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Post-traumatic stress symptoms during the first and second COVID-19 lockdown in Greece: Rates, risk, and protective factors

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ABSTRACT: The aim was to (i) compare the rates of perceived stress, post-traumatic stress symptoms (PTSS) and other potential correlates (i.e., resilience, social support, coping strategies, and loneliness) in the general population between the two COVID-19 lockdowns in Greece and (ii) explore risk and protective factors of PTSS. Online data were collected amid the first (timepoint 1-T1) and second lockdown (timepoint 2-T2) by 1009 and 352 participants, respectively. The PTSD Checklist for DSM-5 and the Perceived Stress Scale measured levels of PTSS and perceived stress. The Brief Resilience Scale, the COPE, the revised UCLA Loneliness Scale, and the ENRICHD Social Support Instrument measured resilience, coping strategies, loneliness, and social support, respectively. Higher levels of PTSS and perceived stress were reported during T2, compared to T1. Clinically significant levels of PTSS were presented by 26.1% and 35.5% of the participants during T1 and T2, respectively. Higher levels of loneliness and use of maladaptive coping strategies and lower levels of social support, resilience and use of adaptive coping strategies were also found. During both lockdowns, PTSS were predicted by perceived stress, loneliness, reduced resilience and the coping strategies of denial and self-blame. PTSS were associated with younger age, female gender, being single, not having children, and the evaluation of the pandemic as a crisis. The findings highlight the significant public mental health concerns during the COVID-19 lockdowns. Understanding the risk and protective factors against

PTSS and focusing on vulnerable populations should be prioritized by the governments worldwide in the development of evidence-based interventions.

KEY WORDS: *SARS-CoV-2, mental health, adaptive and maladaptive coping responses, vulnerability and resilience factors.*

INTRODUCTION

Soon after the onset and explosive spread of the new coronavirus disease (COVID-19) in December 2019, WHO officially declared the COVID-19 outbreak as an international public health emergency on 30 January, 2020, and a pandemic on 11 March, 2020 (World Health Organization, 2020). To prevent the collapse of the healthcare systems and inhibit the rapid and uncontrollable spreading of the virus, governments worldwide implemented unprecedented, more or less strict confinement measures (e.g. physical distancing recommendations, cease of public activities, being quarantined, curfew, stay-at-home orders/social constraints, and lockdown). By the writing of this paper over 230 000 000 confirmed COVID-19 cases and 4,700,000 deaths have been reported globally (World Health Organization, 2021). Greece recently came out from the second lockdown (March 2021) and currently enumerates more than 630 000 confirmed cases and nearly 14 500 deaths (WHO, 2021).

Mental health outcomes during the COVID-19 pandemic and lockdowns

Similar to other infectious disease outbreaks, the COVID-19 pandemic has undoubtedly a significant impact on mental health (Cénat *et al*. 2020; Usher *et al*. 2020). Recent systematic reviews and meta-analyses have reported a high prevalence of psychological distress (13.3%–50.0%), anxiety (15.2%–26.9%), depression (28.0%), and sleep problems (23.9%–27.6%), and estimates for post-traumatic stress symptoms (PTSS), specifically, ranged from 21.9% to 24.1% (Cénat *et al*., 2020; Nochaiwong *et al*. 2021). Although correctly imposed to prevent disease dissemination, strict COVID-19-related confinement measures, such as quarantine and lockdown, may have an unprecedented impact on people's lives. It has been shown that being quarantined during the SARS epidemic (Liu *et al*. 2012) or during COVID-19 lockdown (Lorant *et al*. 2021; Ramiz *et al*. 2021) were associated with increased mental health problems (although some

studies have not found such associations; Zhang *et al*. 2020; Zhu *et al*. 2020).

Lockdown measures, in particular, have been associated with higher rates of psychological distress (Benke *et al*. 2020), depressive, anxiety, and insomnia symptoms (Pieh *et al*. 2021), and PTSD positive scores (Kalaitzaki, 2020). In addition, other adverse psychological outcomes have been associated with lockdown, such as lower life-satisfaction and increased loneliness (Benke *et al*. 2020; Tull *et al*. 2020). Decreased feelings of friendship and increased sense of support (emotional and instrumental) and loneliness, especially in females, have been found during the initial 'stay-at-home' phase in the U.S. (Philpot *et al*. 2021). However, a recent meta-analysis of studies with longitudinal within-person designs and natural experiments involving a control group found that lockdowns had relatively small effects on anxiety and depression and non-significant effects on general distress, negative affect, social support, loneliness, and suicide risk (Prati & Mancini, 2021).

Longitudinal changes of COVID-19-related mental health measures

The long duration of the present pandemic and the repeated lockdowns may have unprecedented longitudinal effects on mental health. So far, few studies have reported prevalence rates of any mental health symptoms during the second wave (Chodkiewicz *et al*. 2021; Fukase *et al*. 2021). An even smaller number of studies has compared mental health symptoms between two different timepoints during the pandemic, such as during the same wave (Valiente *et al*. 2021; Wang, Pan, *et al*. 2020), during the peak and the remission of the first wave (Duan *et al*. 2020), or at the end of the first wave and the beginning of the second one (Kimhi *et al*. 2020). A few studies have compared data between the onset of pandemic/lockdown and the pre-pandemic period (Lorant *et al*. 2021; Pierce *et al*. 2021; Ramiz *et al*. 2021). By the writing of this paper, only one study has compared mental health symptoms in the general population between two different COVID-19 waves or lockdowns. Moradian and

colleagues (2021) compared depressive, generalized anxiety symptoms and distress between the first and second lockdown in the German general population. The second lockdown was imposed after a rapid peak of infections, although it included lesser restrictions of daily life ('lockdown-light') than the first one. They found increased levels of depression symptoms during the second lockdown compared to the first one. Two other studies examined mental health symptoms between the two pandemic peaks in students and found a significant decrease in depression and substance use during the second lockdown; the decrease is assumed to be associated with improvements in educational procedures and COVID-19 information (Reznik et al. 2021). A couple of studies have examined longitudinal changes in other pandemic-related psychological outcomes. For example Kimhi and colleagues (2020) found a significant decrease in resilience at the second wave compared to the first one (Kimhi et al. 2020). However, the first timepoint in this study occurred at the end of the first wave, at a time of recession of cases and reduced restrictions, while the second timepoint occurred at the beginning of the second wave, during the upsurge of the outbreak and the second lockdown. Reznik et al. (2021) have found no significant changes in loneliness between the two timepoints (measuring two waves of infection) among Israeli students, and significant improvements among Russian students. Given the scarce and inconclusive findings, longitudinal examination (e.g. comparison between two lockdowns) of the mental health symptom rates and psychological well-being indicators (e.g. resilience, coping, social support, and loneliness) would offer new evidence of great importance about the effects of the pandemic on the mental health and well-being of the general population.

Psychosocial predictors of mental health symptoms

The role of potential risk and protective psychosocial factors in the development of mental health symptoms and PTSS, in particular, during the pandemic should be elaborately investigated. It was found that resilience may be inversely associated with PTSD (Alshehri et al. 2020). Ye and colleagues found that resilience, adaptive coping strategies, and social support mediate the relationship between COVID-19-related stressful experiences and acute stress disorder (Ye et al. 2020). Social contact and support were negative predictors of mental health symptoms (e.g. stress, anxiety and depression) in university students (Li et al. 2020) and protective factors against post-traumatic stress symptoms (Hong et al. 2021).

Loneliness, alienation, decreased social activity and support during COVID-19-related lockdown have been associated with PTSS (Hong et al. 2021; Zhou & Guo, 2021), increased risk of psychological distress (Liu et al. 2021; Lorant et al. 2021), depressive and anxiety symptoms (González-Sanguino et al. 2020). However, no study has yet examined the potential consistent contribution of the above-mentioned factors across the pandemic.

Coping with the COVID-19 pandemic and lockdowns

Following the escalation of the outbreak, many studies examined the coping strategies used by people in their efforts to deal with the pandemic and/or lockdown. Wang, Xia, et al. (2020) have shown that a negative coping style was associated with higher levels of psychological distress in the early stages of the outbreak. Fukase et al. (2021) found that certain coping strategies (i.e. planning, use of instrumental support, denial, behavioural disengagement, and self-blame) were associated with depression at the second wave in Japan, but less strongly than demographic factors. Jarego et al. (2021) have also reported better mental health associated basically with adaptive coping (active coping, positive reframing, acceptance, and humour), and poorer mental health associated with mostly maladaptive coping (self-blame, venting, denial, behavioural disengagement, substance use, and instrumental and emotional support). In some studies, the problem-focused coping was associated with high PTSD levels (Li et al. 2020), whereas in others it was associated with fewer mental health symptoms (Guo et al. 2020). Similarly, inconsistent results were found for the emotion-focused coping. Guo and colleagues found a link between emotion-focused coping and increased mental health problems (Guo et al. 2020), while Li and colleagues found that both emotion- and problem-focused coping were beneficial for mental health (Li et al. 2020). In Greece, emotion-focused and dysfunctional coping strategies were used at the first lockdown (Kalaitzaki, 2021) and basically maladaptive coping strategies were associated with secondary traumatic stress in a sample of healthcare workers (Kalaitzaki & Rovithis, 2021).

The present study

Longitudinal examination of the consequences of the lockdowns and related psychosocial factors (both risk and protective) could offer information useful for the public health policy in order to mitigate lockdown-related

mental health problems. However, evidence regarding any longitudinal change is scarce and the relevant findings are still inconclusive. Regarding the temporal change in PTSS more specifically and psychosocial factors associated with PTSS there are no research findings as yet. This study aimed to (i) compare the rates of distress, PTSS and other psychological indicators (resilience, social support, coping strategies and loneliness) in the general population between the two lockdowns in Greece and (ii) explore potential risk and protective factors of the PTSS during the two lockdowns. Given that the second wave in Greece was undoubtedly more severe (i.e. higher rates of confirmed cases, patients in ICUs and deaths), and people were likely more vulnerable because of the accumulated long-term consequences of the ongoing pandemic, it could be assumed that the second lockdown would have a greater impact on mental health and psychological well-being. Therefore, the following hypotheses were formulated:

1. Worse mental health outcomes (higher levels of PTSS and perceived stress) would be expected at the second lockdown compared to the first one.
2. Decline in the psychological well-being indicators (e.g. increase in loneliness, lower resilience and social support, and more dysfunctional coping) would be expected at the second lockdown compared to the first one.
3. Protective factors (i.e. resilience, coping strategies, and social support) would correlate negatively and risk factors (e.g. loneliness) would correlate positively with distress and PTSS levels in both lockdowns.

MATERIAL AND METHODS

Participants

A total of 1361 participants completed the online questionnaire, 1009 during the first COVID-19 lockdown (timepoint 1–T1) and 352 during the second lockdown (timepoint 2 T2). The participants' mean age was 36.6 ± 12.9 years for T1 and 32.0 ± 12.9 years for T2. Table 1 displays background characteristics of the respondents for T1 and T2.

Study design and procedure

A survey investigating the PTSS related to COVID-19 pandemic in the general population was conducted during the first and the second lockdown in Greece

TABLE 1 *Sociodemographic characteristics of participants at the first (T1) and second lockdown (T2)*

	T1 (N = 1009)		T2 (N = 352)	
	n	%	*n*	%
Gender				
Male	244	24.2	61	17.3
Female	765	75.8	291	82.7
Region				
Urban	888	88.0	299	84.9
Rural	121	12.0	53	15.1
Marital Status				
Married	396	43.7	106	32.3
Singles	511	56.3	222	67.7
Children				
Yes	420	41.6	101	28.7
No	589	58.4	251	71.3
Education				
Compulsory education	175	17.3	55	15.6
University	579	57.4	239	67.9
Master/Doctoral	255	25.3	58	16.5
Live with				
77 Single	160	16.6	50	14.3
Partner/Husband	194	20.1	83	23.8
Family	612	63.4	216	61.9
Work status				
Unemployed/Student/Household	358	43.9	207	58.8
Working in workplace	197	24.1	70	19.9
Working with telework	261	32.0	75	21.3
Contact with COVID-19				
Infected by Covid-19	13	1.3	7	2.0
A family member was infected	56	5.6	34	9.7
Work with Covid-19 patients	29	2.9	10	2.8
Evaluation of the pandemic as:				
Crisis	824	81.7	280	79.5
Problem	185	18.3	70	19.9

(see Figure 1). Soon after the first confirmed cases (February 2020), Greece abruptly imposed extraordinary precautionary measures, followed by the first lockdown (23 March–May 03, 2020). Data were collected during the first lockdown (5–30 April) and this was the first timepoint (T1) of the study. After a remission period of confirmed cases in early summer (June–July), and the abatement of the strict measures, a gradually increasing number of confirmed cases occurred at the end of summer (August–September), followed by an exponential rise of confirmed cases (https://covid19.who.int/region/euro/country/gr). Aligned with the global trend, this was indicative of the re-emergence of the pandemic (the so-called 'second wave'), which subsequently led to the second lockdown (7 November, 2020–15 May, 2021). Data were collected amid the second lockdown in Greece (15 November–12 December)
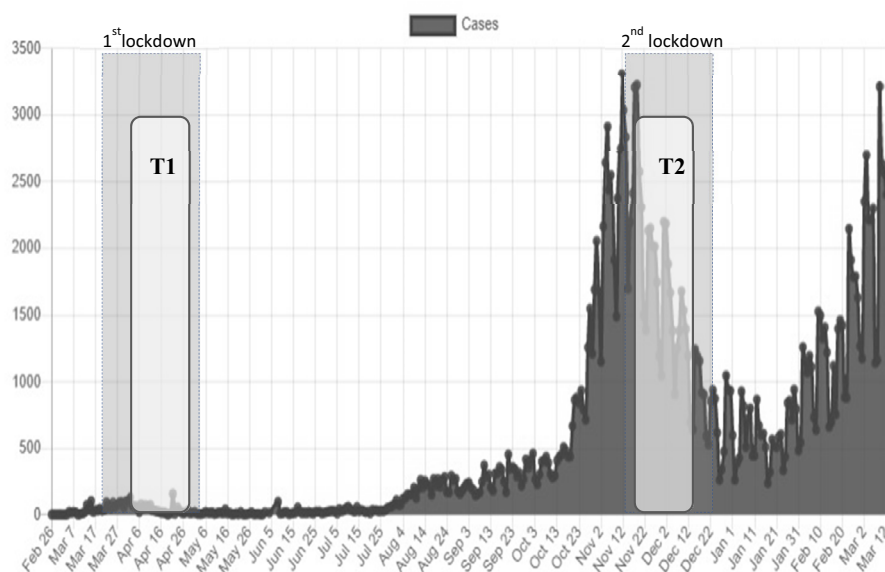
FIG. 1 Daily numbers of confirmed COVID-19 cases in Greece through the evolution of the COVID-19 epidemic from 26 February, 2020, to 12 March, 2021. Data from https://covid19.gov.gr/covid19-live-analytics/. Note. T1: survey during the 1st lockdown from 5 to 30 April, 2020; T2: survey during the 2nd lockdown from 15 November to 12 December, 2020.

and this was the second timepoint (T2) of the study. At each time point, a Google-forms questionnaire was distributed with a convenience and snowball sampling procedure. Participants were recruited through social networking sites and webpages, professional networks, and through authors' email contacts; subsequently participants were asked to recruit their own contacts similarly. Although at T2 about the same number of potential participants were approached through the same or similar networking sites, networks, and webpages, much less responded to the survey. The proliferation of relevant surveys may have discouraged people from participating in this study; this may be particularly true given that the sample was recruited from the same sources and thus, a number of potential participants were presented with the same questionnaire twice. Informed consent statement was included in the first page of the questionnaire. The study was in accordance with the 1964 Helsinki Declaration and its later amendments. Approval was obtained from the Research Ethics Committee of the Hellenic Mediterranean University.

Measures

A google-forms questionnaire was developed including socio-demographic information (gender, age, education, etc.) (Table 1). A number of questionnaires was also administered, the instructions of which and/or the wording of the items was modified to specifically relate to participants' experiences during the lockdown. Participants also answered a question about their exposure to COVID-19 ('Which of the following refers to your COVID-19 experience'?) with responses similar to those of the Life Events Checklist (Gray *et al*. 2004) for DSM-5 (LEC-5) (1 = Happened to me; 2 = Witnessed it through family; 3 = Learned about it; 4 = Part of my job; 5 = Not sure). Where necessary, instruments were translated into Greek and back-translated into English by two independent bilingual persons. The translated versions were compared with the original ones and few slight modifications were made. The Cronbach alphas, the means and standard deviations of all measures are presented in Table 2.

The PTSD Checklist for DSM-5 (PCL-5; Weathers *et al*. 2013). The traumatic stress symptoms related to the COVID-19 lockdown were measured with the *Post-traumatic Check List-5* (PCL-5; Weathers *et al*. 2013). This scale consists of 20 items about the intensity of any PTSS due to the lockdown rated on a 5-point scale ranging from 0 (not at all) to 4 (extremely). The total score, ranging from 0 to 80, is produced by summing all the items. A total score equal or above 33 indicates possible PTSD (Bovin *et al*. 2016).

The Perceived Stress Scale 10-item version (PSS-10; Cohen *et al*. 1983). The perceived stress due to the

TABLE 2 *Differences between the first (T1) and second lockdown (T2) regarding post-traumatic stress symptoms, perceived stress, loneliness, social support, resilience, and coping strategies*

	Cronbach alpha	T1		T2		*t*	*d*
		M	SD	*M*	SD		
PCL-5	0.930	23.54	15.74	27.60	16.60	−4.11***	0.251
PSS-10	0.835	18.80	6.76	21.32	6.56	−6.05***	0.378
UCLA Loneliness Scale	0.817	16.94	5.09	17.76	5.41	−2.48*	0.156
ESSI	0.854	27.13	5.60	24.32	3.58	10.83***	0.598
BRS	0.811	20.48	4.45	19.61	4.60	3.10**	0.192
COPE							
Self-Distraction	0.581	6.06	1.50	5.76	1.55	3.26***	0.197
Active-Coping	0.666	5.86	1.55	5.60	1.58	2.75**	0.166
Denial	0.649	3.42	1.52	3.57	1.58	−1.66	0.097
Substance Use	0.941	2.50	1.22	2.54	1.23	−0.49	0.032
Use Emotional Support	0.790	5.05	1.81	5.24	1.76	−1.78	0.106
Use Instrumental Support	0.818	4.74	1.83	4.97	1.76	−2.03*	0.128
Behavioural Disengagement	0.753	3.04	1.37	3.34	1.51	−3.35***	0.208
Venting	0.542	4.90	1.61	4.98	1.72	−0.74	0.048
Positive Reframing	0.765	6.07	1.57	5.87	1.67	2.01*	0.123
Planning	0.694	6.01	1.57	5.88	1.66	1.36	0.080
Humour	0.571	4.66	1.69	4.95	1.72	−2.71**	0.170
Acceptance	0.599	6.06	1.50	5.76	1.55	3.26***	0.197
Religion	0.791	3.96	1.91	3.91	1.98	0.41	0.026
Self-Blame	0.693	4.31	1.76	4.43	1.74	−1.12	0.069

BRS, Brief Resilience Scale; COPE, Coping Orientation to Problems Experienced; ESSI, ENRICHD Social Support Instrument; PCL-5, PTSD Checklist for DSM-5; PSS-10, Perceived Stress Scale 10-item version; *P < 0.05, **P < 0.01, ***P < 0.001.

COVID-19 lockdown was assessed with the PSS-10. This scale consists of 10 items about the frequency of feelings and thoughts due to the lockdown rated on a 5-point scale ranging from 0 (never) to 4 (very often). A total score, ranging from 0 to 40, is produced by summing all the items.

The Brief Resilience Scale (BRS; Smith *et al*. 2008). One's capacity to bounce back, overcome and adapt after stressors (such as the lockdown) was assessed with the BRS. Respondents' agreement with each of 6 items (e.g. 'tend to bounce back quickly after hard times') is rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). A total score, ranging from 6 to 30, is produced by summing the six items.

The Brief Coping Orientation to Problems Experienced Inventory (COPE; Carver, 1997; Kapsou *et al*. 2010). The 14 two-item subscales (self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioural disengagement, venting, positive reframing, planning, humour, acceptance, religion, and self-blame) measured the frequency with which participants used different coping strategies during lockdown. Responses were rated on 4-point scale ranging from 1 (I have not been doing this at all) to 4 (I have been doing this a lot). Subscale scores are produced by summing the respective two items.

The revised UCLA Loneliness Scale (Russell *et al*. 1978). The perceived loneliness participants felt during lockdown was assessed with the Revised UCLA Loneliness Scale. The scale consists of 20 items descriptive of one's situation (e.g. 'I lack companionship') rated on 4-point scale ranging from 0 (never) to 4 (often). A total score, ranging from 0 to 80, is produced by summing all the items.

The ENRICHD Social Support Instrument (ESSI; Mitchell *et al*. 2003). The social support participants received during lockdown was assessed with the ENRICHD Social Support Instrument (ESSI). The first six items (e.g. 'Is there someone available to you whom you can count on to listen to you when you need to talk?') were rated on a 5-point scale ranging from 1 (never) to 5 (always) and the seventh item is a yes/no question, scored 4 for yes and 2 for no. The total score, ranging from 8 to 34, is produced by summing all items.

Statistical analysis

The independent sample t-test was used to compare the mean scores between the first and second

timepoint (T1 and T2). The chi-square test was used to compare clinical rates of PTSD among the participants between the two timepoints. Pearson r was used to estimate the correlation between PTSS and sociodemographic variables, perceived stress, loneliness, social support, resilience, and coping strategies at the two timepoints. Two hierarchical multiple regression analyses (using stepwise method) were conducted to investigate the effect of potential protective and risk factors on PTSS for the two timepoints separately. Only the variables that significantly correlated with PTSS at both timepoints were entered in the regression analyses as potential predictors of PTSS. Statistical analyses were performed with SPSS Statistic 21.0 and the significance level was set on p<.05.

RESULTS

Differences between the first and second lockdown

As shown in Table 2, participants of the second COVID-19 lockdown (T2) presented statistically significant higher levels of PTSS and perceived stress compared to the first lockdown (T1). The prevalence of PTSS according to PCL-5 cut-off score (33) was 26.1% during T1 and 35.5% during T2. This difference was statistically significant ($\chi2 = 11.43$, $P < 0.001$). Higher levels of loneliness and lower levels of perceived social support and resilience were found in T2 in comparison to T1. Regarding coping strategies, participants in T2 reported significantly less use of self-distraction, active-coping, positive reframing, and acceptance, and more use of instrumental support, behavioural disengagement, and humour.

Correlations between PTSS, sociodemographic, risk and protective factors during the two lockdowns

During both timepoints, PTSS levels were significantly correlated with younger age, female gender, being single, not having children, and the evaluation of the pandemic as a crisis. Furthermore, during the first lockdown (T1), PTSS levels were positively correlated with the infection of a family member with COVID-19, and during the second lockdown (T2), PTSS levels were negatively associated with staying with family or a partner. However, all significant correlations were weak (0.06 to 0.21) (see Table 3). As shown in Table 4, during both timepoints PTSS significantly correlated with

TABLE 3 *Correlations between PTSS (PCL-5) and sociodemographic variables*

	T1	T2
Age	−0.17***	−0.21**
Gender	−0.07*	−0.12*
Region	−0.00	−0.08
Marital status	−0.12***	−0.20**
Children	−0.15**	−0.16**
Educational level	−0.01	0.00
Stay alone	0.01	−0.02
Stay with partner	−0.01	−0.14**
Stay with family	0.00	0.14**
Infected by Covid-19	−0.03	−0.02
A family member was infected by Covid-19	0.06*	0.02
Work with Covid-19 patients	0.01	−0.01
Evaluation of the pandemic	0.11**	0.14**

T1 = Timepoint 1–first lockdown; T2 = Timepoint 2–second lockdown; PTSS = Post-traumatic Stress Symptoms; PCL-5 = PTSD Checklist for DSM-5; For gender 1 = male, 0 = female; For region 1 = urban, 0 = rural; For marital status 1 = married, 0 = single; For Children 1 = have children, 0 = without children; For the variables stay alone, stay with partner, stay with family, infected by Covid-19, a member of my family was infected by Covid-19 and work with Covid-19 patients: 1 = Yes and 0 = No; For the evaluation of the pandemic 0 = a common problem 1 = crisis. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

perceived stress, loneliness, social support, resilience, and coping strategies.

Predictors of the PTSS during the first and second lockdown

Two hierarchical multiple regression analyses (one for each timepoint) using stepwise method were performed to investigate whether sociodemographic variables, perceived stress, loneliness, social support, resilience, and coping strategies predict PTSS levels (PCL-5 score) (see Table 5). In the first step, sociodemographic factors (age, gender, marital status, children, and evaluation of the pandemic) were introduced as potential predictors. Perceived stress (PSS-10 score), loneliness (UCLA Loneliness Scale score), social support (ESSI score), resilience (BRS score) and coping strategies (COPE subscale scores), except planning and active coping, were introduced as potential predictors in the second step. Both regressions were statistically significant; T1: $F = 147.17$, $P < 0.001$ ($R = 0.80$, $R^2 = 0.64$, adjusted $R^2 = 0.64$) and T2: $F = 80.25$, $p < 0.001$ ($R = 0.81$, $R^2 = 0.67$, adjusted $R^2 = 0.66$). Large size effects were found in both models ($F^2_{T1} = 1.78$ and $F^2_{T2} = 2.03$). The final model retained all variables at the 0.05 level or less. According to the final regression

TABLE 4 *Correlations between post-traumatic stress symptoms (PTSS), perceived stress, loneliness, social support, resilience, and coping strategies during the two lockdowns*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. PTSS	1	0.70**	0.67**	-0.26**	-0.55**	-0.11*	-0.08	0.39**	0.27**	0.11*	0.15**	0.50**	0.13*	-0.27**	0.00	0.09	-0.11*	0.12*	0.45**
2. Perceived Stress	0.70**	1	0.50**	-0.18**	-0.49**	-0.13*	-0.09	0.32**	0.21**	0.17**	0.21**	0.47**	0.18**	-0.32**	-0.04	0.07	-0.13*	0.03	0.29**
3. Loneliness	0.57**	0.50**	1	-0.47**	-0.47**	-0.08	-0.10	0.24**	0.25**	-0.04	0.00	0.45**	0.03	-0.25**	-0.04	0.04	-0.08	0.04	0.37**
4. Social Support	-0.25**	-0.24**	-0.57**	1	0.18**	0.09	0.08	-0.02	-0.12*	0.26**	0.17**	-0.20**	0.14**	0.16**	0.08	0.02	0.09	0.01	-0.23**
5. Resilience	-0.48**	-0.46**	-0.45**	0.25**	1	0.20**	0.17**	-0.28**	-0.11*	-0.12*	-0.14**	-0.45**	-0.05	0.35**	0.13*	0.09	0.20**	-0.06	-0.39**
6. Self-Distraction	-0.17**	-0.22**	-0.14**	0.16**	0.25**	1	0.20**	-0.14*	-0.09	0.02	0.03	-0.13*	0.08	0.28**	0.22**	0.05	1.00**	0.03	-0.06
7. Active-Coping	-0.02	-0.09**	-0.10**	0.19**	0.20**	0.25**	1	0.06	0.06	0.21**	0.15**	-0.30**	0.24**	0.46**	0.54**	0.07	0.20**	0.18**	-0.03
8. Denial	0.41**	0.34**	0.28**	-0.11**	-0.28**	-0.13**	0.01	1	0.15**	0.13*	0.09	0.42**	0.21**	-0.11*	0.00	0.06	-0.14**	0.16**	0.21**
9. Substance Use	0.24**	0.18**	0.17**	-0.13**	-0.12*	-0.05	-0.08**	0.15**	1	0.12*	0.10	0.20**	0.03	-0.19**	-0.11*	0.19**	-0.09	-0.05	0.13*
10. Emotional Support	0.20**	0.14**	-0.03	0.28**	-0.11**	0.08**	0.30**	0.18**	0.02	1	0.73**	0.03	0.38**	0.03	0.23**	0.09	0.02	0.07	0.13*
11. Instrumental Support	0.22**	0.13**	0.02	0.20**	-0.14**	0.00	0.29**	0.18**	0.00	0.76**	1	0.05	0.37**	0.03	0.26**	0.01	0.03	0.16**	0.22**
12. Behavioural Disengagement	0.54**	0.43**	0.46**	-0.27**	-0.41**	-0.17**	-0.22**	0.43**	0.24**	0.08**	0.11**	1	-0.05	-0.35**	-0.20**	0.11*	-0.13*	-0.01	0.28**
13. Venting	0.31**	0.23**	0.09**	0.13**	-0.14**	0.05	0.24**	0.28**	0.09**	0.46**	0.48**	0.16**	1	0.09	0.21**	0.14**	0.08	0.18**	0.05
14. Positive Reframing	-0.12**	-0.22**	-0.20**	0.24**	0.31**	0.38**	0.46**	-0.04	-0.07*	0.20**	0.17**	-0.21**	0.19**	1	0.39**	0.17**	0.28**	0.30**	-0.09
15. Planning	0.05	-0.06	-0.05	0.12**	0.12*	0.30**	0.54**	0.06*	-0.05	0.30**	0.33**	-0.09*	0.33**	0.45**	1	0.07	0.22**	0.27**	0.16**
16. Humour	0.09**	0.03	-0.02	0.07*	0.08**	0.16**	0.13**	0.08*	0.14**	0.13**	0.12**	0.10**	0.22**	0.23**	0.19**	1	0.05	0.04	0.06
17. Acceptance	-0.17**	-0.22**	-0.14**	0.16**	0.25**	1.00**	0.25**	-0.13**	-0.05	0.08*	0.00	-0.17**	0.05	0.35**	0.30**	0.16**	1	0.10**	-0.06
18. Religion	0.07*	-0.05	-0.05	0.12**	0.08*	0.10**	0.24**	0.10**	-0.13**	0.19**	0.22**	-0.06*	0.19**	0.29**	0.23**	0.05	0.10**	1	0.15**
19. Self-Blame	0.38**	0.22**	0.22**	-0.03	-0.30**	-0.06	0.14**	0.28**	0.12**	0.27**	0.34**	0.37**	0.31**	0.07*	0.30**	0.17**	-0.06	0.07*	1

Coefficients below the diagonal are correlations between variables for the first timepoint (lockdown) and coefficients above the diagonal are correlations between variables for the second timepoint (lockdown). *$P < 0.05$, **$P < 0.01$.

TABLE 5 *Hierarchical regression analyses for the first (Timepoint 1) and second (Timepoint 2) lockdown with PTSS (PCL-5 score) as the dependent variable and perceived stress, loneliness, social support, resilience, and coping strategies as potential predictors*

PTSS Predictors	First lockdown (Timepoint 1)						Second lockdown (Timepoint 2)					
	Step	B final	SE	β final	t	P	Step	B final	SE	β final	t	P
Constant		−20.95	3.26		−6.42	<.001		−18.54	5.17		−3.59	<0.001
Age	1	−0.01	0.03	−0.01	−.34	0.730	1	0.01	0.05	0.01	0.26	0.793
Gender												
Marital status												
Children												
Evaluation of the pandemic	2	−0.27	0.25	−0.02	−1.09	0.275	2	−0.04	0.41	0.00	−0.10	0.917
Perceived Stress	3	1.01	0.06	0.43	16.73	<0.001	3	0.98	0.10	0.40	9.89	<0.001
Loneliness	5	0.64	0.08	0.21	8.30	<0.001	4	1.02	0.12	0.34	8.67	<0.001
Social Support												
Resilience	10	−0.21	0.09	−0.06	−2.39	0.017	7	−0.35	0.14	−0.10	−2.44	0.015
COPE												
Self−Distraction												
Denial	11	0.58	0.25	0.06	2.36	0.019	6	1.12	0.37	0.11	3.07	0.002
Substance Use	9	0.80	0.27	0.06	2.95	0.003						
Use Emotional Support												
Use Instrumental Support												
Behavioural Disengagement	4	1.64	0.30	0.14	5.46	0.001						
Venting	8	0.76	0.22	0.08	3.49	0.001						
Positive Reframing												
Humour							8	0.64	0.32	0.07	2.02	0.045
Acceptance												
Religion	7	0.80	0.17	0.10	4.64	<0.001						
Self-Blame	6	0.92	0.20	0.10	4.51	<0.001	5	1.43	0.35	0.15	4.13	<0.001
R^2	0.64						0.67					
F^2	1.78						2.03					

PCL-5 = PTSD Checklist for DSM-5; For gender 1 = male, 0 = female; For marital status 1 = married, 0 = single; For Children 1 = have children, 0 = without children; For the evaluation of the pandemic 0 = a common problem 1 = crisis. For the prediction of the PTSS during the first lockdown (T1), gender, marital status, children, social support, self-distraction, positive reframing, humour, acceptance were excluded from the regression analysis. For the prediction of the PTSS during the second lockdown (T2), gender, marital status, children, self-distraction, use emotional support, use instrumental support, behavioural disengagement, venting, positive reframing, acceptance, religion were excluded from the regression analysis.

model, during both timepoints, PTSS levels were predicted by perceived stress (T1: $\beta = 0.43$, $t = 16.73$, $P < 0.001$, T2: $\beta = 0.40$, $t = 9.89$, $P < 0.001$), loneliness (T1: $\beta = 0.21$, $t = 8.30$, $P < 0.001$, T2: $\beta = 0.34$, $t = 8.67$, $P < 0.001$), resilience (inversely) (T1: $\beta = -0.06$, $t = -2.39$ $P = 0.017$, T2: $\beta = -0.10$, $t = -2.44$, $P = 0.015$) and the coping strategies of denial (T1: $\beta = 0.06$, $t = 2.36$, $P = 0.019$, T2: $\beta = 0.11$, $t = 3.07$, $P = 0.002$), and self-blame (T1: $\beta = 0.10$, $t = 4.51$, $P < 0.001$, T2: $\beta = 0.15$, $t = 4.13$, $P < 0.001$). During T1, behavioural disengagement ($\beta = 0.14$, $t = 5.46$, $P = 0.001$), venting ($\beta = 0.08$, $t = 3.49$, $P = 0.001$), substance use ($\beta = 0.06$, $t = 2.95$, $P = 0.003$), and religion ($\beta = 0.10$, $t = 4.64$, $P < 0.001$) were also predictors of PTSS. During T2, humour ($\beta = 0.07$, $t = 2.02$, $P = 0.045$) also predicted PTSS. Whereas age (T1: $\beta = -0.01$, $t = -0.34$, $p = .730$, T2:

$\beta = 0.01$, $t = 0.26$, $P = 0.793$) and evaluation of the pandemic as a crisis (T1: $\beta = -0.02$, $t = -1.09$, $P = 0.275$, T2: $\beta = 0.00$, $t = -0.10$, $P = 0.917$) were included as predictors, in the last step their effect was not statistically significant. Based on beta values, perceived stress, loneliness, and self-blame were robust predictors of PTSS at both timepoints.

DISCUSSION

To the best of the authors' knowledge, the present study is the first comparison of the COVID-19-related PTSS and psychological well-being indicators in the general population between two lockdowns. Owing to the prolonged COVID-19 pandemic and the more severe features during the second lockdown (exponential increase in the confirmed cases and deaths), an

increase in perceived stress and PTSS was expected. Moreover, we hypothesized a decrease in internal protective factors, that is, resilience, coping, and an increase in risk factors, especially loneliness. This hypothesis was also confirmed.

The findings showed that the prevalence estimates of PTSS were in general high during both lockdowns (T1 and T2), and significantly higher at the second one (26.1% vs 35.5%). These rates are within the PTSD range (from 7% to 53.8%) found in the review by Xiong *et al*. (2020). The correlations of sociodemographic characteristics with PTSS were as anticipated. In line with previous findings, women and younger people (Benke *et al*. 2020; Kalaitzaki, 2021; Liu *et al*. 2021; Lorant *et al*. 2021; Pieh *et al*. 2021; Xiong *et al*. 2020) were more at risk of PTSS than men and older people during both lockdowns. Kalaitzaki (2021) has speculated that women are more prone to anxiety and younger people are less experienced in dealing with stressful events, than men and older people, respectively. Being single and not having children (at both lockdowns) and not living with a partner (at the second lockdown) were correlated with higher PTSS levels. Considering that these findings may be associated with feelings of perceived loneliness and unavailability of social support, they were to be expected. Higher PTSS levels for those living with the family at T2 may indicate more intense fear of transmitting the virus to their family members (Tsouvelas *et al*., submitted) compared to T1, since restriction measures were looser at T2 (e.g. people kept on working) despite the staggering rise of conformed cases. Obviously, the evaluation of the pandemic as a crisis (at both lockdowns) and the infection of a family member (at the first lockdown) correlated with higher PTSS levels. Because these correlations were particularly low, we should consider them trends and not definite conclusions.

As hypothesized, higher levels of perceived stress (PSS) were also found at the second lockdown (T2). A few studies have shown decreased stress or PTSS at a second timepoint, but these have been conducted at the beginning of the outbreak and a few weeks later (Duan *et al*. 2020; González-Sanguino *et al*., 2020; Wang, Pan, *et al*. 2020). Our study was conducted amid the two lockdowns. The unique features of the specific geographical location of the study during the measurement points could potentially explain the findings. In Greece, the first lockdown was imposed when scant cases were confirmed and during which the increase in cases was slow. On the other hand, during the second lockdown (T2), there was a sharp increase in the cases. Perhaps,

the study that resembles ours is the longitudinal study by Kimhi *et al*. (2020), which was conducted at a remission period (reduction of cases) and at a resurgence period (increase in cases) in 906 Jewish Israeli respondents. Kimhi *et al*. (2020) also found a significant increase in distress, which is in line with the present findings. It seems that the lockdown policy had adverse mental health impacts on the general population, which were more intense during the second lockdown. We could not know, however, whether the increased rates of distress align with an increase of threat (because of the exponential rise of cases and deaths) or if it resulted from the debilitation experienced because of the prolonged pandemic-related confinement and physical/social distancing measures, or both. Should we have an intermediate measurement during the summer, when the first wave subsided and the confirmed cases followed a downward trend, perhaps we could more accurately speculate about the increase in the distress indicators. Because the second lockdown occurred soon after the first one, it can be assumed that the stress was not relieved meantime but rather had cumulative effects on mental health. At any rate, it seems that Greeks did not return at the pre-pandemic distress levels, nor they effectively adapted to the COVID-19 pandemic.

The finding that perceived stress was a predictor of PTSS at both timepoints probably indicates that participants continued to perceive the lockdowns as unpredictable and uncontrollable situations that exerted significant stress. Other studies have also found an association between perceived stress and PTSD (Zhang *et al*. 2021). It should be reminded that in the present study the experience of lockdown was specifically defined as the stressful situation to which the participants had to respond. Since PSS-10 measures how unpredictable, uncontrollable, and overloaded people find their lives in the past month because of a stressful experience, and PCL-5 examines symptoms that people could likely have in response to an extremely stressful experience, an association between PSS-10 and PCL-5 scores was rather to be expected. More of that, decreased resilience levels were found in the second lockdown (T2) and resilience also negatively predicted PTSS at both timepoints. This finding was also expected (Kimhi *et al*. 2020) and probably indicates that the prolonged COVID-19 pandemic and lockdowns may have gradually bended and drained participants, at least temporarily, and consequently resulted in higher levels of PTSS.

As hypothesized, higher levels of self-reported loneliness and lower levels of social support were found at

T2 (second lockdown). Loneliness but not support predicted PTS at both timepoints. Our findings are in line with previous studies showing that higher levels of restriction during the lockdown were associated with higher levels of loneliness (Benke *et al*. 2020; Tull *et al*. 2020), and loneliness was associated with PTSS (González-Sanguino *et al*., 2021; Zhou & Guo, 2021), and psychological distress (Liu *et al*. 2021; Lorant *et al*. 2021). Because of the escalation of the physical distancing restrictions in Greece during the second lockdown, these findings seem reasonable. Although access to social support is protective against PTSD (Hong *et al*. 2021), and social support decreased at the second lockdown in the present study, it was not a predictor of PTSS. The subjective experience of loneliness significantly predicted PTSS rather than the actual social support received by the participants (which also decreased).

Compared to the first lockdown, in the second one, Greek participants reported overall, reduced use of the four so-called adaptive coping strategies (i.e. self-distraction, active-coping, positive reframing, acceptance) and increased use of one so-called maladaptive coping strategy (i.e. behavioural disengagement). We do not know whether Greeks relinquished from the formerly used adaptive coping strategies because they considered them non-effective. These findings may suggest that Greeks have been exhausted, disappointed, and thus, they abdicated from trying to cope with the crisis adaptively, as they may have felt that the situation is out of hand, unpredictable, and unstoppable. This is in agreement with other studies (Kalaitzaki, 2021; Main *et al*. 2011) which have suggested that when an uncontrollable and life-threatening stressor occur, such as infectious viruses, maladaptive strategies may more frequently be used than adaptive ones. Needing to cope with an unknown situation urgently, maladaptive coping strategies may offer a rapid, direct, effortlessly and temporary way to relief stress (Kalaitzaki & Rovithis, 2021). This assumption is supported by the finding that participants' stress levels increased, and resilience levels decreased. The more frequent use of two adaptive coping strategies (i.e. instrumental support and humour) in the present study, may indicate an (ultimate) effort to use new strategies to deal with the situation.

Although both adaptive and maladaptive coping strategies were associated with PTSS at the first lockdown (in agreement with Kalaitzaki, 2021; Kalaitzaki & Rovithis, 2021), only dysfunctional coping strategies (i.e. self-blame, and denial) predicted PTSS levels at the second lockdown. This may also offer support to the assumption that Greeks have been discouraged and have resigned from trying to cope with the situation (and this does no longer impacts their stress levels); on the other hand, despite the detrimental effects of the dysfunctional coping strategies on their PTSS levels, they keep on using them perhaps as a quick and easy way to deal with the situation.

Limitations

A number of limitations could have influenced the findings of the present study. Because this was a repeated cross-sectional survey, the sample did not comprise of the same respondents between the two timepoints. Although a small number of respondents completed both surveys, anonymity of the respondents made the pairing of the questionnaires impossible. The self-reporting of the symptoms could not be verified by the mental health professionals' clinical evaluation/interview. However, for many variables that are based on personal feelings, such as loneliness and social support, self-reporting seems to be the appropriate evaluation method. Even though the sample was large with a wide distribution of the respondents' basic demographic variables, this was a web-based sample and not on a random one. Selection bias based on the online administration of the questionnaire might have excluded those residing in areas with less access to the Internet, and those with lower digital literacy skills, such as older people. The recruitment method did not allow us to calculate the response rate or compare respondents and non-respondents. We also do not know whether participants previously suffered any mental health symptoms/disorders (e.g. anxiety, depression) which could have likely been worsened during a crisis or stressful situations, such as the lockdowns. Although the two cross-sectional surveys (on samples with similar characteristics) resemble a longitudinal study, no causal inferences could be made.

CONCLUSIONS AND IMPLICATIONS

This study showed that the second lockdown had more detrimental effects on mental health of the Greek general population compared to the first one, since perceived stress and PTSS significantly increased; one out of three Greeks could have been diagnosed with post-traumatic stress symptoms. Participants were lonelier, had less social support, were less resilient, and were using more frequent dysfunctional coping strategies

rather than adaptive ones. All these seem to be significant public health concerns in Greece during the COVID-19 lockdowns. Vulnerable populations (e.g. women, younger, lonely) particularly suffer the negative mental health consequences of the lockdowns.

Although this study has identified that the features or the processes operating during the lockdowns are key determinants of the immediate development of mental health symptoms, in line with the vulnerability-stress models, unfavourable outcomes may be equally likely in the long run. For example Liu *et al.* (2021) have shown that psychological distress increased from the peak to the off-peak transmission period from 24% to 66%. Short-term mental health symptoms may increase the risk of mental disorders in the future (Benke *et al.* 2020). Therefore, identifying the risk and protective factors against PTSS is of great importance for dealing with future pandemics. Examining the effectiveness of evidence-based interventions could be equally important and should be prioritized by governments worldwide.

Relevance for clinical practice

Interventions should target enhancement of resilience, recommendations to strengthen and/or widen social support systems (e.g. through social media because of the physical contact restrictions), and to learn and espouse coping strategies that reduce stress, positively reframe the stressful experience, and help dealing effectively with the unprecedented consequences of the pandemic (extreme stress, fear, and grief). Relinquishing dysfunctional coping strategies (e.g. substance use) should be the focus of the interventions particularly in vulnerable populations (e.g. youngsters) to combat the negative mental health consequences of challenging situations such as lockdowns (Holmes *et al.* 2020).

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