

Impact of the physical, emotional and intellectual well-being on the academic engagement of medical students.

Impacto del bienestar físico, emocional e intelectual en el compromiso académico de los estudiantes de medicina.

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Abstract.

This study aims to identify the impact of physical, emotional, and intellectual well-being on the academic engagement of medical students at the Autonomous University of Chihuahua. A quantitative approach was used with a cross-sectional, correlational design. A questionnaire adapted and validated was administered to a sample of 378 students, comprising 242 women and 136 men, between 18 and 24 years old, from the generation of August to December 2025, the information was analyzed using descriptive and inferential statistics with a significance level of .05. The results demonstrated a deficiency in physical activity among most students (71.7%) and prevalent procrastination behaviors (58%). On the other hand, there were high levels of empathy and emotional intelligence (70%) and adequate eating habits (60%). Male students are the ones who tend to present a more favorable emotional management than women. In addition, a relationship was found between empathy and self-regulation behaviors to positively face daily problems, the improvement of learning strategies for autonomous and meaningful learning, and the importance of motivation in academic engagement was highlighted. Commitment and academic responsibility stood out as predictor variables for positive perceptions of university life during the first semester. This study highlights the importance of analyzing aspects of student well-being, as they are significantly associated with academic engagement, which is considered a key predictor of academic success in medical education.

Keywords: academic engagement, healthy life habits, physical activity, procrastination.

Resumen.

Este estudio tiene como objetivo identificar el impacto del bienestar físico, emocional e intelectual en el rendimiento académico de los estudiantes de medicina de la Universidad Autónoma de Chihuahua. Se utilizó un enfoque cuantitativo con un diseño correlacional transversal. Se aplicó un cuestionario adaptado y validado a una muestra de 378 estudiantes, conformada por 242 mujeres y 136 hombres, de 18 a 24 años, de la generación de agosto a diciembre de 2025. La información se analizó mediante estadística descriptiva e inferencial con un nivel de significancia de 0,05. Los resultados evidenciaron una deficiencia de actividad física en la mayoría de los estudiantes (71,7 %) y conductas de procrastinación prevalentes (58 %). Por otro lado, se encontraron altos niveles de empatía e inteligencia emocional (70%) y de hábitos alimenticios adecuados (60%). Los estudiantes hombres tienden a presentar una gestión emocional más favorable que las mujeres. Además, se encontró una relación entre la empatía y las conductas de autorregulación para afrontar positivamente los problemas cotidianos, la mejora de las estrategias de aprendizaje para un

aprendizaje autónomo y significativo, y se destacó la importancia de la motivación para el compromiso académico. El compromiso y la responsabilidad académica se destacaron como variables predictoras de las percepciones positivas de la vida universitaria durante el primer semestre. Este estudio destaca la importancia de analizar aspectos del bienestar estudiantil, ya que están significativamente asociados con el compromiso académico, lo cual se considera un predictor clave del éxito de la educación médica.

Palabras clave: actividad física, desempeño académico, hábitos alimenticios saludables, procrastinación; hábitos alimenticios.

1. Introduction

The university student population faces radical changes in their lifestyles as they transition to adulthood (1). These modifications are influenced by academic demands and workload, which lead to physical and emotional exhaustion (2). This exhaustion causes deterioration of cognitive skills, poor academic performance, emotional burnout, ineffective study strategies, unhealthy eating habits, and procrastination behaviors (3-4). In 2025, the Sports Practice and Physical Exercise Module, carried out by the National Institute of Statistics and Geography of Mexico, highlighted that only 51% of men and 34.6% of women in early ages are physically active, and shows an increase in sedentary lifestyle practices in young populations, which predisposes to diseases (5).

Integral well-being in students was defined by the research of Parra and Tsuyi (2), who delineated dimensions that socialization skills and school environment in medical students. The areas covered by the study were: emotional, physical, intellectual, environmental, financial, spiritual, social, and occupational. Likewise, González et al. (6), established the relationship between eating habits and psychological symptoms related to stress and anxiety in medical students. This study showed that a lack of concentration, chronic fatigue, worry, and nervousness negatively affect the quality and amount of food consumed by students, which worsens their emotional state by reducing available nutrients. Physical well-being is understood as an adequate functionality of the body according to the required functions and is composed of daily habits, such as exercising, nutritional and sleep habits. Furthermore, emotional well-being refers to the adequate cognitive modifications of the mood according to environmental interactions, including empathy, emotional regulation, and personal satisfaction (7-8). Moreover, intellectual well-being encompasses behaviors that reduce procrastination, such as task planning or the development of personalized learning strategies to improve study (2, 9). These previous components contribute to the awareness of the cognitive processes of learning to increase motivation and create environments that prioritize favorable academic engagement (10-11).

In this study, academic engagement is understood as a multidimensional construct reflecting students' behavioral, emotional, and cognitive involvement in learning activities. Although academic engagement has been widely associated with academic achievement in medical education, it does not constitute a direct measure of objective academic performance (e.g., grades or GPA). Therefore, this study focuses on engagement indicators as proximal predictors of academic success rather than objective academic outcomes.

This research was executed to identify the frequency of practices that are related to physical, emotional, and intellectual well-being and develop strategies that favor a positive academic engagement, with the main purpose of establishing a basis for future institutional actions that highlight the importance of healthy daily habits in medical students

2. Methods

2.1 Design

A cross-sectional, correlational and descriptive study was carried out with a quantitative approach at a single time, aimed at medical students at the Autonomous University of Chihuahua; with the aim of statistically measuring and analyzing the variables to demonstrate the hypotheses raised through data collection from an adapted and validated instrument.

2.2 Population and sample

The study was conducted at the Faculty of Medicine of the Autonomous University of Chihuahua, a public higher education institution in northern Mexico. The academic program is a six-year undergraduate-entry degree equivalent to an MD program, structured into nine academic semesters of preclinical and early clinical training, followed by a one-year rotating internship and a one-year mandatory social service period. The present study included students enrolled in semesters one through nine, corresponding to the classroom-based and initial clinical phases of the curriculum. The required sample size was calculated using the finite population formula with a 95% confidence level and a 5% margin of error, resulting in a minimum estimated sample of 322 students. A total of 471 participants were collected through voluntary participation using a QR code distributed in classrooms.

Exclusion criteria included students outside the study range of semesters 1-9, incomplete questionnaires (more than 10% missing responses) and refusal to participate in the study. After applying these criteria, 93 responses were excluded, resulting in a final analytical sample of 378 students. The final sample included 242 women (64%) and 136 men (36%), with 77% of participants enrolled in the first five semesters of the program. Participation was voluntary and a non-probabilistic sample approach, which may have contributed to differential representation across sex and academic level. Although the final sample exceeded the minimum required size, the voluntary nature of participation may have introduced self-selection bias. The overrepresentation of female students and those in early semesters could influence the generalizability of the findings, particularly regarding engagement patterns and well-being profiles.

2.3 Variables

Independent variables were:

- Physical well-being: adequate functionality of the body, which is achieved through habits such as exercise, selection of foods according to their nutritional level, and sleep habits (4).
- Emotional well-being: a state of mind in which the person is aware of their emotions to positively cope with everyday problems with empathetic attitudes and positive moods (12).
- Intellectual well-being: human ambition to acquire, construct, and structure knowledge, due to the possible benefits it will bring in professional or academic spheres (13).

And the dependent variable was the academic engagement: level of effort of students to get involved in academic activities based on their dedication, focus and integration in their university educational community (14).

2.4 Instruments

The questionnaire was constructed based on sociodemographic data and selected dimensions from previously validated instruments, including the Lifestyle Medicine Health Behavior (15), Brief Emotional Intelligence Scale (16), Learning and Study Strategies Inventory (17), Unintentional Procrastination Scale (18), and University Student Engagement Inventory (19). Items were not used in their entirety. Instead, specific items aligned with the theoretical dimensions of physical, emotional, intellectual well-being, and academic engagement were selected and linguistically adapted to ensure conceptual equivalence within the Mexican medical education context.

The adaptation focused on content relevance and semantic clarity rather than full cross-cultural validation procedures and minor wording adjustments to enhance clarity for undergraduate medical students. No full back-translation procedure was conducted, as the instrument was designed as an integrated questionnaire rather than a formal cross-cultural validation of each original scale. It was distributed via GoogleForms platform.

Content validity was assessed through expert judgment ($n = 10$) using Aiken's V coefficient. A pilot study with 50 students was conducted to evaluate internal consistency and item-total correlations, resulting in refinement and removal of items where necessary. Results are shown in table 1.

Table 1. Cronbach coefficients and item-total correlations by dimension.

	# Item	Cronbach coefficient	Item-total correlations
Physical well-being	11	0.876	0.199
Emotional well-being	14	0.874	0.388
Intellectual well-being	27	0.876	0.196
Academic engagement	32	0.874	0.318

2.5 Procedure

The sample size was selected by simple random sampling with 95% confidence level and a 5% margin of error (20). It was determined by the finite population formula with a representative sample of 322 students. The instrument was personally distributed through a QR code with a link to facilitate access to the questionnaire. Microsoft Office Excel was used to generate the database, and the SPSS statistical program for data analysis.

2.6 Data analysis

Data were analyzed using SPSS. Normality was assessed through skewness and kurtosis values. Univariate descriptive statistics were calculated, including frequencies, percentages, means, and standard deviations. For bivariate analyses, independent samples t-tests and one-way ANOVA were conducted to examine differences by sex and academic semester. Pearson correlation coefficients were used to explore associations between variables. Given the exploratory nature of the study, significance levels were interpreted cautiously and only results consistent across analyses and theoretically supported were emphasized. Multivariate linear regression analyses were performed to examine predictors of academic engagement. Variables were entered based on theoretical relevance and significant bivariate associations. Assumptions of linearity, normality of residuals, homoscedasticity, independence of errors (Durbin-Watson statistic), and multicollinearity ($VIF < 3$) were verified prior to model interpretation, indicating absence of problematic multicollinearity. Adjusted R^2 values were reported to 0.743 to assess model explanatory power. Statistical significance was established at $p < .05$ (20).

2.7 Ethical considerations

The study was conducted in accordance with national regulations governing human subjects research and data protection in Mexico. The study protocol was reviewed and approved by the Research and Ethics Committee of the Faculty of Medicine at the Autonomous University of Chihuahua (Approval No. CI-017-24). All procedures were conducted in accordance with institutional ethical standards and the principles outlined in the Declaration of Helsinki. All participants provided informed consent prior to participation, and data were collected anonymously to ensure confidentiality.

3. Results

3.1 Physical well-being

The univariate analysis of the physical well-being variable identified a decreased frequency (>61.6%) and lower outliers on the weekly exercise among students; by contrast, the consumption of vegetables, cereals, and legumes was consumed with a high weekly frequency (>63.2%). On the other hand, the perception of sleep quality (75.9%) and quantity of six to eight hours a day (58.8%) was perceived with high frequency; however, they pointed out a daytime sleepiness prevalence (73.5%), which highlights an insufficient daily rest for the academic demands.

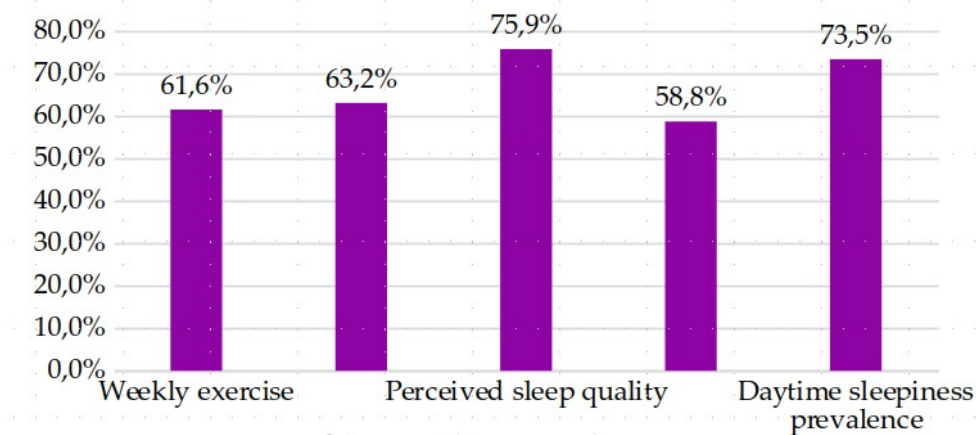


Figure 1. Variables identificadas en el análisis univariado.

The bivariate analysis highlighted that male students and those who are in the ninth semester perform physical activity more frequently than those of the female gender and those who study in the first semesters. Though, women had greater consistency when it came to maintaining proper eating habits. On the other hand, sleep patterns fluctuated between semesters of the bachelor's degree. Likewise, significant relations were found between the eating and sleep habits; however, they did not relate to each other. Besides, the multivariate analysis demonstrated a negative association when controlling for other engagement-related variables of academic enthusiasm: moderate-intensity physical activity.

The analysis identified low physical activity and high daytime sleepiness. Differences by sex and semester show differentiated patterns of self-care, and significant relations between eating and sleeping habits. Moderate physical activity was identified as a factor that could negatively affect academic enthusiasm.

3.2 Emotional well-being

In relation to the univariate analysis of the emotional well-being, a high perception of positive coping skills towards daily difficulties and the course of life was found in 73.3% and 70.6%, respectively; while the feeling that the challenges in life were too many reached a lower outlier and a low frequency (69.6%). In addition, 50% prioritized regulation and emotional satisfaction tended towards the highest frequencies. On the other hand, the practice of empathic attitudes was indicated with a moderate frequency (>73.5%). Likewise, indicators of emotional intelligence, such as awareness and use of emotions to face problems, were within the highest frequencies of the scale (>72%); in addition, the latter was found to be a higher outlier (figure 2).

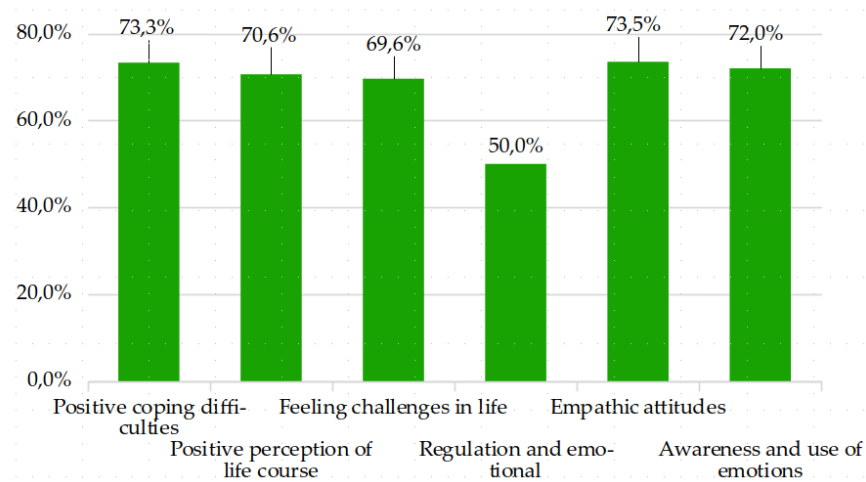


Figure 2. Univariate analysis of emotional well-being.

The bivariate analysis showed a positive trend towards male students in favorable emotional management, adequate perception of the course of their lives, search for pleasurable activities, and a greater ability to face daily difficulties; also, empathic attitudes such as recognizing the emotional state of other people and acting according to their interpretation. No differences were found between the semesters of the bachelor's degree in relation to emotional well-being. On the other hand, a significant relationship was found between emotional satisfaction and the search for well-being with the ability to solve problems and with the awareness and use of emotions to face daily challenges; In addition, attitudes of empathy were related to each other.

The results show adequate emotional well-being, characterized by high levels of positive coping and emotional regulation. Significant relationships between emotional satisfaction, problem solving and empathy reinforce emotional intelligence. While differences by sex favor men, no relevant variations are observed between semesters.

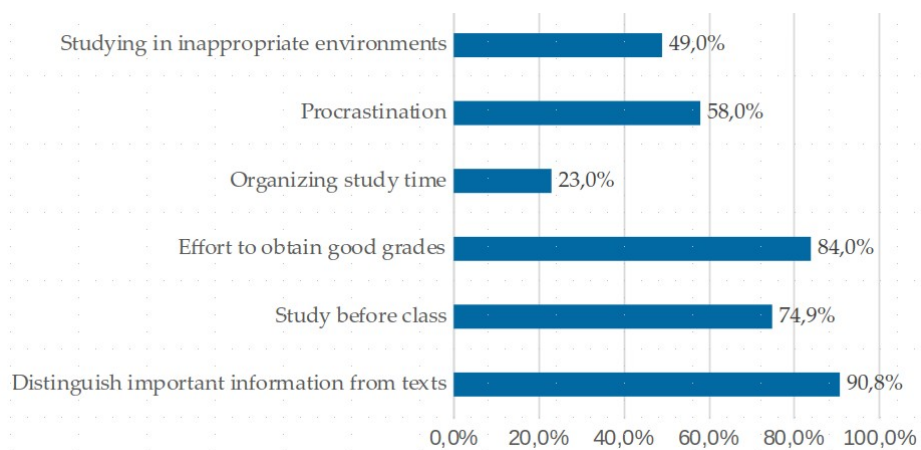


Figure 3. Univariate analysis of intellectual well-being.

3.3 Intellectual well-being

With the univariate analysis of the intellectual well-being variable, it was identified that 90.8% of the students distinguish important information from texts easily; besides, the study before class (74.9%) and effort to obtain good grades (84%) were reported with high frequency on the scale; in

addition to standing out among the higher outliers. On the other hand, organizing the studying time, as well as procrastination, were reported with a low frequency (23% and 58%, respectively). Similarly, starting the tasks assigned without finishing them was calculated with a lower outlier. Furthermore, 49% of the participants reported studying in inappropriate environments with a high frequency (figure 3).

The bivariate analysis of the data identified statistically significant differences between genders and semesters, where female students and those who are in the first semester expressed a preference for visual and personalized study strategies, such as drawings charts, or diagrams; while men highlighted the hierarchy of the study, academic organization, and resilience with greater relevance. In addition, the first semesters of the career attend the classroom with greater preparation when reviewing the topics before class, compared to those of more advanced semesters of the career. On another note, statistically significant relationships were found between visual study strategies, task organization, and study commitment items. The multivariate analysis of linear regression of the dependent variable: academic enthusiasm, highlighted a positive predictor variable related to not completing school pending; and negative predictor variables like attending class without studying, integrating information to generate comprehensive knowledge, and reading class notes to study.

The results reflect high academic engagement and cognitive skills. The differences between sex and semester show differentiated learning strategies, while the relationship between organization, visual strategies and academic engagement confirms their interdependence. Multivariate analysis suggests that certain study practices are negatively associated with academic enthusiasm.

3.4 Academic engagement

Regarding the univariate analysis of the academic engagement, it was identified that 97.7%, 97.1%, 93.7% and 88.9% of the students turn in assignments within the deadline, respect the rules, pay attention, and behave seriously in class with high frequency, respectively, which were found with a higher outlier. In addition, the integration of knowledge to generate comprehensive knowledge for problem solving was found within moderate frequencies in more than 73% of the responses. Likewise, social interaction with schoolmates showed a tendency towards the central values of the scale in more than 53%; on the contrary, experiencing disagreements with them was valued at the lowest frequency of the scale (74.7%) and with a lower outlier. In relation to academic participation, the enthusiasm (62.5%) towards extracurricular activities and having positive feelings towards the facilities (>61.4%) were rated with medium frequency. On the other hand, correcting assignments (58.5%) and consuming academic content (68%) were found in the central responses of the scale (figure 4).

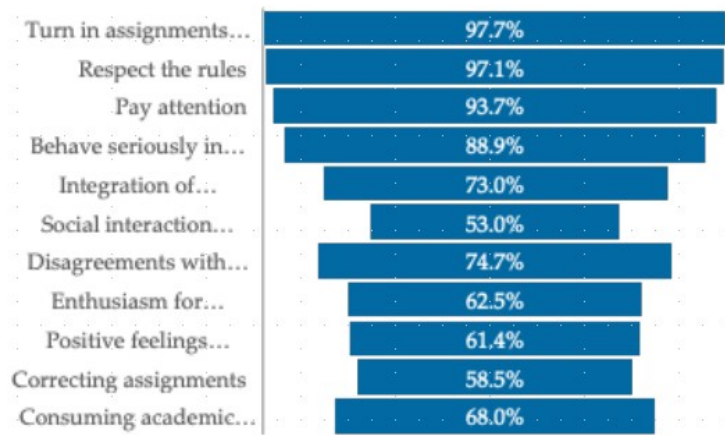


Figure 4. Univariate analysis of the academic engagement.

Likewise, the bivariate analysis evidenced significant differences between gender and semester, where the female and first-semester students showed a predilection for serious behavior, review of notes, and correction of tasks; while the male gender gave greater importance to

expressing doubts, discussing issues with teachers, integrating and questioning knowledge, and presenting disagreements with their schoolmates. In addition, students in advanced semesters presented a positive perception towards coexistence with their schoolmates; besides, the earlier semesters showed a longer study time, constant development of learning strategies, and positive feelings in the facilities. Regarding the significant correlations, the analysis of students' responses identified relationships between engaged behavior in the classroom, the review of assignments and notes to correct them, the integration of information to generate knowledge and to solve problems, coexistence among schoolmates, enthusiasm for extracurricular activities, and between the consumption of academic content and talking to people outside the career about the knowledge acquired.

Finally, the multivariate analysis used academic enthusiasm as a dependent variable with high correlations with the rest of the items. The positive predictor variables of the academic engagement were interest and attendance to academic activities, paying attention, discussing with schoolmates, reviewing notes, and enjoying time at the facilities. When controlling for other engagement-related variables, attending class without prior study, integrating information to generate knowledge, and reading class notes showed negative association with standardized coefficients, suggesting complex interrelations among cognitive engagement components, like excessive workload, low motivation, among others (table 2).

Table 2. Lineal regression results.

Academic enthusiasm model	Standardized coefficient		Collinearity	
	Beta	Significance	Tolerance	VIF
Interest in academic activities	.614	.000	.555	1.801
Attending to extracurricular activities	.141	.000	.628	1.593
Review assignments to fix errors	.089	.005	.678	1.475
Discuss with schoolmates on how to improve the course	.117	.000	.776	1.289
Fruit consumption frequency	.079	.004	.913	1.095
Enjoyment while spending time on the school	.072	.020	.723	1.384
Express doubts in class	.085	.004	.796	1.257
Integrate subjects to generate comprehensive knowledge	-.070	.024	.709	1.411
Consume content on topics that are discussed in class	.073	.021	.682	1.467
Frequency of moderate physical activity practice	-.076	.007	.887	1.128
Attend classes without study the topic indicated by the teacher	-.076	.009	.819	1.221
Start tasks, but do not finish them	.078	.006	.848	1.179
Read notes several times for a better understanding of the subject	-.077	.011	.743	1.346
Pay attention during classes	.059	.048	.772	1.295

The results show a high level of regulatory compliance and responsible behavior in the classroom, accompanied by an integration of knowledge and coexistence among schoolmates. Differences by sex and semester reflect different academic styles, while correlations show that class engagement, homework review, and academic interaction strengthen performance. Multivariate analysis confirms academic enthusiasm as a central axis of engagement.

4. Discussion

The findings of this study showed deficiencies in the frequency and intensity of physical activity, where male and advanced semester students indicated higher levels; similarly, men had a greater impact on empathy and emotional self-regulation. In addition, the female population showed a preference for visual and customizable study strategies, while male students preferred auditive strategies and involvement with schoolmates.

The identification of profiles differentiated by gender and semester demonstrate the need to adopt personalized intervention approaches. Men in upper semesters had higher levels of collaboration with their schoolmates, physical activity, and emotional self-regulation; while women in initial semesters stood out for their academic organization, visual strategies, and balanced diet. These patterns coincide with what was reported by Luna et al. (21), who also found differentiated profiles according to gender, empathy, and progress in the bachelor's degree, which confirms the complexity of well-being in medical students.

These results of this study are consistent with the ones reported by Parra et al. (2), who demonstrated that mood, meaningful learning, and academic engagement have a significant influence, which associates with the perception of the educational environment and social skills; as well as the importance of achieving adequate integral well-being in the students.

The differences found according to the gender of the students provide information to create strategies that have a greater influence on a demographic group. It was observed that the women chose to maintain a balanced diet, a visual and structured study, while men reported more frequent physical activity, high emotional control, empathy, and study strategies that favor coexistence. These findings are consistent with what Plasencia (22), stated, who reported differences between study strategies, level, emotional symptoms, and academic commitment according to the gender.

In addition, the profiles of the students were identified according to the advancement of the bachelor's degree, where those who were studying the first semesters showed greater academic commitment and higher preference for personalized study strategies; in contrast to the upper semesters, where a collaborative pattern was identified with a high level of significant learning. The results can be compared with those obtained by the study carried out by Bernabé et al. (23), where it was found that students at higher levels demonstrated a deeper and more significant learning process with the learning strategies used.

The correlations found the integration of healthy habits to enhance protective behaviors of physical, emotional, and intellectual health, which shows the importance to integrate these attitudes to enhance academic engagement. This was also described by León et al. (24), where the relevance of integrating healthy habits into the academic program to promote a healthy life and increase academic engagement was highlighted.

On the other hand, the linear regression model demonstrated the relevance of academic enthusiasm and is a determinant of autonomous learning, a balanced diet, favorable motivation, and coexistence among peers. Interestingly, some study-related behaviors such as integrating information to generate knowledge and reading class notes appeared as negative predictors in the multivariate model. Although these behaviors are conceptually associated with academic engagement, this finding may be explained by statistical suppression effects or shared variance among closely related engagement variables. When highly correlated predictors are included simultaneously in regression models, coefficient direction may change due to partialization effects, even in the absence of problematic multicollinearity. VIF values indicated no severe collinearity;

therefore, these results should be interpreted cautiously as relative rather than absolute effects within the model (25).

The results of this study are comparable to the systematic review carried out by Jorge et al. (26), which revealed the importance of applying the Health-Related Quality of Life (HRQoL) questionnaire in the student population, since the environment in which they develop is vital for the development of attitudes related to their well-being and their transition to adulthood. It was found that some of the factors that affect the mental health status of students are academic stress, sedentary behaviors, lack of belonging to the academic context and isolation from their peers for the above reasons. Therefore, this population is considered to be highly vulnerable and a growing need to know their emotional state and improve the university experience.

This study is comparable to the one carried out by Fazia et al. (27), where it was detailed that medical students have a higher rate of stress compared to the rest of the population. Stress-reducing and well-being actions such as physical activity, nutrition interventions, and meetings that provide guidance for emotional management, significantly improve academic performance, resilience, emotional and intellectual well-being, and provide advantages in clinical practices.

The findings suggest that physical, emotional, and intellectual well-being are significantly associated with higher levels of academic engagement. Given that engagement has been identified in previous research as a predictor of academic achievement, these results may have indirect implications for academic performance in medical students.

This study contributes to the international medical education literature by providing empirical evidence from a Latin American setting. By presenting an integrated profile of physical, emotional, and academic well-being among Mexican medical students, the findings expand the cross-cultural understanding of how institutional environments influence student performance and health.

The study presents limitations related to sampling procedures. Despite exceeding the estimated minimum sample size, the voluntary participation method may have introduced selection bias. The overrepresentation of female students and those in early semesters limits the generalizability of the findings to the entire medical student population. Future research should consider stratified probabilistic sampling to ensure proportional representation by sex and academic level. Although the instrument was based on validated scales, it does not constitute a formally validated Spanish adaptation of each instrument independently. Therefore, construct validity should be interpreted within the framework of the integrated questionnaire design.

Importantly, the results support the growing international argument that student wellness should be embedded within curricular design and institutional policy frameworks rather than addressed solely through isolated interventions. The study offers context-sensitive evidence that may inform comparative research and guide curriculum development strategies in similar educational systems. Overall, the results showed that the students presented favorable levels of physical, emotional, and intellectual well-being, as well as the impact of diverse factors on academic engagement. Nevertheless, areas of opportunity remain to strengthen physical, emotional, and intellectual well-being, to consolidate students' academic engagement and promote their comprehensive personal and professional development. Likewise, López-Angulo et al. (28), highlighted in the results of their study the importance of favoring the positive university experience, through the establishment of areas for improvement and active interventions in the social, institutional, academic, and personal spheres of the students.

5. Conclusions

- Physical, emotional, and intellectual well-being are significantly associated with students' academic engagement, a construct closely related to academic achievement in medical education.
- Statistically significant differences were identified in the level of physical activity, emotional regulation, empathy, and group study strategies that predominated in the male gender; while in the women's group, healthy eating practices, visual study strategies, and time organization stood out.
- The most advanced semesters of the medical career presented a lower sense of belonging that is reflected in behaviors that decrease the level of commitment and academic responsibility; In addition, these students presented study strategies that favor deep and meaningful learning.
- It is important to know the indicators by gender and semester to develop institutional strategies that allow maintaining a pertinent academic engagement in accordance with the physical, emotional, and intellectual well-being of future health professionals.

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