

# SELF-MOTIVATION, SOCIAL SKILLS, AND RESILIENCE: THE TRANSFORMATIVE INFLUENCE OF PHYSICAL ACTIVITY ON COLLEGE STUDENTS

## LA AUTOMOTIVACIÓN, HABILIDADES SOCIALES Y RESILIENCIA: LA INFLUENCIA TRANSFORMADORA DE LA ACTIVIDAD FÍSICA EN ESTUDIANTES UNIVERSITARIOS

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### Abstract

The presented study explores a gap in research related to the influence of physical activity on the emotional intelligence of university students. Its main objective is to investigate the relationship between physical activity and emotional intelligence in university students, focusing on self-motivation, social skills, and resilience. A quantitative cross-sectional methodology was used, collecting data through online surveys from 813 students at the National University of Tumbes. The instruments included items from the emotional intelligence skills test and the International Physical Activity Questionnaire. The results indicated that physical activity has a significant positive impact on the emotional intelligence of university students. The findings show that students who regularly engage in physical activities exhibit greater self-motivation, better social skills, and higher resilience. It is concluded that promoting physical activity programs in the university setting not only improves students' physical health but also enhances their psychological and social well-being, significantly contributing to their academic and personal success.

**Keywords:** Self-motivation, social skills, resilience, physical activity, emotional intelligence.

### Resumen

El estudio presentado, explora una brecha en la investigación relacionada con la influencia de la actividad física en la inteligencia emocional de los estudiantes universitarios, tiene como objetivo principal, investigar la relación entre la actividad física y la inteligencia emocional en estudiantes universitarios, centrándose en la automotivación, habilidades sociales y resiliencia. Se utilizó una metodología cuantitativa transversal, recolectando datos mediante encuestas en línea a 813 estudiantes de la Universidad Nacional de Tumbes. Los instrumentos incluyeron ítems del test de habilidades de inteligencia emocional y del Cuestionario Internacional de Actividad Física. Los resultados indicaron que la actividad física tiene un impacto positivo significativo en la inteligencia emocional de los estudiantes universitarios. Los resultados indican que los estudiantes que participan regularmente en actividades físicas muestran mayor automotivación, mejores habilidades sociales y mayor resiliencia. Se concluye que fomentar programas de actividad física en el entorno universitario no solo mejora la salud física de los estudiantes, sino que también potencia su bienestar psicológico y social, contribuyendo significativamente a su éxito académico y personal.

**Palabras Clave:** Automotivación, habilidades sociales, resiliencia, actividad física, inteligencia emocional.

### Introduction

In the university context, physical activity has been recognized as a determining factor in the general well-being and personal development of students (Gómez, 2024). Regular physical activity not only improves physical health, but also positively influences several psychological and social aspects (Herbert et al., 2020). Social skills, self-motivation, and resilience are critical components that affect the academic performance and quality of life of university students. The ability to interact effectively, stay motivated, and overcome adversity is essential for success in both college and personal and professional life (Chen et al., 2023).

Despite the recognized importance of physical activity, many college students do not participate in sufficient levels of exercise, which can negatively impact their psychological and social well-being (Cassaretto et al., 2021; Granero-Jiménez et al., 2022). Lack of physical activity can lead to a decrease in social skills, less self-motivation, and less resilience, which

impacts their academic performance and quality of life (Ávila et al., 2021). This problem is aggravated by the high academic load and social pressures faced by university students, which limits their time and energy to participate in regular physical activities (Ferreira et al., 2022).

The proposed study addresses important aspects related to contributing scientific evidence about the effects of physical activity on the development of self-motivation, social skills, and adaptability in a Peruvian university environment, especially in rural areas like Tumbes.

### Physical Activity in University Students

Participation in physical activities, especially those that are done in groups, provides opportunities for students to develop and practice these skills in a dynamic and supportive environment (Di Bartolomeo & Papa, 2019). Additionally, regular exercise can increase self-confidence and reduce stress, which in turn can improve students' ability to interact effectively with their peers (Escobar et al., 2021; Martín-Rodríguez et al., 2024). In that same context, Herbert (2022) points out that physical activity is a factor that positively influences mental health and everything related to anxiety, depression, and stress reduction. It is also stated that it improves cognitive abilities, social skills, self-concept, and resilience in university students. Therefore, encouraging physical activity in the university context not only has benefits for physical health, but also for the development of other skills crucial for academic and personal success (Brown et al., 2024).

### Social Skills in University Students

On the other hand, social skills are essential for effective interaction and academic success in the university environment (Cajas et al., 2020). The ability to communicate, collaborate, and build healthy relationships is critical not only for academic development, but also for students' personal and professional growth (Le et al., 2018). These skills allow students to actively participate in group discussions, work effectively in teams, and establish social support networks that are crucial for emotional well-being and academic performance (Huang & Lajoie, 2023).

### Physical Activity and Social Skills in University Students

Regular participation in physical activities, especially those that involve group interaction, such as team sports or group exercise classes, provides an environment conducive to developing and practicing social skills (Rosenkranz et al., 2023). These activities allow students to interact with their peers, encouraging effective communication, cooperation, and building healthy relationships (Grady et al., 2022). In addition, physical exercise can increase self-confidence and reduce stress levels, which in turn facilitates more positive and effective social interactions (Durán et al., 2017). Several studies have shown that physical activity is associated with an increase in the perception of social support and in the ability to form and maintain interpersonal relationships (Huang et al., 2022). Likewise, promoting physical activity in the university environment not only offers benefits for physical health, but also reveals itself as an effective strategy to improve social skills (Johannes et al., 2024). This practice contributes significantly to students' overall well-being and academic success by fostering positive social interactions and the development of essential interpersonal competencies (Zheng, 2021).

In view of this, the first hypothesis (H1) is proposed: Physical activity significantly improves social skills by facilitating more positive and collaborative interactions between students.

### Self-motivation in University Students

Self-motivation is a critical component in the educational field, as it plays a crucial role in the academic success and personal development of students (Rossi et al., 2020). Students who are self-motivated have a greater ability to set and achieve personal goals, maintain focus, and overcome academic obstacles (Steinmayr et al., 2019). These students are more resilient in the face of difficulties, show greater persistence in their efforts, and have a more positive attitude towards learning (Ben-Eliyahu, 2019; Muenks et al., 2018). Self-motivation not only boosts academic performance, but it also fosters a sense of responsibility and self-discipline that is essential for long-term success (Tao & Jing, 2023).

### Physical Activity and Self-motivation in University Students

Regular participation in physical activities can provide students with the boost needed to stay focused and persistent in their studies (Buckley & Lee, 2021). Physical exercise releases endorphins and other neurotransmitters that improve mood and energy, which can translate into increased intrinsic motivation (Heijnen et al., 2016). In addition, physical activity can help develop self-discipline and time management, skills that are transferable to academic and personal contexts (Brown, 2024). The improvement in self-motivation derived from physical activity can lead students to adopt a more proactive attitude towards their studies, increasing their ability to face challenges and achieve their academic and personal goals (Sáez et al., 2021). Therefore, encouraging physical activity in the university environment not only benefits physical health, but also enhances self-motivation, contributing to the overall success of students (Cámara et al., 2023; Teuber et al., 2024).

This gives rise to the following second hypothesis (H2): Physical activity has a significant positive impact on self-motivation.

## Resilience in University Students

Resilience, defined as the ability to bounce back from adversity and adapt positively to stressful situations, is essential for success and well-being in university life (Cassidy, 2015; Gianino & Guzmán, 2022). Resilient students are able to cope with stress and academic difficulties with a positive and proactive attitude, allowing them to not only survive, but thrive in a challenging environment (Ang et al., 2021; Backmann et al., 2019; Ross et al., 2022). Resilience includes the ability to remain calm under pressure, find creative solutions to problems, and persist despite setbacks—skills that are crucial for long-term academic and personal success (Morgan, 2020; Rose & Palattiyil, 2020).

## Physical Activity and Resilience in University Students

Regular participation in physical activities can serve as a powerful tool for managing stress and improving resilience (Flores et al., 2021; García & Froment, 2017; San Román-Mata et al., 2020). Exercise not only improves physical health, but also has psychological benefits, such as reducing levels of anxiety and depression, and increasing self-esteem and a sense of control (Ghrouz et al., 2019; Hoyos-Cifuentes & Bernal-Torres, 2021; Mahindru et al., 2023). In addition, physical activities, especially those carried out in a team, can foster a sense of belonging and social support, which is essential for resilience (Jaramillo-Moreno & Rueda, 2021). By facing and overcoming physical challenges, students develop greater confidence in their abilities to handle adversity in other areas of their lives, including academic challenges (Fletcher & Sarkar, 2016; Seligman, 2011). Therefore, encouraging physical activity in the university environment not only improves physical health, but also provides students with the necessary tools to develop solid resilience, which is essential for their academic success and overall well-being (Yang et al., 2024; Zhang et al., 2022).

For this reason, the following third hypothesis (H3) is indicated: Physical activity contributes significantly to the development of resilience in university students.

This study aims to analyze the relationship between physical activity and these three crucial aspects of student development: social skills, self-motivation, and resilience. The findings of this research have the potential to provide valuable inputs for the design of interventions and programs that promote physical activity in the university environment, with the aim of improving the well-being and academic performance of students. By better understanding the connections between physical activity and these important psychological and social factors, effective strategies can be developed to support the well-rounded development of college students.

## Materials and Methods

### Methodology

The study used a cross-sectional quantitative design to examine the relationships between physical activity and emotional intelligence. It observed the level of development among university students who engage in physical activity, noting an increase in their social skills, higher levels of resilience, as well as improved psychological well-being. The data were collected at a specific time, reflecting the current state of these variables. Using PLS partial minimum equations, the hypotheses were analyzed and direct relationships between variables were explored.

### Participants

The participants in the study were university students from the National University of Tumbes, totaling 813, of which 56.09% were women and 43.91% were men. The ages of the participants ranged from 18 to 25 years, and they voluntarily agreed to participate and completed the online questionnaire. For the study, those with disabilities who do not engage in regular physical activity were excluded.

The study was conducted at the National University of Tumbes, located in northern Peru, which plays a fundamental role in the academic and social development of the region's youth. The socioeconomic characteristics of this university and its focus on the disciplines it offers made it a suitable candidate for the study, allowing for an analysis of the behavior of these variables. The need to promote physical activity within the university context has also been taken into account, based on a scientific study that highlights the benefits and enables authorities to provide more support for such activities.

### Instruments

To assess resilience, social skills, and self-motivation, some items from the emotional intelligence skills test developed by Ocaña (2011) were adapted. These items were presented on a 3-point Likert scale: "never," "sometimes," and "always." To measure physical activity, items from the International Physical Activity Questionnaire (IPAQ), adapted by Mantilla & Gómez-Conesa (2007), were used. These items were presented on a Likert scale ranging from 1 day to 7 days.

## Procedure

Data collection was carried out through online surveys using Google Forms, which were distributed to students of the National University of Tumbes. To reach a greater number of participants, social networks and institutional emails were used. Students received a direct link to the questionnaire, as well as QR codes that they could scan with their mobile devices for easy access to the survey.

Before starting the questionnaire, an informed consent section was included explaining the purpose of the study, the voluntary nature of participation, and the confidentiality and anonymity of the responses was guaranteed. Students had to read and accept informed consent in order to proceed with the survey.

## Statistical Analysis

The factor loads of the items were calculated for each latent variable, expecting loads greater than .7 to indicate an adequate contribution of the items to their respective latent variables. Internal reliability was evaluated using Cronbach's Alpha coefficient, with values greater than .7 considered acceptable to confirm the reliability of the scale. Composite reliability (RRC) was also calculated, expecting values greater than .7 to confirm the reliability of the scales. The extracted mean variance (AVE) was calculated to evaluate convergent validity, expecting values greater than .5 to consider that an adequate amount of variance is explained by the latent variables. In addition, discriminant validity was evaluated using the Heterotrait-Monotrait ratio (HTMT), expecting values lower than .85 to ensure that the latent variables are distinct from each other.

For the structural assessment, a structural model was specified to examine the relationships between the latent variables Physical Activity (PA), Self-Motivation (SM), Social Skill (SS), and Resilience (RE). The parameters of the model were estimated using the partial least squares method (PLS-SEM). Path Coefficients were calculated to evaluate the strength and direction of the relationships between latent variables, expecting significant coefficients ( $p$  values  $< .05$ ) and  $t$ -statistic coefficients greater than 1.96 to confirm significant hypotheses. The coefficients of determination ( $R^2$ ) and adjusted  $R^2$  were calculated to evaluate the explanatory power of the model, interpreting the values of  $R^2$  as follows: values of about .75 are considered substantial, values around .50 are considered moderate, and values of about .25 are considered weak. Finally, a collinearity test was performed by evaluating the Variance Inflation Factor (VIF), expecting values below five to ensure that there is no problematic collinearity in the model.

## Results

### Measurement Model

The reliability and convergent and discriminant validity analysis was carried out for the latent variables Social Skill (SS), Self-Motivation (SM), Resilience (RE) and Physical Activity (PA).

For Social Skill (SS), the factor loads of the items ranged from .501 to .867. Cronbach's Alpha was .702, the composite reliability (R.C.) was .798 and the extracted mean variance (AVE) reached a value of .505. These results indicate acceptable reliability and adequate convergent validity, exceeding the minimum threshold of .5 for AVE.

Regarding Self-Motivation (SM), the factor loads varied between .651 and .806. Cronbach's Alpha was .780, the C.R. .843 and the AVE .526. These values reflect high reliability and adequate convergent validity, meeting the minimum required criterion of .5 for AVE.

For Resilience (RE), the factor loads were in the range of .643 to .776. Cronbach's Alpha was .773, the C.R. .845 and the AVE .522. These results demonstrate good reliability and acceptable convergent validity, with an AVE meeting the minimum criterion of .5.

In relation to Physical Activity (PA), the factor loads were .940 and .813. Cronbach's Alpha was .723, the R.C. .871 and the AVE .772. The high reliability and excellent convergent validity of this variable are evident, as the AVE is significantly higher than the threshold of .5.

To evaluate discriminant validity, the HTMT was used. The results obtained were: SM  $\leftrightarrow$  PA: .207, SS  $\leftrightarrow$  PA: .179, SS  $\leftrightarrow$  SM: .677, RE  $\leftrightarrow$  PA: .293, RE  $\leftrightarrow$  SM: .754 and RE  $\leftrightarrow$  SS: .609. All HTMT values are less than .85, which indicates an adequate discriminant validity between the latent variables.

The results of the analysis indicate that the scales used to measure Social Skill, Self-Motivation, Resilience, and Physical Activity are reliable and valid. The values of Cronbach's Alpha, C.R. and AVE comply with acceptable parameters, and the HTMT indices suggest an adequate discriminant validity. This supports the reliability and validity of the measurements used in the study (table 1).

**Table 1**  
*Convergent and Discriminant Reliability and Validity Analysis*

Latent variables	Ítems	Factor Load	Alpha	C.R.	AVE
Social Skills (SS)			.702	.798	.505
I have conversations with people	SS1	.746			
I have a good sense of humor	SS2	.867			
I am able to understand the point of view of others	SS3	.501			
I communicate well with the people I interact with	SS4	.680			
Self-Motivation (SM)			.780	.843	.526
I value the good things I do	SM1	.767			
I am able to motivate myself to learn, study, pass, achieve something	SM2	.651			
I have confidence in myself, in what I am capable of doing, thinking and feeling	SM3	.806			
When I do things right I congratulate myself	SM4	.652			
I look on the bright side of things, I'm optimistic	SM5	.737			
Resilience (RE)			.773	.845	.522
I am able to get the worries that obsess me out of my mind	RE1	.724			
When things go wrong, my mood holds on until things go better	RE2	.643			
I think I am an emotionally balanced person	RE3	.750			
I control my fears and fears well	RE4	.776			
In moments of tension and anxiety I am able to relax and calm down so as not to lose control and act hastily.	RE5	.712			
Physical Activity (PA)			.723	.871	.772
During the past 7 days, how many days did you engage in intense physical activity such as lifting heavy weights, digging, aerobics, or brisk biking?	PAI	.940			
During the past 7 days, how many days did you do moderate physical activity such as carrying light weights, riding a bike at regular speed, or playing doubles tennis? Do not include walking.	PAM	.813			
Discriminant Validity - Heterotrait-Monotrait ratio (HTMT) - List					
SM <-> PA			.207		
SS <-> PA			.179		
SS <-> SM			.677		
RE <-> PA			.293		
RE <-> SM			.754		
RE <-> SS			.609		

Table 2 reports the results of the collinearity test performed to evaluate the internal model of our study. This test is to determine if there is an excessive linear relationship between predictors (constructs), which could affect the reliability of the estimates of the model parameters. The Variance Inflation Factor (FIV) was used as an indicator to measure the degree of collinearity between the constructs. In this table, it can be seen that the values of the Collinearity Inflationary Variable (FIV) for the relationships between Physical Activity (PA) and the other latent variables (SM, SS and RE) are 1.000. This indicates the absence of problematic collinearity between PA and the other variables of the model.

**Table 2**  
*Co-linearity Testing Internal Model*

Variables	PA	SM	SS	RE
PA		1.000	1.000	1.000
SM				VIC
SS				
RE				

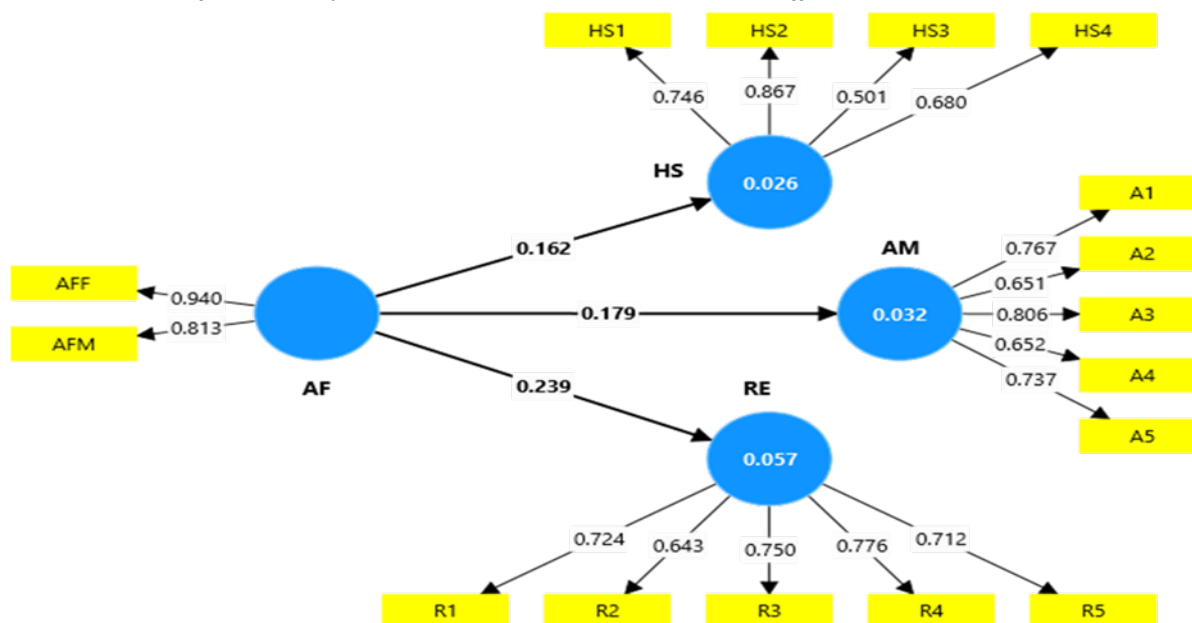
**Figure 1***Structural Model of Relationships Between Latent Variables With Route Coefficients and R<sup>2</sup>*

Table 3 presents the results of the structural model, where the relationships between the latent variables Physical Activity (PA), Self-Motivation (SM), Social Skill (SS) and Resilience (RE) are evaluated.

**Table 3***Results of the Structural Model*

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard deviation (SD)	T statistics (O/SD)	p values
PA -> SM	0.179	0.186	0.030	5.989	.000
PA -> SS	0.162	0.170	0.032	5.018	.000
PA -> RE	0.239	0.244	0.033	7.135	.000
PA -> SM	0.179	0.186	0.030	5.989	.000

For the relationship between Physical Activity (PA) and Self-Motivation (SM), the coefficient of the original sample (O) is 0.179, with a mean of the sample (M) of 0.186. The standard deviation (SD) is 0.030, resulting in a *t*-statistic of 5.989 and a *p*-value of .000. These results indicate a significant relationship between PA and SM.

Regarding the relationship between Physical Activity (PA) and Social Skill (SS), a coefficient of the original sample (O) of 0.162 and a mean of the sample (M) of 0.170 was observed. The standard deviation (SD) is 0.032, with a *t*-statistic of 5.018 and a *p*-value of .000. This also suggests a significant relationship between PA and SS.

For the relationship between Physical Activity (PA) and Resilience (RE), the coefficient of the original sample (O) is 0.239, with a mean of the sample (M) of 0.244. The standard deviation (SD) is 0.033, resulting in a *t*-statistic of 7.135 and a *p*-value of .000. These results indicate a significant relationship between PA and RE.

Finally, the consistency of the results of the relationship between Physical Activity (PA) and Self-Motivation (SM) is confirmed with an original sample coefficient (O) of 0.179, a sample mean (M) of 0.186, a standard deviation (SD) of 0.030, a *t*-statistic of 5.989 and a *p*-value of .000.

In summary, these results indicate that Physical Activity (PA) has a positive and significant impact on Self-Motivation (SM), Social Skill (SS) and Resilience (RE), with *p* values less than .05, which supports the validity of the hypotheses raised in the structural model.

## Discussion

The findings show that physical activity (PA) has a significant positive relationship with self-motivation (SM), evidenced by an increase in self-motivation associated with an increase in physical activity ( $\beta = .179$ ,  $p < .001$ ;  $T = 5.989$ ). Physical activity



is critical to various aspects of health, yet most college students are not active enough to fully benefit. Understanding the factors that influence physical activity from the perspective of behavior change theory is essential to developing effective, evidence-based interventions that promote physical activity in this group (Brown et al., 2024). These findings are consistent in part with the results of Guan et al. (2023), whose multivariate and univariate analysis of variance revealed that students scored significantly higher in motivation, perceived competence, and moderate physical activity. In addition, physical activity contributes to students' self-motivation by fostering skills such as self-discipline and time management, which are transferable to academic and personal contexts (Brown et al., 2024). These results suggest that educational institutions should promote physical activity to improve student motivation and well-being; it is crucial to design specific interventions based on behavior change theory to increase physical activity in university students; and public policies should encourage physical activity to reduce sedentary lifestyles and improve public health among young people.

The results of the research demonstrate that Physical Activity (PA) was positively and significantly related to Social Skills (HS), supporting the hypothesis that physical activity contributes to greater social skill acquisition ( $\beta = .162, p < .001$ ). A significant number of university students do not meet the physical activity guidelines recommended by the World Health Organization (WHO), which suggest that university students should aim for 150 to 300 minutes of moderate physical activity or 75 to 150 minutes of intense physical activity (Johannes et al., 2024). According to the results, it can be noted that those who exhibit positive behavior in the development of physical activities have better outcomes related to social skills. Therefore, it is important to recognize this and strengthen it for the benefit of the students.

The findings align with what Herbert (2022) indicates when stating that physical activity helps improve levels of anxiety, depression, and stress reduction. This will lead to better mental health, which in turn will enhance cognitive abilities, social skills, self-concept, and resilience in university students. In the same vein, Zhang et al. (2023) explain that physical activity improves cognitive abilities, social skills, self-concept, and resilience in university students, affirming the benefits to university students by fostering their non-academic skills, such as social relationships, life satisfaction, and mental health, thereby boosting their academic achievement, academic motivation, and commitment. Toriola et al. (2010) concludes with statistical support based on structural equations that health promotion, social development, personal development, and physical development are the activities that showed acceptable reliability estimates for the model. In light of the results, it is imperative to establish policies and programs that promote regular physical activity among students, due to its positive impact on the development of social skills. Integrating physical activity into the university curriculum can ensure that all students participate regularly. In addition, awareness of the benefits of physical activity for both physical health and the development of social skills should be increased.

The findings demonstrate a strong positive relationship between Physical Activity (PA) and Resilience (SR), that is, greater physical activity is significantly associated with greater resilience ( $\beta = .239, p < .001$ ). Our result coincides with the results of Dunston et al. (2022), since they state in their results that vigorous physical activity in undergraduate students was positively associated with resilience and perseverance in the mastery of effort, in addition, determination and resilience scores were significantly higher with higher volumes of vigorous physical activity and concludes that the intensity of physical activity may play an important role in the psychosocial determinants related to student success, such as courage and resilience.

On the other hand, Secer and Yildizhan (2020) conclude that the level of physical activity in university students is a variable that predicts the level of psychological resilience, finding no difference between men and women. Likewise, Lines et al. (2020) state that certain resilience resources at the individual level in university students were perceived as beneficial for physical activity and sedentary time, the findings did not support the moderating role of resilience resources. The direct and moderating effects between stress, physical activity, and resilience resources require further testing using longitudinal designs in which stressful periods occur naturally (e.g., student exams) or are experimentally manipulated. These findings suggest that universities should implement programs that promote vigorous physical activity to improve their students' resilience, contributing to both their physical and psychological well-being, and better preparing them to face academic and personal challenges.

## Conclusions

The study's findings demonstrate that physical activity (PA) has a significant positive impact on college students' self-motivation (SM), social skills (SS), and resilience (RE). PA is related to an increase in self-motivation, showing that students who exercise regularly have greater self-discipline and better time management, which is reflected in better academic performance. In addition, PA improves social skills by providing an environment to develop interpersonal competencies such as cooperation and effective communication, underlining the importance of integrating PA into the university curriculum. It was also evidenced that PA contributes to the development of resilience, helping students manage stress and increase their self-esteem, which improves their ability to face academic and personal adversities. These findings suggest the need to implement and promote physical activity programs in universities and public policies, highlighting that PA not only improves physical health, but also the psychological and social well-being of students, contributing to their overall success.

## Ethics Committee Statement

Not applicable because the study was conducted without putting the integrity of the participants at risk, participation was anonymous.

## Conflict of Interest Statement

The authors declare that there is no personal conflict of interest that could influence the presentation or interpretation of the results.

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## Authors' Contribution

Conceptualization Oscar C. La Rosa-Feijoó.; Methodology Ghenkis A. Ezcurra-Zavaleta.; Software Ghenkis A. Ezcurra-Zavaleta.; Validation Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Formal Analysis Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Investigation Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Resources Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Data Curation Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Writing – Original Draft Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Writing – Review & Editing Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Visualization Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Supervision Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Project Administration Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta.; Funding Acquisition Oscar C. La Rosa-Feijoó & Ghenkis A. Ezcurra-Zavaleta. All authors have read and agreed to the published version of the manuscript.

## Data Availability Statement

The data are not available because the results obtained were only used by the authors for the preparation of this article; they have not been submitted or uploaded to any database or repository. The data were used solely for the preparation of this scientific article.

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