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Frequency of physical inactivity and insufficient sleep, and their mixed effects on academic achievement in ethnic minority students: A matched case–control study in a dental school

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Abstract:

BACKGROUND: Ethnic minorities are underrepresented in health sciences programs in various nations. Furthermore, there is no known research studying the occurrence of physical inactivity (PI) and insufficient sleep (IS), and their effects on academic achievement (AA) in ethnic minority students (EMS) in higher education.

OBJECTIVE: The objective of this study is to explore the occurrence of PI and IS, and their independent and mixed effects on AA in EMS of a dental school.

MATERIALS AND METHODS: Thirty EMS and sixty non-EMSs were matched (1:2) in this case–control study. It was utilized as an administrative dataset that stores register related to the students. Moreover, the grade point average was considered an indicator of AA. Logistic regressions models were run, expressed in odds ratios, complemented by confidence intervals (CIs) of 95%.

RESULTS: A total of 73% and 60% EMS were PI and slept insufficiently, respectively. The groups presented statistically significant differences ($P < 0.0001$) in physical activity, sleep, and AA, with inferior values for EMS. All unadjusted models showed that PS, IS, and low AA were strongly associated with EMS, demonstrating their independent effect. After controlling for PI and IS, the multivariate model for AA and EMS increased odds by 6.5 times (95%CI: 1.8–23;), indicating that EMS is strongly associated with low AA. Besides, PI and IS were also statistically significant higher (<0.0001) in the model, demonstrating their mixed effect.

CONCLUSIONS: This study found a higher occurrence of PI and IS in EMS. Besides, independent and mixed effects of these variables on low AA in EMS were very significant.

Keywords:

Educational achievement, ethnic groups, inequalities, physical activity, sleep

Introduction

Adequate physical activity and sleep help to a healthy lifestyle.^[1] Different researchers describe that consistent physical activity enhances bone health, promotes cardiorespiratory and muscular vigor, and declines stages of body fat; moreover, the intensification in physical

activity protects against chronic illnesses and benefits in the enhancement of cognitive condition.^[2,3] On the other hand, the public concern about inadequate sleep is an emergent and critical public health burden. Insufficient sleep (IS) prejudices cognitive capacity, including active mind, concentration, processing rapidity, and immediate memory.^[4-6]

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Some researchers described that particular illnesses are more represented in diverse ethnic groups. These health inequalities are probably influenced by the existence of public and corporate aspects, which ethnic minority persons confront after request assistance for their health difficulties.^[7]

Dissimilarities in physical activity occurrence in ethnic minorities are frequently ascribed to cultural distinctness and socioeconomic considerations.^[8-11] Thus, minority ethnic groups suffer a noticeably higher load of ailment than nonminorities.^[12] Furthermore, it has been indicated that minority ethnic groups comprehend less respecting the health consequences of some conducts, including the reduction of sleep;^[13] then, the tiredness concomitant with scarce sleep is usual, and subsequently, sleep complaints are rarely considered problematic.^[14-18]

Conclusions from researches studying the connection concerning personal lifestyle compartments and academic achievement (AA) established that persons with healthy lifestyle conduct accomplish improved educationally.^[1,4,19,20] For instance, stages of sleep and physical activity are related to AA,^[1,4,21] motivating to study these relationships in children,^[1,3,17] adolescents,^[3,20] and higher education students.^[4,21] However, there is no known research studying the occurrence of physical inactivity (PI) and IS and its effects on AA in ethnic minority students (EMSs) in higher education. Besides, ethnic minorities are underrepresented in health sciences programs in various nations.^[22] Therefore, the present research aimed to study the occurrence of PI and IS, and its independent and mixed effects on AA in EMSs of a dental school.

Materials and Methods

Study design and participants

A matched case-control research was proposed. This study incorporated students registered in the academic period 2018-2 in one of the 10 semesters of the dental school at the University. This 5-year dental program confers a doctor of dental surgery degree. The curriculum includes 2 years of social-humanistic and basic sciences, preclinical and laboratory courses, and 3 years of clinical instruction. During the past year, students take rotations in communities, hospitals, and health institutes, including some international training.

In Colombia, four ethnic groups of the majority of the population have been identified, being Afro-Colombians (10.6%) and indigenous people (3.4%) the most representative.^[23]

Evidence about the number of students belonging to ethnic minorities was acquired; thus, thirty EMSs were

selected as the case group, and sixty non-EMSs were matched (1:2) by age and gender, considering that these characteristics could be confusing variables.^[8] The non-EMS were randomly elected from the students registered in the dental school ($n = 510$). Therefore, ninety students participate in the present research.

Questionnaires

It was utilized as an administrative dataset that stores register related to the students. This material is a segment of a volunteer characterization that is applied to students, presenting support on each student's physical activity customs and sporting participation at the university, counting the manner of sporting and physical activity, as well as the occurrence of each one. Following previous recommendations,^[4] this self-report questionnaire also asks about indicators of sleep diminution, such as shortness of sleep ("Are you a person who does not get sufficient sleep?"), with a qualitative response (yes/no). Moreover, the suggestion of the World Health Organization that recommends that adults engage in moderate-intensity physical activity, 5 days/week, for at least 30 min/session (150 min weekly) was also an inclusion condition.^[24]

Following previous reports, the grade point average (GPA) was considered an indicator of AA.^[21,25] GPA at the university is a continuous variable fluctuating from 0 to 5. However, for the logistic analysis, this variable was dichotomized ($<3.99 / \geq 4$), seeing that a value ≥ 4 is considered as a good AA in our context.^[25] Formal GPA data for the preceding semester were acquired from the administrative records of the school.

The Bioethics Board of the dental school of the University of Antioquia (IRB 03-03-19), permitted this report. All students signed the informed consent freely, permitting their involvement in this research.

Statistical analysis

A descriptive analysis was completed, operating means and standard deviations (quantitative variables), and frequencies and percentages (qualitative variables). To determine data distribution, the Kolmogorov-Smirnov normality test was effected. A bivariate analysis was implemented with a statistical test of association (Chi-square). To find the mean changes between the groups, a Student's *t*-test was achieved. Later, contemplating the statistically significant outcomes acquired by the bivariate exploration, logistic regressions were run, expressed in odds ratios, complemented by confidence intervals of 95%, and statistical significance. Values of $P < 0.05$ were contemplated as statistically significant. All explore were terminated with statistical software (SPSS version 25.0; SPSS, Chicago, IL, USA).

Results

All EMS ($n = 30$) enrolled during the academic period explored (2018-2), participated in the present matched case-control study. Thus, a total of 90 students (30 EMS and 60 non-EMS) were studied. Table 1 depicts the students' characteristics. A total of 73% and 60% EMS were PI and reported to sleep insufficiently, respectively. The groups presented statistically significant differences ($P < 0.0001$) in physical activity, sleep, and AA, with inferior values for EMS. The most preferred physical activity modality in both groups was work out at the gym (71%), followed by soccer (42%).

Bivariate associations showed significant associations between EMS and PI, IS, and low AA [Table 2].

Considering these bivariate associations, logistic regression models were run. Table 3 presents the crude models for the associations between EMS and physical activity, sleep, and AA. All unadjusted models depicted that PI, IS, and low AA were strongly associated with EMS, demonstrating their independent effect. Interestingly, after controlling for PI, and IS, the multivariate model for AA and EMS increased odds by 6.5 times [Table 4], indicating that EMS is strongly associated with low AA (more than six times more likely than non-EMS). Besides, PI and IS were also statistically significant higher (<0.0001) in the model, demonstrating their mixed effect.

Discussion

Enough physical activity and sleep provide a healthy lifestyle.^[1] The evidence shows that socioeconomic disparities do not exclusively elucidate most of the well-being inequalities that appear between ethnic minority communities in comparison with Whites. Whereas cultural and genetic distinctions likewise add to these inequalities, it is conceivable that these factors could exert their influence diffusely, and that the detrimental effect of lifestyle aspects could be intermediated across their impact on physical activity and sleep.^[5,8,12,17] Besides, various scholars likewise denote an adverse connotation among insalubrious lifestyle behaviors and reduced cognitive capacity and AA.^[1,19-21]

There is no known research examining both physical activity and sleep habits and the association with AA in EMSs in higher education.

The present study found that 73% of ethnic minority dental students were physically inactive. Similarly, a report from the American Heart Association indicated that non-Hispanic black and Hispanic adults were more inactive (39.4% and 39.8%, respectively). Besides, persons with minor education and income stages had an appreciably superior occurrence of PI;^[10] significantly, social context helps to considerate ethnic inequalities in PI.^[26] On the other hand, a study in Saudi Arabia also presented a relevant frequency (53%) of PI in nonethnic minority medical students.^[21] Moreover, a study in nonethnic minority dental students in Iran showed that for a diversity of motives, they might not be implicated in physical activity, including the number of courses, fewer sports services, or less exciting sport choices. The reasons explained above plus the particular context may affect in a higher manner the ethnic minorities studied in the present study.

This research also found that 60% of ethnic minority dental students sleep insufficiently. Comparably to these results, it was observed that various ethnic minorities presented stronger relations with IS than the reference groups. Thus, it was described that around 46% of ethnic minority communities in the United States did not reach sufficient sleep,^[17] and Latino populations had poorer sleep conditions than Caucasian persons.^[27] This could suggest that communities such as Latinos are more vulnerable to the consequences of reduced sleep and that as a minority, they are not prepared to treat with situations that conduct to adverse-quality sleep.^[6] On the other hand, researches in higher education non-minority students in the Netherlands,^[4] Morocco,^[28] Brazil,^[29] and Colombia^[25] explained that 45%, 58%, 63%, and 79% of them, respectively, had an IS. Academics established that university students who presented an unbalanced sleep-wake agenda report IS.^[30]

The regression models in the present research depicted that PI, IS, and low AA were strongly associated with EMSs, demonstrating their independent effect. Interestingly, after controlling for PI, and IS, the

Table 1: Sociodemographic, physical activity, sleep habits, and academic features in 90 students

Feature	Ethnic minority students ($n=30$), n (%)	Nonethnic minority students ($n=60$), n (%)	P
Age (years)	23±3*	23±3*	NS
Number and percentage of women	20 (67)	43 (72)	NS
Number and percentage of men	10 (33)	17 (28)	NS
Physically active students	8 (27)	49 (82)	<0.0001‡
Students who report enough sleep	12 (40)	48 (80)	<0.0001‡
Grade point average	3.6±0.3*	4.0±0.2*	<0.0001‡

*Values are presented as a mean±SD, †Statistically significant differences. SD=Standard deviation, NS=Not statistically significant

multivariate model for AA and EMSs, increased odds substantially, indicating that EMSs are strongly associated with low AA. Unfortunately, no studies have explored the independent and mixed connection of various lifestyle compartments with AA in EMSs. However, research of elementary school non-EMSs in Canada observed that PI and IS were also associated with the worse academic performance,^[1] indicating that several lifestyles conducts had a superior impact on AA than those that emphasis on particular compartment. Thus, different studies described low AA exploring the association with PI or IS in nonethnic minority medical students separately. For example, Al-Drees *et al.*^[21] showed a significant positive connection between students' physical active and high AA. Differently, Machado-Duque *et al.*^[25] reported an association between IS and poor AA. The principal difficulties that preclude health sciences undergraduates from being physically active are lack of time and laziness,^[21,31] while the stress of the health sciences students related to elevated academic burden including examinations and clinical exercises, conduct to a vicious circle among stress, IS, and low AA.^[28]

Behavior and community principles and philosophies^[32,33] documented that apart from the formed background,

Table 2: Bivariate analysis between ethnic minority students and physical inactivity, insufficient sleep, and low academic achievement

Bivariate analysis	P
Association between ethnic minority students and physical inactivity	0.0002*
Association between ethnic minority students and insufficient sleep	<0.0001*
Association between ethnic minority students and low academic achievement	<0.0001*

*Statistically significant association

Table 3: Crude regression models for ethnic minority students and physical inactivity, insufficient sleep, and low academic achievement

Independent variable	Crude regression models OR (95% CI)	P
Physical inactivity	12 (4.3-34)	<0.0001 [†]
Insufficient sleep	6 (2.2-15)	<0.0001 [†]
Low academic achievement	4.6 (1.7-12)	0.003 [†]

[†]Statistically significant association. 95% CI=95% confidence interval, OR=Odds ratio

Table 4: Multivariable regression analysis for ethnic minority students and low academic achievement, adjusted for physical inactivity, and insufficient sleep

Independent variable	Crude model OR (95% CI)	P	Multivariable model [†] OR (95% CI)	P
Low academic achievement	4.6 (1.7-12)	0.003	6.5 (1.8-23)	0.005 [‡]
Physical inactivity			12 (3.6-42)	<0.0001 [‡]
Insufficient sleep			5 (1.5-16)	<0.0001 [‡]

[†]Adjusted for physical inactivity and insufficient sleep, [‡]Statistically significant association. 95% CI=95% confidence interval, OR=Odds ratio

particular social context intrinsically mold physical activity and sleep compartments, where the majority of behaviors result inside the environment of relatives, communes, and neighborhoods; thus, the "social-ecological model"^[32] exemplifies the multiple stages of influence that the social context develops on a person's opportunities. Consequently, generating impartial prospects for ethnic minorities' involvement will benefit from decreasing unfairness in health compartments, promoting parity in health effects.^[8]

The present research has some limitations. This case-control design avoids a chronological causal correspondence. Besides, valuations relied on self-reports; however, this kind of strategy is implemented broadly in studies like the present research.^[1,4,20,21,25,28,30] Furthermore, preceding studies described that self-reported sleep is related to the actigraphy-assessed sleep period.^[34,35] Moreover, the EMSs searched are not representative of the country; nonetheless, the University is the second-largest academic institution in the country that collects a pertinent quantity of the applicants from different territories. Furthermore, this research incorporated all ethnic minority dental students of the program, which were randomly matched with non-EMSs. Furthermore, the case-control investigation is the most proper epidemiological strategy when the cases are uncommon.

Conclusions

The current research demonstrates higher occurrences of PI and IS in EMSs, associate with low AA than non-ethnic minority undergraduates. Moreover, it establishes that EMS lifestyle compartments such as PI and IS present independent relations with AA, and that their mixed effects show a stronger association with academic results.

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Conflicts of interest

There are no conflicts of interest.

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