2024, Retos, 54, 264-271

Perceived academic self-efficacy of adolescents and the relationship with physical activity
Autoeficacia académica percibida de los adolescentes y la relación con la actividad física

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Abstract. Given the challenges and levels of competitiveness that exist at the educational level, it is necessary to analyze the different factors that determine academic effectiveness, in consideration of sedentary tendencies and the need for physical activation in the school-age population, research to determine the relationships between academic self-efficacy with physical activity is carried out in this population. Methods: to carry out this project, a sample of 248 secondary and high school students was used, from whom characteristic information was collected on the perception of academic self-efficacy, on physical activity carried out using accelerometer over seven days, as well as the analysis of factors such as travel and sports practice. Results: it is shown that the variables surrounding rest show a negative correlation with academic efficiency, while the different levels of physical activity show a greater positive correlation with academic self-efficacy. Conclusions: moderate physical activity and MVPA show a greater benefit in perceived academic self-efficiency, while the rest variables show a negative relationship with academic efficiency.
Keywords: adolescents, academic self-efficacy, accelerometer, physical activity

Resumen. Ante los retos y niveles de competitividad que existe a nivel educativo se hace necesario el análisis de los diferentes factores que determinan la eficacia académica, en consideración a las tendencias sedentarias y la necesidad de activación física en la población en edad escolar se elabora una investigación para determinar las relaciones entre la autoeficacia académica con la actividad física realizada en esta población. Métodos: para la elaboración este proyecto se contó con una muestra de 248 estudiantes de nivel secundaria y bachillerato de los cuales se recopiló información característica sobre la percepción de la autoeficacia académica, sobre la actividad física realizada mediante el uso de acelerometría en el transcurso de siete días, así como el análisis de los factores como el desplazamiento y la práctica deportiva. Resultados: se muestra que las variables entorno al descanso muestra una correlación negativa con respecto la eficiencia académica, por su parte los diferentes niveles de actividad física muestran una mayor correlación positiva en cuando la autoeficacia académica. Conclusiones: la actividad física en grado moderado y MVPA muestran un mayor beneficio en la autoeficiencia académica percibida, por su parte las variables en el descanso muestran una relación negativa con la eficiencia académica.
Palabras clave: adolescentes, autoeficacia académica, acelerometría, actividad física

Fecha recepción: 20-10-23. Fecha de aceptación: 14-02-24
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Introduction

Education is fundamental and essential for the future development of a population; it is a priority issue on the country's agenda. As the future and status of a country depend on its human capital, and so on the skills and knowledge of its citizens, education has become a new priority in the face of growing globalization to help improve the competitiveness of national economies (Ordov, Madlyarova, Ermilov, & Murzagulova, 2019; Alarm & Parvin, 2021; Loprinzi, Cardinal, & Loprinzi, 2021). Like any other problem, if it can't be measured, it can't be improved. Therefore, academic performance is of great importance when it comes to educational issues. Academic achievements are often used as educational expressions since over the last century, academic performance has become the gatekeeper of basic, secondary, and higher education institutions, shaping the career path and course of study in a person's life (Hands, Chivers, & Parker, 2021). At an international level, the development of all countries depends on the quality of their professionals, so all societies must have talented students who succeed as professionals in different fields (Sánchez-Álvarez, Barrios, & Extremara, 2020; Edwars, Mauch, & Winklman, 2021).

In an integrated degree and merit system, academic achievement is one of the few assessments available to measure success. Although there is no general agreement regarding the evaluation of academic performance, measures of cognitive ability or declarative knowledge are the most important factors evaluated (Lei & Lee, n.d.; Mitchell, Gray, & Ichley, 2018; Mendoza-Castejón & Clemente-Suárez, 2020). Additionally, the most commonly used metric to measure academic performance is usually the grade point average (Hocnicke & Broadbent, 2019). In this sense, considering the importance of academic performance seems to be crucial to understanding its predictors, so for that reason, research has focused on identifying predictors of academic performance, finding intelligence and effort as key factors. In this context, given the importance of academic performance in education, it is important to understand the factors that influence it, finding that cognitive ability is essential to predict academic performance in points and cognitive ability are strong predictors of academic performance (Krucel & Hezlett, 2020; Zhang, Tian, & Zou, 2022).

The educational sector is increasingly realizing that it impacts not only the academic performance of its students but also their current and future health. Recent studies by Langford et al. (2014) and McHugh & Horner (2020) have highlighted the multifaceted influence of education on various health outcomes. These findings underscore the importance of adopting holistic approaches in educational settings to promote not only academic excellence but also the overall health and well-being of students. In this sense, interventions on social determinants of health and promotion and development implement basic competencies (Mok & Flynn, 2019). This is important because a healthy lifestyle

can affect academic performance, and this leads to better health in the short, medium, and long term, reducing the risk of developing cardiovascular diseases and other chronic diseases. Specifically, it was found that adolescents who engaged in higher levels of physical activity had better well-being and quality of life compared to those who were more sedentary (Bermejo-Cantarero, 2017). The findings suggest a significant association between sleep quality, dietary habits, and anthropometric profile, indicating that a healthy lifestyle can influence both academic performance and the long-term health of adolescents. (López Malque, et al, 2023). While these practices are beneficial for the general public, they are especially beneficial for children and adolescents. (Colomer-Pérez, Paredes-Carbonell, Sarabia-Cobo, & Gea-Caballero, 2019). Additionally, promoting physical fitness and regular physical activity has been shown to positively impact academic achievement among adolescents (Copetti et al., 2020). Previous studies have found a positive association between maintaining a healthy diet and regular physical activity at school (Lopez-Sanchez, et al., 2020). On the contrary, several studies have reported malnutrition in this population, especially low consumption of fruits and vegetables, and over consumption of meat, sweets, and sugary drinks (Mayer & Boness, 2021). A significant and direct association was found between sleep quality and dietary habits, as well as between sleep quality and body mass index (BMI), and waist-to-height ratio (WHtR) (López Malque, et al., 2023). The results suggest the importance of implementing intervention programs to promote healthy lifestyle habits and prevent obesity in this adolescent population.

Other factors contributing to the suboptimal lifestyle of this population include the digital transformation that has led to increased screen use and a concomitant decrease in daily physical activity. According to a recent study on sedentary habits, especially computer time, were found to be negatively related to school climate (Yáñez-Sepúlveda et al. 2024). This finding underscores the importance of addressing sedentary behaviors in the educational context to promote a positive school climate and, enhance academic self-efficacy among students. Therefore, childhood and adolescent obesity have become a public health problem worldwide (Furley, 2017; Trinh, Wong, & Faulkner, 2020). Another factor that affects academic performance is maintaining adequate sleep levels and schedule since several studies reported a positive association with school performance. Addressing these factors through targeted intervention programs, such as sleep-focused educational initiatives, can play a crucial role in enhancing students' academic performance and overall well-being (López Malque et al., 2023; Olivo et al., 2024). Therefore, addressing lifestyle factors in educational settings is essential for promoting positive school climates and enhancing students' academic self-efficacy. The excessive use of electronic devices and the consumption of tobacco, alcohol, and other substances can negatively affect academic performance (Joyce, Dabrawski, Aston, & Carey, 2018). Adolescence can also be a dangerous time to start using drugs, including tobacco, alcohol, and other substances that can have undesirable effects on the body. However, the evidence for an association between lifestyle and academic performance is unclear. (Kristiánsson, Sigfúsdottir, & Allegrante, 2020) in this context, some studies have observed weak or marginal associations between diet and academic performance but to date have not found an association between regular physical activity and academic performance. Furthermore, the available evidence is limited since no previous study has analyzed these variables simultaneously (Kristiánsson, Sigfúsdottir, & Allegrante, 2020).

The perception of academic performance refers to students' cognitive perceptions of attitudes and practices related to their grades and academic success, mainly reflecting inappropriate behaviors such as absenteeism. It is currently a school variable of high concern due to its association with school behavior, and its impact on schools. However, significant declines in the academic performance of adolescents have been reported. Given that children and adolescents spend most of their lives in school, some authors emphasize the need to focus on specific personal and educational variables; an aspect that has been largely ignored in previous studies. (Sounders, Gray, Poltas, Chaput, Jansse, & P, 2019; Fong, Chen, Zhang, & Liang, 2020).

Material and method

Design and sample

This is a cross-sectional study. Participants were selected by non-probabilistic convenience sampling across all schools in the Basque Country. To carry out the project, a sample of 248 students from 12 to 17 years old (126 boys and 122 girls) from 24 high schools (11 private and 13 public) participated.

Selection criteria

- Signing of informed consent by parents or guardians.
- Complete all tests and measurements during the time established for the preparation of the study.
- Have the physical and mental conditions to allow adequate participation in the study.

Measurement and/or monitoring

As measurement instruments, ActiGraph WGT3X accelerometers were used (with all the accessories necessary for their use, such as elastic belts, straps, Velcro for the wrist, and cables for data transfer) in combination with the Actilife 6 actigraph software for measuring physical activity. The use of this software has been considered due to its feasibility for children and adolescents. Likewise, a questionnaire was used to measure perceived academic self-efficacy in order to obtain data on the perceptions of self-efficacy in the sample population based on the model (Palenzuela, 2012).

Variables

For the development of the research, the following variables and sub-variables (table 1) have been taken into account.

Table 1.
Correlations between variables.

Variable 1: Physical activity	Variable 2: Sleep	Variable 3: Displacements	Variable 4: Organized sport
Sedentary	Efficiency	Travel to school	
Light	Total, minutes in bed	Travel to other places	
Moderate	Total, time asleep		
Vigorous	Time to fall asleep		
MVPA			

Chart 1. Variables and sub-variables considered in the study.

Statistical analysis

To carry out the analysis of the statistical variables and identify the different correlations in the study variables, the SPSS® analysis program was used. Significance was determined at $p < 0.05$. Initially, the Kolmogorov-Smirnov test assessed normality alongside descriptive statistics (means, standard deviation, etc.). None of the variables met these assumptions, leading to the utilization of non-parametric tests: the Mann-Whitney U test for two samples and the Kruskal-Wallis one-factor ANOVA for multiple samples. Correlation analysis was performed using Spearman's Rho.

Ethical considerations

General principles for scientific requirements and protocols for research

- A fundamental objective of medical research is to understand the causes, course, and effects of disease to improve interventions and the application of preventive, diagnostic, or therapeutic measures, including methods, procedures, and treatments (FHI, 2021). For this reason, medical research is subject to bioethical standards that promote and ensure respect for all participants, protecting their health and rights (WMA, 2019).

In this sense, agreements between researchers and participants must always include a reference to the bioethical considerations that apply to each situation, and these principles must be considered throughout the process. Contracts should include details of funding, sponsorship, organizational relationships, potential conflicts of interest, and remuneration for researchers, as well as compensation provisions for injured research participants. The processing of personal data is unlawful unless the owner gives free and explicit informed consent and must be recorded by the necessary means. Consent must be clearly stated before notifying the owner of the information (WMA, 2019).

Results

This section presents a comprehensive analysis of factors influencing academic effectiveness, with a particular focus on sedentary tendencies and the importance of physical activation among school-age individuals. The aim of the study was to explore the relationships between academic self-efficacy and physical activity within this demographic.

The demographic characteristics of the study population were assessed, including sex distribution, socioeconomic status, educational attainment, height, and weight.

- The sex distribution in the poverty sample is 49.19% for women and 50.81% for men.
- Regarding the socioeconomic level of the population, the majority belong to a low level with 31.98%, followed by a medium-high level of 26.32%, and in third place with 23.08% to the medium-low.
- Regarding the educational level, the highest frequency is distributed for 4-year compulsory secondary education (CSE) with 17.3%, followed by equal distributions for 1 CSE and 2 CSE with 16.9%, and 16.1% for the post-16 stage of education.
- With respect to the height of the sample population, the average height of the participants is 1.65 m, where the minimum height recorded is 1.37 m and the maximum height is 1.95 m.
- Regarding the weight of the sample population, the average value was found to be 56 kg, with a minimum value of 34 kg and a maximum of 86 kg.

Physical Activity Levels

Various metrics of physical activity were evaluated, including sedentary time, light physical activity, moderate physical activity, vigorous physical activity, and moderate-to-vigorous physical activity (MVPA). The measurement of this variable and its subscales were obtained after a measurement within a period of 24 hours for 7 continuous days, considering the removal of the device for activities such as grooming or swimming; however, for practical purposes, we have sought to determine the time of physical activity in a single day.

About sedentary time

The average score was 4004 points, with a minimum value of zero and a maximum of 6936, indicating that the majority of the study participants spent a significant amount of time in a sedentary state. The Kolmogorov-Smirnov normality test shows that the value of $P = 0.000$ reveals significant asymmetry in the sedentary time distribution among participants. Regarding its distribution graph, it can be seen that at least 50% of the recorded data is in a distribution range between 3750 and 5000 points obtained.

About light physical activity

Participants engaged in a considerable amount of light physical activity, with an average of 1228 points. The significant p-value of 0.011 in the normality test indicates that the data distribution is not normal, suggesting some variability in light physical activity levels among participants. Additionally, the distribution around the median value of 1229 suggests a relatively uniform distribution of the data.

About moderate physical activity

An average value of 356.5 points was recorded, with a

maximum value of 806.75 and a minimum of 0, where the normality test shows a value of P = 0.047, implying some variability in moderate physical activity levels among participants. Additionally, the distribution graph indicates that most data points cluster around the range of 300 to 450 points, suggesting a concentration of moderate physical activity within this range among participants.

About vigorous physical activity

Participants engaged in vigorous physical activity to a limited extent, with an average score of 20.45 points, a minimum value of zero, and a maximum of 209. Regarding the normality test, a value of P =0.000 was recorded, so the data present a statistically significant difference. However, its distribution graph showed that more than 50% of the recorded data is below 50 points. In this particular case, it is possible to observe that the records show data that far exceeds the distribution range, which could imply some type of bias in the capture or recording of data.

About the MVPA (Moderate Vigorous Physical Activity) activity

The average value recorded was 390.87 points, with a minimum value of zero and a maximum of 908. Before the normality test, a value of P = 0.021 was recorded, which represents that the data are statistically significant, and in its distribution graph, it is observed that the most data is between 300 and 500 points.

The results of the Physical Activity Levels study reveal that the majority of participants in the study spend a significant amount of time in a sedentary state. While a considerable amount of light physical activity is observed, levels of moderate and vigorous physical activity are low in comparison. However, most participants engage in moderate-to-vigorous physical activity, with the majority of data concentrated between 300 and 500 points on the activity scale. These findings underscore the importance of implementing interventions aimed at increasing physical activity and reducing sedentary behavior in the studied population.

Sleep Patterns

Sleep patterns were analyzed, including rest efficiency, total minutes in bed, total time asleep, and time to fall asleep. Data on sleep patterns was collected through self-report and objective measures.

About rest efficiency

Rest efficiency reflects the effectiveness of sleep by measuring the percentage of time spent asleep while in bed. The data revealed a wide range of rest efficiency scores, with the maximum value recorded at 98.15 points, indicating highly efficient sleep, and the minimum at 67.66 points, suggesting lower sleep efficiency. On average, participants achieved a rest efficiency score of 86.54 points.

Furthermore, the normality test indicated a statistically significant distribution of rest efficiency scores (p = 0.000). The concentration of scores within the range of 80 to 90 points suggests that a significant proportion of participants experienced moderately high to high rest efficiency. These findings underscore the variability in sleep quality among participants, with some achieving optimal rest efficiency while others may experience challenges in maintaining consistent and effective sleep patterns.

Regarding the total minutes in bed

Total minutes in bed represent the duration of time participants spend in bed, encompassing both sleep and awake periods. The data indicates variability in this metric, with a wide range of scores observed. The maximum value is 660.29 points, with a minimum of 359.43 and an average value of 496.42. The normality test gives a value of P =0.200, indicating that the distribution of total minutes in bed is not statistically significant. This suggests that the variability in this metric may not be due to random chance alone but rather to other factors not captured in the analysis. Meanwhile, its distribution graph shows that the scores range between 475 and 525 points. For this particular variable, the record of two data points is observed, which is well above the average data range. Overall, these findings highlight the diversity in total minutes spent in bed among participants, with some individuals experiencing longer or shorter durations. The presence of outliers suggests potential variability in sleep habits or external factors influencing bedtimes.

In terms of total time asleep

The data regarding total time asleep provides insights into the duration of sleep experienced by participants, encompassing both sleep duration and sleep quality. The maximum value was recorded at 554.57, with a minimum value of 285.86 and an average value of 423 points; similarly to the previous variable, a value of P = 0.200 has been recorded, so the data are not statistically significant, while both its distribution graphs show that most of the data is between 400 and 450 points. Overall, these findings highlight the variability in total time asleep among participants, with some individuals experiencing longer or shorter sleep durations.

How long it takes to fall asleep

The data on how long it takes to fall asleep provides insights into sleep onset latency, or the time it takes for participants to transition from wakefulness to sleep. The maximum value recorded was found at 159.86, with a minimum value of 7.86 and an average value of 60.57. In contrast to the previous variables, the normality test shows a value of P =0.000, so the results are statistically significant. The traffic distribution shows that the majority of data is between 50 and 70 points. It is worth mentioning the record of a single point that is above the established range.

Daily Displacements

Participants' daily travel habits, such as modes of transportation to school and other destinations, were examined to assess their relationship with physical activity levels and

academic performance. Data on daily displacements were obtained through self-report.

The following graph shows that 54.44% of the studied population travels to school on foot, and 4.84 percent do so by bike or scooter; however, 40.73 percent do so by car or electric scooter. This shows a distribution slightly skewed towards physical activity, considering the way participants get to school.

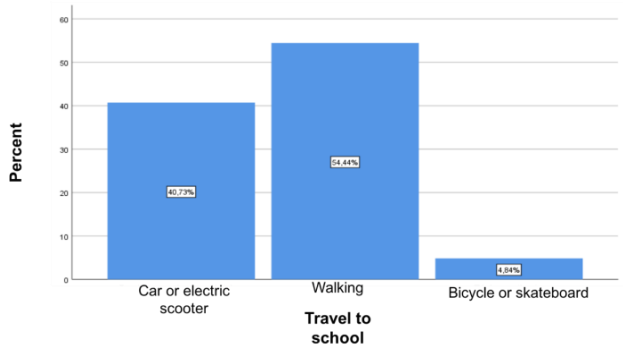

Figure 1. Frequencies in traveling to school

About daily travel

The data collected shows that 54.44% of the participants make their daily trips on foot, while 8.87% do so in a way that involves physical activity, such as riding a bike or scooter, compared to 36.69% of those who do so by car or electric scooter. These data show a similarity to the variable on traveling to school, where a tendency is perceived to make trips that involve physical activity.

Participation in Organized sport

The study investigated participants' engagement in organized sports, examining trends in approval and disapproval of such activities among the population. Data on participation in organized sports were collected through self-report.

The results show that 90 and 8.79% of the participants totally disagree with the practice of an organized sport, in contrast to the same proportions of 0.40% for some degree of approval with this type of practice.

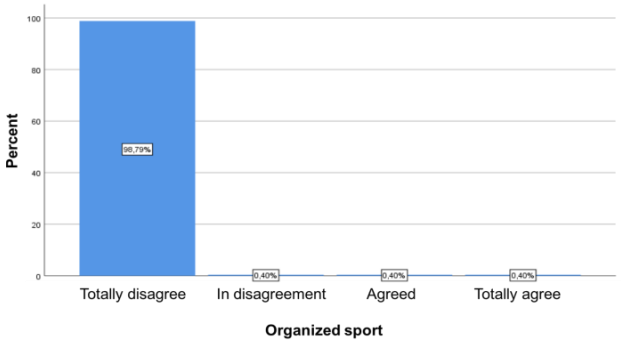

Figure 2. Approval for sports practice

Correlation between Academic Efficiency and Physical Activity/Seep

The relationship between academic efficiency, as measured by academic deficiency, and physical activity/sleep patterns was explored. Correlation analyses were conducted to identify potential associations between these variables. This comprehensive examination utilizes a combination of self-report and objective measures to provide insights into the multifaceted relationships between physical activity, sleep, and academic effectiveness among school-age individuals. Results of perceived academic deficiency. The candidate record shows an average value of 86.54, with a maximum value of 98.15 and a minimum of 67.66. On the other hand, in normality, they show a value of P =0.000, so these results are statistically significant. The distribution graph shows that the percentages obtained are between 80 and 90 points.

Results between academic verification correlations and variables related to physical activity

For the analysis of this data, the premise is generated that the values close to 0 today do not show a correlation, while the data closer to 1 shows a stronger positive correlation; in the opposite case, a value closer to -1 shows a stronger negative correlation.

The findings suggest a significant relationship between academic efficiency and various factors, including height, weight, sleep efficiency, total physical activity time, total sleep time, and different levels of physical activity (table 2).

Table 2.
Correlations between variables.

Rho de Spearman		Heigh	Weight	Efficiency	TMB	TTAS	TUFS	Sedentary	Light	Moderate	Vigorous	MVPA	Academic Efficiency
Heigh	r	1,000	,780*	-,023	-,156*	-,213**	-,004	,204**	-,179**	-,417**	-,284**	-,407**	-,215**
Weigh	r	,780**	1,00	-,001	-,161*	-,176**	-,042	,183**	-,257**	-,432**	-,316**	-,424**	-,231**
Efficiency	r	-,023	-,001	1,000	-,354**	,499**	-,960**	,068	-,128*	-,079	-,051	-,087	,257**
TMB	r	-,156*	-,161	-,354**	1,000	,565**	,455**	-,171**	-,070	,055	,111	,070	-,100
TTAS	r	-,213**	-,176*	,499**	,565**	1,000	-,374**	-,114	-,187**	,007	,092	,016	,114
TUFS	r	-,004	-,042	-,960**	,455**	-,374**	1,000	-,092	,100	,072	,080	,085	-,226**
Sedentary	r	,204**	,183*	,068	-,171**	-,114	-,092	1,000	,043	-,263**	-,244**	-,283**	-,056
Light	r	-,179**	-,257**	-,128*	-,070	-,187**	,100	,043	1,000	,656**	,288**	,626**	,329**
Moderate	r	-,417**	-,432**	-,079	,055	,007	,072	-,263**	,656**	1,000	,609**	,989**	,446**
Vigorous	r	-,284**	-,316**	-,051	,111	,092	,080	-,244**	,288**	,609**	1,000	,702**	,389**
MVPA	r	-,407**	-,424**	-,087	,070	,016	,085	-,283**	,626**	,989**	,702**	1,000	,463**
Academic Efficiency	r	-,215**	-,231**	,257**	-,100	,114	-,226**	-,056	,329**	,446**	,389**	,463**	1,000

**. The correlation is significant at the 0.01 level (two-sided).
*. The correlation is significant at the 0.05 level (two-sided).
TMB: Total Min. in Bed
TTAS: Total Time Asleep
TUFS: Time Until Fall Sleep

Discussion

The results of the study shed light on the complex interplay between physical activity, sleep patterns, and academic performance among adolescents.

Based on the results obtained, it is possible to discuss the different results obtained for the variables in physical activity, where it has been shown that (1) there is a positive correlation with academic effectiveness, especially with moderate exercise and MVPA. This aligns with previous findings by Rodríguez, Esteváz, and Cadenas (2019), who demonstrated a positive correlation between physical activity and cognitive function, thus reinforcing the idea that physical activity can impact academic outcomes. Additionally, López Malque et al. (2023) and Copetti et al. (2020) reported positive associations between physical activity and academic achievement in adolescents, providing further support for the observed correlation. For instance, Keane et al. (2018) demonstrated that physical activity enhances cognitive function, which in turn contributes to academic success. Similarly, Rodríguez et al. (2019) and Xia et al. (2021) found that adolescents engaged in regular physical activity exhibited improved cognitive abilities, leading to better academic performance. Moreover, López Malque et al. (2023) and García-Hermoso et al. (2021) reported a direct link between physical activity and academic achievement, indicating that students who are physically active tend to perform better academically. Therefore, the study's findings are in line with these previous research outcomes, reinforcing the notion that regular physical activity positively influences both cognitive function and academic achievement among adolescents. In the same way that increasing usual physical activity can help improve physical health and reduce cognitive decline in adolescents (Verstrate, Cardon, & De Clerco, 2018; Augests & Jiang, 2018), High physical activity has been reported to be associated with mental health, including depression, anxiety, and stress in children and adolescents, and can reduce negative emotions in young people (Ma, Chiu, Wang, & Wang, 2020). Some studies have also shown that physical exercise and screen time are related to children's academic performance and that of young people. The findings of a study by Álvarez-Bueno et al. (2018) show that physical activity, especially physical exercise, improves classroom behavior and improves many aspects of academic performance, especially skills related to mathematics, reading comprehension, and composite scores. Shown to promote in adolescents.

For their part, (2) the conditions of rest are observed as a negative relationship to academic efficiency, however it has not been possible to determine which condition prevails over the other, that is; If high academic efficiency is conditioned and reduces the quality of sleep and rest, or if adequate sleep and rest are obtained at the cost of a decrease in academic efficiency, in this sense, current literature describes that the interaction between subjective sleep and academic performance in college students, reporting a positive association between sleep quality and academic performance (Ahrberg, Dresler, & Niedermair, 2022; Baert, Omey, & Vershaest, 2018; Toscano-Hermoso, Arbiniga, & Férnandez-Ozcota, 2020). For their part, sleep quality and deprivation have been identified as significantly associated with lower academic performance. Regarding academic performance, it was reported that the proportion and mean test results of students with sleep disorders were significantly higher compared to students with good grades (Datta, Nag, & Karmankar, 2018; Sweileh, Ali, & Sawalha, 2021; Eliasson, Lettieri, & Eliasson, 2020). Outside of these studies, there is no association between sleep quality and academic performance. However, the time needed to fall asleep and wake up influences school performance even more than sleep time (Armand & Biassoni, 2021), as higher academic performance has also been observed to be associated with shorter sleep in young adults aged 10 to 20 years, including students of different levels. In summary, the latest findings published in the literature on the consensus on the relationship between sleep and academic performance are not yet available. Furthermore, by examining the relationship between sleep and academic performance in the region, it has been possible to provide valuable information and provide an overview of the evolution of sleep habits in young people (Kheirandish-Gozal, 2019; Xu, Su, & Zou, 2021).

The discussion sheds light on the intricate interplay among physical activity, sleep patterns, and academic performance in adolescents, drawing from both the study's findings and existing literature. While the positive correlation between physical activity and academic effectiveness, particularly with moderate exercise and MVPA, aligns with previous research, several limitations should be considered. These include the relatively small sample size, potential response bias in self-report measures, and the omission of important variables like socioeconomic status and diagnosed sleep disorders. Additionally, the cross-sectional design hinders causal inference, urging for longitudinal studies to elucidate the temporal dynamics of these relationships. Furthermore, the study's specific focus on adolescents may limit the generalizability of the findings to other age groups. Addressing these limitations in future research could enhance our understanding of how physical activity and sleep patterns impact academic performance across diverse populations and contexts.

Conclusions

Academic efficiency is the result of different conditions that are related to the lives of students, in particular physical activity and rest, which are marked in a more profound way since they are related to the academic self-efficiency that students perceive.

It has been determined that physical activity, especially moderate degree and MVPA, presents a benefit in perceived academic efficiency, so it can be concluded that moderately intense physical activities are discreetly related to greater academic self-efficacy in the population of

students at the secondary and high school level.

For their part, the variables during the break show a negative relationship with respect to academic self-efficiency; however, it has not been possible to determine the predominance of one variable over another.

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