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Effects of physical exercise on academic performance in university students: A systematic review

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Cover Page Footnote

There are no acknowledgements in our study

REVIEWS

Effects of Physical Exercise on Academic Performance in University Students: A Systematic Review

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Abstract

Purpose: **To evaluate the scientific evidence on the effects of physical exercise on the academic performance of university students, through a systematic review.**

Methods: **Eleven hundred and fifty-three studies emerged from this search, based on the following selection criteria: articles published in the last 5 years, original studies of different types: experimental at any level, correlational, analytical, and observational, where any type of physical exercise is applied, in undergraduate university students, of any sex and university career. The review was finally performed with only 11 studies. Search for appropriate manuscripts was based on the following descriptive terms: "Exercise" AND "Academic Performance" AND "University Students" in English and Spanish. The search was conducted in the following databases: Web of Science (Core Collection), Scopus, and Pubmed. Our search strategy followed the PRISMA protocol. The Newcastle−Ottawa scale was used to assess the methodological quality and risk of bias of the studies.**

Results: **1153 studies were found and the systematic review was finally performed with 11 selected studies. Only 2 were conducted in Europe, 6 in Asia and 3 in America. The overall quality and level of bias could be considered as moderately positive with an average of 6.7 out of 9 stars. 7 were cross-sectional descriptive (64 % of the total), 2 correlational (18 %), 1 cross-sectional with correlational and linear regression analyses (9 %) and 1 quasi-experimental study (9 %). In all 11 the sampling was non-probabilistic. The samples ranged from 58 to 2324 students. The overall results of the correlations of some studies between physical exercise and academic performance, on average, there was a moderately significant and directly proportional relationship between both variables ($r = 0.348$; $p = 0.001$).**

Discussion: **Physical exercise has a moderate positive effect on the academic performance of university students at the international level.**

Keywords: Exercise, Academic performance, University students, Higher education

1. Introduction

Higher education represents a crucial stage in people's lives, where they acquire knowledge and skills for their professional future. In this context, academic performance becomes a determining factor for the success of university students [1,2].

The academic performance of university students is an essential factor in addressing the issue of the quality of higher education. On the other hand, academic performance is understood as that which visualizes the success of a student and is measured by the grade point average or through standardized performance tests [3−5], which allows a glimpse of the student's success or failure during his career, seen in another way, it is the performance in general terms where the student finishes his academic period and is assigned an average grade. University students present changes in their lifestyle, as an attribute of the transition to adulthood, some of which are not very beneficial since the decrease in their level of physical activity would be negatively related to a healthy lifestyle, which is why it is of interest to evaluate these variables [5].

The academic performance of university students is a topic of great interest to educators and researchers alike, as it plays a crucial role in the educational and professional success of individuals

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[6]. Over the decades, various factors have been identified as influencing academic performance, including cognitive, emotional, and social aspects [7–9]. However, in recent years, there has been a growing interest in understanding how lifestyle factors, such as physical exercise, may affect students' ability to perform academically.

Physical exercise has been widely recognized for its physical and mental health benefits. It can be defined as a type of planned and structured physical activity. It consists of repeating certain movements with the objective of improving or maintaining one of the components of physical fitness [10,11]. Numerous studies have demonstrated the positive effects of physical exercise on cardiovascular health, cognitive function, mood, and general well-being, especially aerobic exercise, on structural changes in the brain, such as neurogenesis, angiogenesis, hippocampal enlargement, and connectivity [12–16]. The brain also exhibits structural changes in response to regular exercise. In particular, structural changes have been observed in the hippocampus that modulate memory and stress regulation. Neurogenesis and increased white matter connectivity have also been observed in some studies in response to exercise. Physiological changes resulting from exercise suggest adaptive plasticity that could be harnessed to improve fitness, cognition [17–19].

However, its specific impact on the academic performance of university students has been the subject of debate and exploration. Although previous research has been conducted on this association, the evidence is heterogeneous and often contradictory.

In this context, a systematic review could be crucial to synthesize and critically evaluate the existing evidence on the effects of physical exercise on academic performance in university students. By comprehensively examining the available studies, this review could identify patterns, inconsistencies, and gaps in the current research, as well as provide an objective assessment of the strength and direction of the association between physical exercise and academic performance. The results of this systematic review could provide valuable information for university students seeking to improve their academic performance, educational institutions wishing to implement physical activity promotion programs, and public policy makers seeking to improve the health and well-being of the university population. However, despite the existence of research on the subject, no updated systematic reviews were found that synthesize the scientific evidence on the effects of physical exercise on the academic performance of university students.

Therefore, the main purpose of the systematic review was to evaluate the scientific evidence on the effects of physical exercise on the academic performance of university students, through a systematic review.

2. Methods

Eleven hundred and fifty-three studies emerged from this search, based on the following selection criteria: articles published in the last 5 years, original studies of different types: experimental at any level, correlational, analytical, and observational, where any type of physical exercise is applied, in undergraduate university students, of any sex and university career. The review was finally performed with only 11 studies.

2.1. Search strategies

The search strategies followed the guidelines of the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement [20] and were based on the following descriptive terms and keywords defined by the authors and indexed in the Medical Subject Headings (MESH): “Exercise” AND “Academic Performance” AND “University Students”. Only the Boolean operator “AND” was used to locate records containing all the desired terms and to make the search more specific and selective.

The search was performed in English and Spanish using the same methodology. The combination of these keywords was taken from the following academic journal databases: Web of Science (Core Collection), Scopus and Medline through Pubmed. The advanced metasearch option was performed, using the resources inherent to each database.

The search procedures were performed from February 1 to 28, 2024. The period selected for the search was: all articles, meeting the inclusion requirements, published between January 1, 2019 and January 31, 2024. The search strategy was carried out by two independent and blinded reviewers, who performed the initial search using the list of key words prepared for this analysis by the authors who wrote the article. With a degree of concordance of the evaluators for the selection, according to the Kappa test of 0.86, it can be classified as very good.

2.2. Data extraction

The following screening procedures were implemented to determine whether the articles obtained in the initial searches were relevant to the present study: (a) reading the titles, if the titles appeared relevant and after initial review all duplicates were removed; (b) reading the abstracts, if the abstracts

did not provide sufficient information related to the inclusion criteria or appeared to be unavailable, they were excluded from the study; (c) reading the full-text articles, if the articles did not meet the inclusion criteria, they were excluded from the study; (d) in case of disagreement among the investigators, a third opinion was requested from an independent reviewer to assist with the evaluation (included, excluded and borderline) and discussion of the articles until consensus was obtained for inclusion or exclusion in the systematic review.

2.3. Study selection protocol

The protocol used included inclusion and exclusion criteria. The inclusion criteria used were: articles in journals indexed in the scientific databases described above, in English and Spanish, in the last 5 years, original studies of different types: experimental at any level, correlational, analytical, and observational.

Where any type of physical exercise is applied, in undergraduate university students exclusively in populations only of university students of regular daytime courses at the undergraduate level, of any age and sex and of any university career. In addition, that the terms: physical exercise or physical activity and academic performance and students were explicitly found in the title and/or abstract. Open access studies.

The exclusion criteria included studies that presented evidence of results that did not include the academic performance of university students in their analysis, but only other elements of an academic nature. Descriptive observational studies. Studies on students at other levels, primary, secondary or postgraduate.

Studies in students who also work, or in students of encounter courses. In residents of medicine and health sciences; and in review articles and/or meta-analysis.

2.4. Quality assessment (QA)

The positioning guidelines of the PRISMA statement [20] were followed to assist in the methodological design of this study. These guidelines describe the three stages (identification, screening, and inclusion) for conducting research and manuscript selection within a systematic review (SR) and present the graphical option of drawing a study flowchart according to this statement (Fig. 1).

The Newcastle–Ottawa Scale (NOS) was used to evaluate the methodological quality and risk of bias of the studies [21]. One of the most commonly used to evaluate non-randomized studies. It consists of three dimensions: Selection, Comparability and Outcome. With seven categories in total, assessing: representativeness of the sample, justification of sample size, comparability between respondents and non-respondents, determination of exposure, comparability based on study design or analysis, assessment of outcome, adequacy of statistical analysis, and sufficient follow-up to produce the outcome. A total of nine stars may be awarded if the study meets certain criteria, with a maximum of four stars assigned for the screening dimension, a maximum of two stars assigned for the comparability dimension, and a maximum of three stars assigned for the outcome dimension [22].

Since the study was a systematic review without meta-analysis, the heterogeneity of the selected studies was not assessed. The decision not to perform a meta-analysis was made on the basis of the large differences found among the studies reviewed. Studies were excluded, according to the criteria proposed above that did not meet the above characteristics and thus reduce possible confounding in the results of the included studies.

3. Results

In the comprehensive search of all the databases mentioned, 1153 studies were found according to the descriptors used (265 in Medline/Pubmed, 733 in Web of Science Core Collection and 155 in Scopus). The vast majority of them were not related to the topic reviewed or were duplicates, by reading the title, leaving 264 studies. Eighteen studies were included by reading the abstract and meeting the inclusion criteria.

Finally, there were 11 studies to be considered to conclude the research at this level, included after the complete reading of the text. The systematic review was finally performed with these 11 selected studies (see Fig. 1).

The overall quality and level of bias of the included studies could be considered moderately positive, with total stars awarded ranging from 5 to 8. There were two studies with 8 stars, five studies with 7 stars, three with 6 and one with 5 stars, for an average of out of 9 stars (see Table 1).

The 11 studies selected were original and carried out in different countries. Of these only 2 were conducted in Europe (the 2 in Turkey for 18 % of the total), most of them were conducted in Asia (3 in China and 3 in Saudi Arabia for 54.5 %) and finally 3 were conducted in America (specifically in the United States for 27.5 %). Regarding the types of studies, 7 studies were descriptive cross-sectional

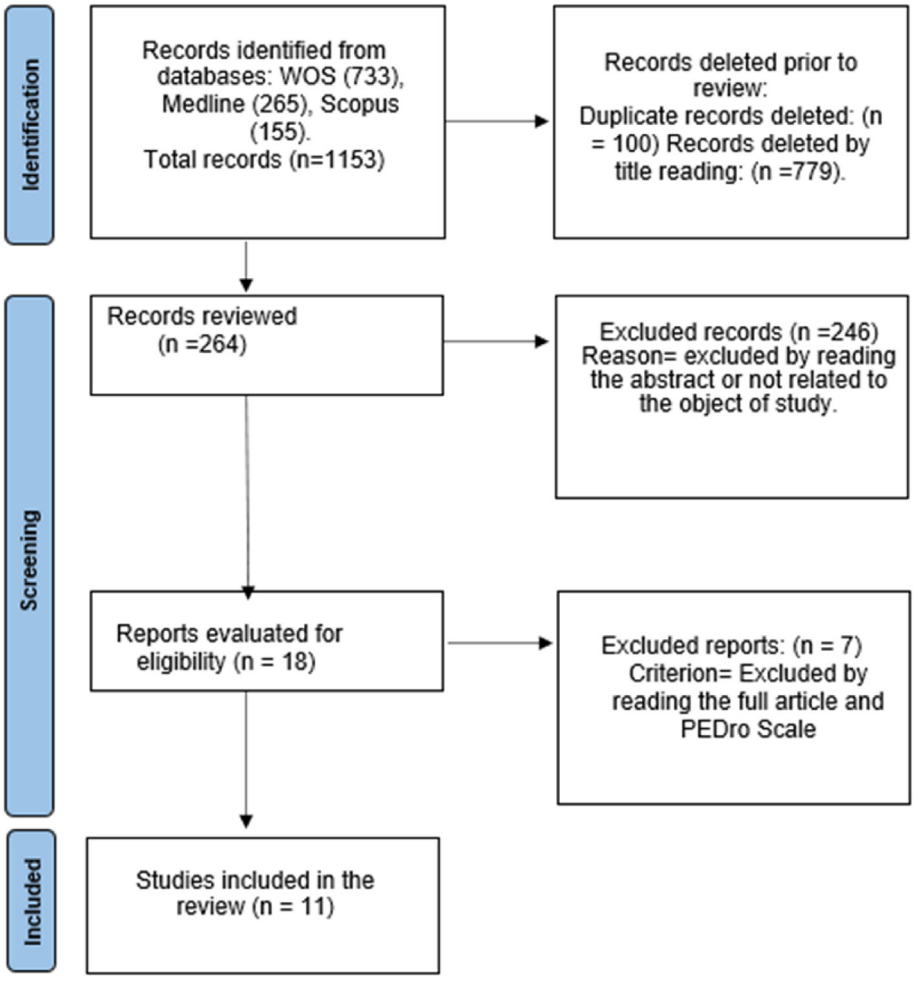

Fig. 1. PRISMA flowchart for the study selection process.

Table 1. Results of the evaluation of the methodological quality of the studies with the Newcastle–Ottawa scale.

References	Selection				Comparability	Exhibition			Total	
	1	2	3	4	5–6	7	8	9	Study quality	
Alshammari et al. [25]		*	*	*	**	*	*	*	8	High
Hou et al. [26]	*	*		*	**			*	6	Moderate
Broaddus et al. [27]		*	*	*	**	*	*		7	High
Du et al. [28]	*		*	*	**	*	*		7	High
Alhazmi et al. [29]		*	*	*	**	*	*		7	High
Moawd et al. [30]	*	*	*	*		*		*	6	Moderate
Zhai et al. [31]	*	*	*	*			*		5	Moderate
Kotaman and Evran [32]		*	*	*		*	*	*	6	Moderate
Bayramlar et al. [33]	*	*	*		**	*		*	7	High
Nemec et al. [34]		*	*	*	**	*	*	*	8	High
Niedermeier et al. [35]		*	*	*	**		*	*	7	High

Note: 1: Representativeness of the sample, 2: Sample size, 3: Comparability between respondents and non-respondents, 4: Determination of exposure, 5–6: Comparability based on study design or analysis, 7: Evaluation of results, 8: Statistical test, 9: Sufficient follow-up to ensure that the study is result. *: One point, **: Two points.

studies (64 % of the total), 2 correlation studies (18 %), 1 cross-sectional study with correlational and linear regression analysis (9 %), 1 quasi-experimental study (9 %). In the 11 studies, non-probability sampling was used. The samples ranged from 58 to 2324 students. The sum of the samples of the previous studies was 6553 students (X = 595.73). Data were extracted from the articles included in the

studies and organized in a specific table, following the PRISMA statement. The different items included: authors, year of publication, country where the study was conducted, sample, research methods and main results of the study (see Table 2).

The most frequent university careers were those related to health sciences such as medicine, dentistry, pharmacy, nursing and clinical laboratory. In addition, in the overall results of the correlations of some studies between physical exercise and academic performance, on average, there was a moderately significant and directly proportional relationship between both variables ($r = 0.348$; $p = 0.001$).

The main instruments used to measure physical exercise levels were the daily number of steps, the International Physical Activity Questionnaire (IPAQ), the Fitbit instrument, the Physical Activity Readiness Questionnaire (PAR-Q) and, to a lesser extent, Ad Hoc surveys. In the case of the academic performance variable, the students' grade point average during the study period was mainly used.

4. Discussion

The main objective of this study was to evaluate the scientific evidence on the effects of physical exercise on the academic performance of university students (specifically undergraduate students), by means of a systematic review.

The above results could be due to various reasons, among them could be the need to carry out a greater number of experimental type research at any of the existing experimentation levels, since most of the studies found were of the cross-sectional descriptive and correlational type. It is also necessary for a higher level of results that the sampling processes be prioritized probabilistic, which would considerably reduce the problems of bias in the sampling and increase the representativeness of the sample [23].

The priority use of the International Physical Activity Questionnaire (IPAQ) in the measurement of physical exercise levels may be due to its ease of application and the quality of the data obtained. This instrument arose in response to the need to create a standardized questionnaire for population-based studies worldwide, which cushions the excess of uncontrolled information resulting from the excessive application of evaluation questionnaires that have hindered the comparison of results and the insufficiency to assess physical activity in different settings. It examines different dimensions of physical activity, in order to have information that can be used in population-wide health monitoring and surveillance systems. It has been validated in several studies in European, Asian, Australian, African and American populations, showing encouraging results [24]. Similar to the Physical Activity Readiness Questionnaire (PAR-Q) which is a questionnaire consisting of 7 simple questions about the health of the person who wants to start a Physical Activity program. Originally developed by the Canadian Society of Exercise Physiology, the PAR-Q is validated in multiple publications and is used worldwide by organizations to quickly and easily assess the existence of health risks before starting a physical activity program [25].

The comparison of the results among the different studies selected shows the diversity among them, eight studies [26–33] conclude that physical exercises have favorable effects on the academic performance of university students. Such as the one conducted by Hou et al. (27) on Chinese students exposing that fitness levels in two health careers (medicine: $r = 0.34$, $p < 0.001$; dentistry: $r = 0.47$, $p < 0.001$), were significantly associated with academic performance. Also, Broaddus et al. [28] found positive and significant correlations between Fitbit step count, lifestyle times, and academic performance.

These results highlight the importance of students maintaining a physically active and healthy lifestyle when entering college. Academic performance was significantly and negatively correlated with Life Score and Minutes. The variable with the highest overall correlation with academic performance was $r = 0.41$, $p < 0.0001$).

For Du et al. [29] exercise regularity significantly influences academic performance ($p < 0.001$). As long as they maintain good exercise regularity, they can achieve satisfactory academic performance. To achieve higher academic performance, it is imperative that students not only show exceptional physical activity regularity, but also maintain an increased average step frequency. In another research by Alhazmi et al. [30] Academic performance was positively correlated with physical activity, directly influencing the academic performance of Arab university students ($r = 0.048$, p-Value $= 0.367$).

Moawd et al. [31] also found a high significant correlation between academic performance and physical activity ($p < 0.05$) at moderate and high levels of physical activity, with no significant differences at low levels of physical activity in Arab female undergraduate medical students. Physical activity had a direct effect on cardiorespiratory fitness, which in turn influenced academic performance among participants only at moderate to high levels of physical activity. Similar to the study by Zhai et al. [32] where several fitness indicators (50 m sprint, long jump, pull-ups, pull-ups, 100 m run) predicted academic performance. Overall fitness

Table 2. Results of the 12 selected studies.

Authors	Year	Country	Type of Study	Sample	Methods	Main Results
Alshammari et al. [25]	2022	Saudi Arabia	Cross-sectional descriptive study	317 medical students at the University of Ha'il. Non- probability sampling	An Ad Hoc instrument (survey) of 28 questions was applied, divided into four different sections: (1) Socio-demographic characteristics (five questions); (2) Physical activity pattern (seven questions); (3) Eating habits (eleven questions); and (4) Academic performance (five questions).	Of the respondents, 31.2% performed light activities, such as walking, on an average of six to seven days, while 71.3% performed moderate activities once a week and 61.5% performed strenuous activities on an average of one day a week. A strong statistically significant association was determined between hours of vigorous physical activity with test performance with a p value of 0.001.
Hou et al. [26]	2020	China	Cross-sectional descriptive study	316 total students, 212 medical and 104 dental students from Tongji University.	Physical test scores were used to represent students' physical fitness. Academic performance was measured by mean course grade ($p < 0.05$).	Physical fitness scores (medicine: $r = 0.34$, $p < 0.001$; dentistry: $r = 0.47$, $p < 0.001$) were significantly associated with academic performance. Physical fitness, significantly contributed to the academic performance of Chinese medical and dental students.
Broaddus et al. [27]	2021	United States	Correlation study	581 first-semester students enrolled at Oral Roberts University	Data were collected on physical activity levels (Fitbit instrument) and heart rate, 1-mile field test times, and results of a healthy lifestyle survey. Academic performance measured by semester grade point average.	Positive and significant correlations between Fitbit step count, lifestyle times and academic performance, Academic performance was significantly and positively correlated with sex, mode and the two activity-related Fitbit activity variables, Steps and FatBurn. The variable with the highest overall correlation with academic performance was Steps ($r = 0.41$, $p < 0.0001$). Performing linear regression, it was found that academic performance changes linearly with Steps ($\beta = 0.0001$, $p < 0.0001$), FatBurn ($\beta = 0.0012$, $p = 0.0003$), Sex ($\beta = 0.2240$, $p = 0.0004$), Mode ($\beta = 0.2464$, $p = 0.0057$).

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Table 2. (continued)

Authors	Year	Country	Type of Study	Sample	Methods	Main Results
Du et al. [28]	2023	China	Correlation study	2219 students from Sichuan University of International Studies.	Academic year average scores for academic achievement. Physical fitness test scores from the Educational Management System. Physical activity log data were extracted from a running app installed on their cell phones, Physical behavior indicators by Physical Activity Readiness Questionnaire (PAR-Q).	Students who complete running exercise with a mean frequency of 1 time/week and a duration of 16 −25 min outperform approximately 88% of other students in academic performance. Regularity of exercise significantly influences academic performance ($p < 0.001$). As long as they maintain good exercise regularity, they can achieve satisfactory academic performance (PA = 79.951, comparable to the overall mean of 79.553). It is the students who present regular exercise patterns, slower pace and lower frequency of steps those who excel in academic achievement.
Alhazmi et al. [29]	2021	Saudi Arabia	Cross-sectional descriptive study	379 undergraduate students (Nursing, Medical Laboratory, Physiotherapy), Medicine and Surgery, Dentistry and Oral Surgery, Diagnostic Radiology, Pharmacy of King Khalid University.	Online questionnaire through the university's web portal that included academic performance according to the National Center for Assessment in Higher Education (NCAHE) used in the country's cumulative average. Physical activity pattern with question: How many hours do you exercise?	Academic performance was negatively correlated with BMI at a significance level of 0.001, and positively but insignificantly correlated with physical activity ($r = 0.048$, p-Value = 0.367).
Moawd et al. [30]	2020	Saudi Arabia	Cross-sectional descriptive study	100 female undergraduate medical students at Prince Sattam Bin Abdulaziz University.	Physical fitness was assessed using the 20 m Shuttle Run Test [SRT], physical activity levels were determined using the International Physical Activity Questionnaire [IPAQ] and Academic Performance [PA] was detected using Grade Point Average in the last three consecutive semesters and the relationship between them was tested	High significant correlation between physical ability, academic performance and physical activity ($p < 0.05$) at moderate and high levels of physical activity, with no significant difference at low levels of physical activity in students ($p > 0.05$).Results of bootstrapped mediation analysis indicated that physical activity had a direct effect on physical ability, which in turn influenced academic performance among participants only at moderate to high levels of physical activity.

Zhai et al. [31]	2020	China	Descriptive cross- sectional design	2324 undergraduate students from three Chinese universities.	Physical fitness was measured using the Chinese National Student Physical Fitness Standard for Chinese students; academic performance was determined based on one's overall grade point average during the last academic year. These were used to divide participants into three categories: low, moderate and high. Into three categories: low, moderate and high.	Among male students, several indicators of physical fitness (50 m sprint, standing long jump, sit-ups, timed squats, 1000 m run) predicted academic performance. Among female students, several indicators of physical fitness (50 m sprint, timed sit-ups squats, 800 m run) predicted academic performance, Overall physical fitness was positively associated with academic performance, Low academic performance was related to low overall physical fitness. The probability of low academic performance was lower among students with low physical fitness.
Kotaman and Evran [32]	2021	Turkey	Quasi-experimental study	58 students from Harran University in total. Experimental group (29 students), Control group (29 students).	Intervention consisted of 2-min exercises consisting of moving all joints five times at the beginning and in the middle of each lecture; nothing was applied to the control group. To measure academic performance, standardized multiple-choice test items from the Examination for Selecting Government Officers (ESGO) were used.	Academic performance was significantly higher in the experimental group, with a mean difference of $\Delta M = 3.373$, $SD = 1.053$, ($p = 0.006$) with respect to the control group and with the mean difference of $\Delta M = 3.344$, $SD = 0.979$, ($p = 0.002$). The movement intervention had a positive and significant effect on academic performance. Direct positive impact of physical exercise on academic performance. Physical exercise functioned as a brief time-out, which elicited relaxation and arousal in the participants.
Bayramlar et al. [33]	2022	Turkey	Cross-sectional descriptive study	65 volunteer medical students from Istanbul Medeniyet University, non-probability sampling.	The International Physical Activity Questionnaire and cardiopulmonary exercise test results were applied. For academic performance, the results of the university exams were used.	No significant relationship was found between aerobic capacity and academic performance ($p < 0.05$). The correlation between aerobic capacity and academic performance were ($p < 0.05$, $r \geq 0.025$). Flexibility score was found to be significantly higher in individuals with high academic activity scores ($p < 0.05$).

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Table 2. (continued)

Authors	Year	Country	Type of Study	Sample	Methods	Main Results
Nemec et al. [34]	2020	United States	Cross-sectional descriptive study	63 s-year pharmacy students at Western New England University, non-probability sampling.	Daily number of steps and physical activity levels were measured using the Fitbit. Academic performance through the students' grade point average during the study period.	No significant and identifiable relationships were found between test scores or grade point average and physical activity. Physical activity was not a strong predictor of either test scores or grades. Students took an average of 7622 steps per day. There was a 20% decrease in steps in the 48 h prior to exams ($p < 0.001$). There were no significant relationships between overall academic performance and the number of steps measured with the Fitbit.
Niedermeier et al. [35]	2022	United States	Cross-sectional design with correlational and regression analysis.	121 nursing students at the University of Alabama.	A questionnaire developed by the researcher was used to collect information on the type, duration, frequency, and intensity of physical exercise performed by the nursing students. The students provided their grade point average as a measure of their academic performance.	There was no evidence that exercise was associated with academic performance, r105 = −0.036, 95% CI (−0.224 to 0.155), P = 0.714. Correlations between academic performance and specific types of exercise were not significant for aerobic exercise, r105 = −0.09, P = 0.38; strength exercise, r105 = −0.03, P = 0.76; balance exercise, r107 = 0.02, P = 0.85; or flexibility exercise r105 = 0.11, P = 0.25. Exercise was not significantly associated with anxiety or academic performance.

was positively associated with academic performance, even after controlling for the effects of lifestyle-related behaviors. Low academic performance was related to low general fitness. Furthermore, in an exercise intervention study by Kotaman and Evran [33] in Turkish students, there was a positive and significant effect on their academic performance ($p = 0.002$).

The above studies differ from those by Bayramlar et al. [34] who found no significant relationship between aerobic capacity and academic performance ($p < 0.05$, $r \geq 0.025$). Similarly, Nemec et al. [35] found no significant and identifiable relationships between test scores or grade point average and physical activity ($p < 0.001$). Physical activity was not a strong predictor of either test scores or grades. There were no significant relationships between overall academic performance and the number of steps measured with the Fitbit. Also, Niedermeier et al. [36] observed no evidence that exercise was associated with academic performance, r105 = −0.036, 95% CI (−0.22 to 0.16), P = 0.71. Correlations between academic performance and specific types of exercise were not significant for aerobic exercise, r105 = −0.09, P = 0.38; strength exercise, r105 = −0.03, P = 0.76; balance exercise, r107 = 0.02, P = 0.85; or flexibility exercise r105 = 0.11, P = 0.25.

Among the possible strengths of this study is the use of the PRISMA tool, the most widely used international design for systematic reviews with or without meta-analysis. Another notable strength is that this study can be considered as one of the first reviews that considers specific populations of undergraduate university students in this important topic of physical exercise practice and its relationship with academic performance in university students, compiling and analyzing correctly what was found in the main international scientific databases.

On the other hand, among the limitations could be the inability to reach a quantitative level of meta-analysis, despite the use of the PRISMA tool. There was a high degree of heterogeneity in the instruments used in each of the studies to measure the correlation between the variables, mainly in the measurement of physical exercise levels.

In the search, we did not find a variety of studies that met the criteria used, and few experimental studies at any level, since most were descriptive, cross-sectional and correlational. This could be considered a limitation in the quantification and qualification of the scientific evidence, since there is still not enough in-depth studies that relate physical exercise and academic performance in university students.

5. Conclusion

In general, it could be concluded that, according to the scientific evidence found, predominantly physical exercises have a moderate positive effect on the academic performance of university students at the international level. Most studies support this assertion, although there are others that fail to prove it.

Conflicts of interest

No conflict of interest.

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