Mediterranean Journal of Clinical Psychology

ISSN 2282-1619

MJCP

Volume 14, n 1, 2026

Clinical Psychology

Disordered eating among university students at pre- and post - COVID-19: a repeated cross-sectional study

Maria Koushiou [1], Georgios Stavrinos [1], Nuno Ferreira [1], Marios Adonis [1]*

Abstract

Background: Although the COVID-19 pandemic has passed, its impact on university students' mental health remains evident, with lasting increases in anxiety, depression, and eating disorder symptoms. A repeated cross-sectional comparison was conducted to understand the role of weight concerns, emotion regulation, stress, anxiety and depression in the expression of eating disorders (ED) symptoms among two independent cross-sectional university samples collected in 2019, before COVID-19, and in 2022, after the pandemic.

Method: A total of 845 students completed the Depression, anxiety, stress questionnaire-21, the Difficulties in emotion regulation scale and the Weight concerns scale as part of a campus-wide campaign that aimed to raise awareness on psychological well-being among students, conducted before and after the pandemic. Multiple regression with interactions was run to test the effects of emotion regulation, stress, anxiety, depression and weight concerns on ED symptoms, controlling for participants' age and sex.

Results: Results showed significant increases in students' levels of stress, anxiety, depression as well as higher emotion regulation difficulties at post-pandemic. There were also, significant effects of anxiety and emotion regulation on ED symptoms across both years whereas students who experienced higher stress and weight concerns in 2022, towards the end of the pandemic, were more likely to report ED symptoms as compared to students at pre-pandemic.

Conclusion: These findings indicate that significant changes were noted in students' emotional well-being while students with higher stress and weight concerns were more prone to disordered eating after the pandemic. Further evaluation of these factors is necessary to better understand the impact of COVID-19 on ED risk among university students and to inform universities efforts to revise and adapt prevention and screening programs to the post-COVID-19 era.

[1] Department of Social Sciences, University of Nicosia, Cyprus

E-mail corresponding author: koushiou.m@unic.ac.cy

Keywords:
Anxiety; COVID-19 pandemic; Disordered eating; Emotion regulation; University students.

Received: 8 December 2025
Accepted: 22 April 2026
Published: 30 April 2026

Citation: Koushiou, M., Stavrinos, G., Ferreira, N., & Adonis, M. (2026). Disordered eating among university students at pre- and post - COVID-19: a repeated cross-sectional study. *Mediterranean Journal of Clinical Psychology 14*(1). https://doi.org/10.13129/2282-1619/mjcp-5279

1. Introduction

University students may be considered as a vulnerable population often presenting with high rates of mental health problems. Due to the high number of academic, financial, social and personal stressors while transitioning to adulthood and university life, students often experience mental health difficulties such as depression, anxiety, and eating disorders (ED) with significant cognitive and functional impairments (Alonso et al., 2019; Auerbach et al., 2018; Gómez & Grisales, 2023; Quirama et al., 2025) and declines in their subjective well-being and quality of life *(Rodríguez et al., 2024)*. One of the most prevalent mental health problems among young adults, and particularly university students, is ED with prevalence rates for clinical syndromes ranging from 1.7 – 2.3% (Smink et al., 2014) and from 10-20% for subthreshold eating problems among young adults (Galmiche et al., 2019; Koushiou et al., 2020). Empirical evidence suggests a sharp increase in ED risk (e.g., see Tavolacci et al., 2021) during the Coronavirus Disease 2019 (COVID-19) pandemic prompting for further research in understanding ED risk and associated factors as a pandemic contingent.

The surge of COVID-19 had a substantial impact on university students adding new challenges in their every-day life such as disruptions in teaching, adaptation to online learning methods, delays in students' courses, internships/practicums and probably degree completion with both academic and financial implications for students and their families (Graupensperger et al., 2023). Further disruptions in every-day activities, restrictions in physical activity and social contact, especially during lockdown periods and lockdown stress, may have contributed to the increased levels of stress, anxiety and depression among university students as compared to non-students (Arsandaux et al 2021; Brooks et al., 2020; Elmer et al., 2020; Wang et al., 2021) as well as to the increases in disordered eating among vulnerable groups and exacerbated ED risk (Rodgers et al., 2020; Tavolacci et al., 2021).

Increasing trends of ED symptoms have been associated with increased negative affect (e.g., see Gao et al., 2022; Merlyn et al., 2025). Poor emotion regulation has also, been associated with worse eating outcomes among ED patients' groups and university students during the pandemic (Flaudias et al., 2020; Machado et al., 2020). These findings support established theoretical models of ED, particularly Fairburn's transdiagnostic cognitive-behavioral model, which emphasizes the processes through which emotion regulation difficulties and psychological distress can affect disordered eating (Fairburn et al., 2003). For example, poorer emotional clarity and non-acceptance of emotions were associated with higher emotional distress among adults with self-reported ED during the pandemic (Vuillier et al, 2021). This evidence, albeit limited, may help to identify potential psychological risk factors that exacerbate ED risk during crises, such as the pandemic, which can elicit heightened psychological distress, and warrants further investigation.

To date, the majority of studies examine disordered eating at a specific time-window (e.g., during lockdown, at the beginning of the pandemic, etc.; Flaudias et al., 2020; Simone et al., 2021) thus providing little insight as to changes in the relation between disordered eating and possible risk factors from pre- to post-pandemic. The present study aims to examine stress, anxiety, depression, emotion regulation and weight concerns as potential predictors of ED symptoms among university students at the University of Nicosia in Cyprus at two time-points, namely at pre-COVID-19 pandemic (in 2019) and towards the end of the pandemic (in 2022).

The first identified COVID-19 case in Cyprus was in March 2020 and it was followed by public mobility restrictions and suspension of all in-school operations in the same month (Press and Information Office, Republic of Cyprus; https://www.pio.gov.cy/coronavirus/eng). During the same period, university students across the country moved to online teaching mode and finally returned to in-person teaching in the fall semester of 2021 with several precautious measures (e.g., mandatory mask wearing in class, provision of proof of safe pass to enter class, employing physical distancing measures, etc.). Gradual relaxation of measures followed during the 2022 academic year. For the purposes of the present study, it is therefore assumed that participants in the 2019 campaign had no exposure to the COVID-19 pandemic whereas participants in the 2022 campaign had experienced the pandemic and were gradually returning to their pre-pandemic normalcy. The present study aimed to examine whether the associations between stress, anxiety, depression, emotion regulation, and weight concerns and eating disorder (ED) symptoms differ across two time points: pre-pandemic (2019) and post-pandemic (2022) in two independent samples. While previous research has documented overall increases in ED risk during the pandemic, the current study specifically focuses on whether these psychological predictors (stress, anxiety, depression, emotion regulation and weight concerns) have stronger or weaker relationships with ED symptoms depending on the year of data collection. It was expected that interactions with the pandemic year (in 2022) would have higher significant effects on ED symptoms compared to the pre-pandemic year of 2019, with stress and weight concerns showing the most pronounced effects, consistent with empirical evidence linking these factors to elevated ED risk during COVID-19.

2. Methodology

2.1 Participants

Participants were recruited on campus at the University of Nicosia and could participate in this study if they were over the age of 18 and capable of providing informed consent. Data collection was part of a campus-wide mental health campaign conducted at two time-periods, during the fall semester of 2019 and during fall and spring semester (October – May) of 2022. There were 979 participants who took part in both campaigns combined. After removing participants with missing values in sex (n = 6) or participants who answered only the demographic questions (n

=128), the resulting total sample size included in the following analyses was 845 participants from which 523 were recruited in 2019 (346 female; M_{age} = 21.94, SD = 3.60) and 322 (242 females; M_{age} = 23.37, SD = 5.11) in 2022. No additional exclusion criteria were applied.

2.2 Procedure

Data collection was conducted in two time periods, in 2019 and in 2022, as part of a campus-wide mental health campaign aimed at raising awareness of psychological well-being and eating-related concerns among university students. The campaign was promoted through multiple channels including the University's official social media platforms and website in 2019 and 2022. In 2019 printed posters were also, displayed in highly visible locations within campus, such as academic buildings, common walkways, and the University's cafeteria. Questionnaire administration was conducted in 2019 with the support of trained research assistants at specific locations on campus, during class time and online. Questionnaire administration in 2022 was conducted entirely online with participants recruited only through digital channels, e.g., university's website and social media. Participation of students in both campaigns was voluntary, and no incentives (e.g., monetary compensation, gift cards, or course credit) were provided. The study was approved by the Cyprus Bioethics Committee (identification number ΕΕΒΚ/ΕΠ/2018/28). Informed consent was signed either in paper or online by participants before questionnaire completion. Participants were offered the opportunity to receive individualized, online feedback regarding their results on specific questionnaires showing risk for depression, anxiety, stress and ED. Students in high risk for any of the above-mentioned problems were provided with appropriate referrals for further psychological assessment and/or treatment at the university's counselling center and state's mental health services.

2.3 Measures

Descriptive statistics and internal consistency reliability coefficients Cronbach's alpha for each of the following measures are reported in Table 1 for every data collection time-point and in total. In the present sample, all measures demonstrated good internal consistency reliability coefficients (see Table 1), with Cronbach's alpha ranging from .80 to .90 across scales and time points.

The Eating Attitudes Test (EAT-26; Garner et al., 1982) is a 26-item self-report questionnaire that assesses abnormal eating attitudes and behaviors via a 6-point Likert scale (1 = always and 6 = never). The EAT Total score is calculated by adding the 26 items. A higher total score indicates greater risk for developing an ED (Garfinkel & Newman, 2001). More specifically, participants with a total score of higher than 20 in the present study were referred for further assessment and/or treatment. In the present study, the EAT-26 total score was used as an outcome measure in the multiple regression analyses models tested.

The Weight Concerns Scale (WCS; Killen et al., 1994) is a 5-item self-report scale that examines fear of weight gain, worry about weight and body shape, the importance of weight, dieting history, and perceived fatness rated on a 5-point Likert scale. The WCS total score was calculated by summing the five items, with higher scores indicating greater weight concerns.

The Difficulties in Emotion Regulation-18 (DERS-18; Victor & Klonsky, 2016) is a shortened version of DERS-36 that measures emotion regulation (Gratz & Roemer, 2004). DERS-18 is divided into the following six subscales: Awareness (lack of emotional awareness), Clarity (lack of emotional clarity), Goals (impaired goal-related activity), Impulse (lack of inhibition), Non-acceptance (non-acceptance of negative affective states), and Strategies (lack of effective coping strategies) which are assessed via three questions each. Questions are rated on a 5-point Likert scale (Almost never to Almost always) and higher total score (sum of the subscales) indicate higher difficulty with emotion regulation. Due to a questionnaire administration error in 2022, four DERS items were completely missing: two from the strategies subscale, one from the awareness subscale, and one from the non-acceptance subscale. To address this, the DERS Total score was recalculated by entirely excluding the strategies subscale and the two missing items from the other subscales. Because only one item was missing in each of the awareness and non-acceptance subscales, these subscales were retained. All estimates reported in the analyses are based on this recalculated DERS Total score for both 2019 and 2022. The DERS-18 total score was used as a predictor in the multiple regression analysis.

Depression Anxiety Stress scale 21-item short form (DASS-21; Lovibond & Lovibond, 1995): is a Likert-type 21-item questionnaire that examines responders' symptoms of stress, anxiety, and depression through its tripartite factor structure. Each factor comprises of seven items that are rated from zero to three, where higher scores indicate higher agreement with the statement.

The *stress* subscale examines tendencies to overreact to stressful situations and symptoms of tension in general; the *anxiety* subscale assesses primarily physical manifestations of stress response and fear; and the *depression* subscale examines dysphoria and cognitions centring around worthlessness as well as anhedonia (Anthony et al., 1998). All three subscales were used as predictors in the multiple regression analyses run for the purposes of this study.

2.4 Data analysis

2.4.1 Missing data and data imputations

The total missing data was 2.95% in the entire dataset. The amount of missingness per variable was also calculated resulting in 0.45% missingness in EAT-26, 2.15% in WCS, 2.63% in DERS (after excluding the four items mentioned above), 6.41% in DASS Stress, 6.39% in DASS Anxiety, and 6.49% in DASS Depression. Following previous studies (e.g., see McEnery et al., 2016), we conducted an independent samples t-test to examine potential age biases in testing items with more than 5% missingness.

Results did not show a significant effect between the missing and non-missing, $t(827) = -0.53$, $p = .596$, providing however limited support for the Missing At Random (MAR) assumption in respect to age. The missing data mechanism was assumed to be MAR, consistent with the voluntary nature of the data collection procedure, where non-response is more plausibly related to observable characteristics than to the unobserved values themselves. We acknowledge however that the MAR assumption cannot be formally verified. We used 100 imputations following the Monte Carlo simulation guidelines with the potential to sustain a falloff in statistical power of less than 1% (Graham et al., 2007). Moreover, we used 10 iterations in the imputation process, as suggested by Raghunathan et al. (2022), and assessed and confirmed their convergence through visual inspection of plots of the means and Standard Deviation (SDs) of each variable.

Main statistical analysis

We used multiple regression with interactions to examine whether each campaign's year (2019 pre-COVID vs. 2022 post-COVID) affected the relationship between predictors (WCS, DERS, DASS Stress, DASS Anxiety, DASS Depression) and the EAT-26 score controlling for the effects of age and sex. Analysis was conducted using R package, version 4.1.3. The 'mice' package was used to impute the data (using predictive mean matching method) at the item level (before scoring each subscale) and then the base R package to run standard multiple linear regressions for each imputation. The imputation model included all variables in the dataset, including age, gender, and year of data collection. All continuous predictors were mean-centered prior to analysis to reduce non-essential multicollinearity introduced by the inclusion of interaction terms. Finally, the 'parameters' package was used to pool the parameters of each model together to create the pooled results reported in the next section. Overall model significance was assessed using pooled F-tests based on the D1 method (Meng & Rubin, 1992). Adjusted R^2 was pooled across the 100 imputed datasets following the method described by Harel (2009), which takes the square root of each R^2 value, applies Fisher's z transformation, pools the transformed values using Rubin's Rules, and back-transforms to the R^2 scale. Descriptive statistics, correlations, reliability coefficients, multicollinearity indices, were computed within each imputed dataset and averaged across imputations.

3. Results

3.1 Preliminary analysis

Pearson correlation analyses conducted after imputing the data show strong correlations between stress, anxiety and depression (DASS-21 subscales) as expected. Strong correlations between weight concerns (WCS) and ED symptoms (EAT-26) as well as between emotion regulation (DERS-18) with stress and depression (DASS-21) appeared only in year 2022. Table

1 presents sample's descriptives, Cronbach's alpha and correlations between measures for each year and in total, combining data from both years.

Table 1.

Cronbach's alpha, descriptives, and correlations between measures per year and in total

Year 2019 (N = 523)								
Scale	α	M (SD)	EAT Total	WCS Total	DERS Total	DASS Stress	DASS Anxiety	DASS Depression
EAT Total	.88	11.28 (10.64)	-					
WCS Total	.80	12.74 (5.10)	.50***	-				
DERS Total	.82	34.98 (9.56)	.26***	.26***	-			
DASS Stress	.86	12.96 (9.53)	.21***	.26***	.54***	-		
DASS Anxiety	.84	10.22 (9.37)	.23***	.22***	.47***	.77***	-	
DASS Depression	.88	9.37 (9.37)	.21***	.20***	.50***	.79***	.72***	-
Year 2022 (N = 322)								
	α	M (SD)	EAT Total	WCS Total	DERS Total	DASS Stress	DASS Anxiety	DASS Depression
EAT Total	.90	12.23 (12.04)	-					
WCS Total	.84	13.69 (5.36)	.67***	-				
DERS Total	.87	37.11 (10.48)	.36***	.27***	-			
DASS Stress	.86	16.91 (9.99)	.41***	.30***	.63***	-		
DASS Anxiety	.85	13.76 (10.44)	.32***	.25***	.52***	.73***	-	
DASS Depression	.90	14.22 (11.41)	.38***	.29***	.63***	.77***	.67***	-
Total (Year 2019 and 2022; N = 845)								
	α	M (SD)	EAT Total	WCS Total	DERS Total	DASS Stress	DASS Anxiety	DASS Depression
EAT Total	.89	11.75 (11.34)	-					
WCS Total	.82	13.21 (5.23)	.58***	-				
DERS Total	.84	36.05 (10.02)	.31***	.26***	-			
DASS Stress	.86	14.94 (9.76)	.31***	.28***	.59***	-		
DASS Anxiety	.84	11.99 (9.90)	.28***	.23***	.50***	.75***	-	
DASS Depression	.89	11.80 (10.39)	.29***	.25***	.56***	.78***	.70***	-

Note. *** $p < .001$. DASS: Depression, Anxiety and Stress Scales; DERS: Difficulties in Emotion Regulation; EAT: Eating Attitudes Test; WCS: Weight Concerns Scale

To compare the results of each of the variables between the two years we conducted independent samples t-test for each imputation. After pooling the results together, we present the findings in Table 2. All variables demonstrated significantly increased scores in 2022 compared to 2019, except for EAT Total.

Table 2.

Independent samples t-test results

Scale	t	df	p	95% CI	
				lower	upper
EAT Total	-1.16	616.25	.245	-2.55	0.65
WCS Total	-2.54	653.91	.011	-1.68	-0.22
DERS Total	-2.86	639.59	.004	-3.20	-0.60
DASS Stress	-5.59	655.18	< *.001*	-5.34	-2.57
DASS Anxiety	-4.89	624.13	< *.001*	-4.97	-2.12
DASS Depression	-6.43	581.46	< *.001*	-6.35	-3.35

Note. CI: Confidence Interval; DASS: Depression, Anxiety and Stress Scales-21; DERS: Difficulties in Emotion Regulation-18; EAT: Eating Attitudes Test-26; WCS: Weight Concerns Scale.

Main analyses

Table 3 summarizes the pooled findings of the multiple regression models that were conducted for each of the 100 imputations. The Adjusted R^2 of the overall model was 0.37 [0.32, 0.42], while the model was statistically significant as shown in the ANOVA results of the model, $F(13, 828.26) = 37.64$, $p < .001$. Unstandardized regression coefficients (B) are reported in Table 3. Moreover, multicollinearity diagnostics were conducted by calculating mean Variance Inflation Factor (VIF) statistics across all 100 imputations, reported in Table 3. The three DASS subscales and their respective interaction terms showed elevated VIF values exceeding the threshold of 5 (Hair et al., 2018), indicating high multicollinearity among these predictors.

Table 3.

Parameters of the Pooled Multiple Regression Models for Each Variable and Interaction

Predictors	B (SE)	95% CI		t	p	VIF
		lower	upper			
(Intercept)	12.31 (0.62)	11.09	13.52	19.87	< .001	-
WCS Total	0.97 (0.08)	0.81	1.13	11.90	< .001	1.92
DERS Total	0.14 (0.05)	0.04	0.25	2.62	.009	2.58
DASS Stress	-0.10 (0.08)	-0.26	0.06	-1.27	.205	6.40
DASS Anxiety	0.15 (0.07)	0.01	0.28	2.10	.036	4.86
DASS Depression	0.04 (0.07)	-0.10	0.19	0.56	.576	6.05
Gender	-0.58 (0.71)	-1.96	0.81	-0.82	.414	1.11
Age	0.13 (0.08)	-0.02	0.29	1.71	.088	1.06
Year	-1.26 (0.66)	-2.56	0.05	-1.89	.058	1.10
WCS Total*Year	0.38 (0.13)	0.13	0.63	3.01	.003	1.88
DERS Total*Year	-0.04 (0.09)	-0.22	0.13	-0.47	.636	2.93
DASS Stress*Year	0.26 (0.12)	0.02	0.50	2.13	.034	6.03
DASS Anxiety*Year	-0.14 (0.10)	-0.34	0.06	-1.40	.161	4.45
DASS Depression*Year	0.02 (0.10)	-0.18	0.23	0.20	.838	5.76

Note. CI: Confidence Interval; DASS-21: Depression, Anxiety and Stress Scales; DERS-18: Difficulties in Emotion Regulation; EAT-26: Eating Attitudes Test-26; WCS: Weight Concerns Scale.

Results showed a significant interaction between WCS and Year, B = 0.38; p = .003, suggesting that participants with higher weight concerns were more likely to report higher ED symptoms in 2022 as compared to 2019. Similarly, the interaction between DASS Stress Subscale and Year was also significant, B = 0.26, p = .034, indicating that students with higher stress levels were reporting more ED symptoms in 2022 as compared to 2019. In addition, significant main effects of DERS and DASS – Anxiety subscale, p = .009 and p = .036 respectively, were found on EAT-26. In models including interaction terms, main effects represent conditional effects at the reference level, which in this case is Year 2019. Therefore, these significant main effects reflect associations of DERS and DASS Anxiety with ED symptoms specifically in 2019.

4. Discussion

University students' transition and adaptation to adulthood and university life is considered as a critical period for the development of mental health problems such as stress, anxiety, depression and ED. Based on previous research, these problems were increased during the COVID-19 pandemic (Elmer et al., 2021; Salimi et al., 2023; Son et al., 2020). Particularly there was a sharp increase in ED among university students since COVID-19 pandemic with evidence suggesting an increase of 20% from 2018 to 2021 in female students (Tavolacci et al., 2021). This increase has been attributed to the drastic changes that students experience in their academic and every-day life (e.g., multiple lockdowns, food insecurity, disrupted access to professional care, etc.) and has been associated with significant increases in stress, anxiety, depression symptoms as well as poor emotion regulation during the pandemic (Flaudias et al., 2020; Wang et al., 2021). Despite evidence documenting increases in prevalence rates, there is limited research on associated factors and comparative data collected before the pandemic.

The present study examined the association of emotion regulation, weight concerns, stress, anxiety and depression with self-reported ED, controlling for age and sex, in two independent samples of university students at before the pandemic (2019) and towards the end of the pandemic (2022) where relaxation measures in Cyprus were implemented. Results showed statistically significant increases in students' levels of weight concerns, stress, anxiety and depression as well as more emotion regulation difficulties towards the end of the pandemic as compared to pre-pandemic. Although these patterns may reflect the impact of the COVID-19 pandemic, causal conclusions cannot be drawn due to the independent nature of the samples. Differences could also stem from cohort effects, recruitment variations, differences in response context (paper-and-pencil vs. online), or broader sociocultural changes. Additionally, significant main effects of emotion regulation (emotional awareness, clarity, goal-related activity, impulse control and emotional non-acceptance) and anxiety were found on ED symptoms in 2019. Given the small and non-significant interaction terms for these predictors, their associations with ED symptoms in 2022 were not significantly different from those observed in 2019. This is in accordance with previous research (Prefit et al., 2019; Swinbourne & Touyz, 2007) and suggests that anxiety levels and poor emotion regulation should be addressed in early ED screening programs targeting university students.

A significant interaction between year 2022 and weight concerns was found suggesting that students who had experienced the pandemic and had higher weight concerns were more likely to report ED symptoms as compared to students with weight concerns at pre-pandemic. These results are in agreement with previous research showing that female students with eating and body image concerns are more vulnerable to develop ED symptoms during the pandemic

(Flaudias et al., 2020). It appears that students with existing ED-related vulnerabilities might be more prone to stressful conditions such as during epidemics (Wang et al., 2021).

The current study's results also suggest that students with higher stress levels were more likely to report ED symptoms in 2022 as compared to 2019. These results expand on previous evidence showing that stress related to lockdowns was associated with greater ED symptoms (e.g., binge eating and dietary restriction) (Flaudias et al., 2020). Our results suggest that stress levels during 2022, where there were no lockdowns in the country, still affected the expression of ED symptoms among university students. Further research is thus, warranted to examine lockdown lingering stress effects on disordered eating among students.

Importantly, the year-interaction with emotion regulation did not reach significance, possibly indicating that emotion regulation is a relatively stable correlate of ED symptoms that may not be highly sensitive to situational or contextual fluctuations, such as stress levels (e.g., Leppanen et al., 2022). In addition, it should be noted that the elevated VIF values for the DASS subscales indicate high multicollinearity among these predictors, which may have contributed to the observed pattern of a non-significant negative main effect of stress alongside a significant positive stress-by-year interaction. This pattern may therefore reflect statistical suppression rather than a substantive effect and should be interpreted with caution.

Our study has several limitations. First, a key limitation of this study is its repeated cross-sectional design, with independent samples collected in 2019 and 2022. Because participants were not followed longitudinally, causal inferences regarding the impact of the COVID-19 pandemic on students' mental health cannot be drawn. Observed differences may also reflect cohort effects, variations in recruitment procedures, differences in response context, participation patterns or broader sociocultural changes rather than the pandemic itself. Future research using longitudinal designs would help clarify the temporal and causal relationships among these variables. Second, our results are interpreted in light of the official announcements regarding COVID-19 management in Cyprus and therefore, they might have limited ecological validity, not reflecting the subjective experience of students in their every-day life. Thirdly, the use of a relatively homogeneous sample may limit the generalizability of the findings to broader, more diverse populations. Fourth, it was not possible to assess emotion regulation subscale strategies of the emotion regulation questionnaire (DERS-18) which based on previous literature might have significant contributions to the experience of disordered eating (Baenas et al., 2020). Therefore, findings involving emotion regulation, particularly year comparisons and regression analyses, should be interpreted with caution, as the construct was assessed in a partial form and may not be fully comparable to standard DERS-18 scores. Fifth, the elevated VIF values observed for the DASS subscales suggest that multicollinearity among these subscales

may have affected the stability of individual regression coefficients. This is particularly relevant for interpreting the stress findings, where the non-significant negative main effect alongside a significant positive stress-by-year interaction may reflect suppression effects arising from the overlap between stress, anxiety and depression rather than a true underlying pattern. Future studies should consider examining these predictors independently or using composite measures to avoid multicollinearity. Sixth, while the omnibus F statistic and adjusted R2 were pooled using methods described earlier in Methodology (Harel, 2009; Meng & Rubin, 1992), other estimates (e.g., correlation coefficients) were pooled by averaging across imputed datasets. For statistics with non-normal sampling distributions such as correlation coefficients, averaging on the original scale may produce less accurate pooled estimates compared to transformation-based pooling approaches (Van Buuren, 2018; Marshall et al., 2009). Sixth, the role of confounding variables such as participants' prior ED history, body mass index, psychiatric treatment, physical health status , fear of contracting COVID-19, effects of physical and social distancing as well as the role of personality dimensions (e.g., see Klanduchova & Adamovska, 2025) was not examined in our study, and should be addressed in relation to ED risk in future studies. Lastly, another limitation involves the exclusive reliance on self-report measures collected within a single survey context which may have increased susceptibility to shared method variance and response biases, as no clinician-administered assessments (e.g., diagnostic interviews, behavioral measures, etc.) were included.

Despite these limitations, the present study findings suggest that emotion regulation and anxiety levels should be monitored continuously during university screenings for EDs among students, as they appeared to increase ED risk at both pre-pandemic and towards the end of the pandemic. Protecting student mental health, and especially of vulnerable groups, is critical in crises, such as the COVID-19 pandemic, highlighting the need of accessible interventions such as online counselling services (Esposito et al., 2023) that promote protective factors (Gómez-Tabares et al., 2024). Even when exiting the pandemic in 2022, students with higher weight concerns and stress levels were more prone to experience ED symptoms as compared to students at pre-pandemic. Insights from this study could inform universities' efforts to provide evidence-based mental health care to their students by revising and adapting their prevention, early identification actions to the post-COVID-19 era.

Ethical approval

The study was approved by the Cyprus Bioethics Committee (identification number ΕΕΒΚ/ΕΠ/2018/28; March 14th, 2022).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Data underlying the results of the study are available from the corresponding author upon request.

Conflict of interest statement

The authors declare no conflicts of interest.

Funding

This study received funding from the University of Nicosia, Cyprus.

Acknowledgments

We would like to thank the students who participated and the volunteers who offered their time and effort to support the implementation of this study.

Authors' Contribution

M.K.: conceptualization, methodology, investigation, writing-original draft, writing-review & editing, supervision, project administration, funding acquisition; G.S.: software, formal analysis, data curation, writing-original draft, visualization; N.F.: methodology, writing – review & editing, supervision; M.A. funding acquisition, writing – review & editing.

AI Disclosure Statement

The authors declare that no artificial intelligence (AI) tools, including generative AI systems, were used in the conception, design, analysis, interpretation of data, drafting, or writing of this manuscript. All intellectual content, scientific reasoning, and manuscript preparation were carried out solely by the authors.

References

1. Alonso, J., Vilagut, G., Mortier, P., Auerbach, R. P., Bruffaerts, R., Cuijpers, P., Demyttenaere, K., Erbert, D. D., Ennis, E., Gutiérrez-García, R. A., Greif Green, J., Hasking, P., Lee, S., Bantjes, J., Nok, M. K., Pinder-Amaker, S., Sampson, N A., Zaslavsky, A. M., Kessler, R. C. & WHO WMH-ICS Collaborators. (2019). The role impairment associated with mental disorder risk profiles in the WHO World Mental Health International College Student Initiative. *International Journal of Methods in Psychiatric Research*, *28*(2), e1750. https://doi.org/10.1002/mpr.1750
2. Anthony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological Assessment, 10*(2), 176–181. http://doi.org/10.1037/1040-3590.10.2.176
3. Arsandaux, J., Montagni, I., Macalli, M., Texier, N., Pouriel, M., Germain, R., Mebarki, A., Kinouani, S., Tournier, M., Schuck, S., & Tzourio, C. (2021). Mental health condition of college students compared to non-students during COVID-19 lockdown: the CONFINS study. *BMJ Open*, *11*(8), e053231. https://doi.org/10.1136/bmjopen-2021-053231
4. Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., Demyttenaere, K., Ebert, D. D., Green, J. G., Hasking, P., Murray, E., Nock, M. K., Pinder-Amaker, S., Sampson, N. A., Stein, D. J., Vilagut, G., Zaslavsky, A. M., Kessler, R. C., & WHO WMH-ICS Collaborators. (2018). WHO world mental health surveys international college student project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology*, *127*(7), 623. https://dx.doi.org/10.1037/abn0000362
5. Baenas, I., Caravaca-Sanz, E., Granero, R., Sánchez, I., Riesco, N., Testa, G., Vintró-Alcaraz, C., Treasure, J., Jiménez-Murcia, S., & Fernández-Aranda, F. (2020). COVID-19 and eating disorders during confinement: Analysis of factors associated with resilience and aggravation of symptoms. *European Eating Disorders Review*, *28*(6), 855-863. https://doi.org/10.1002/erv.2771
6. Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8
7. Elmer, T., Mepham, K., & Stadtfeld, C. (2020). Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland. *Plos one*, *15*(7), e0236337. https://doi.org/10.1371/journal.pone.0236337
8. Esposito, G., Passeggia, R., Pepicelli, G., Cannata, A., Di Natale, M. R., Parlato, F., & Freda, M. F. (2023). Supporting university students during the pandemic: A study on the efficacy of a mentalizing online group counselling. *Mediterranean Journal of Clinical Psychology*, *11*(1). https://doi.org/10.13129/2282-1619/mjcp-3705
9. Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: A "transdiagnostic" theory and treatment. *Behaviour Research and Therapy*, *41*(5), 509-528. https://doi.org/10.1016/S0005-7967(02)00088-8

10. Flaudias, V., Iceta, S., Zerhouni, O., Rodgers, R. F., Billieux, J., Llorca, P. M., Boudesseul, J., de Chazeron, I., Romo, L., Maurage, P., Samalin, L., Bègue, L., Naassila, M., Brousse, G., & Guillaume, S. (2020). COVID-19 pandemic lockdown and problematic eating behaviors in a student population. *Journal of Behavioral Addictions*, *9*(3), 826-835. https://doi.org/10.1556/2006.2020.00053
11. Galmiche, M., Dechelotte, P., Lambert, G., & Tavolacci, M. P. (2019). *"Prevalence of eating disorders over the 2000-2018 period: A systematic literature review." American Journal of Clinical Nutrition, 109*(5), 1402–1413. https://doi.org/10.1093/ajcn/nqy342
12. Gao, Y., Bagheri, N., & Furuya-Kanamori, L. (2022). Has the COVID-19 pandemic lockdown worsened eating disorders symptoms among patients with eating disorders? A systematic review. *Journal of Public Health*, *30*(11), 2743-2752. https://doi.org/10.1007/s10389-022-01704-4
13. Garfinkel, P. E., & Newman, A. (2001). The Eating Attitudes Test: Tenty-five Years Later. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *6*. https://doi.org/https://doi.org/10.1007/BF03339747
14. Garner, D. M., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric Features and Clinical Correlates. *Psychological Medicine*, *12*(4), 871–878. https://doi.org/10.1017/S0033291700049163
15. Gómez, J. F. P., & Grisales, A. M. (2023). Executive functioning in college students with anxiety and depression: a multivariate analysis. *Mediterranean Journal of Clinical Psychology*, *11*(1). https://doi.org/10.13129/2282-1619/mjcp-3596
16. Gómez-Tabares, A. S., Restrepo, J. E., Aguirre, N. H., & González-Pérez, A. (2024). The Mediating role of purpose in life in the relationship between hopelessness, depression, and suicide risk. *Mediterranean Journal of Clinical Psychology*, *12*(1). https://doi.org/10.13129/2282-1619/mjcp-4047
17. Graham, J. W., Olchowski, A. E., & Gilreath, T. D. (2007). How many imputations are really needed? Some practical clarifications of multiple imputation theory. *Prevention Science*, *8*(3), 206–213. https://doi.org/10.1007/s11121-007-0070-9
18. Gratz, K. L., & Roemer, L. (2004). Multidimensional Assessment of Emotion Regulation and Dysregulation: Development, Factor Structure, and Initial Validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94
19. Graupensperger, S., Cadigan, J. M., Einberger, C., & Lee, C. M. (2023). Multifaceted COVID-19-related stressors and associations with indices of mental health, well-being, and substance use among young adults. *International Journal of Mental Health and Addiction*, *21*(1), 418-431. https://doi.org/10.1007/s11469-021-00636-6
20. Hair, J. F., Risher, Jeffrey J., Sarstedt, M., Ringle, C. M., Svensson, G., Svensson, G.. (2018). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203
21. Harel, O. (2009). The estimation of R2 and adjusted R2 in incomplete data sets using multiple imputation. *Journal of Applied Statistics, 36*(10), 1109–1118. https://doi.org/10.1080/02664760802553000

22. Killen, J. D., Taylor, C. B., Hayward, C., Wilson, D. M., Haydel, K. F., Hammer, L. D., Simmonds, B., Robinson, T. N., Litt, I., Varady, A., & Kraemer, H. (1994). Pursuit of thinness and onset of eating disorder symptoms in a community sample of adolescent girls: A three-year prospective analysis. *International Journal of Eating Disorders*, *16*(3), 227–238. https://doi.org/10.1002/1098-108X(199411)16:3<227::AID-EAT2260160303>3.0.CO;2-L
23. Klanduchova, E., & Adamovska, L. (2025). Emotion and stress related eating and personality dimensions predict food addiction: Implications for personalized weight management and primary prevention. *Mediterranean Journal of Clinical Psychology*, *13*(1). https://doi.org/10.13129/2282-1619/mjcp-4328
24. Koushiou, M., Nikolaou, P., & Karekla, M. (2020). Prevalence and correlates of eating disorders in greek-cypriot adolescents and young adults. *The European Journal of Counselling Psychology*, *8*(1), 3-18. https://doi.org/10.5964/ejcop.v8i1.170
25. Leppanen, J., Brown, D., McLinden, H., Williams, S., & Tchanturia, K. (2022). The role of emotion regulation in eating disorders: a network meta-analysis approach. *Frontiers in Psychiatry*, *13*, 793094. https://doi.org/10.3389/fpsyt.2022.793094
26. Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335–343. https://doi.org/10.1007/BF02511245
27. Machado, P. P., Pinto-Bastos, A., Ramos, R., Rodrigues, T. F., Louro, E., Gonçalves, S., Brandão, I., & Vaz, A. (2020). Impact of COVID-19 lockdown measures on a cohort of eating disorders patients. *Journal of Eating Disorders*, *8*, 1-8. https://doi.org/10.1186/s40337-020-00340-1
28. Marshall, A., Altman, D. G., Holder, R. L., & Royston, P. (2009). Combining estimates of interest in prognostic modelling studies after multiple imputation: Current practice and guidelines. *BMC Medical Research Methodology, 9*(1), 1–8. https://doi.org/10.1186/1471-2288-9-57
29. McEnery, F., Fitzgerald, A., McNicholas, F., & Dooley, B. (2016). Fit for Purpose, Psychometric Assessment of the Eating Attitudes Test-26 in an Irish Adolescent Sample. *Eating Behaviors*, *23*, 52–57. https://doi.org/10.1016/j.eatbeh.2016.07.006
30. Meng, X.-L., & Rubin, D. B. (1992). Performing Likelihood Ratio Tests with Multiply-Imputed Data Sets Author. *Biometrika, 79*(1), 103–111. https://doi.org/10.1093/biomet/79.1.103
31. Merlyn, M. F., Moreta-Herrera, R., Díaz-Mosquera, E., Orbe, C., Rodas, J. A., Caycho-Rodríguez, T., & Torres-Gomez, B. (2025). Negative Body Image and Negative Eating Attitudes as Predictors of Depressive Symptoms in Women. *Mediterranean Journal of Clinical Psychology*, *13*(3). https://doi.org/10.13129/2282-1619/mjcp-4989
32. Prefit, A. B., Candea, D. M., & Szentagotai-Tătar, A. (2019). Emotion regulation across eating pathology: A meta-analysis. *Appetite*, *143*, 104438. https://doi.org/10.1016/j.appet.2019.104438
33. Quirama, T. C., Restrepo, J. E., & Alzate, R. C. (2025). Effects of Academic Stress on Psychological Distress and Suicidal Ideation in University Students: The Mediating Role of Coping Strategies. *Mediterranean Journal of Clinical Psychology*, *13*(3). https://doi.org/10.13129/2282-1619/mjcp-5093

34. Raghunathan, T., Solenberger, P., Berglund, P., & van Hoewyk, J. (2022). *IVEware: Imputation and Variance Estimation Software.* https://smponline.isr.umich.edu/software/wp-content/uploads/iveware_manual_updated_19nov2022.pdf
35. Rodgers, R. F., Lombardo, C., Cerolini, S., Franko, D. L., Omori, M., Fuller-Tyszkiewicz, M., Linardon, J., Courtet, P., & Guillaume, S. (2020). The impact of the COVID-19 pandemic on eating disorder risk and symptoms. *International Journal of Eating Disorders*, *53*(7), 1166-1170. https://doi.org/10.1002/eat.23318
36. Rodríguez, P. J., Restrepo, J. E., & Lara, R. M. M. (2024). Self-Care mediates the Effect of Psychological Distress on the Subjective Well-Being and Quality of Life among University Students. *Mediterranean Journal of Clinical Psychology*, *12*(3). https://doi.org/10.13129/2282-1619/mjcp-4349
37. Salimi, N., Gere, B., Talley, W., & Irioogbe, B. (2023). College students mental health challenges: Concerns and considerations in the COVID-19 pandemic. *Journal of College Student Psychotherapy*, *37*(1), 39-51. https://doi.org/10.1080/87568225.2021.1890298
38. Simone, M., Emery, R. L., Hazzard, V. M., Eisenberg, M. E., Larson, N., & Neumark-Sztainer, D. (2021). Disordered eating in a population-based sample of young adults during the COVID-19 outbreak. *International Journal of Eating Disorders*, *54*(7), 1189-1201. https://doi.org/10.1002/eat.23505
39. Smink, F. R., van Hoeken, D., Oldehinkel, A. J., Hoek, H. W. (2014). Prevalence and severity of DSM-5 eating disorders in a community cohort of adolescents. *International Journal of Eating Disorders 47*, 610–619. https://doi.org/10.1002/eat.22316
40. Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research*, *22*(9), e21279. https://doi.org/10.2196/21279
41. Swinbourne, J. M., & Touyz, S. W. (2007). The co-morbidity of eating disorders and anxiety disorders: A review. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, *15*(4), 253-274. https://doi.org/10.1002/erv.784
42. Tavolacci, M. P., Ladner, J., & Déchelotte, P. (2021). Sharp increase in eating disorders among university students since the COVID-19 pandemic. *Nutrients*, *13*(10), 3415. https://doi.org/10.3390/nu13103415
43. Van Buuren, S. (2018). Flexible imputation of missing data (2nd ed.). CRC Press. https://stefvanbuuren.name/fimd/
44. Victor, S. E., & Klonsky, E. D. (2016). Validation of a Brief Version of the Difficulties in Emotion Regulation Scale (DERS-18) in Five Samples. *Journal of Psychopathology and Behavioral Assessment*, *38*(4), 582–589. https://doi.org/10.1007/s10862-016-9547-9
45. Vuillier, L., May, L., Greville-Harris, M., Surman, R., & Moseley, R. L. (2021). The impact of the COVID-19 pandemic on individuals with eating disorders: the role of emotion regulation and exploration of online treatment experiences. *Journal of eating disorders*, *9*, 1-18. https://doi.org/10.1186/s40337-020-00362-9
46. Wang, C., Wen, W., Zhang, H., Ni, J., Jiang, J., Cheng, Y., Zhou, M., Ye, L., Feng, Z., Ge, Z., Luo, H., Wang, M., Zhang, X., & Liu, W. (2021). Anxiety, depression, and stress prevalence among college students during the COVID-19 pandemic: A systematic review and meta-analysis. *Journal of American College Health*, *71*(7), 2123-2130. https://doi.org/10.1080/07448481.2021.1960849

47. Zipfel, S., Schmidt, U., & Giel, K. E. (2022). The hidden burden of eating disorders during the COVID-19 pandemic. *The Lancet Psychiatry*, *9*(1), 9-11. https://doi.org/10.1016/S2215-0366(21)00435-1

DOI: 10.13129/2282-1619/mjcp-5279