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Adding stress to the stressed: Senior high school students' mental health amidst the COVID-19 nationwide lockdown in Greece

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ABSTRACT

The two-year preparation for the National university entrance exams in Greece is one of the most trying periods in a young person's life, physically and emotionally. The present study reports the results from 442 last year senior high school students who completed an online survey (16-30 April 2020) concerning the lockdown impact on their mental health. Overall, the rate of positive screen for depression (PHQ-9 score ≥ 11) significantly increased from 48.5% to 63.8% and of those scoring within severe depression range (PHQ-9 ≥ 20) from 10% to 27%; for anxiety (GAD-7 score ≥ 11) increased from 23.8% to 49.5% and of those scoring within severe anxiety range (GAD-7 ≥ 17) from 3.8% to 20.5%. After taking sex and baseline (one month prior to the lockdown) levels of depression and anxiety into account, the level of lockdown experienced distress was predictive of depression and anxiety levels in time of home confinement, accounting for about 30% of variance in symptoms severity scores. Although our results may be subject to sampling and recall bias, the unexpectedly high rates of anxiety and depression warrant an urgent call to action aiming at mitigating and managing mental health risks of senior high school students in future waves of pandemic.

1. Introduction

On March 11th, WHO declared the disease caused by COVID-19 a pandemic due to its widespread and rapid rate of transmission. The first COVID-19 case was diagnosed in Greece on February 26th. On March 10th, with officially 89 confirmed COVID-19 cases and 0 deaths, the Greek government implemented national school and university closures and following this, new measures were gradually introduced, every 2-3 days, to mitigate the risk of exponential virus transmission. On March 23rd with 695 confirmed cases and 17 deaths, nationwide lockdown (i.e. restriction of movement, whereby citizens could leave their house only for specific reasons and with a special permit) was enforced as a key emergency public health measure (Giannopoulou & Tsobanoglou 2020). Studies have shown that prolonged school closure and home confinement during a disease outbreak might have negative effects on children's physical and mental health (for review Guessoum et al., 2020) but no studies to date have reported on mental health of final year high school students facing university entrance exams.

Successful admission to a higher education institution in Greece is

determined through the combination of: (a) the candidate's score on the National Higher Education entrance exams, known as Panhellenic exams, administered by the Ministry of Education, (b) the candidate's choices (by order of preference) of desired degree courses and academic institutions, and (c) the number of places available in each academic department. Greek society places a high value on tertiary education, and psychological pressure for success in university entrance exams is great given that it is perceived as having major consequences for determining the young person's future life and career prospects (OECD, 2018). The two-year preparation for the Panhellenic university entrance exams is one of the most trying periods in a young person's life, physically and emotionally. Almost every student is overburdened by a considerable workload and long hours of study due to enrollment in two parallel educational systems - regular school and private coursework delivered by a cram school, so called "frontistirio" and/or individual tutoring (Giannopoulou, 2019; Liodaki & Liodakis, 2016). The pressure to score high in these exams in combination with the Greek society's view that every student should obtain a University degree makes the Panhellenic exams a highly stressful and often traumatic event for many Greek

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youngsters, and particularly for those who wish to be admitted to a highly ranked academic institution (e.g. Medicine, Law, Electrical & Computer Engineering). The money invested by parents in their child's extra private tuition adds more financial strain to the family, raises parental expectations and puts some young people under enormous stress to succeed. This year, students were faced with abrupt coronavirus-related disruption adjustment in their daily life and new challenges, including the adaptation to the sudden switch to online learning, combined with uncertainty about the timing of the exams, the conditions under which these will take place, the exact material they will be tested on, and the date of any return to school.

The aim of the present study was to examine the impact of the nationwide lockdown on the levels of anxiety and depression among last year senior high school students preparing for the upcoming Panhellenic university entrance exams. We expected to find an increase in anxiety and depression scores from one month prior to the lockdown to past two weeks during the lockdown. We anticipated that the level of lockdown experienced distress impinging on students' preparation for national exams would be significant predictors of anxiety and depression levels during the lockdown.

2. Methods

2.1. Data collection procedure

A brief survey was constructed and made available in electronic form, using a secure web-based application REDCap (Research Electronic Data Capture) hosted at the National and Kapodistrian University of Athens.

Self-selection sampling procedure was followed; the study with its link was publicized, through social media and websites of educational news, but also through sending an email invitation to students from cram schools (frontistiria). Students were informed about the goals of the study, its rationale, and the process by which data would be collected, and about confidentiality and anonymity of their voluntary participation. For those under 18 years of age informed parental consent was sought, in addition to the young person's consent. Young people were given an option to contact our service through e-mail or telephone if they felt they needed guidance/psychological support. The study was approved by the Ethics Committee of the Attikon University General Hospital. Data was collected over two weeks from April 16 to April 30.

2.2. Sample

A total of 459 students completed the survey; 4 students who reported that they will not take part in the Panhellenic exams and 13 students who indicated that they were sitting the exams for the second time were excluded from the data analysis, as the numbers were too low to allow for separate groups analysis. Thus, the final sample comprised 442 (96.3%) students; 304 (68.8%) girls and 138 (31.2%) boys; 286 (64%) students were living in the Athens greater metropolitan area, 14 (3.2%) on the Peloponnese, 48 (10.9%) in the Northern Greece region, 25 (5.7%) in Central Greece, and 72 (16.3%) on the islands; 434 (98.2%) were living with both parents, 2 (0.5%) on their own and 5 (1.1%) with relatives; for 1 student data was missing. With respect to the tuition courses attended in relation to the Panhellenic exams the respondents were almost equally divided: 121 (27.4%) students were enrolled in humanities course, 109 (24.7%) in science course, 99 (22.3%) in economics course, 113 (25.6%) in health science course.

Only one student requested psychological help via sending an e-mail to our service.

2.3. Survey Measures

The questions were presented in four sections: (a) demographic characteristics, (b) anxiety and depressive symptoms over the first two

weeks of February (prior to nationwide lockdown - baseline); (c) anxiety and depressive symptoms during the past two weeks (during lockdown - current), using the Greek versions of GAD-7 and PHQ-9 (www.phqscreeners.com); (d) distress experienced during lockdown.

2.3.1. Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006)

Anxiety was measured using the 7-item Generalized Anxiety Disorder Scale (GAD-7), which has been validated in adolescent populations (Mossman et al., 2017; Tiirikainen et al., 2019). The respondents were asked to indicate on a 4-point Likert-type scale (0 = not at all, 1 = several days, 2 = over half of the days, 3 = nearly every day) the frequency of each anxiety symptom over two weeks. The scores on these seven items were summed to generate the total anxiety symptoms severity score (range 0-21). The internal consistency of the GAD-7 in the present study was good in the total sample ($\alpha = 0.81$ for the baseline -prior to the lockdown), and $\alpha = 0.88$ for the current - during the lockdown) measure, with Cronbach's alpha ranging from 0.82 to 0.91 in the sex subgroups. Consistent with research literature we used a GAD-7 score of 11 or greater as indicating a positive screen for anxiety. In addition, we applied the cut-off score of 17 as indicating severe anxiety, which coincided with ≥ 96 th percentile at baseline.

2.3.2. The Patient Health Questionnaire-9 (PHQ-9) Modified for Teens (Johnson et al., 2002)

This is a 9-item self-report questionnaire assessing depression symptoms over the past two weeks; the PHQ-9-Modified includes minimal adjustments to the original PHQ-9 (Spitzer, Williams, & Kroenke, 1999) to incorporate characteristics of depression in adolescents and age-appropriate language. Specifically, the PHQ-9-Modified includes irritability in the item assessing depressed mood, and weight loss in the item assessing appetite. Throughout this paper the abbreviation "PHQ-9" is used to indicate the PHQ-9-Modified. The PHQ-9 has been validated among adolescents across various cultures and settings (Adewuya et al., 2006; Burdzovic Andreas and Brunborg, 2017; Fatiregun and Kumapayi, 2014; Richardson et al., 2010; Tsai et al., 2014). Each item is rated on a 4-point scale ranging from 0 ("not at all") to 3 ("nearly every day"). In our study, Cronbach's alphas were 0.86 prior to the lockdown and 0.90 during the lockdown; 0.86 and 0.91 respectively for male sex, and 0.85 and 0.89 respectively for female sex. Consistent with research literature we used a PHQ-9 score of 11 or greater as indicating a positive screen for depression. In addition, we applied the cut-off score of 20 as indicating severe depression, which coincided with ≥ 90 th percentile at baseline.

2.3.3. Lockdown experienced distress measure

For the purpose of the study we developed a brief measure of distress experienced during lockdown, impinging on the students' preparation and revision for the exams. Respondents were asked to rate on a 5-point scale (1 = not at all, 2 = slightly, 3 = moderately, 4 = very, 5 = extremely) how often, since the nationwide lockdown, they had been experiencing heightened anxiety/insecurity about the Panhellenic exams, feeling loneliness, feeling boredom, feeling abandoned by their teachers, feeling estranged from their friends/school peers, feeling worried about future, being troubled by negative thoughts/images, experiencing difficulty to feel close to others, experiencing a fear of death. The scores on these nine items were summed to generate the total lockdown-experienced distress score, which ranges from 9 to 45. The Cronbach's alpha of this measure for the entire sample was 0.82, indicating good internal consistency.

2.4. Statistical analysis

Descriptive statistics were calculated and presented as mean and standard deviation (M, SD) for continuous measures and absolute and relative (%) frequencies for categorical variables. Simple comparisons between groups were performed using independent samples *t* tests for quantitative variables and the chi-squared test for categorical variables.

A two-way mixed analysis of variance (ANOVA) was performed to assess the within-person changes, i.e. prior to the lockdown (baseline) versus past two weeks (current) and the main effect of sex (male vs female) on the levels of anxiety and depression symptoms. In addition, McNemar test was used to examine within individual changes in symptom severity according to measures' cut off points.

Two-stage multiple regression analyses were carried out to identify significant predictors of self-report GAD-7 and PHQ-9 current scores (dependent variables). Independent predictor variables included in the analysis were sex, baseline depression symptoms severity and baseline anxiety symptoms severity (Stage one) and lockdown distress measure (Stage two); interactions were tested and found non-significant. Prior to conducting the multiple regressions, the relevant assumptions of this statistical analysis were tested, i.e. correlations between independent variables, the collinearity statistics (i.e., Tolerance and VIF), residual and scatter plots, indicating whether the assumptions of normality, linearity and homoscedasticity were all satisfied.

All the analysis was done at 95% level of confidence using SPSS software version 24.

3. Results

3.1. Anxiety and Depression

A two-way mixed ANOVA revealed a significant increase in GAD-7 and PHQ-9 severity scores from one month prior to the lockdown to during the lockdown period, with girls scoring significantly higher than boys at both points in time (see Table 1). No significant interaction was found for either measure, $F(1,436) = 0.918, p=0.339$ for GAD-7 and $F(1,433) = 0.058, p=0.809$.

Table 2 shows the frequency of positive screen for anxiety and depression, using cut off scores. The proportion of all respondents who screened positive for anxiety ($GAD-7 \geq 11$) increased from 28.3% before the pandemic to 49.5% for the time of home confinement (McNemar test $p < 0.0001$) and of those scoring within the severe anxiety range ($GAD-7 \geq 17$) increased from 3.8% to 20.5% (McNemar test $p < 0.0001$).

The proportion of all respondents who scored above the PHQ-9 cut off 11 or greater indicating positive screen for depression increased from 48.5% before the pandemic to 63.8% for the time of home confinement (McNemar test $p < 0.0001$) and of those scoring within the severe depression range ($PHQ-9 \geq 20$) increased from 10% to 27% ($p < 0.001$).

The proportion of respondents who reported having thoughts that they would be better off dead, or of hurting themselves in some way increased from 25.9% before the pandemic to 29.7% during the lockdown period (McNemar test $p < 0.05$). More specifically, the proportion of those who reported having these thoughts nearly every day increased from 6% before the pandemic to 11.1% during the lockdown.

The comorbidity, defined as positive screen for depression and anxiety, increased from 24% to 45% (McNemar-Bowker test $p < 0.0001$); for females from 28.1% to 48% (McNemar-Bowker test $p < 0.0001$), and for males from 14.8% to 37.8% (McNemar-Bowker test $p < 0.0001$).

Table 1
Means and Standard deviations of GAD-7 and PHQ-9 by sex.

	Baseline (1month before lockdown)			Current (last 2 weeks during lockdown)			Time Effect F (df)	Sex Effect F (df)
	Total n=438	Male n=140	Female n=315	Total n=452	Male n=138	Female n=314		
GAD7 [#] Mean (SD)	7.93 (4.60)	6.57 (4.46)	8.52 (4.53)	10.59 (5.79)	8.86 (5.97)	11.36 (5.54)	84.76*** (1,436)	24.53*** (1,436)
PHQ9 ^{##} Mean (SD)	10.82 (6.24)	9.17 (6.01)	11.56 (6.21)	13.59 (7.25)	12.05 (7.63)	14.28 (6.90)	78.90*** (1,433)	13.89*** (1,433)

*** $p < 0.001$

Wilk's lamda = 0.837 ($p < 0.001$)

Wilk's lamda = 0.846 ($p < 0.001$)

Table 2
Anxiety and depression rates prior and during the lockdown.

Measure	Baseline (1 month prior to the lockdown), n (%)	Current (past 2 weeks during the lockdown), n (%)	McNemar's chi-square	p
GAD-7 ≥ 11 (positive screen)	125 (28.3)	219 (49.5)	57.66	<0.001
PHQ-9 ≥ 11 (positive screen)	212 (48.5)	278 (63.8)	31.53	<0.001
GAD-7 ≥ 17 (severe)	17 (3.8)	90 (20.5)	59.59	<0.001
PHQ-9 ≥ 20 (severe)	44 (10.1)	118 (27.0)	59.21	<0.001

3.2. Predictors of depression and generalized anxiety levels during the lockdown

A two-stage multiple regression was conducted with depression symptoms severity score as the dependent variable. Sex, baseline depression symptoms severity score and baseline anxiety symptoms severity score were entered at stage one of regression and lockdown experienced distress measure was entered at Stage two (see Table 3). In relation to anxiety symptoms, the multiple regression revealed that at Stage one, female sex, baseline depression symptoms severity score and baseline anxiety symptoms severity score contributed significantly to the regression model, $F(3,434) = 54.917, p < 0.001$, and accounted for 27.2% of the variation in GAD-7 scores during the lockdown period. Introducing the lockdown experienced distress score explained an additional 29.6% of variation in GAD-7 scores and this change in R^2 was significant, $F(1,430) = 297.968, p < 0.001$. When all four independent variables were included in Stage two of the regression model, sex and baseline depression symptoms severity score lost statistical significance, whereas higher baseline anxiety symptoms score ($\beta = 0.209, p < 0.001$) and greater lockdown experienced distress ($\beta = 0.607, p < 0.001$) were significantly associated with higher anxiety levels in time of home confinement. Together the four independent variables accounted for 56.9% of variance in depression symptoms severity scores during the lockdown, $F(4, 434) = 144.059, p < 0.001$.

With regards to depression symptoms severity score, the multiple regression revealed that at Stage one, sex, baseline depression symptoms severity score and baseline anxiety symptoms score contributed significantly to the regression model, $F(3,433) = 83.513, p < 0.001$, and accounted for 36.4% of the variation in PHQ-9 scores during the lockdown period; baseline depression symptoms severity was the only significant predictor ($\beta = 0.588, p < 0.001$). Introducing the lockdown experienced distress score explained an additional 29.3% of variation in PHQ-9 scores and this change in R^2 was significant, $F(1,429) = 371.093, p < 0.001$. In stage two of the regression model higher baseline depression symptoms severity score ($\beta = 0.409, p < 0.001$) and greater lockdown experienced distress ($\beta = 0.603, p < 0.001$) were significantly associated with higher depression symptoms score in time of home confinement. Together the four independent variables accounted for 65.8% of

Table 3
Hierarchical multiple regression analyses predicting depression and anxiety levels during home confinement.

Variable	B	SE (B)	stand. β^a	Adj. R^2	Overall F	F change
Dependent: Anxiety in time of home confinement						
Step 1				0.272	54.917***	54.917***
Sex (girls vs. boys)	1.234*	0.525	0.098			
Baseline anxiety	0.381***	0.072	0.302			
Baseline depression	0.219***	0.053	0.236			
Step 2				0.569	144.059***	297.968***
Sex (girls vs. boys)	0.644	0.405	0.051			
Baseline anxiety	0.263***	0.056	0.209			
Baseline depression	0.051	0.042	0.055			
Lockdown distress	0.481***	0.028	0.607			
Dependent: Depression in time of home confinement						
Step 1				0.364	83.513***	83.513***
Sex (girls vs. boys)	0.519	0.615	0.033			
Baseline anxiety	0.028	0.085	0.018			
Baseline depression	0.683***	0.062	0.588			
Step 2				0.658	209.317***	371.093***
Sex (girls vs. boys)	-0.193	0.453	-0.012			
Baseline anxiety	-0.119	0.062	-0.075			
Baseline depression	0.475***	0.047	0.409			
Lockdown distress	0.598***	0.031	0.603			

* $p < .05$ *** $p < .001$

variance in depression symptoms severity scores during lockdown, $F(4, 434) = 209.317, p < 0.001$.

4. Discussion

To the best of our knowledge this is the first study reporting data concerning the impact of the nationwide lockdown on the mental health of last year senior high school students preparing for the national university entrance exams in Greece. The results indicate a substantial and worrying increase in anxiety and depression symptoms from before the COVID-19 outbreak to the period of nationwide lockdown. The high rate of 48.5% of positive screen for depression before the pandemic found in our sample is unprecedented in Greece and may reflect heightened exam-related academic pressure linked to uncertainty about securing a university placement, and pressure relating to family and social expectations, as the exams approach. Previous field studies in Greece that have looked at the epidemiology of depressive symptoms among senior high school students reported prevalence rates of depression ranging from 17.4% (Magklara et al., 2015) to 26.2% (Lazaratou et al., 2010); however, neither study has provided prevalence figures for adolescents facing university entrance exams. Research in countries with similar educational structures (e.g. Korea, Turkey) has reported comparable depression rates in this population group (Yildirim et al., 2007; Lee & Larson, 2000).

The rates of positive screen for depression and anxiety during the lockdown increased significantly to 64% and 50% respectively and were similar to those reported for the senior grade three students during the COVID-19 outbreak in China, i.e. 60% for depression and 53% for anxiety (Zhou et al., 2020). The prevalence rates of severe depressive symptoms (PHQ-9 score ≥ 20) and severe anxiety symptoms (GAD-7 score ≥ 17) during nationwide lockdown are staggering, as these increased from 10% before the pandemic to 27% for depression and from 3.8% to 20.5% for anxiety. The alarming rates of self-harm/suicidal thoughts merit attention, considering that the proportion of the participants who reported during the past two weeks having these thoughts increased from 26% before the pandemic to almost 30% during the lockdown period; and from 6% to 11.1% respectively with regards to having these thoughts nearly every day. The latter findings may be comparable with those reported in a recent study of university students' mental health during the nationwide lockdown in Greece, whereby 9.7% of the sample reported currently thinking of committing suicide and doing some specific plans on how to do it,

amounting to an almost 8-fold increase in suicidal thoughts (Kaparonaki et al., 2020).

As expected, higher levels of depressive and anxiety symptoms prior to pandemic were associated with a further increase in symptomatology, but the impact of distress experienced during the lockdown was found to be the most robust predictor for a poorer mental health. After taking sex, baseline (one-month prior to pandemic) levels of depression and anxiety into account, the level of distress experienced during the lockdown was predictive of depression and anxiety levels in time of home confinement, accounting for about 30% of variance in symptoms severity scores.

The findings of this study should be interpreted considering several important limitations in its design. First, the data was collected via online survey with social media and websites of educational news as the primary avenue for promotion. As such, random sampling did not occur which may have introduced sampling bias into the survey. The number of young people who saw the survey and chose not to participate could not be determined; however, it is plausible that those with a pre-existing interest in mental health and/or experiencing psychological distress would be more likely to respond to the survey, which may have inflated the rates of depression and anxiety. However, this limitation applies to most of the mental health surveys of COVID-19, which have mostly used web-based convenience samples (Pierce et al., 2020). Second, the measures, i.e. GAD-7 and PHQ-9, have not been validated in Greek adolescents' population. However, both demonstrated high internal consistency in the entire sample and in both sexes. Third, both self-reported and retrospective rating of symptoms, prior and during the lockdown, are subject to recall bias. Fourth, the estimates of anxiety and depression based on cut-off values on the self-report questionnaires may not be consistent with those based on clinical structured interviews. Fifth, the use of the lockdown experienced distress measure developed for the purpose of the present study, despite its good internal consistency, being a non-validated previously measure may compromise the quality of the results. However, the within subjects' comparison of prior to (baseline) and during (current) the lockdown GAD-7 and PHQ-9 scores supports our conclusion that the observed significant increase in depressive and anxiety symptoms was lockdown-related. Moreover, 30% of the variability in depression and anxiety scores in time of home confinement was explained by distress experienced during the lockdown. Sixth, important predisposing and mediating factors, such as stressful and traumatic experiences prior to the pandemic, family/parental stress (e.g. related to financial difficulty, living conditions, social and interpersonal changes, family functioning) considered important predictors of

psychological and mental health well-being were regrettably not assessed. Although our results may be subject to sampling and recall bias, the unexpectedly high rates of anxiety, depression and self/harm suicidal thoughts warrant an urgent call to action. Identifying and monitoring young people with such vulnerabilities, especially in time of preparation for the exams, is of paramount importance. To mitigate the mental health impact of potential future restrictions measures in response to the ongoing pandemic, the Ministry of Education, the community primary health services, the educators, and parents need to be aware of the downsides of the home confinement situation in order to address more effectively the issues related to added stress experienced by already stressed young people preparing for highly competitive university entrance exams. The COVID-19 outbreak in Greece may be an opportunity to look for new models to manage more effective education and to tackle the many flaws underpinning the system of the Panhellenic university entrance exams. Future studies should employ qualitative mixed methods design to explore the lived lockdown-related experiences of the students, their parents and their educators in the context of preparation for highly competitive exams. This approach will provide an important insight into the interplay between risk factors and buffers affecting young peoples' mental health outcomes and will inform interventions aiming at mitigating and managing mental health risks in future waves of pandemic.

Declaration of Competing Interest

Authors have no conflicts of interest to declare.

Author Statement

I.G., G.T. and P.K. designed the study. V.E. designed and built the online data base for data collection. I.G. and V.E. analyzed the data. I.G. and V.E. drafted the manuscript, and G.T. and A.D. provided critical revisions. All authors approved the final manuscript for submission.

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