2022) indicates that, on average, women have approximately five percentage points lower levels of physical activity than men. This difference could be explained by the profile of the participants, with a predominance of female students in health-related degree programs, who have shown greater commitment to self-care and the adoption of healthy behaviors, such as regular exercise (Rodríguez-Muñoz et al., 2020).

In addition, González et al. (2018) highlight that risk perception and professional training influence participation in preventive activities, which could justify the higher physical activity levels among female students in these university degree programs.

The present study found that most university students who had ever used tobacco in their lifetime had low levels of tobacco or nicotine dependence, consistent with Armas & Ponce (2024), who reported 75.2% of students with low consumption, 17.8% with moderate consumption, and 6.9% with severe consumption. These results suggest that, although most students maintain low consumption, there is a significant proportion that could be at risk of developing a more serious dependence.

The similarity could be due to common factors in the university population, such as academic pressure, stress, and the search for social acceptance, that can influence patterns of substance use (Blows & Isaacs, 2022). Another factor could be the need for more effective substance use prevention and education programs in universities, which could contribute to these observed levels of dependence (Ministry of Justice and Law, 2023).

Regarding the overall objective, a positive and significant relationship was identified between vigorous physical activity and the level of nicotine dependence. This finding suggests that, in this sample, students who engage in vigorous physical activity have higher levels of nicotine dependence, which contrasts with most of the existing literature, that generally reports an inverse relationship between physical activity and tobacco use. For example, Rodríguez-Romo et al. (2010) found that smokers tend to have lower levels of physical activity compared to non-smokers.

This discrepancy could be explained by sociocultural factors, such as local traditions like the Xhitas carnival, which shows how physical activity has historically been linked to cultural, ritual, and community expressions. These dances, which combine physical effort, symbolism, and spirituality, are a form of vigorous activity that is not necessarily unrelated to other social practices, such as substance use.

It is possible that some students, despite engaging in physical activity, also use substances such as tobacco or nicotine. This reflects complex behavior patterns that warrant further investigation. Qualitative studies are recommended to explore the motivations behind nicotine use in physically active students, as well as research analyzing the type of nicotine consumed and its relationship to lifestyle.

In addition, it would be valuable to develop longitudinal studies to observe the evolution of these habits, and cultural studies that consider the community context, such as that of Jilotepec, where traditions could influence substance use.

Limitations of the Study

One limitation of the study is its cross-sectional design, which prevents the establishment of causal relationships between physical activity and nicotine dependence. In addition, the sample was limited to students from a single public university, which limits the generalizability of the results to other university populations. Another limitation was the exclusion of questionnaires with incomplete information, which, while strengthening the validity of the results, may have slightly reduced the effective sample size.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest. They also declare the use of artificial intelligence tools (ChatGPT and Microsoft Copilot) for the sole purpose of editorial review of the text. All content was verified and edited by the authors, who assume full responsibility for the final version of the manuscript.

AUTHORS CONTRIBUTIONS

Iván Fernando Vargas Ignacio: conceptualization, methodology, research, data curation, visualization, project management.
Montserrat Sánchez Farías: research, writing—original draft, data curation, writing—original draft, review, and editing.
Lourdes Flores Feliciano: research, resources, data curation.
Olivia Sánchez Rodríguez: research, data curation, visualization.
Cynthia Berenice Rueda Sánchez: validation, writing – review and editing, supervision.
Roger Quintana-Lagunas: formal analysis, writing—review and editing, supervision, project management.

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