

Influence of bio-psycho-social factors on physical activity in Spanish undergraduate education students

Influencia de los factores bio-psico-sociales en la actividad física de estudiantes universitarios españoles

Daniel Sanz-Martín^{1*}, José Luis Ubago-Jiménez², Javier Cachón-Zagalaz³, Gabriel González-Valero²

1. CEIP Infantes de Lara (Soria)
2. Universidad de Granada
3. Universidad de Jaén

* Correspondence: Daniel Sanz-Martín; raumaran@gmail.com

ABSTRACT

It is essential to know the precise levels of compliance with physical activity recommendations for each population group and the determinants that condition them directly and indirectly. A cross-sectional study was designed for Spanish undergraduate education students with the following aims: 1) To analyse the influence of body mass index, Mediterranean diet, social network addiction, emotional intelligence and sitting time as predictors of compliance with physical activity recommendations; 2) To design an explanatory model to establish the relationships between body mass index, Mediterranean diet, addiction to social networks, emotional intelligence and sitting time of students who comply with physical activity recommendations. The binary logistic regression model designed had good fit ($X^2=4.15$, $p=0.04$; $R^2 = 0.126$; Hosmer-Leneshow $p > 0.05$). The structural equation model designed had good fit (CFI= 0.970, NFI=0.906, IFI= 0.971, TLI = 0.960, and RMSEA0.039). It can be concluded that the regression model predicts 12.6% of compliance with physical activity recommendations. Likewise, in the regression and structural equation models, time spent in moderate-vigorous physical activity is positively related to body mass index and adherence to the Mediterranean diet.

KEYWORDS

Moderate-vigorous physical activity; sitting time; Mediterranean diet; body mass index; emotional intelligence; social media addiction

RESUMEN

Es fundamental conocer los niveles precisos de cumplimiento de las recomendaciones de práctica de actividad física de cada grupo poblacional y los determinantes que los condicionan directa e indirectamente. Se diseñó un estudio transversal para estudiantes españoles de los Grados de Educación con los siguientes objetivos: 1) Analizar la influencia del índice de masa corporal, la dieta mediterránea, la adicción a redes sociales, la inteligencia emocional y tiempo sentado como predictores del cumplimiento de las recomendaciones de práctica de actividad física; 2) Diseñar un modelo explicativo para establecer las relaciones entre el índice de masa corporal, la dieta mediterránea, la adicción a redes sociales, la inteligencia emocional y tiempo sentado de los estudiantes que cumplen las recomendaciones de práctica de actividad física. El modelo de regresión logística binaria diseñado tuvo buena bondad de ajuste ($X^2=4.15$, $p=0.04$; $R^2 = 0.126$; Hosmer-Leneshow $p> 0.05$). El modelo de ecuaciones estructurales tuvo buena bondad de ajuste (CFI= 0.970, NFI=0.906, IFI= 0.971, TLI = 0.960, and RMSEA0.039). Se puede concluir que el modelo de regresión predice el 12.6% del cumplimiento de las recomendaciones de actividad física. Asimismo, en los modelos de regresión y de ecuaciones estructurales, el tiempo de actividad física moderada-vigorosa tiene relación positiva con el índice de masa corporal y la adherencia a la dieta mediterránea.

PALABRAS CLAVE

Actividad física moderada-vigorosa; tiempo sentado; dieta mediterránea; índice de masa corporal; inteligencia emocional; adicción a redes sociales

1. INTRODUCTION

Preventable premature deaths account for 3.9 million deaths annually, accounting for 15% of total annual deaths (Strain et al., 2020). Preventable premature deaths have been shown to be related to personal factors, such as physical inactivity (Strain et al, 2020) and obesity (Australian Institute of Health and Welfare, 2018) and socio-environmental factors, such as air pollution (Khomenko, 2021). One of the most important factors is physical inactivity that accounts for 6.4% of premature deaths (Strain et al., 2020). Another major contributor to premature deaths is overweight and obesity, which is also mainly related to physical inactivity and sedentary lifestyles (Aggarwal and Jain, 2018). According to WHO (2021), more than 1.9 billion adults (+18 years) worldwide were overweight and 650 million were obese in 2016.

In Spain, 53% of the adult population were overweight or obese in 2017 (Ministry of Health, 2018), with a 16.01% obesity rate in 2020 (Government of Spain, 2021). The extra medical costs associated with overweight/obesity were 2% of the health budget in 2016 (Hernández et al., 2019). Moreover, if the Spanish healthcare situation is not reversed, the health budget could be 58% of the budget (3,000,000,000,000 euros/year), with 16% more people being overweight by 2030 (Hernández et al., 2019).

Physical activity has many health benefits, such as: preventing cardiovascular disease, metabolic syndrome, type II diabetes, cancer and overweight/obesity; improving bone quality; and reducing symptoms of depression and anxiety (Bowden et al., 2019; WHO 2020). It is necessary to comply with physical activity practice recommendations to be beneficial, which differ for each age group (WHO, 2020). According to WHO (2020) adults (18-64 years) should engage in at least 150 minutes/week of moderate physical activity, 75 minutes/week of vigorous physical activity or an equivalent combination of both. In addition, WHO recommends reducing sedentary time.

Several studies have shown that the majority of Spanish university students meet the recommendations for physical activity. Acebes-Sánchez et al. (2019) showed that 77.6% of university students in Madrid (Spain) met the physical activity recommendations. Rodríguez-Larrad et al. (2021) found that Spanish university students perform 327 minutes/week (± 374) of vigorous physical activity and 376 minutes/week (± 563) of moderate physical activity before COVID-19 confinement. Sañudo et al. (2020) showed that 84% of Spanish young adults met the physical activity recommendations before COVID-19 confinement and 74% did so during COVID-19 confinement.

Physical activity levels of adults are conditioned by several determinants: negative relationship with body mass index (Acebes-Sánchez et al. 2019; Enriquez-Del Castillo et al., 2021), negative relationship with sitting time (Acebes-Sánchez et al., 2019; Murillo et al., 2019), negative relationship with social network addiction (Alime et al., 2021; Akbal et al., 2023), positive relationship with Mediterranean diet (Tárraga et al., 2021; García-Pérez et al., 2023) and positive relationship with emotional intelligence (Omar et al., 2012; Ubago-Jiménez et al., 2019).

Based on the above, the physical activity levels of university students appear to be higher than those of other population groups, since, for example, 81% of young people aged 11-17 years worldwide do not meet the recommended levels of physical activity (Guthold et al., 2020). In addition, there are fewer studies in the scientific literature on the determinants that condition such practice in university students, even though we know that these vary by age group (Farooq et al., 2019). There is even less scientific evidence on the levels of physical activity adherence and its determinants among Spanish Undergraduate Education Students.

For all the reasons above, it was considered novel and essential to design a research project to study the physical activity levels of Spanish Undergraduate Education Students and how they are directly and indirectly influenced by various bio-psycho-social determinants, being especially important to analyse those that influence compliance with the recommendations to practice physical activity. If physical activity levels were low, effective health promotion proposals could be designed in general, not only including physical activity. Studying the relationships between different lifestyle habits would help to design more effective proposals. On the one hand, proposals would have an impact on students' health in the short and medium term. On the other hand, if physical activity levels were high, it would be possible to study the influence of its determinants, which would favour a potential extrapolation of the results to health promotion designs for other population groups, such as children and adolescents. In addition, this could help students to be more aware of the importance of acquiring healthy habits and to be able to teach this to future generations when they work as teachers.

The aims of the study were: 1) To analyse the influence of body mass index, Mediterranean diet, social network addiction, emotional intelligence and sitting time as predictors of compliance with physical activity recommendations; 2) To design an explanatory model to establish the relationships between body mass index, Mediterranean diet, addiction to social networks, emotional intelligence and sitting time of students who comply with the physical activity recommendations.

Based on these objectives, four research hypotheses have been established:

- (1) Moderate-vigorous physical activity time is positively related to Mediterranean diet adherence, emotional intelligence and sitting time.
- (2) Moderate-vigorous physical activity time is negatively related to body mass index and social network addiction.
- (3) Body mass index, sitting time and Mediterranean diet adherence are three predictors of compliance (or non-compliance) with physical activity recommendations.
- (4) There is a theoretical model regarding compliance with physical activity recommendations that directly explains the relationships between moderate-vigorous physical activity time, body mass index and Mediterranean diet adherence. In addition, this model indirectly explains the relationship between moderate-vigorous physical activity time and social network addiction, emotional intelligence and sitting time.

2. METHODS

2.1 Design and subjects

The study design was cross-sectional with descriptive-correlational nature, about bio-psycho-social determinants influencing compliance with physical activity recommendations.

The target population consisted of the 150,565 undergraduates studying Education Degrees during the 2022-2023 academic year in Spain (Ministry of Education and Vocational Training, 2023). Some of the most senior university officials in the faculties (dean or vice-dean of students) and universities (vice-rector of students or research) were informed of the study by e-mail. In that communication, they were informed of the aims and characteristics of the study and were invited to forward the communication to the students so that they could participate. In this way, an attempt was made to cover the entire target population.

Finally, 423 students decided to participate in the study, of which nine were excluded because of outliers in any of the questionnaire responses. The final sample of 414 university students was representative with an estimation error of 4.81%, for a variance of 95% and a standard deviation of 50. The sample is characterised by the fact that 69.8% were female and 30.2% male, with a mean age of 20.82 years (± 2.90). Moreover, 44.23% of the provinces had research participants (23/52) and 64.71% of the autonomous regions (11/17).

The ethical principles established in the Declaration of Helsinki were followed. In addition, students gave their voluntary consent to participate in the study at the beginning of the questionnaire by ticking the corresponding box.

2.2 Instruments and variables

A questionnaire was designed using the Google® Forms platform (Mountain View, CA, USA) and the link was sent by e-mail to the students through the university heads, as explained in the previous section. The questionnaire consisted of five sections:

2.2.1 Socio-demographic section.

The design was ad hoc and the researchers included questions related to: sex (male/female), age (years), place of residence (selection was facilitated by including a list of the 52 Spanish provinces), weight (kilograms) and height (cm). Subsequently, body mass index was calculated by dividing the weight of each participant by the square of their height in metres (kg/m^2), as recommended by the World Health Organization (WHO, 2021).

2.2.2 Dietary section.

The Spanish version of the PREDIMED questionnaire validated by Martínez-González et al. (2012) was used. This instrument asks 14 questions on dietary patterns, such as the number of tablespoons of olive oil, servings of vegetables, pieces of fruit, number of sugary drinks and consumption of commercial confectionery. Each item is scored as 0 or 1 point depending on the answer.

In the present study, the Mediterranean diet variable was measured as the final score of the PREDIMED questionnaire, being in the range 0-14 points. The internal consistency of the instrument was $\alpha=0.859$. This questionnaire has been used in previous studies (López-Olivares et al., 2023; Romero-Blanco et al., 2022; Tárraga et al., 2021).

2.2.3 Physical activity section.

This section included the IPAQ-SF questionnaire, specifically the Spanish version was validated by Rodríguez-Muñoz et al. (2017). This instrument includes seven questions on physical activity performed during the last seven days. The first two items ask about the number of days and the average daily time of vigorous physical activity performed for at least ten minutes in a row. The next two items are similar to the first two but ask about moderate physical activity. The fifth and sixth questions are also similar to the previous ones, but this time they ask about walking. The seventh question asks about the average daily time spent sitting on a working day. This questionnaire has already been used in other research involving Spanish university students (López-Olivares et al., 2020; Ramón-Arбуés et al., 2022).

In this study, three variables related to physical activity were identified: compliance with the recommendations for physical activity (yes/no), average time spent in moderate-vigorous physical activity (minutes/week) and average time spent sitting during working days (minutes/day).

2.2.4 Emotional intelligence section.

The Spanish version of the Trait Meta-Mood Scale (TMMS-24) was validated by Fernández-Berrocal et al., (2004) for adults aged 18 to 57. This instrument covers three dimensions of emotional intelligence (attention, clarity and repair), asking eight questions about each of them. All the questions are Likert scale responses from 1-5 (from 1 = Strongly disagree to 5 = Strongly agree). Each question is assigned a maximum score of five points (one for each Likert scale value). Thus, the score for each dimension ranges from 8 to 40 points. Strong internal consistencies were obtained for each dimension (emotional attention: $\alpha=0.865$; emotional clarity: $\alpha=0.911$; emotional repair:

$\alpha=0.848$). This scale has been previously used by Redondo-Rodríguez et al. (2023) and Carbonero-Martín et al. (2022).

In this study, three variables related to emotional intelligence have been established, one for each dimension measured by TMMS-24. Each variable was measured as the final score of the eight questions that make up the dimension, with the final score ranging from 8 to 40 points.

2.2.5 Social network addiction section.

This section included the multidimensional SNAAddS-6S, which was designed by Cuadrado et al. (2020) for Spanish adults aged 18-40 years. Although Cuadrado et al. validated two versions of the scale, the one selected in this study is the multidimensional version, which consists of 18 questions covering five different factors: time-management (questions 1-6), mood modification (questions 7-9), relapse (questions 10-12), withdrawal (questions 13-15), and conflict (questions 16-18). Responses are on a Likert scale 1-5, with 1 being "never" and 5 being "very often". This scale is useful to assess the extent to which people are addicted to social networks and to study the predictors and risks of such addiction (Cuadrado et al., 2020). Some previous studies have already used these scales (Gallegos and Flores, 2021; López-Gil et al., 2023).

In this study, five variables related to social network addiction have been established, one for each dimension. Each variable has been calculated as the mean score of the items that comprise it, so the score interval is 1-5. Strong internal consistencies were obtained for each dimension (time-management: $\alpha=0.826$; mood modification: $\alpha=0.910$; relapse: $\alpha=0.805$; withdrawal: $\alpha=0.865$; conflict: $\alpha=0.773$).

2.3 Data analysis

The statistical analysis was carried out in three phases: 1) preparatory and descriptive statistics phase, 2) creation of the predictive model of compliance with the physical activity recommendations and 3) design of the explanatory model of students who comply with the practice recommendations. For the first two phases, the IBM SPSS 26.0 software (International Business Machines Corporation, Armonk, NY, USA) was used, and for the last phase, the IBM SPSS Amos 26.0 (IBM Corp, Armonk, NY, USA) was used.

During the first phase, the data matrix was created with the students' answers to the questions in the online questionnaire. The matrix was cleaned, eliminating those outliers who had z-scores of the variables outside the ± 3 interval in order not to condition the results of subsequent statistical tests

(Gil, 2011). Therefore, nine participants were eliminated, reaching a final sample of 414 students. In addition, descriptive statistics and correlations between variables were calculated.

In the second phase, an initial binary logistic regression model was designed based on the following formula: $y = \frac{1}{1+e^{-f(x)}}$; where $f(x)$ is the physical activity compliance and in turn, it is satisfied that $f(x) = a + \beta_1 * \text{body mass index}_{i1} + \beta_2 * \text{sitting time}_{i2} + \beta_3 * \text{Mediterranean diet}_{i3} + \epsilon_i$. The goodness of fit of the logistic regression model was assessed using the Hosmer-Lemeshow test, being optimal as long as the p-value is > 0.05 (Nattino et al., 2020). The Nagelkerke R^2 statistic was also used to perform the analysis of variance.

In the third phase of the statistical analysis, a structural equation model was created, which made it possible to test the goodness of fit of the theoretical model designed (Figure 1) by jointly analysing the relationships between the research variables. This theoretical model is only valid for those students who comply with the physical activity recommendations and allows us to understand the direct and indirect relationships between the study variables.

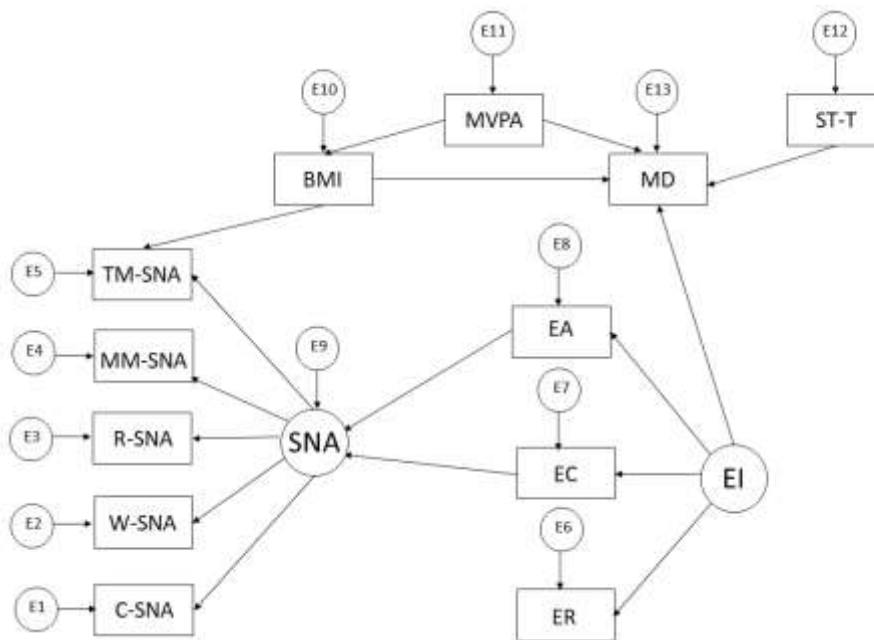


Figure 1. Theoretical model proposed in relation to compliance with the physical activity guidelines. *Note: Moderate-vigorous physical activity (MVPA); Sitting time (ST-T); body mass index (BMI); Mediterranean diet (MD); social network addiction (SNA); time-management social network addiction (TM-SNA); mood modification social network addiction (MM-SNA); relapse social network addiction (R-SNA); withdrawal social network addiction (W-SNA); conflict social network addiction (C-SNA); emotional intelligence (EI); emotional attention (EA); emotional clarity (EC); emotional repair (ER); measurement error (E).*

The model includes thirteen endogenous variables, of which twelve are observed (body mass index, adherence to the Mediterranean diet, weekly moderate-vigorous physical activity, weekly sitting time, emotional attention, emotional clarity, emotional repair, time-management social network addiction, mood modification social network addiction, relapse social network addiction, withdrawal social network addiction and conflict social network addiction) and one is unobserved (social network addiction). In addition, there are fourteen unobserved exogenous variables (emotional intelligence and measurement errors for all variables). This serves to provide a causal explanation of the relationship between indicators and measurement reliabilities. In addition, the one-way arrows represent the relationships between the variables. The regression weights are also incorporated. The goodness-of-fit test took into account that the comparative fit index (CFI) was greater than 0.95, the normal fit index (NFI) was greater than 0.90, the incremental fit index (IFI) was greater than 0.90, the Tucker-Lewis index (TLI) was greater than 0.90 and the root mean square error of approximation (RMSEA) was less than 0.1 (Kline, 2006).

3. RESULTS

In relation to the physical activity recommendations for adults, 34.55% of the participants (n=146) do not comply with them, compared to 65.5% (n=277) who do comply with them. Students perform an average of 404.26(±462.26) minutes of moderate-vigorous physical activity and 232.64 (±200.74) minutes of sitting time. In addition, students have a body mass index of 22.63(±2.99) and they obtain an average diet adherence score of 5.51(±2.28). Descriptive statistics for the remaining research variables can be found in table 1.

Table 1. Descriptive statistics of the research variables.

	M(SD)	CI 95%	K-S	Skewness	Curtosis
MVPA (min/w)	404.26(462.26)	360.07/448.45	***	1.59	3.02
ST-T (min/d)	232.64(200.74)	213.46/251.83	***	0.30	-1.01
BMI	22.63(2.99)	22.34/22.91	0.007	0.64	0.82
MD	5.51(2.28)	5.31/5.74	***	-0.15	-0.26
EA	30.33(6.06)	29.75/30.91	***	-0.51	-0.02
EC	28.16(6.34)	27.56/28.77	***	-0.15	-0.26
ER	28.45(5.98)	27.88/29.03	***	-0.07	-0.31
TM-SNA	2.58(0.86)	2.50/2.67	***	0.31	-0.46
MM-SNA	2.49(1.08)	2.39/2.60	***	0.29	-0.89

R-SNA	2.16(1.05)	2.06/2.26	***	0.63	-0.55
W-SNA	1.84(0.97)	1.75/1.93	***	1.11	0.24
C-SNA	1.83(0.90)	1.75/1.92	***	0.99	0.27

Note: Moderate-vigorous physical activity (MVPA); sitting time (ST-T); body mass index (BMI); Mediterranean diet (MD); emotional attention (EA); emotional clarity (EC); emotional repair (ER); time-management social network addiction (TM-SNA); mood modification social network addiction (MM-SNA); relapse social network addiction (R-SNA); withdrawal social network addiction (W-SNA); conflict social network addiction (C-SNA); Kolmogorov-Smirnov (K-S); minutes (min); week (w); day (d); p -value ≤ 0.001 (***).

Moderate-vigorous physical activity time is positively and significantly related to sitting time ($r=0.49$, $p<0.01$) and dietary adherence ($r=0.21$, $p<0.01$). Table 2 shows the bivariate correlations between the research variables.

Table 2. Correlations between research variables.

	2	3	4	5	6	7	8	9	10	11	12	
MVPA	0.49**	0.09	0.21**	-0.02	0.08	0.08	-0.01	-0.07	0.03	0.03	-0.02	
ST-T		0.08	0.11*	-0.04	0.02	0.04	0.02	-0.01	0.05	0.06	0.03	
BMI			0.02	-	0.10*	-0.06	-0.04	0.08	0.04	0.06	-0.03	0.02
MD				0.06	0.13**	0.15**	-0.10*	-	0.14**	0.02	-0.07	-0.05
EA					0.32**	0.17**	0.24**	0.27**	0.19**	0.10*	0.15**	
EC						0.44**	-0.11*	-	0.13**	0.16**	-0.09	-
ER							-0.01	-	0.16**	-0.01	-0.08	-0.02
TM-SNA								0.58**	0.59**	0.48**	0.49**	
MM-SNA									0.55**	0.47**	0.46**	
R-SNA										0.47**	0.52**	
W-SNA											0.48**	
C-SNA												-

Note: Moderate-vigorous physical activity (MVPA); sitting time (ST-T); body mass index (BMI); Mediterranean diet (MD); emotional attention (EA); emotional clarity (EC); emotional repair (ER);

time-management social network addiction (TM-SNA); mood modification social network addiction (MM-SNA); relapse social network addiction (R-SNA); withdrawal social network addiction (W-SNA); conflict social network addiction (C-SNA); p-value ≤ 0.05 (); p-value ≤ 0.01 (**).*

A stepwise binary logistic regression model was applied, with compliance with the physical activity recommendations as the dependent variable and all the variables considered in the investigation as independent variables. The model obtained only included the variables body mass index, sitting time and Mediterranean diet. Table 3 shows the statistics of the model. The formula of the final model was: $y = \frac{1}{1+e^{-f(x)}}$; where $f(x)$ is the physical activity compliance and in turn, $f(x) = -3.24 + 0.101 \cdot \text{body mass index} + 0.001 \cdot \text{sitting time} + 0.256 \cdot \text{Mediterranean diet}$. The model has a good fit (Hosmer-Lemeshow p -value > 0.05) and serves to explain 12.6% of compliance with physical activity recommendations (Nagelkerke's $R^2 = 0.126$). The closer the outcome of the model is to 1, based on the participant's data, the greater the probability of complying with the physical activity recommendations.

Table 3. Statistics of the binary logistic regression model.

PA guidelines	β	SE	Wald	p-value	R^2	Chi-square	H-L
BMI	0.101	0.038	7.086	0.008	0.126	4.15 (p=0.04)	0.073
ST-T	0.001	0.001	4.083	0.043			
MD	0.256	0.050	25.998	<0.001			
Constant	-3.235	0.919	12.405	<0.001			

Note: Physical activity (PA); body mass index (BMI); Sitting time (ST-T); Mediterranean diet (MD); Standard Error (SE); Hosmer-Lemeshow.

The initial model designed with the research variables with respect to the student body that complied with the physical activity recommendations showed a significant p -value ($X^2 = 70.696$; $df = 50$; $p = 0.029$). However, this result should not be interpreted independently (Tenenbaum, 2007), so other adjustment indexes were calculated. The CFI scored 0.970, the NFI was 0.906, the IFI reached the value of 0.971, the TLI scored 0.960, and the RMSEA was 0.039.

Table 4. Statistics of the model developed in relation to physical activity guidelines.

Associations between variables	R.W				S.R.W
	Estimations	S.E	C.R	<i>p</i>	Estimations
EC ← EI	1.448	0.514	2.817	0.005	0.847
EA ← EI	0.343	0.117	2.937	0.003	0.220
BMI ← MVPA	0.000	0.000	0.412	0.681	0.025
SNA ← EA	0.128	0.022	5.953	***	0.406
SNA ← EC	-0.069	0.019	-3.628	***	-0.241
C-SNA ← SNA	1				0.668
W-SNA ← SNA	1.192	0.118	10.118	***	0.707
R-SNA ← SNA	1.396	0.133	10.512	***	0.790
MM-SNA ← SNA	1.397	0.131	10.642	***	0.805
TM-SNA ← SNA	2.244	0.220	10.212	***	0.778
ER ← EI	1				0.618
MD ← EI	0.080	0.041	1.936	0.053	0.140
TM-SNA ← BMI	0.058	0.078	0.746	0.455	0.032
MD ← BMI	-0.006	0.044	-0.131	0.896	-0.008
MD ← MVPA	0.000	0.000	1.202	0.229	0.074
MD ← ST-T	0.001	0.001	1.675	0.094	0.102

Note: Regression Weights (R.W); Standardised Regression Weights (S.R.W); Standard Error (S.E.); Critical Ratio (C.R); Moderate-vigorous physical activity (MVPA); sitting time (ST-T); body mass index (BMI); Mediterranean diet (MD); social network addiction (SNA); time-management social network addiction (TM-SNA); mood modification social network addiction (MM-SNA); relapse

*social network addiction (R-SNA); withdrawal social network addiction (W-SNA); conflict social network addiction (C-SNA); emotional intelligence (EI); emotional attention (EA); emotional clarity (EC); emotional repair (ER); $p \leq 0.001$ (***)*.

The initial model designed did not obtain an appropriate goodness of fit for students who did not comply with the physical activity recommendations ($X^2 = 85.295$; $df = 50$; $p = 0.001$; $CFI = 0.891$, $NFI = 0.781$, $IFI = 0.896$, $TLI = 0.856$, and $RMSEA = 0.070$). Likewise, no valid model was found to jointly interpret the relationships between the research variables.

4. DISCUSSION

The study had two aims: 1) To analyze the influence of body mass index, Mediterranean diet, social networks addiction, emotional intelligence and sitting time as predictors of compliance with physical activity recommendations; 2) To design an explanatory model to establish the relationships between body mass index, Mediterranean diet, social networks addiction, emotional intelligence and sitting time of students who comply with physical activity recommendations.

Most of the participants met the recommendations for physical activity practice (65.5%), performing a mean of 404.26 minutes/week (± 462.26) of moderate-vigorous physical activity and a mean daily sitting time of 232.64 minutes (± 200.74). Participants in the Rodríguez-Larrad et al. (2021) study showed higher levels of moderate-vigorous physical activity and sitting time. The minutes of moderate-vigorous physical activity showed by Sañudo et al. (2020) were also higher. In contrast, participants in the study by Romero-Blanco et al. (2020) achieved less moderate-vigorous physical activity time and higher sitting time (418.59 ± 201.58). Regarding the degree of compliance with the recommendations, Sañudo et al. (2020) and Acebes-Sánchez et al. (2019) obtained higher levels than those of the present study (84% and 74%, respectively).

The mean body mass index of the students was 22.63 (± 2.99), which can be considered normal. This value is slightly higher than that of Rodríguez-Larrad et al. (2021) (22.6 ± 3.3) and lower than that of Rodríguez-Besteiro et al. (2021) (23.65 ± 2.93). Similarly, Romero-Blanco et al. (2020) and Acebes-Sánchez et al. (2019) found that the majority of participants had a normal body mass index.

The mean score for adherence to the Mediterranean diet was 5.51 (± 2.28). This score is lower than that obtained by López-Olivares et al. (2023) for students from Melilla (Spain) (men: 8.32 ± 1.7 ; women: 8.26 ± 1.8) and Romero-Blanco et al. (2022) for undergraduates from Castilla-La Mancha (Spain) (7.51 ± 1.90).

Emotional intelligence scores varied according to dimension, being higher in emotional attention (30.33 ± 6.06) and emotional repair (28.45 ± 5.98) with respect to emotional clarity (28.16 ± 6.34). These levels were higher than those obtained by Mayorga-Lascano (2019) for Psychology students (emotional attention: 26.74 ± 6.78 ; emotional clarity: 25.46 ± 6.62 ; emotional repair: 27.65 ± 6.37) and to those of Hidalgo-Fuentes et al. (2021) for Spanish university students of Psychology, Teaching, Social Work and Criminology (emotional attention: 29.61 ± 6.33 ; emotional clarity: 26.19 ± 6.40 ; emotional repair: 27.12 ± 6.17).

With regard to the social network addiction variables, the highest mean score is for time-management and the lowest for conflict. It should be noted that none of the variables are above the median score (>3 points), although time-management and mood modification are close to 2.5 points. These results are not comparable with those of other previous studies, as none have been found that use an instrument to measure adult social network addiction that integrates the same dimensions. Rivera-Véliz and Araujo-Robles (2021) also concluded that the dimension of excessive use of social networks had the highest score.

The time spent in moderate-vigorous physical activity of the participants in this study was positively related to sitting time and to Mediterranean diet adherence. Acebes-Sánchez et al. (2019) and Murillo et al. (2019) also showed negative relationship of physical activity with sitting time. Tárraga et al. (2021) and García-Pérez et al. (2023) also obtained positive relationship of physical activity with Mediterranean diet. The body mass index has no relationship with the time of moderate-vigorous physical activity, but it does have a relationship with compliance with the practice recommendations. This relationship is not similar to that obtained by Acebes-Sánchez et al. (2019) and Enriquez-Del Castillo et al. (2021), being negative in their studies.

The binary logistic regression model designed is valid to explain 12.6% of the compliance or non-compliance with the physical activity recommendations. The most influential variable in the model is dietary adherence, followed by body mass index and daily sitting time.

The structural equation model designed has had an optimal goodness of fit. This has allowed us to demonstrate that, in the group of participants who comply with the physical activity recommendations, all the research variables are directly or indirectly related. As in the regression model, in the equation model, moderate-vigorous physical activity is related to body mass index and Mediterranean diet. In addition, emotional intelligence and sitting time are indirectly related to moderate-vigorous physical activity time, through diet. All relationships are positive, except for the one concerning body mass index and dietary adherence and that of emotional clarity and social

network addiction. Breti et al. (2022) also found a negative relationship between body mass index and diet in Chilean university students.

In the structural equation model, there are two relationships that deserve special mention due to their importance and novelty, as there are no similar previous studies. Time-management social network addiction is indirectly related to moderate-vigorous physical activity through body mass index. Similarly, emotional attention and emotional clarity are positively and negatively related to social network addiction, respectively. Amiquero and Asto (2022) have already demonstrated in nursing students in Peru that as the level of emotional intelligence decreased, the level of addiction to social networks increased. The findings of Amiquero and Asto are related to the results of Spanish university students because the variable that has the greatest influence on emotional intelligence is emotional clarity, which in turn is negatively related to addiction to social networks.

The study conducted has some limitations that should be mentioned. The first is derived from the type of study designed. Since it is a cross-sectional design, the results obtained are those measured at a specific time, so they could have varied over time. Secondly, it should be mentioned that the sampling was not probabilistic. This has been partially compensated for because the sampling error was lower than recommended in scientific research and the participants are from most Spanish regions. Finally, it should be noted that a questionnaire was used to measure physical activity. Although there are other more accurate instruments for measuring physical activity, such as accelerometers, the questionnaire used was adapted and validated for the participating population. Furthermore, this instrument makes it possible to measure the physical activity of more participants at a lower cost (Dishman et al., 2004).

The results of the present study and their discussion within the framework of previous literature allow us to establish some future lines of research. It would be convenient to carry out similar studies for all age groups. In addition, a longitudinal study could be carried out to analyse the temporal variation in the levels of the habits studied and their relationships (Farooq et al., 2019). It would also be appropriate to analyse how other factors directly and indirectly influence compliance with the physical activity recommendations, such as the consumption of tobacco, alcohol or other harmful substances (Rodríguez-Muñoz et al., 2020). Although most students comply with the practice recommendations, more than one third do not. Therefore, designing a health promotion proposal would be appropriate. It would be desirable for these health promotion proposals to cover both personal and social approaches (Antonopoulou et al., 2020; Messing et al., 2019). At the societal level, public health policies should be improved (Kris-Etherton et al., 2020). At the individual level,

awareness (Kymäläinen et al., 2021) and physical activity levels should be improved (Guthold et al., 2018). In addition, these proposals could encompass the promotion of physical activity together with healthy diet, to improve the food safety (Leung et al., 2019).

5. CONCLUSIONS

Most of university students comply with the recommendations for weekly moderate-vigorous physical activity. Likewise, the average time spent in vigorous-moderate physical activity is higher than recommended. The average daily time spent sitting should be reduced, as it is close to four hours. The average levels of dietary adherence are moderate. Emotional attention is higher than emotional clarity and emotional repair. Levels of social network addiction are not worrisome but have room for reduction.

The first hypothesis was: moderate-vigorous physical activity time is positively related to Mediterranean diet adherence, emotional intelligence and sitting time. This hypothesis has been largely confirmed, as moderate-vigorous physical activity time has been shown to be positively and significantly related to daily sitting time and dietary adherence. In connection to physical activity and emotional intelligence, a positive relationship has been shown with respect to emotional clarity and emotional repair, but a negative one with respect to emotional attention.

The second hypothesis was: moderate-vigorous physical activity time is negatively related to body mass index and social network addiction. This hypothesis has been partially confirmed. Physical activity is negatively related to three dimensions of social network addiction (time-management, mode modification and conflict), but positively related to other two (relapse and withdrawal). In addition, time spent in moderate-vigorous physical activity is positively related to body mass index.

The third hypothesis was: body mass index, sitting time and Mediterranean diet adherence are three predictors of compliance (or non-compliance) with physical activity recommendations. This hypothesis has been confirmed. The proposed regression model has an optimal goodness-of-fit. It predicts 12.6% of compliance or non-compliance with physical activity recommendations among university students. In descending order of prediction, the most influential variables are Mediterranean diet, body mass index and sitting time. Moreover, these variables have a positive influence on compliance with the recommendations.

The fourth hypothesis was: there is a theoretical model regarding compliance with physical activity recommendations that directly explains the relationships between moderate-vigorous physical activity time, body mass index and Mediterranean diet adherence. In addition, this model

indirectly explains the relationship between moderate-vigorous physical activity time and social network addiction, emotional intelligence and sitting time. This hypothesis has been confirmed. The structural equation model designed has an optimal goodness-of-fit to explain the relationships between the variables for participants who comply with the practice recommendations, but not for those who do not. This model allows us to analyse the direct and indirect influence between all the variables, a purpose that could not be achieved with such accuracy with other statistical analyses. In the model, body mass index and dietary adherence are positively and directly related to moderate-vigorous physical activity time. Social network addiction is indirectly related to moderate-vigorous physical activity through body mass index. Likewise, sitting time and emotional intelligence are indirectly related to moderate-vigorous physical activity through Mediterranean diet adherence.

6. REFERENCES

- Acebes-Sánchez, J., Díez-Vega, I., & Rodríguez-Romo, G. (2019). Physical Activity among Spanish Undergraduate Students: A Descriptive Correlational Study. *International Journal of Environmental Research and Public Health*, 16(15), 2770. <https://doi.org/10.3390/ijerph16152770>
- Aggarwal, B., & Jain, V. (2018). Obesity in Children: Definition, Etiology and Approach. *Indian Journal of Pediatrics*, 85, 463–471. <https://doi.org/10.1007/s12098-017-2531-x>
- Akbal, M., Deniz, Y., & Soyer, F. (2023). The Relationship Between Social Media Addiction and Physical Activity Participation Level in Teachers. *KOSALB International Journal of Human Movements Science*, 2(1), 18–29. <https://doi.org/10.5281/zenodo.8073389%20>
- Alime, T., Talha, M., Lok, N., & Lok, S. (2021). Investigation of The Relationship Between Physical Activity and Social Media Addiction in Adults. *Gymnasium. Scientific Journal of Education, Sports and Health*, 22(2), 38-48. <https://doi.org/10.29081/gsjesh.2021.22.2.03>
- Amiquero, A.M., & Asto, L.M. (2022). *Inteligencia emocional y su relación con la adicción a redes sociales en estudiantes de enfermería de la Universidad Nacional de San Cristóbal de Huamanga, 2021*. (Degree Dissertation). Universidad Nacional de San Cristóbal de Huamanga, Perú.
- Antonopoulou, M., Mantzourou, M., Serdari, A., Bonotis, K., Vasios, G., Pavlidou, E., Trifonos, C., Vadikolias, K., Petridis, D., & Giaginis, C. (2020). Evaluating Mediterranean diet adherence in university student populations: Does this dietary pattern affect students' academic performance and mental health? *International Journal of Health Planning and Management*, 35(1), 5-21. <https://doi.org/10.1002/hpm.2881>

- Australian Institute of Health and Welfare. (2018). *Australia's Health 2018*. AIHW.
- Bowden, K.A., Pickles, S., Sprung, V.S., Kemp, G.J., Alam, U., Moore, D.R., Tahrani, A.A., & Cuthbertson, D. J. (2019). Reduced physical activity in young and older adults: metabolic and musculoskeletal implications. *Therapeutic Advances in Endocrinology and Metabolism*, *10*, 2042018819888824. <https://doi.org/10.1177/2042018819888824>
- Breti, V., Yanine, M.J., & Marcos, N. (2022). Relación entre la calidad de la dieta, el índice de masa corporal y el perímetro de cintura en estudiantes de la Facultad de Ciencias de la Salud de la Universidad del Desarrollo, Concepción 2022. (Degree Dissertation). Universidad del Desarrollo, Chile.
- Carbonero-Martín, M.Á., Arteaga-Cedeño, W.L., Martín-Antón, L.J., & Molinero-González, P. (2022). Group Segmentation as a Strategy for Implementing the Intervention Programme in Emotional Education for Infant and Primary Teachers. *International Journal of Environmental Research and Public Health*, *19*(23), 15702. <https://doi.org/10.3390/ijerph192315702>
- Cuadrado, E., Rojas, R., & Tabernero, C. (2020). Development and Validation of the Social Network Addiction Scale (SNAddS-6S). *European Journal of Investigation in Health, Psychology and Education.*, *10*(3), 763-778. <https://doi.org/10.3390/ejihpe10030056>
- Dishman, R.K., Wasburn, R., & Heath, G.W. (2004). *Physical Activity Epidemiology*. Human Kinetics.
- Enriquez-Del Castillo, L.A., Cervantes, N., Candia, R., & Flores, L.A. (2021). Capacidades físicas y su relación con la actividad física y composición corporal en adultos: su relación con la actividad física en adultos. *Retos*, *41*, 674–683. <https://doi.org/10.47197/retos.v41i0.83067>
- Farooq, A., Martin, A., Janssen, X., Wilson, M.G., Gibson, A.M., Hughes, A., & Reilly, J.J. (2020). Longitudinal changes in moderate-tovigorous-intensity physical activity in children and adolescents: A systematic review and meta-analysis. *Obesity Reviews*, *21*, e12953. <https://doi.org/10.1111/obr.12953>
- Fernández-Berrocal, P., Extremera, N., & Ramos, N. (2004). Validity and reliability of the Spanish modified version of the Trait Meta-Mood Scale. *Psychological Reports*, *94*, 751–755. <https://doi.org/10.2466/pr0.94.3.751-755>
- Gallegos, F., & Flores, M. (2021). Uso de redes sociales, orientación a la dominancia social y prejuicio hacia los inmigrantes. *Psocial*, *7*(1), 1-12.

- García-Pérez, L., Zamorano, S., Rojas-Cepero, I., & Miras-Moreno, S. (2023). Healthy habits and mental health of undergraduates in non-health related careers. *SPORT TK-EuroAmerican Journal of Sport Sciences*, 12 (6), 1-10. <https://doi.org/10.6018/sportk.568301>
- Gil, J.A. (2011). *Quantitative Methodology in Education*. National University of Distance Education.
- Guthold, R., Stevens, G.A., Riley, L.M., & Bull, F.C. (2018). Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. *Lancet Global Health*, 6(10), e1077-e1086. [https://doi.org/10.1016/S2214-109X\(18\)30357-7](https://doi.org/10.1016/S2214-109X(18)30357-7)
- Guthold, R., Stevens, G.A., Riley, L.M., & Bull, F.C. (2020). Global trends in insufficient physical activity among adolescents: A pooled analysis of 298 population-based surveys with 1.6 million participants. *Lancet Child & Adolescent Health*, 4, 23–35. [https://doi.org/10.1016/S2352-4642\(19\)30323-2](https://doi.org/10.1016/S2352-4642(19)30323-2)
- Hernández, Á., Zomeño, M.D., Dégano, I.R., Pérez-Fernández, S., Goday, A., Vila, J., Civeira, F., Moure, R., Marrugat, J. (2019). Excess Weight in Spain: Current Situation, Projections for 2030, and Estimated Direct Extra Cost for the Spanish Health System. *Revista Española de Cardiología*, 72(11), 916-924. <https://doi.org/10.1016/j.rec.2018.10.010>
- Hidalgo-Fuentes, S., Martínez-Álvarez, I., & Sospedra-Baeza, M.J. (2021). La relación entre inteligencia emocional y personalidad en estudiantes universitarios españoles. *Apuntes de Psicología*, 39(2), 87-93.
- Khomenko, S., Cirach, M., Pereira-Barboza, E., Mueller, N., Barrera-Gómez, J., Rojas-Rueda, D., de Hoogh, K., Hoek, G., & Nieuwenhuijsen, M. (2021). Premature mortality due to air pollution in European cities: a health impact assessment. *Lancet Planet Health*, 5(3), e121-e134. [https://doi.org/10.1016/S2542-5196\(20\)30272-2](https://doi.org/10.1016/S2542-5196(20)30272-2)
- Kline, R.B. (2016). *Principles and Practice of Structural Equation Modeling*. The Guilford Press.
- Kris-Etherton, P.M., Petersen, K.S., Velarde, G., Barnard, N.D., Miller, M., Ros, E., O'Keefe, J.H., Williams, K., Horn, L.V., Na, M., Shay, C., Douglass, P., Katz, D.L., & Freeman, A.M. (2020). Barriers, Opportunities, and Challenges in Addressing Disparities in Diet-Related Cardiovascular Disease in the United States. *Journal of the American Heart Association*, 9, e014433. <https://doi.org/10.1161/JAHA.119.014433>
- Kymäläinen, T., Seisto, A., & Malila, R. (2021). Generation Z Food Waste, Diet and Consumption Habits: A Finnish Social Design Study with Future Consumers. *Sustainability*, 13(4), 2124. <https://doi.org/10.3390/su13042124>

- Leung, C.W., Wolfson, J.A., Lahne, J., Barry, M.R., Kasper, N., & Cohen, A.J. (2019). Associations between Food Security Status and Diet-Related Outcomes among Students at a Large, Public Midwestern University. *Journal of the Academy of Nutrition and Dietetics*, 119, 1623-1631. <https://doi.org/10.1016/j.jand.2019.06.251>
- López-Gil, J.F., Chen, S., Jiménez-López, E., Abellán-Huerta, J., Herrera-Gutiérrez, E., Panisello, J.M., Eumann, A., & Tárraga-López, P.J. (2023). Are the Use and Addiction to Social Networks Associated with Disordered Eating Among Adolescents? Findings from the EHDLA Study. *International Journal of Mental Health and Addiction*, 1-15. <https://doi.org/10.1007/s11469-023-01081-3>
- López-Olivares, M., Fernández-Gómez, E., Mohatar-Barba, M., Luque-Vara, T., Nestares, T., López-Bueno, M., & Enrique-Mirón, C. (2023). Adherence to the Mediterranean Diet Is Associated with Health-Related Quality of Life and Anthropometric Measurements in University Professors. *Healthcare*, 11(13), 1928. <https://doi.org/10.3390/healthcare11131928>
- López-Olivares, M., Mohatar-Barba, M., Fernández-Gómez, E., & Enrique-Mirón, C. (2020). Mediterranean Diet and the Emotional Well-Being of Students of the Campus of Melilla (University of Granada). *Nutrients*, 12(6), 1826. <https://doi.org/10.3390/nu12061826>
- Mayorga, M. (2019). Relación entre la creatividad, la inteligencia emocional y el rendimiento académico de estudiantes universitarios. *Veritas & Research*, 1(1), 013-021.
- Martínez-González, M.A., García-Arellano, A., Toledo, E., Salas-Salvadó, J., Buil-Cosiales, P., Corella, D., Covas, M.I., Schröder, H., Arós, F., Gómez-Gracia, E., Fiol, M., Ruiz-Gutiérrez, V., Lapetra, J., Lamuela-Raventós, R.M., Serra-Majem, L., Pintó, X., Muñoz, M.A., Wärnberg, J., Ros, E., Estruch, R., & PREDIMED Study Investigators. (2012). A 14-item Mediterranean diet assessment tool and obesity indexes among high-risk subjects: the PREDIMED trial. *PLoS One*, 7(8), e43134. <https://doi.org/10.1371/journal.pone.0043134>
- Messing, S., Rütten, A., Abu-Omar, K., Ungerer-Röhrich, U., Goodwin, L., Burlacu, I., & Gediga, G. (2019). How Can Physical Activity Be Promoted Among Children and Adolescents? A Systematic Review of Reviews Across Settings. *Frontiers in Public Health*, 7, 55. <https://doi.org/10.3389/fpubh.2019.00055>
- Ministry of Health Government of Spain. (2018). *Spanish National Health Survey 2017*. <https://www.sanidad.gob.es/estadEstudios/estadisticas/encuestaNacional/encuesta2017.htm>
- Ministry of Health Government of Spain. (2021). Key indicators in the National Health System. <https://www.sanidad.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/mortalidad/mortalidad.htm>

- Ministry of Education and Vocational Training Government of Spain. (2023). Estadísticas de la Educación. <https://www.educacionyfp.gob.es/servicios-al-ciudadano/estadisticas.html>
- Murillo, A.L., Rangel, L.G., Gamboa, E.M., & Delgado, J.C. (2020). Estudio correlacional sobre la actividad física y conducta sedentaria en senderistas de Bucaramanga, Colombia. *Revista Cubana de Investigaciones Biomédicas*, 39(1), e154.
- Nattino, G., Pennell, M.L., & Lemeshow, S. (2020). Assessing the goodness of fit of logistic regression models in large samples: A modification of the Hosmer-Lemeshow test. *Biometrics*, 76, 549–560. <https://doi.org/10.1111/biom.13249>
- Omar, R.D., Ismail, I.A., Omar-Fauzee, M.S., Abdullah, M.C., & Geok, S.K. (2012). Emotional Intelligence as A Potential Underlying Mechanism For Physical Activity Among Malaysian Adults. *American Journal of Health Sciences (AJHS)*, 3(3), 211–222. <https://doi.org/10.5829/idosi.mejsr.2014.19.icmrp.25>
- Ramón-Arбуés, E., Granada-López, J.M., Martínez-Abadía, B., Echániz-Serrano, E., Antón-Solana, I., & Jerue, B.A. (2022). The Association between Diet and Sleep Quality among Spanish University Students. *Nutrients*, 14(16), 3291. <https://doi.org/10.3390/nu14163291>
- Redondo-Rodríguez, C., Becerra-Mejías, J.A., Gil-Fernández, G., & Rodríguez-Velasco, F.J. (2023). Influence of Gamification and Cooperative Work in Peer, Mixed and Interdisciplinary Teams on Emotional Intelligence, Learning Strategies and Life Goals That Motivate University Students to Study. *International Journal of Environmental Research and Public Health*, 20(1), 547. <https://doi.org/10.3390/ijerph20010547>
- Rivera-Véliz, A.J., & Araujo-Robles, E.D. (2021). Relación entre inteligencia emocional y riesgo de adicción a redes sociales en estudiantes de educación superior no universitaria de Lima Metropolitana. *Revista Psicológica Herediana*, 13(1), 1-11. <https://doi.org/10.20453/rph.v13i1.3848>
- Rodríguez-Besteiro, S., Tornero-Aguilera, J.F., Fernández-Lucas, J., & Clemente-Suárez, V.J. (2021). Gender Differences in the COVID-19 Pandemic Risk Perception, Psychology, and Behaviors of Spanish University Students. *International Journal of Environmental Research and Public Health*, 18(8), 3908. <https://doi.org/10.3390/ijerph18083908>
- Rodríguez-Larrad, A., Mañas, A., Labayen, I., González-Gross, M., Espin, A., Aznar, S., Serrano-Sánchez, J.A., Vera-García, F.J., González-Lamuño, D., Ara, I., Carrasco-Páez, L., Castro-Piñero, J., Gómez-Cabrera, M.C., Márquez, S., Tur, J.A., Gusi, N., Benito, P.J., Moliner-Urdiales, D., Ruiz, J.R., Ortega, F.B., ... Irazuste, I. (2021). Impact of COVID-19 Confinement on Physical Activity and Sedentary Behaviour in Spanish University Students:

- Role of Gender. *International Journal of Environmental Research and Public Health*, 18(2), 369. <https://doi.org/10.3390/ijerph18020369>
- Rodríguez-Muñoz, P.M., Carmona-Torres, J.M., & Rodríguez-Borrego, M.A. (2020). Influence of tobacco, alcohol consumption, eating habits and physical activity in nursing students. *Revista Latino-Americana de Enfermagem*, 28, e3230. <https://doi.org/10.1590/1518-8345.3198.3230>
- Rodríguez-Muñoz, S., Corella, C., Abarca-Sos, A., & Zaragoza, J. (2017). Validation of three short physical activity questionnaires with accelerometers among university students in Spain. *The Journal of Sports Medicine and Physical Fitness*, 57, 1660-1668. <https://doi.org/10.23736/S0022-4707.17.06665-8>
- Romero-Blanco, C., Rodríguez-Almagro, J., Onieva-Zafra, M.D., Parra-Fernández, M.L., Prado-Laguna, M.d.C., & Hernández-Martínez, A. (2020). Physical Activity and Sedentary Lifestyle in University Students: Changes during Confinement Due to the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, 17(18), 6567. <https://doi.org/10.3390/ijerph17186567>
- Romero-Blanco, C., Hernández-Martínez, A., Parra-Fernández, M.L., Onieva-Zafra, M.D., Prado-Laguna, M.d.C., & Rodríguez-Almagro, J. (2022). Food Preferences in Undergraduate Nursing Students and Its Relationship with Food Addiction and Physical Activity. *International Journal of Environmental Research and Public Health*, 19(7), 3858. <https://doi.org/10.3390/ijerph19073858>
- Sanz-Martín, D., Melguizo-Ibáñez, E., Ruiz-Tendero, G., Zurita-Ortega, F., & Ubago-Jiménez, J.L. (2022). Physical Activity, Energy Expenditure, Screen Time and Social Support in Spanish Adolescents—Towards an Explanatory Model about Health Risk Factors. *International Journal of Environmental Research and Public Health*, 19(16), 10222. <https://doi.org/10.3390/ijerph191610222>
- Sañudo, B., Fennell, C., & Sánchez-Oliver, A.J. (2020). Objectively-Assessed Physical Activity, Sedentary Behavior, Smartphone Use, and Sleep Patterns Pre- and during-COVID-19 Quarantine in Young Adults from Spain. *Sustainability*, 12(15), 5890. <https://doi.org/10.3390/su12155890>
- Strain, T., Brage, S., Sharp, S.J., Richards, J., Tainio, M., Ding, D., Benichou, J., & Kelly, P. (2020). Use of the prevented fraction for the population to determine deaths averted by existing prevalence of physical activity: A descriptive study. *Lancet Global Health*, 8, e920–e930. [https://doi.org/10.1016/S2214-109X\(20\)30211-4](https://doi.org/10.1016/S2214-109X(20)30211-4)

- Tárraga, A., Panisello, J.M., Carbayo, J.A., López, J.F., García, E., & Tárraga, P.J. (2021). Valoración de la adherencia a la dieta mediterránea en estudiantes universitarios de Ciencias de la Salud y su relación con el nivel de actividad física. *Nutrición Hospitalaria*, 38(4), 814-820. <https://dx.doi.org/10.20960/nh.03531>
- Tenenbaum, G., & Eklund, R.C. (2007). *Handbook of sport psychology*. John Wiley & Sons.
- Ubago-Jiménez, J.L., González-Valero, G., Puertas-Molero, P., & García-Martínez, I. (2019). Development of Emotional Intelligence through Physical Activity and Sport Practice. A Systematic Review. *Behavioral Sciences*, 9(4), 44. <https://doi.org/10.3390/bs9040044>
- World Health Organization (WHO). (2020). *Guidelines on Physical Activity and Sedentary Behaviour*. World Health Organization.
- World Health Organization (WHO). (2021). *Obesity and overweight*. <https://www.who.int/es/news-room/fact-sheets/detail/obesity-and-overweight>

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

COPYRIGHT

© Copyright 2024: Publication Service of the University of Murcia, Murcia, Spain.