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Sleep, chronotype, anxiety, personality, quality of life young university students

Sueño, cronotipo, ansiedad, personalidad, calidad de vida y rendimiento académico en adolescentes universitarios

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ABSTRACT

Introduction: Little is known about the relationship of sleep, personality and Academic Performance (RA) in students. **Objective:** To explore the relationship between sleep, chronotype, anxiety, personality, quality of life, and RA in university students. **Method:** The study was quantitative, observational cross-sectional. Cumulative RA (RAA), physiological sleep parameters, sleep quality index, chronotype, personality, anxiety and quality of life were explored in university students. Comparison and multiple linear regression were performed. **Results:** In a sample of 27 students, the following were found: Significant positive correlations between RAA and sex and sleep duration; variance for age, sleep, anxiety, attention to norms and sensitivity; significant effect in age and standard deviation of sleep, on the variance of the RAA (p=.001) with 39.1% to 50.8% of causality (R^2a= .391; R2= .508). **Conclusions:** The RAA in youth is moderated by sleep duration and sleep activity is sensitive to identifying significant changes in RAA. The index of sleep quality, chronotype, personality, anxiety and quality of life are not susceptible to identifying significant effects on the RAA in students. It is recommended to continue research in this area with larger samples

Palabras clave: sueño; cronotipo: ansiedad; personalidad; calidad de vida

RESUMEN

Introducción: se sabe poco de la relación de parámetros fisiológicos del sueño con personalidad y rendimiento académico (RA) en estudiantes universitarios. **Objetivo:** explorar la relación entre sueño, cronotipo, ansiedad, personalidad, calidad de vida y RA en adolescentes universitarios. **Método**: el estudio fue de corte cuantitativo, observacional transversal. Se exploró el RA acumulado (RAA), los parámetros fisiológicos del sueño, índice de calidad de sueño, cronotipo, personalidad, ansiedad y calidad de vida en estudiantes universitarios. Se realizó comparación y regresión lineal múltiple. **Resultados**: en una muestra de 27 estudiantes, se encontraron: Correlaciones significativas positivas entre RAA y sexo y duración del sueño; varianza para edad, del sueño, ansiedad, atención a normas y sensibilidad; efecto significativo en edad y desviación estándar del sueño, sobre la varianza del RAA (p=0,001) con 39,1% a 50,8% de causalidad (R^2a=0,39; R^2=0,51). **Conclusiones**: el RAA en jóvenes es moderado por la duración del sueño y de la actividad de sueño es sensible para identificar cambios significativos en el RAA. El índice de calidad de sueño, cronotipo, personalidad, ansiedad y calidad de vida no son susceptibles de identificar efectos significativos en el RAA en estudiantes. Se recomienda continuar las investigaciones en esta área con muestras más amplias.

INTRODUCTION

Academic performance has multiple interpretations, and the forms of its investigative approach are diverse[1]. A student will have good academic performance when, in the sequence of evaluations to which he is subjected, he presents good grades and, to the extent that these are cumulative throughout the academic training process, it is known as cumulative academic performance (CAP).

According to the guidelines of the Higher Education Institution (HEI) where this study was carried out, a student will have a high CAP when he passes a grade greater than or equal to 420 points out of 500 points, and students with grades between 321 and 350 points are considered with low CAP. Those who are below this limit are excluded from the University. Thus, current evaluation processes focus on examining students' abilities to interpret, analyze, discuss, and solve problems in different areas of academic training. The results of these evaluations are expressed in notes, processed by experts (teachers) who decree whether or not a student has acquired the necessary competencies[2,3], but they do not necessarily reflect learning. However, academic performance (AP) and learning are variables that are strongly associated, which means that they are generally confused in their conceptual interpretations and research approaches, with many studies reaching contradictory results when trying to explain CAP and learning with multiple variables, as demonstrated by a recent meta-analysis[4], as well as its relationship with personality and other variables[5-7].

Academic performance, sleep, and chronotype

Sleep and AP have a complex relationship, and evidence has shown that sleep quality, chronotype, and other associated factors play a crucial role in cognitive functioning[8]; in such a way that short sleep duration is associated with deficiencies in emotional, organic, and cognitive areas such as academic performance although no linear main effects of objective and subjective sleep measures on AP in students have been found[9]. Likewise, a meta-analysis has shown modest relationships between sleep and AP[10] and, in some cases, non-significant relationships in young people[11]; in another study[12] with medical students, significant correlations were observed between sleep efficiency and all academic average scores.

It is essential to mention that recent studies have found significant quadratic relationships between academic performance and sleep levels, where students who reported the absence of sleep disorders achieved higher academic performance, identifying that sleeping too much or too little affects the problem-solving skills[13-15]; however, it has been found that high-achieving students are at greater risk of developing sleep disorders due to academic stress[14].

Academic performance and anxiety

On the other hand, regarding test anxiety and its relationship with AP goals and motivational commitment, it is known that concern about learning content predicts AP by increasing commitment and maladaptive motivation[16]. In more recent research, it has been proven that, in the significant correlation between test anxiety and academic performance, the level of interference is lower in cases in which the evaluations were goal-oriented[17].

On the other hand, it has been found that visuospatial working memory has a positive effect on mathematical academic performance, contributing to the reduction of anxiety regarding this type of exams[18]. Likewise, a significant influence continues to be found between anxiety and AP, presenting dependencies of up to 63.1% according to the Nagelkerke coefficient[19,20].

Academic performance and personality

A recent meta-analysis[4] examined personality with academic success in youth and found that some personality measures perform similarly in adolescents and older populations in predicting grades. However, this study focused on the Big Five personality model. The questionnaire did not find significant correlations between all the factors; another study with university students emphasizes the need to examine more specific traits than those defined in the Big Five Questionnaire to increase the understanding of the relationships between the two variables under study[5]. However, in another recent study[6,] the personality traits defined in Cattel *et al*[7] 16 factors were correlated, and academic performance translated into grades and found significant

correlations between the CAP and two traits: abstraction and perfectionism[6].

It is relevant to highlight that significant positive associations have been found between the agreeableness trait and academic performance; likewise, significant negative correlations have been observed between the reasoning and privacy traits with the AP[21]. Recent research has identified that the dimensions that predict academic performance are responsibility, kindness, and reflective learning[22,23].

Academic performance and quality of life

The interest in understanding the relationship between quality of life and academic performance continues, so various authors persist in confirming this connection. In this sense, recent research carried out with Colombian university students has shown that the positive perception of quality of life through the development of physical activities significantly influences the academic performance of students[24]. On the other hand, it has been identified that fundamental aspects of quality of life, such as health satisfaction and the absence of symptoms such as depression, are significantly associated with AP[25].

Regarding the quality of life, although its influence on academic performance is recognized[26,27], there is conclusive evidence on the effects of this variable on CAP; at least, that is what a recent meta-analysis study shows[28].

Although academic performance has been studied through various variables, as previously stated. In a research carried out with 493 HEI students in 2019, the authors 29 discovered that only 1% of the variance of RAA is clarified by age; the eight types of multiple intelligences, chronotype, emotions, and suicidal ideation do not explain CAP. In this context, the present study addresses 38 different variables, which include chronotype, sleep quality, quality of life, anxiety, 16 personality factors, 16 sleep/wake activity parameters, as well as sex and age.

It is crucial to note that, despite the previous research efforts, more is needed to know about the relationship of physiological sleep parameters with personality and RA in university students. Here lies mainly the study's novelty in all scientific branches considering educational variables crossed by psychophysiological factors. Therefore, the objective was to explore the relationship between sleep, chronotype, anxiety, personality, quality of life, and academic performance in university adolescents.

METHOD

Type of investigation

The study was quantitative, observational, and cross-sectional.

Participants

The study was developed in the Psychology program of the Facultad de Ciencias de la Salud, a public institution in the department of Magdalena, located in Santa Marta (Colombia). Under the convenience sample selection method, students were selected who presented the conditions of One group with low-CAP and the other group with high CAP.

The inclusion criteria were considered: Being of legal age and not more than 21 years of age (that is, being between 18 and 21)—report CAP (second-semester students onwards). Have low-CAP or high-CAP, want to participate in the study, and sign the free and informed consent. The exclusion criterion was being under the influence of psychoactive substances or the effects of psychiatric medications at the time of the study.

Instruments

Micro Motionlogger® Watch[30]. It is a pulse accelerometer or actigraph watch. It uses a triaxial accelerometer that provides precision compared to standard polysomnography and physiological measurements. It offers information on sleep/wake activity levels, distribution, rhythms, and estimates of sleep quantity and quality. The higher the scores for each actigraphy parameter, the greater the indicator of the quality measured.

Morning/Evening Questionnaire (MEQ). It is made up of 19 questions. With scores ranging from 16 to 86 points, scores less than or equal to 41 indicate evening type. Greater than or equal to 59 are considered morning type, and scores between 42 and 58 indicate they are intermediate. The Spanish version of the MEQ questionnaire was used[31]. A previous study[32] confirmed Cronbach's alpha

coefficient (α) of 0.71, and in the present study, an α=0.79 was found.

Pittsburgh Sleep Quality Index (PSQI)[33]. The PQSI evaluates the quality of sleep and its clinical alterations during the previous month. The questionnaire has 19 self-assessment questions. The sum of the scores gives a total that varies between 0 and 21 points: low scores (≤ 5 points) indicate the subject without sleep problems. High scores indicate sleep problems in the subject. Therefore, the higher the score, the lower the quality of sleep. Previous study [34] demonstrated a coefficient of α=0.72. For the present study, the coefficient was α=0.72.

Manifest Anxiety in University Students (AMAS-C)[35]. It is made up of 49 reagents. High scores represent generalized anxiety-related problems, and low scores imply the absence of these problems. In a previous study[36], reliability was reported with a general coefficient α=0.89 (subscale 1 α=0.77; subscale 2 α=0.82; subscale 3 α=0.61 and subscale 4 α=0.62).

Quality of Life (Whoqol-Bref)[3.] It is a scale made up of 26 items. Regarding its interpretation, the higher the score, the higher the quality of life. The internal consistency reported in a previous study[38] for this scale was α=0.90. For the present study, the coefficient α=0.85 was confirmed, represented for the general quality of life scale, with the following subscales, as follows: Physics: α=0.76; Psychological: α=0.71; Social relations: α=0.79 and Environment α=0.88.

Questionnaire of the 16 Personality factors (16PF). This questionnaire was developed by Cattell[7], with whom multimodal logic studies have also been carried out [39] with excellent results. It measures 16 first-order traits and five global personality dimensions. It is made up of 185 items with three response options. For each personality trait, the direct score was calculated, and the statistical analysis was based on this numerical basis. Given the robustness of the instrument, it is traditionally used and accepted by the international scientific community in psychology, with clinical verifications beyond psychometrics. A previous study[40] reported a general scale coefficient of α=0.37, and for the present study, it was α=0.65. The following are the Cronbach's Alpha coefficients and are positive values for each factor (B: α=0.16; C: α=0.24; E: α=0.10; H: α=0.64; L: α =0.42; M: α=0.01; N: α=0.19; Q2: α =0.02; Q3: α =0.14; Q4: α=0.39) and those presented Below are those that returned a negative coefficient, due to a negative average covariance between elements: this violates the assumptions of the reliability model (A: α =-0.15; F: α =-039; G: α =- 0.91; I: α =-1.39; O: α =-0.35; Q1: α =-0.06). However, it was decided to continue with the study.

Procedure

On the first day of the study, all students were asked to fill out an identification form with personal information, including their daily activities and health problems. They signed a term agreeing to participate in the research voluntarily, and no monetary compensation was granted. For two weeks, after instruction on its use, the students wore the actigraph permanently attached to their wrist to record sleep/wake activity. The other psychometric instruments were applied with ongoing advice from a psychology professional. Only three subjects were evaluated at a time every two weeks. The information from the actigraphs was processed, and the respective maintenance was carried out to begin collecting information with three more subjects until the total sample was completed.

The dependent variable was RAA, provided by the Directorate of Admissions, Registration, and Academic Control of the University under study. The CAP is the standardized and accumulated numerical indicator of university performance, which is reported and calculated by semester periods. For this reason, first-semester students were excluded from the study. The rest of the variables were assumed to be independent variables.

Statistic analysis

In addition to the respective descriptive analysis of the data, the Shapiro-Will normality test was applied, which better adjusted to the sample size. The Non-normality of the collected data was determined (when verifying the distribution of the variables in the studied sample, a non-normal distribution was verified, given that the variables do not have asymmetry), which allowed the decision to use non-parametric statistical tests. For correlations, Spearman's correlation coefficient (rho) and Kendall's Tau_b correlation coefficient (t) were calculated for categorical variables such as Sex. For hypothesis testing and analysis of variances, the

Mann-Whitney U Chi-Square (X^2 U) and Kruskal-Wallis H Chi-Square (X^2 H) with their respective *Post hoc* were used. After identifying the significances (*p*), the underlying multiple linear regression model was identified, based on the variables that showed statistically significant associations, in order to extract the possible explanatory mathematical model of the CAP in its multimodal nature.

For information processing of the actigraph data, *Watchware Software (Version 1.94.0.0 and higher)* was used, and *IBM SPSS Statistics version 28.0.0.0(190)* was used for psychometric data.

Statement on ethical aspects

The study followed the requirements issued by resolution 8430 of 1993 of the Ministry of Health of Colombia and what is specified in the Deontological and Bioethical Code of Psychology in Colombia regarding research with human beings. The research was endorsed by the ethics committee of the University of Magdalena through Code: M301PR07F03 and Code: BPIN 2020000100758.

RESULTS

In a total population of 708 qualified students (70% women and 30% men), aged between 16 and 46 years of age (22.5±4.1), there were 71 potential subjects to participate in the study: 24 subjects with RAA-low and 47 subjects with RAA-high. The final sample was 27 participants (33% women and 67% men), 19 subjects with high CAP, and 8 with low CAP. Eleven subjects were studied between the second and fourth semesters, nine subjects between the fifth and seventh semesters, and seven subjects were studied between the eighth and tenth semesters; all psychology students.

The sample was organized into two groups: 1). Students with low cumulative academic performance (RAA-low) with grades or scores between 321 and 350 points. 2). Students with high CAP, with scores ≥420 points. The RAA was in the range of 321 to 471 points out of a possible maximum of 500 points ($\bar{X}$=381±24). Students with RAA ≤320 points are excluded *from* the University.

From the Shapiro-Will test (*W*), 19 variables with a non-normal distribution and 19 with a normal distribution were found, so it was decided to treat all the variables as having a Non-normal distribution (table 1). Next, the Spearman correlation test (Rho) is presented in the same way to examine the intensity of the association between the non-parametric quantitative variables associated with CAP, as well as some measures of central tendency (Table 1).

Two significant positive correlations were found for CAP: Sex (p=0.035) and sleep duration (p=0.49).

It was then further contrasted with a hypothesis test using the chi-square (X^2) of the Mann-Whitney U and its respective post hoc test in order to identify significant differences in the two CAP groups (low and high) (Table 2).

The Mann-Whitney U, for Anxiety (p=0.04) and for the personality factors Attention to Norms (p<0.005) and Sensitivity (p=0.04).

Exploring the relationships and effects of the variables studied on the CAP concerning the distribution of the groups by semesters, to the extent that the sample consisted of students from the second to ninth semester, the analysis of variance with chi Kruaskal-Wallis square (X^2 H) did not reveal a significant difference in CAP by semester [X^2 H=0.07(2), p=0.96]. Multiple comparisons were not made because the overall test does not show significant differences in the sample by group.

To identify the implicit mathematical model of the CAP, multiple linear regression of least squares weighted by Sleep Duration was performed, as this was the quantitative variable that presented a significant correlation rho=*0.38*, p=0.04 (Table 1).

The studied variables that presented significant correlations and variances were included (Age, Sleep Standard Deviation, Anxiety, Attention to Rules, and Sensitivity). Sex was excluded from the model because it is a qualitative, ordinal, and dichotomous variable despite having correlated significantly with CAP (Table 1); the other variables were also excluded to determine the regression model, as they did not present significance in the correlation and inferential analyses.

Table 1. Descriptives of central tendency, Normality Test, and correlations.

Parameter		**Mdn [$\bar{X}$(±)]**	***W* (gl); *p***	***rho(p)***
RAA		424 [405.15 (41.95)]	0.77(27); <0.001*	-----
Age		1, [19.44 (1.12)]	0.86(27); 0.002*	-0.33(0.89)
Sex		-----	0.597 (27); <0.001*	0.34(0.03)[1]*
Actigraphy Parameters	Sleep duration	1264.75 [1282.20(76.52)]	0.89(27); 0.012*	0.38(0.04)*
	Sleep Average	77.08 [75.13(15.02)]	0.90(27); 0.01*	0.11(0.56)
	Median sleep	77.44 [78.35(27.19)]	0.97(27); 0.63**	0.15(0.43)
	SD of sleep activity	60.54 [59.43(7.4)]	0.659(27); <0.001*	0.25(0.19)
	% sleep	30.74 [33.71(12.3)]	0.87(27); 0.003*	-0.02(0.89)
	Sleep efficiency	65.11 [64.18(10.8)]	0.97(27); 0.60**	-0.15(0.45)
	Sleep onset latency	282.91 [288.41(137.43)]	0.97(27); 0.81**	0.16(0.42)
	Sleep persistence latency	423.57 [400.74(165.25)]	0.95(27); 0.23**	0.11(0.56)
	Wake up after sleep onset	324.94 [332.04(108.22)]	0.97(27); 0.76**	-0.04(0.83)
	Brief wakefulness ratios	0.38 [0.35(0.09)]	0.90(27); 0.01*	-0.08(0.68)
	Episodes of awakenings	15.75 [16.53(5.73)]	0.90(27); 0.02*	-0.01(0.96)
	Average number of waking episodes	65.86 [64.24(16.26)]	0.98(27); 0.94**	0.08(0.68)
	Episodes of long wakefulness	6.25 [6.85(2.35)]	0.88(27); 0.01*	0.16(0.40)
Dream	long episodes	427.56 [419.58(105.74)]	0.84(27); <0.001*	0.09(0.62)
	Sleep episodes	15 [15.78(5.56)]	0.89(27); 0.01*	-0.01(0.96)
	Average number of dream episodes	27.92 [73.18(137.56)]	0.44(27); <0.001*	0.04(0.81)
Chronotype		58 [55.07(9.63)]	0.89(27); 0.01*	0.22(0.26)
Sleep Quality		10 [9.51(2.95)]	0.91(27); 0.02*	-0.09(0.64)
Anxiety		25 [24.40(7.68)]	0.95(27); 0.29**	0.21(0.28)
Quality of life		90 [89.03(10.27)]	0.96(27); 0.40**	0.15(0.45)
Personality	Affability	18 [17.92(2.43)]	0.94(27); 0.13**	-0.07(0.72)
	Reasoning	25 [25.85(2.38)]	0.95(27); 0.35**	0.12(0.55)
	Stability	25 [24.03(2.78)]	0.93(27); 0.10**	0.12(0.52)
	Dominance	22 [22.25(2.44)]	0.91(27); 0.02*	-0.18(0.35)
	Animation	24 [23.88(2.18)]	0.95(27); 0.35**	0.28(0.14)
	Attention to standards	17 [17.29(1.89)]	0.93(27); 0.10**	-0.27(0.16)
	Dare	21 [21.59(3.47)]	0.94(27); 0.12**	0.01(0.93)
	Sensitivity	18 [18.29(1.68)]	0.92(27); 0.04*	0.10(0.59)
	Surveillance	16 [16.22(2.47)]	0.93(27); 0.07**	-0.01(0.92)
	Abstraction	23 [23.03(2.40)]	0.95(27); 0.36**	0.19(0.32)
	Privacy	17 [16.66(2.03)]	0.94(27); 0.13**	0.20(0.29)
	Apprehension	24 [23.85(2.12)]	0.91(27); 0.03*	0.03(0.85)
	Opening to change	18 [18.22(2.20)]	0.93(27); 0.11**	0.25(0.19)
	Self-sufficiency	19 [18.88(2.24)]	0.97(27): 0.61**	-0.23(0.24)
	Perfectionism	17 [17.70(2.16)]	0.91(27); 0.02*	0.36(0.06)
	Strain	21 [21.14(2.65)]	0.90(27); 0.02*	-0.11(0.58)

Mdn = Median. $\bar{X}$ = Mean. ± = Standard Deviation. ***W*** = Shapiro-Will (normality test). **gl** = Degrees of Freedom. ***p*** = significance.
***** $p < 0.05$ = Non-Normal Distribution. ****** $p > 0.05$ = Normal Distribution). **rho=** Spearman correlation coefficient. 1= In the case of the variable Sex, the correlation coefficient was Kendall's Tau_b.
Note: RAA Correlation (dependent) variable.

Next, the extracted Regression Model is presented with the values of coefficients of determination (R and R^2 and adjusted R^2 -aR^2), root mean square value (RMS) and degrees of freedom (df), the variance coefficient (F) and its significance (*p*):

[R=0.71; R^2 =0.50; R^2 a=0.39; RMS=5870516.31(df=5), F=4.33(*p* =0.007)] And the residuals of the Model: RMS=1354189.32(df= 21).

These values suggest a significant effect of the model and its predictors on the variance of the CAP (*p*=0.007). Furthermore, the proportion of the variance of the CAP can be explained by the predictors in 39.1% (aR^2=0.391), which is relatively

significant. The coefficients of the regression model are presented in Table 2.

Table 2. Coefficients of Linear, multiple, and simple regression.

Predictors	β 0	Dev. Mistake	β 1	T	*p*
(Constant)	681.16	196.3	-----	3.47	0.002
Age	-----	5.74	-0.35	-2.26	0.03
Sleep Standard Deviation	-----	1.02	0.45	2.50	0.02
Anxiety	-----	1.14	0.15	0.73	0.47
Attention to standards	-----	6.3	-0.47	-1.65	0.11
Sensitivity	-----	5.54	-0.03	-0.16	0.87

β 0 = Unstandardized Beta coefficient of the constant. **β 1** = Standardized Beta coefficient of the predictor variables. **T** = Standardization coefficient. ***p*** = significance. ***** *Significant*.
Dependent variable: academic performance.
Weighting variable: Sleep duration.
Predictor variables: age, sleep standard deviation, anxiety, attention to norms, and sensitivity.
Method: Weighted least squares with control model, predictive (MCP) for sleep duration.

It is verified in the previous table that the predictor variables Age (p=0.03) and Sleep Standard Deviation (p=0.02) are significant in the mathematical model, and that Sleep Duration is an adequate Predictive Control Model in the CAP for young university students.

The Sex variable showed statistically significant correlations in the CAP (Table 1), where the scores of men (Mdn=425.5; range=122) were higher than those of women (Mdn=350; range=89) X^2 U=122, p=0.035; however, the effect size was small (g Heges=0.002). That is, although there are statistically significant correlations, causal relationships are not verified. This is possible because the sample size is substantially different between men and women (70% women and 30% men).

DISCUSSION

Academic performance, sleep, and chronotype

The multiple linear regression with weighted estimation suggests that the CAP is moderated by sleep activity with a more significant effect in younger students, whose inverse correlation is significant (Table 1). Likewise, actigraphy turns out to be a fundamental technique for measuring physiological activity such as sleep/wakefulness[41], of whose parameters (such as the Standard Deviation of sleep activity) are sensitive to finding significant effects on social and educational variables, such as academic performance, which crosses psychological and emotional variables, among others, as some research suggests[8-12].

The findings that relate sleep and AR are also confirmed, demonstrating that sleep duration is strongly associated with cognitive functioning[8-11,42-45] as well as sleep efficiency and academic scores[12]; Furthermore, the evidence prior to this study of the effect that age has on CAP is confirmed[17], while no significant effects were found with the other variables studied.

Academic performance and anxiety

On the other hand, focusing on the variables with significant differences between the CAP groups, a higher score for Total Anxiety is verified in students with high CAP; that is, problems related to anxious states are present in younger students and those with high academic performance, confirming recent studies[13,38-40,42,46,47].

Academic performance and personality

Regarding personality factors, attention to norms has higher scores in students with low-CAP, while in the low-CAP group, it is at a medium level. The attention to norms factor is related to Self-control or responses to environmental controls on behavior; It is a measure of internal self-discipline. That is, subjects with low CAP are more attentive to the rules than subjects in the high CAP group. Likewise, the Sensitivity factor, which is related to Hardness, describes the way the individual processes information and the degree to which to solve problems objectively and cognitively. In this way, even though there are significant differences between the groups, the scores are in a high range, which marks a high sensitivity in both groups; that is to say, they are people affected by feelings, idealistic and quite sensitive, waiting for affection and attention, kind and indulgent.

The present study confirms the studies that found that personality as a structural factor of the person predicts CAP[4-6]. However, more studies are still needed to find robust evidence and know-how and which personality factors are more potent in predicting CAP.

Academic performance and quality of life

Today, it is known that quality of life affects the individual generally, including academic performance; however, in the present investigation, no significant associations were found that would allow us to establish what other studies have confirmed[14,15]. Therefore, so far, the effects of quality of life on academic performance are not necessary, under a study already mentioned[16].

LIMITATIONS

The sample spectrum of the study was segmented into two ranges of academic performance (low and high), as well as focusing on students from a single faculty. For future studies, it is recommended to expand the sample to students from faculties other than Psychology and, if possible, include students with average performance. It is recommended to continue research in this area with larger samples. In this sense, consider the Cronbach's alpha values presented here.

CONCLUSIONS

As a practical implication, it is emphasized that it is a demonstrable fact. The scientific evidence is extensive that the sleep/wake cycle in adolescence has particularities that affect cognition, learning, emotion and physiology, and health, where one of the most dramatic changes is delayed sleep. For this reason, this study contributes to the need to influence public policy regarding education if we want healthy patterns in the lives of our young people and increasingly more school achievement about academic performance, proposing educational campaigns to break the myths adolescents have about sleep. To this extent, the present study also highlights the importance of considering academic performance as a variable associated with learning and not as a synonym, without focusing solely on grades and considering sleep and all its implications.

CAP in youth is moderated by sleep duration, and sleep activity is sensitive to identifying significant changes in CAP. The sleep quality index, chronotype, personality, anxiety, and quality of life are not susceptible to identifying significant effects on the CAP in students.

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STATEMENT ON CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

CONTRIBUTION OF THE AUTHORS

The first author made the methodological design and statistical analysis.
The second author contributed with methodological design and statistical analysis.
The third author did the fieldwork and writing.

REFERENCES

1. Rodríguez-De Ávila. Emociones, inteligencias múltiples y rendimiento académico en universitarios. Santa Marta: Editorial Unimagdalena; 2019.

2. Song BK. E-portfolio implementation: examining learners' perception of usefulness, self-directed learning process and value of learning, Australas. J Educ Technol. 2021;68-81. Doi: https://doi.org/10.14742/ajet.6126

3. Yang H, Su J, Bradley K. Applying the rasch model to evaluate the self-directed online learning scale (SDOLS) for graduate students. Int Rev Res Open Distr Learn. 2020;21(3):99-120. https://doi.org/10.19173/irrodl.v21i3.4654

4. Phoebe RH, Nathan RK. Beyond grades: A meta-analysis of personality predictors of academic behavior in middle school and high school. Pers and Ind Diff. 2022;(199):111809. https://doi.org/10.1016/j.paid.2022.111809

5. Serrano C, Murgui S, Andreu Y. Improving the prediction and understanding of academic success: The role of personality facets and academic engagement. Rev. de Psicodidactica. 2022;27(1):21-28. https://doi.org/10.1016/j.psicoe.2021.11.002

6. Mateus C, Campis R, Aguaded I, Parody A, Ruiz F. Analysis of personality traits and academic performance in higher education at a Colombian university. Heliyon. 2021;7(5):e06998. https://doi.org/10.1016/j.heliyon.2021.e06998

7. Cattell RB, Cattell HE. Personality structure and the new fifth edition of the 16 PF. Educ Psychol Meas. 1995;55(6):926-937. https://doi.org/10.1177/0013164495055006002

8. Gomez-Fonseca A, Genzel L. Sleep and academic performance: considering amount, quality and timing. Curr Opin Behav Sci. 2020;(33):65-71. https://doi.org/10.1016/j.cobeha.2019.12.008

9. Rea-Sandin G, Breitenstein R, Doane L, Vakulskas E, Valiente C, Lemery-Chalfant K. Early life socioeconomic differences in associations between childhood sleep and academic performance. J Appl Psychol. 2022;(79):101392. https://doi.org/10.1016/j.appdev.2022.101392

10. Dewald J, Meijer A, Oort F, Kerkhof G, Bögels S. The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. Sleep Med Rev. 2010;(14):179-189. https://doi.org/10.1016/j.smrv.2009.10.004

11. Leslie AM, Rachel ST, Aya A, Courtney E, Sims-Gomillia LS, Pongetti FT, et al. Associations between sleep and academic performance in US adolescents: a systematic review and meta-analysis. Sleep Med. 2023;(83):71-82. https://doi.org/10.1016/j.sleep.2021.04.015

12. Szemik S, Gajda M, Kowalska M. The review of prospective studies on mental health and the quality of life of physicians and medical students. Med Pr. 2020;71(4):483-491. https://doi.org/10.13075/mp.5893.00958

13. Chan NY, Wu WJ, Chan JWY, Chan KCC, Li AM, Chan SSM, et al. Sleep and academic performance among students in Hong Kong: Curvilinear relationship suggesting an optimal amount of sleep. Sleep Med. 2023;106:97-105. http://dx.doi.org/10.1016/j.sleep.2023.04.001

14. Jiang Y, Guo L, Lai W, Li Y, Sun X, Zhao H, et al. Association of emotional and behavioral problems with sleep disturbance among Chinese adolescents: The moderation effect of academic performance. J Affect Disord. 2023;330:94-100. http://dx.doi.org/10.1016/j.jad.2023.02.136

15. Rea-Sandin G, Breitenstein RS, Doane LD, Vakulskas E, Valiente C, Lemery-Chalfant K. Early life socioeconomic differences in associations between childhood sleep and academic performance. J Appl Dev Psychol. 2022;79(101392):101392. http://dx.doi.org/10.1016/j.appdev.2022.101392

16. Ying-Fen C. 2-dimensional cognitive test anxieties and their relationships with achievement goals, cognitive resources, motivational engagement, and academic performance. Learn Individ Differ. 2021;92:102084. https://doi.org/10.1016/j.lindif.2021.102084

17. Möcklinghoff S, Rapoport O, Heckel C, Messerschmidt-Grandi C, Ringeisen T. Relationships between achievement goal orientations, multidimensional test anxiety, and performance – In conclusion, every facet counts. Learn Individ Differ. 2023;102(102269):102269. http://dx.doi.org/10.1016/j.lindif.2023.102269

18. Cuder A, Živković M, Doz E, Pellizzoni S, Passolunghi MC. The relationship between math anxiety and math performance: The moderating role of visuospatial working memory. J Exp Child Psychol. 2023;233(105688):105688. http://dx.doi.org/10.1016/j.jecp.2023.105688

19. Saravia PCC, Pardo JEP, Durán YA, León RS. Actitud, motivación y ansiedad y su relación con el rendimiento académico. Conrado. 2023;19(S1):259-267. http://dx.doi.org/10.24265/horizmed.2020.v20n1.06.

20. La Serna-Solari PB, Castillo-Cornock TB, Viera-Quijano YG. Ansiedad, autoestima y

hábitos de estudio en relación al rendimiento académico de estudiantes universitarios peruanos: contexto Covid-19. Av Odontoestomatol. 2023;39(1):2-8.

21. Armas Juárez RA, García Juárez HD, Mendoza Zuta JC, Cruz Salinas LE. Ansiedad ante exámenes, rasgos de personalidad, autoconcepto, asertividad y su relación con el rendimiento académico. Horizontes. 2023; 7(29):1221-1234. https://doi.org/10.33996/revistahorizontes.v7i29.586

22. Lopez del Río NM, Artuch-Garde R. Relación entre rasgos de personalidad, estilos y estrategias de aprendizaje y rendimiento académico en alumnado español adolescente. Estud. Pedagog. 2022;48(1):273-289. http://dx.doi.org/10.4067/S0718-07052022000100273

23. Beltrán-Velasco AI, Donoso-González M, Clemente-Suárez VJ. Analysis of perceptual, psychological, and behavioral factors that affect the academic performance of education university students. Physiol Behav. 2021;238(113497):113497. http://dx.doi.org/10.1016/j.physbeh.2021.113497

24. Silveira Pérez Y, Sanabria Navarro JR, Cortina Núñez M de J, Guillen Pereira L, Arango Buelvas LJ. Percepciones de la asociación de la actividad física y la calidad de vida en el rendimiento académico en universidades colombianas. Retos. 2023;47:902-914. https://doi.org/10.47197/retos.v47.95066

25. Baquerizo-Quispe NS, Miguel-Ponce HR, Castañeda-Marinovich LF, Romero-Mejía AJ, Aquino-Canchari CR. Asociación entre presencia de estrés, depresión y/o ideación suicida con el rendimiento académico en estudiantes de medicina de una Universidad peruana en medio de la pandemia por COVID-19. Rev Med Rosario. 2022;88(1):7-15.

26. Christodoulou N, Maruani J, d'Ortho M, Lejoyeux M, Geoffroy P. Sleep quality of medical students and relationships with academic performances. L'Encéphale. 2021;49(1):9-14. https://doi.org/10.1016/j.encep.2021.09.006

27. Aldridge JM, McChesney K. The relationships between school climate and adolescent mental health and wellbeing: A systematic literature review. Int J Educ Res. 2018;88:121-145. https://doi.org/10.1016/j.ijer.2018.01.012

28. Fernandes MSV, Rodrigues-Mendonça C, Vital-da Silva TM, Noll M. The relationship between depression and quality of life in students and the academic consequences: Protocol for a systematic review with meta-analysis. Inter J Educ Res. 2021.109:101812. https://doi.org/10.1016/j.ijer.2021.101812

29. Rodríguez-De Avila U, Rodrigues-de França F, Chionbacanga-Nafital A, Ceballos-Ospino G, Paba-Barbosa C. Las inteligencias, emociones y cronotipo, ¿explican el desempeño académico en universitarios? Educ Hum. 2019;(22):1-21. https://doi.org/10.17081/eduhum.22.38.3636

30. Ambulatory Monitoring Inc. Micro motionlogger watch. New York: AMI; 2022.

31. Horne JA, Ostberg O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. Int J Chronobiol. 1976;4(2):97-110.

32. Rodríguez- de Avila U, Rodrigues-deFrança Campos F, Chionbacanga-Nafital A, Ceballos-ospino G, Paba-Barbosa C. Las inteligencias, emociones y cronotipo, ¿explican el desempeño académico en universitarios? Educación y Humanismo. 2019;(22)38:1-21. https://doi.org/10.17081/eduhum.22.38.3636

33. Escobar-Córdoba F, Eslava-Schmalbach, J. Colombian Validation of the Pittsburgh Sleep Quality. Rev Neurol. 2005;40:150-155. https://doi.org/10.33588/rn.4003.2004320

34. Rodríguez-de Avila UE, León-Valle ZL, Ceballos-Ospino GA. Ideación suicida, ansiedad, capital social y calidad de sueño en colombianos durante el primer mes de aislamiento físico por COVID-19. Psicogente. 2020;45(24):1-20. https://doi.org/10.17081/psico.24.45.4075

35. Reynolds CR, Richmond BO, Lowe PA. AMA: escala de ansiedad manifiesta en adultos. México: El Manual Moderno; 2007.

36. Yacelga C, Montenegro E, Barreyro JP, Sánchez OT. Propiedades psicométricas de la escala AMAS (Ansiedad Manifiesta en Adultos) para Ecuador. Ciencia Latina. 2022;6(2):4050-4068. https://doi.org/10.37811/cl_rcm.v6i2.2146

37. World Health Organization. WHOQOL-BREF: Introduction, administration, scoring and generic version of the assessment. Washington DC: WHO; 1996.

38. Rojas-Gualdrón DF, Díaz-Gordon P, Jaramillo-Ortegón DP, Ortega-Ortiz ME, Castellanos-Ruiz J, González-Marín A. Análisis RASCH del WHOQOL-BREF en adultos mayores de Bucaramanga y Manizales. Psicol Caribe. 2018;35(3):183-196. https://doi.org/10.14482/psdc.35.3.153

39. Córdoba JE, Jaramillo GP. Inclusion of the latent personality variable in multinomial logit models using the 16pf psychometric test. Procedia - Social and Behavioral Sciences. 2012.54:169-178. https://doi.org/10.1016/j.sbspro.2012.09.736

40. Jaimes-Osma JE. Adaptación de pruebas psicológicas y desarrollo de Software para población limitada visual: cuestionario de personalidad 16PF forma C. Act Colom Psicol. 1999;5:123-134.

41. Sadeh A, Hauri PJ, Kripke DF, Lavie P. The role of actigraphy in the evaluation of sleep disorders. Sleep. 1995;18(4):288-302. https://doi.org/10.1093/sleep/18.4.288

42. Hummer DL, Lee TM. Daily timing of the adolescent sleep phase: Insights from a cross-species comparison. Neurosci Biobehav Rev. 2016;70:171-181. http://dx.doi.org/10.1016/j.neubiorev.2016.07.023

43. Sheldon SH, Ferber R, Kryger MH. Principles and Practice of Pediatric Sleep Medicine. Chicago: Elsevier Inc; 2005.

44. Touitou Y, Touitou D, Reinberg A. Disruption of adolescents' circadian clock: The vicious circle of media use, exposure to light at night, sleep loss and risk behaviors. J Physiol Paris. 2017;110(4PtB):467-479. http://dx.doi.org/10.1016/j.jphysparis.2017.05.001

45. Desjardins S, Grandbois M. Sleep parameters associated with university students' grade point average and dissatisfaction with academic performance. Sleep Epidemiol. 2022;2:100038. https://doi.org/10.1016/j.sleepe.2022.100038

46. Rodríguez-de Ávila UE, Chiombacanga-Nafital A, Rodrigues-de França F. Sueño, aprendizaje y escuela. Ensayo preliminar para una relación con la política educativa. Educacion y Ciudad. 2018;(34):53-62. https://doi.org/10.36737/01230425.v0.n34.2018.1872

47. Robbins R, Beebe DW, Byars KC, Grandner M, Hale L, Tapia IE, Wolfson AR, Owens JA. Adolescent sleep myths: identifying false beliefs that impact adolescent sleep and well-being. Sleep Health. 2022;8(6):632-639. https://doi.org/10.1016/j.sleh.2022.08.001