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Lifestyle Behaviors and their association with self-rated health among university students in Spain: A cross-sectional study

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ABSTRACT

Objective: To evaluate lifestyle behaviors, gender differences, and factors independently associated with unfavorable self-rated health (SRH) among university students.
Methods: In this cross-sectional study, 453 university students at a private university in Spain completed a baseline assessment of SRH, physical activity (PA), sedentary behavior, Mediterranean diet adherence, sleep quality, perceived stress, and substance use in September 2025. Associations with unfavorable SRH were analyzed using multivariable logistic regression ($n = 426$).
Results: Although 83.44% reported favorable SRH, women reported poorer SRH and higher stress, while men showed higher PA and at-risk drinking ($p < 0.05$). In multivariable analysis, perceived stress was strongly associated with unfavorable SRH (OR = 1.10, 95% CI: 1.05, 1.16). Being a man (OR = 0.46, 95% CI: 0.23, 0.93) and Mediterranean diet adherence (OR = 0.82, 95% CI: 0.68, 0.97) were associated with lower odds of unfavorable SRH. PA, sleep quality, and substance use showed no independent associations.
Conclusions: Perceived stress is the primary factor associated with unfavorable SRH. University health promotion strategies should integrate psychological support with lifestyle interventions. However, findings should be interpreted cautiously given the predominance of students from health-related disciplines.

Study setting and period

Data were collected at University College Alberta Giménez (CESAG-UP Comillas), Palma de Mallorca, Spain, in September 2025.

1. Introduction

The transition to university is a critical stage where disrupted habits establish lifelong behavioral patterns (Winpenny et al., 2020). Students frequently experience adverse lifestyle changes, including increased sedentary time (Castro et al., 2020), poorer diet quality, hazardous drinking (Savage et al., 2024), and irregular sleep (Hershner and Chervin, 2014). Concurrently, academic demands and social transitions exacerbate anxiety and perceived stress (Ramón-Arbués et al., 2020; Santomauro et al., 2021; Tan et al., 2023).

Health behaviors cluster into distinct lifestyle profiles among

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university students rather than occurring in isolation (van Hooijdonk et al., 2023; Yang et al., 2025). Unhealthy habits like inactivity, poor diet, and substance use co-occur (Alosaimi et al., 2023; Moreno-Gómez et al., 2012), while prolonged sedentary time impairs psychological well-being (Basterra-Gortari et al., 2024). Conversely, regular physical activity (PA) correlates with healthier diet and sleep, lowering anxiety, depression, and mortality risks (Deforche et al., 2015; Li et al., 2024; Tamakoshi et al., 2009). Sociodemographic factors like gender and academic environment shape these behavioral clusters. Women generally report healthier diets but higher stress and poorer sleep, whereas men exhibit higher PA (Savage et al., 2024; Winpenny et al., 2020). To capture these interconnected biological, behavioral, and psychological influences, self-rated health (SRH) serves as a robust global indicator.

Better SRH consistently aligns with healthier behaviors (greater PA, better diet, lower stress), whereas poorer SRH links to smoking, excess weight, and adverse psychosocial factors (Antonopoulou et al., 2020; Cena et al., 2021; Franzoi et al., 2021; Ohtsuki et al., 2021). This necessitates shifting from isolated habit analysis toward a salutogenic, cluster-based approach to identify modifiable drivers along the health-disease continuum (Antonovsky, 1996; Moreno-Gómez et al., 2012; Skivington et al., 2021; Yang et al., 2025).

Although recent studies examine multiple lifestyle behaviors simultaneously, evidence remains limited regarding their relative independent associations with global SRH when perceived stress is included in the same adjusted model. Existing research varies widely in outcomes, behavior coverage, and sociocultural contexts, with few jointly evaluating stress, PA, diet, sleep, and substance use against SRH in Spanish university populations. Addressing this gap is essential for universities to prioritize targeted, multicomponent health promotion strategies. Therefore, this study aims to (1) analyze lifestyle behaviors among university students; (2) examine gender differences in these behaviors and SRH; and (3) identify factors independently associated with unfavorable SRH.

2. Methods

2.1. Study design and population

This cross-sectional study represents the baseline diagnostic phase of a university health promotion initiative. Data were collected in September 2025 via an anonymous, self-administered Google Forms questionnaire distributed in classrooms under researcher supervision. Following brief introductory presentations across all undergraduate degree programmes, all enrolled students were invited to participate. Overall, 477 individuals responded; 24 staff members were excluded as ineligible, yielding 453 students (response rate: 66.33% of 683 enrolled students at a private university in Palma de Mallorca, Spain). Inclusion criteria required active enrolment and voluntary participation. One non-binary participant was retained in all analyses.

2.2. Measures

The questionnaire captured sociodemographic data (self-reported gender—using a single item with response options including woman, man, and non-binary—age, academic discipline, and academic year) alongside validated measures of lifestyle behaviors and health indicators: (1) Self-Rated Health (SRH): Assessed using a single item from the Spanish Health Survey (*ESdE*) (Ministerio de Sanidad, 2023), asking participants to rate their health over the past 12 months on a 5-point Likert scale; (2) Physical Activity and Sedentary Behavior: Measured via the Spanish International Physical Activity Questionnaire-Short Form (IPAQ-SF) (Román Viñas et al., 2013). PA was categorized as low, moderate, or high, and continuous total energy expenditure (MET-min/week) was calculated following standard protocols; (3) Mediterranean Diet Adherence: Evaluated using the 14-item Mediterranean Diet Adherence Screener (MEDAS) (Schröder et al., 2011). Scores range from 0 to 14, classifying as low (0–5), medium (6–9), or high (≥10) adherence; (4) Sleep Quality: Assessed with the 6-item Brief Pittsburgh Sleep Quality Index (B-PSQI) (Sancho-Domingo et al., 2021). Scores range from 0 **to** 15, with a > 5 cut-off indicating poor sleep. (5) Perceived Stress: Measured via the 10-item Perceived Stress Scale (PSS-10) (Remor, 2006). Total scores (0–40) were categorized as low (0−13), moderate (14–26), or high (27–40); (6) Alcohol Consumption: Screened using the Alcohol Use Disorders Identification Test (AUDIT) (Contel Guillamón et al., 1999; Saunders et al., 1993). For analysis, scores were dichotomized into low risk (0–7) and at-risk drinking (≥8); (7) Tobacco and *E*-cigarette Use: Adapted from the ESdE (Ministerio de Sanidad, 2023). Participants were categorized as current (daily/occasional), former, or never users.

2.3. Statistical analysis

Normality of continuous variables was assessed via Shapiro-Wilk tests. Non-normal variables are reported as medians [IQR] and categorical variables as frequencies (%). Gender differences were assessed using Mann-Whitney *U* tests (r) for continuous variables and Chi-square or Fisher's exact tests (Cramér's V), as appropriate, for categorical variables.

Multivariable binary logistic regression identified factors independently associated with unfavorable SRH (Fair/Poor/Very poor vs. Good/Very good). Predictors selected a priori included gender, age, academic discipline, sedentary time (h/day), PA level, Mediterranean diet adherence (MEDAS score), sleep quality (poor sleeper: B-PSQI >5), perceived stress (PSS-10 score), at-risk drinking, and tobacco or e-cigarette use. To improve estimate stability, degree programmes were grouped into three disciplines: Health-related (Nursing, Physical Activity and Sport Sciences), Education-related (Early Childhood, Primary, Double Degree in Education, Master's in Teacher Training), and Communication-related (Journalism, Audiovisual, Advertising/Public Relations, Double Degree in Communication).

Collinearity among predictors was assessed using generalised variance inflation factors, tolerance and the condition number of the design matrix (Supplementary Tables S2 and S3). The assumption of linearity for the continuous predictors was examined by comparing the linear specification with restricted cubic splines using likelihood-ratio tests (Supplementary Table S5). Two pre-specified interactions (gender by perceived stress and gender by Mediterranean diet adherence) were tested by likelihood-ratio tests (Supplementary Table S4). Sleep quality could not be scored for 18 participants whose reported bed and wake times were mutually inconsistent, precluding calculation of the sleep-efficiency component; these participants were treated as missing rather than assigned to a category. Because a single participant identified as non-binary and reported unfavorable SHR, that category is completely separated on the outcome and its odds ratio is not estimable; the participant was retained in the model, which was additionally refitted with Firth's penalised likelihood to confirm that the remaining coefficients were unaffected. As a sensitivity analysis, a proportional-odds ordinal logistic regression was fitted on the full five-point SRH scale (Supplementary Table S1). Women, low PA, and Health-related academic disciplines served as reference categories. Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated. Model discrimination was evaluated with the area under the ROC curve (AUC); calibration was assessed with the Hosmer-Lemeshow goodness-of-fit test ($g = 10$ groups). Statistical significance was set at $\alpha = 0.05$. All statistical analyses were conducted in R version 4.4.1 (R Core Team, Vienna, Austria).

2.4. Disclosure of ethical compliance

This study met the institution's guidelines for the protection of human subjects concerning safety and privacy. Participation was entirely voluntary. The study received ethical approval from the Ethics

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Committee of Comillas Pontifical University (Approval Code: 083/24–25; 24 February 2025). All participants provided written informed consent prior to data collection and authorized the use of their anonymized data for research purposes.

3. Results

The sample comprised 453 students (55.19% women, 44.59% men, 0.22% non-binary; mean age 21.58 ± 3.94 years), predominantly in Nursing (32.45%) and Physical Activity and Sport Sciences (31.13%) (Table 1).

Overall, 83.44% reported favorable SRH. High PA was prevalent (69.76%), whereas Mediterranean diet adherence (52.98%) and perceived stress (57.40%) were predominantly moderate. Most participants were non-smokers (86.98%) and low-risk drinkers (84.55%) (Table 2). Men reported significantly better SRH than women (92.08% vs. 76.80%; $p < 0.001$), higher total PA, lower sedentary time ($p < 0.001$), and higher at-risk drinking (19.31% vs. 12.40%; $p = 0.05$). Women reported higher perceived stress (median 18.00 vs. 13.00; $p < 0.001$). Largest gender effect sizes occurred for stress and PA. Diet adherence, sleep quality, and tobacco/e-cigarette use showed no gender differences.

After listwise deletion of missing values, the multivariable logistic regression model included 426 participants. Missing data arose from two variables: sleep quality, which could not be scored in 18 participants (3.97%) whose reported bed and wake times were mutually inconsistent, and current vaping (10 participants, 2.21%), with one participant missing both, giving a total loss of 27 of 453 students (5.96%). Gender, Mediterranean diet adherence, and perceived stress were independently associated with unfavorable SRH (Table 3). Men had significantly lower odds of reporting unfavorable SRH than women (OR = 0.46; 95% CI: 0.23, 0.93). Higher adherence to the Mediterranean diet was also associated with lower odds of reporting unfavorable health (OR = 0.82; 95% CI: 0.68, 0.97). A two-point increase in the MEDAS score corresponded to an odds ratio of 0.66 (95% CI: 0.47, 0.95) and a three-point increase to 0.54 (95% CI: 0.32, 0.92). Conversely, perceived stress was the factor most strongly associated with unfavorable SRH; each one-point increase corresponded to 10% higher odds of poor SRH (OR = 1.10; 95% CI: 1.05, 1.16), and an increase of one standard deviation (6.73 points) to an odds ratio of 1.92 (95% CI: 1.40, 2.65); the shift from the low-stress to the moderate-stress stratum corresponded to an odds ratio of 2.40 (95% CI: 1.57, 3.67). No significant associations were observed for age, academic discipline, sedentary time, PA, sleep quality, alcohol consumption, smoking, or e-cigarette use after adjustment. The model showed acceptable discrimination (area under the curve 0.77; 95% CI: 0.72, 0.83) and adequate calibration (Hosmer-Lemeshow chi-square (8) = 7.52, $p = 0.48$). Collinearity was not a concern: the maximum generalised variance inflation factor was 1.11 and the condition number of the design matrix was 4.61 (Supplementary Tables S2 and S3). Neither of the two pre-specified interactions was statistically significant (gender by perceived stress, $p = 0.79$; gender by Mediterranean diet adherence, $p = 0.38$; Supplementary Table S4). A proportional-odds ordinal model on the full five-point scale yielded consistent estimates (Mediterranean diet adherence 0.85; 95% CI: 0.76, 0.96; perceived stress 1.08; 95% CI: 1.04, 1.11; Supplementary Table S1).

Table 1
Sociodemographic and academic characteristics of university students, Spain, 2025–2026 academic year.

Characteristic	n (%) or mean ± SD
Age (years)	21.58 ± 3.94
Gender	
Women	250 (55.19)
Men	202 (44.59)
Non-binary	1 (0.22)
Degree program	
Nursing	147 (32.45)
Physical Activity and Sport Sciences	141 (31.13)
Early Childhood Education	9 (1.99)
Primary Education	41 (9.05)
Double degree in Early Childhood and Primary Education	42 (9.27)
Journalism	10 (2.21)
Audiovisual Communication	11 (2.43)
Advertising and Public Relations	26 (5.74)
Double degree in Journalism and Audiovisual Communication	14 (3.09)
Master's in Teacher Training	12 (2.65)
Academic discipline	
Health-related	288 (63.58)
Education-related	104 (22.96)
Communication-related	61 (13.47)
Year of study	
First year	135 (29.80)
Second year	124 (27.37)
Third year	74 (16.34)
Fourth year	110 (24.28)
Fifth year	1 (0.22)
Master's	9 (1.99)

Note. n = 453 students. Values are n (%) unless otherwise indicated. Percentages were calculated using the full student sample and may not sum to 100 because of rounding. Health-related discipline comprises Nursing and Physical Activity and Sport Sciences; Education-related discipline comprises Early Childhood Education, Primary Education, the double degree in Early Childhood and Primary Education, and the Master's in Teacher Training; Communication-related discipline comprises Journalism, Audiovisual Communication, Advertising and Public Relations, and the double degree in Journalism and Audiovisual Communication. SD, standard deviation.

4. Discussion

This study evaluated independent associations between lifestyle behaviors, perceived stress, and self-rated health (SRH) in university students. Perceived stress showed the strongest association with unfavorable SRH, while male gender and Mediterranean diet adherence were associated with lower odds of unfavorable SRH. These findings demonstrate that psychological and sociodemographic factors shape health perceptions, often outweighing the influence of individual lifestyle habits.

Stress remained a central determinant of SRH after multivariable adjustment (Ramón-Arbués et al., 2020; Tan et al., 2023), indicating that universities must prioritize stress management within health promotion rather than targeting lifestyle habits in isolation. Gender differences further highlighted this complexity: women reported poorer SRH and higher stress despite similar dietary and substance habits to men. Conversely, men showed higher PA, lower sedentary time, and persistently lower odds of unfavorable SRH (Cena et al., 2021; Savage et al., 2024; Winpenny et al., 2020), suggesting that broader psychosocial or cultural factors influence health appraisal and supporting gender-sensitive interventions.

Mediterranean diet adherence was independently associated with better SRH, affirming its role as a key modifiable factor. Consistent with previous research, diet quality likely benefits mental well-being by regulating inflammation, oxidative stress, and neurotransmitter pathways (Antonopoulou et al., 2020; Dakanalis et al., 2025). Despite a modest effect size, the consistency of this association supports dietary interventions as a component of comprehensive health programs. However, only a small proportion of participants exhibited high Mediterranean diet adherence. This limited variability at the upper end of the MEDAS distribution may have reduced our ability to estimate the full magnitude of its protective association with SRH. Nevertheless, the median MEDAS score observed in our sample is comparable to those reported in previous studies of university students, suggesting that it reflects generally suboptimal adherence to the Mediterranean diet rather than inadequate performance of the MEDAS instrument in this population.

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Table 2
Self-rated health and lifestyle behaviors overall and by gender among university students, Spain, 2025–2026 academic year.

Characteristic	Total (n = 453)	Women (n = 250)	Men (n = 202)	p-value	Effect size
Self-rated health (SRH), n (%)				<0.001	0.20
Good/Very good	378 (83.44)	192 (76.80)	186 (92.08)		
Fair/Poor/Very poor	75 (16.56)	58 (23.20)	16 (7.92)		
Physical activity level, n (%)				<0.001	0.29
Low	22 (4.86)	17 (6.80)	5 (2.48)		
Moderate	115 (25.39)	88 (35.20)	26 (12.87)		
High	316 (69.76)	145 (58.00)	171 (84.65)		
Total physical activity (MET-min/week), median [IQR]	4068.00 [2466.00–6078.00]	3279.00 [1971.75–5161.50]	5113.50 [3586.25–7278.00]	<0.001	0.33
Sedentary time (h/day), median [IQR]	6.00 [5.00–8.00]	7.00 [5.00–8.00]	6.00 [4.00–7.38]	<0.001	0.18
Mediterranean diet adherence, n (%)				0.51	0.05
Low	206 (45.47)	108 (43.20)	98 (48.51)		
Medium	240 (52.98)	138 (55.20)	101 (50.00)		
High	7 (1.55)	4 (1.60)	3 (1.49)		
MEDAS score, median [IQR]	6.00 [5.00–7.00]	6.00 [5.00–7.00]	6.00 [5.00–7.00]	0.45	0.04
Poor sleep quality (B-PSQI >5), n (%)	173 (39.77)	99 (41.25)	73 (37.63)	0.49	0.03
B-PSQI score, median [IQR]	5.00 [3.00–7.00]	5.00 [3.00–7.00]	5.00 [3.00–7.00]	0.63	0.02
Perceived stress level, n (%)				<0.001	0.31
Low	159 (35.10)	56 (22.40)	103 (50.99)		
Moderate	260 (57.40)	167 (66.80)	92 (45.54)		
High	34 (7.51)	27 (10.80)	7 (3.47)		
PSS-10 score, median [IQR]	16.00 [11.00–20.00]	18.00 [14.00–23.00]	13.00 [10.00–18.00]	<0.001	0.35
At-risk drinking, n (%)	70 (15.45)	31 (12.40)	39 (19.31)	0.05	0.09
AUDIT score, median [IQR]	3.00 [1.00–6.00]	3.00 [1.00–5.00]	4.00 [2.00–7.00]	<0.01	0.14
Current smoking, n (%)	59 (13.02)	34 (13.60)	24 (11.88)	0.67	0.02
Current e-cigarette use, n (%)	40 (9.03)	23 (9.35)	17 (8.67)	0.87	0.00

Note. Values are n (%) unless otherwise indicated. Percentages for the total column were calculated using the full sample (n = 453) and those for the gender columns using the corresponding subgroup. One participant identified as non-binary and was included in the total column but is not shown as a separate column; p-values compare women and men only. Denominators differed for two variables: sleep quality was scored for 435 students (240 women, 194 men) because bed and wake times were internally inconsistent for 18 participants, and current e-cigarette use was reported by 443 students (246 women, 196 men). Physical activity level was measured using the International Physical Activity Questionnaire Short Form (IPAQ-SF), Mediterranean diet adherence using the Mediterranean Diet Adherence Screener (MEDAS), sleep quality using the Brief Pittsburgh Sleep Quality Index (B-PSQI; poor sleep quality defined as a global score > 5), perceived stress using the 10-item Perceived Stress Scale (PSS-10), and alcohol use using the Alcohol Use Disorders Identification Test (AUDIT; at-risk use defined as a total score ≥ 8). P-values were obtained using Fisher's exact test for 2 × 2 tables and tables with any expected cell count <5, the chi-square test for the remaining categorical variables, and the Mann–Whitney U test for continuous variables. Effect sizes are Cramér's V for categorical variables and the rank-biserial correlation coefficient for continuous variables. IQR, interquartile range.

Table 3
Adjusted odds ratios for unfavorable self-rated health among university students, Spain, 2025–2026 academic year.

Predictor	OR (95% CI)
Gender: Men (ref: Women)	0.46 (0.23, 0.93)
Gender: Non-binary (ref: Women)	Not estimable (perfect separation, n = 1)
Age (years)	1.01 (0.93, 1.09)
Discipline: Communication-related (ref: Health-related)	1.39 (0.62, 3.14)
Discipline: Education-related (ref: Health-related)	1.19 (0.61, 2.33)
Sedentary time (h/day)	1.04 (0.94, 1.14)
Physical activity level: High (ref: Low)	1.29 (0.32, 5.18)
Physical activity level: Moderate (ref: Low)	1.87 (0.46, 7.64)
Mediterranean diet adherence (MEDAS, per point)	0.82 (0.68, 0.97)
Sleep quality: Poor sleeper (ref: Good sleeper)	1.03 (0.57, 1.87)
Perceived stress (PSS-10, per point)	1.10 (1.05, 1.16)
Alcohol consumption: At-risk drinking (ref: Low risk)	1.19 (0.54, 2.59)
Current smoking: Yes (ref: No)	2.08 (0.95, 4.58)
Current e-cigarette use: Yes (ref: No)	1.39 (0.54, 3.55)

Note. Multivariable binary logistic regression; n = 426 students with complete data, of whom 70 reported unfavorable self-rated health. The reference category for the outcome was good or very good self-rated health. The odds ratio for the non-binary gender category was not estimable because a single participant reported this identity and was completely separated on the outcome; the participant was retained in the model. A two-point increase in the MEDAS score corresponds to an odds ratio of 0.66 (95% CI: 0.47, 0.95), and a three-point increase to 0.54 (95% CI: 0.32, 0.92); an increase of one standard deviation in the PSS-10 score (6.70 points) corresponds to an odds ratio of 1.92 (95% CI: 1.40, 2.65). OR, odds ratio; CI, confidence interval; MEDAS, Mediterranean Diet Adherence Screener; PSS-10, 10-item Perceived Stress Scale.

Interestingly, PA was not independently associated with SRH. This may reflect a ceiling effect driven by the high proportion of Physical Activity and Sport Sciences students in our sample, which likely reduced data variability. Furthermore, the benefits of PA on perceived health may be overshadowed by psychological factors like stress. Similarly, sleep quality, alcohol consumption, and tobacco use showed no independent associations, likely due to the low baseline prevalence of high-risk behaviors and the broad nature of SRH as a global outcome measure. Although these specific habits did not reach statistical significance here, extensive evidence confirms their long-term impact on mental health (Donnelly et al., 2024; Hershner and Chervin, 2014; Huang et al., 2024; Wang et al., 2024).

Ultimately, these results support a multidimensional perspective where behavioral and psychological factors form interconnected profiles. Universities represent ideal settings to implement these integrated interventions (Dooris et al., 2017; International Conference on Health Promoting Universities and Colleges, 2015). Traditional approaches prioritizing only PA or diet must evolve; incorporating mental health support into lifestyle promotion is essential for meaningful and sustainable improvements in student well-being.

4.1. Limitations and strengths

Several limitations warrant consideration. First, the cross-sectional design precludes causal inference. Second, self-reported measures are subject to recall and social desirability biases, potentially overestimating PA and underreporting substance use. This bias may be pronounced among Sport Sciences students aware of PA recommendations using the IPAQ-SF. Objective measures (e.g., accelerometry) were unavailable. Third, instruments used varying recall periods (12 months for SRH vs. recent weeks for lifestyle/stress), which may have attenuated observed

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associations. Third, two pre-specified interactions (gender by perceived stress and gender by Mediterranean diet adherence) were tested by likelihood-ratio tests and neither was statistically significant; these tests were restricted to women and men and were powered only to detect large effect modification. Gender-specific estimates could not be obtained for non-binary students because a single participant reported this identity, an equity limitation of a single-institution sample. Fourth, although all enrolled students were invited to participate, the use of a voluntary convenience sample may have introduced self-selection bias, as students with greater interest in health-related topics may have been more likely to participate. Consequently, the findings should be interpreted with caution, as the sampling strategy restricts their generalizability to other university populations. In addition, nearly two-thirds of participants were enrolled in health-related disciplines (Nursing and Physical Activity and Sport Sciences). This academic composition may have influenced the prevalence of several lifestyle behaviors observed in the sample, including the high proportion of physically active students and the relatively low prevalence of smoking and at-risk alcohol consumption. Consequently, the findings should be interpreted with caution and may not be fully representative of students from other academic disciplines.

Finally, SRH—while a robust global indicator—can be influenced by short-term affective states at the time of questionnaire completion. Future studies utilizing larger, representative samples and longitudinal designs should explore potential effect modifications and the long-term impacts of these behavioral clusters.

Despite these limitations, this study has notable strengths. The primary strength is its comprehensive, integrated assessment of multiple validated lifestyle and psychosocial factors within a single analytical framework, moving beyond the traditional isolation of these variables. Additionally, the relatively large sample size across diverse academic disciplines further enhances the robustness of the findings.

5. Conclusion

This study highlights the central role of perceived stress as the factor most strongly associated with unfavorable SRH among university students, while being a man and greater adherence to the Mediterranean diet were independently linked to better health perception. These findings demonstrate that psychological, behavioral, and sociodemographic factors jointly shape perceived health during emerging adulthood. Accordingly, in line with the Health Promoting Universities framework, institutions must move beyond isolated health advice. University health promotion strategies should adopt integrated, multicomponent approaches that embed stress management directly into lifestyle behavior programs, prioritizing scalable and context-embedded interventions for higher-risk groups. Such holistic approaches will enhance both individual well-being and the long-term effectiveness of institutional health promotion strategies. Nevertheless, given the predominance of students from health-related disciplines, caution is warranted when extrapolating these findings to the broader university student population.

CRediT authorship contribution statement

Isabel M. Martín-López: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Teresa Gutiérrez-Alemán:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **María Isabel Cerezo Sánchez:** Writing – review & editing, Validation, Methodology, Investigation. **Antoni Colom Fernández:** Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Methodology, Investigation, Formal analysis, Data curation.

Ethical compliance

This study met the institution's guidelines for the protection of human subjects concerning safety and privacy. Participation was entirely voluntary. The study received ethical approval from the Ethics Committee of Comillas Pontifical University (Approval Code: 083/24–25; 24 February 2025). All participants provided written informed consent prior to data collection and authorized the use of their anonymized data for research purposes.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2026.103623.

Data availability

Data will be made available on request.

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