

Going through the lockdown: a longitudinal study on the psychological consequences of the coronavirus pandemic

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ABSTRACT

Coronavirus 2019 pandemic lockdown in Italy lasted for 2 months, 1 week and 2 days. During this long period, one of the longest in Europe, the restrictions produced effects on people's psychological well-being, with consequences that also continued after lockdown. The purpose of the study is to investigate these effects and how they changed in the general population over a period of time. We are also interested in exploring people's post-lockdown anxiety and concerns. We conducted an online survey using snowball sampling techniques. The longitudinal study consisted of four administrations covering a period of 10 weeks between April (baseline) and June (last follow-up). Levels of anxiety and depression were assessed by GAD-7 and PHQ-9, coping strategies were assessed by Brief Resilient Coping Scale (BRCS) and social support was assessed by MSPSS. Post-lockdown anxiety was explored by developing a set of *ad-hoc questions*. PCA was used to determine the principal categories of post-lockdown anxiety/concern resulting from the ad-hoc questions. Longitudinal data, given their nested structure, were analyzed through mixed modeling. Of the 411 responders at baseline, 169 had at least 3 out of 4 data points; the analysis was therefore conducted on this sample. Levels of depression and anxiety were found to be significantly higher in the study sample in comparison with normative samples for each of the four-time points; levels of coping showed that scores from the study sample were significantly lower than normative data at all-time points. Levels of perceived social support were significantly lower than normative data at the baseline and the first follow-up. The results of the study suggest that the lockdown experience had enduring consequences on the mental health of individuals. Prevention and support interventions to limit the psychological distress caused by COVID-19 should be taken into consideration in countries experiencing a second wave of the pandemic.

Key words: Coronavirus; social support during COVID-19; anxiety COVID-19 related; depression COVID-19 related; COVID-19 longitudinal study; negative emotions COVID-19 related.

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See online appendix for Supplementary Tables.

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Introduction

Restrictive measures used in Italy

The coronavirus 2019 (COVID-19) pandemic originated in Wuhan (China) and spread rapidly around the world from December 2019; in Italy, due to the increase in COVID-19 cases, in March 2020, the government ordered a period of precautionary lockdown, with restrictions on non-essential movement and business. This lockdown period was divided into two periods, named *Phase 1* and *Phase 2*.

In detail, except for people testing positive for COVID-19, who were not allowed to leave their homes under any circumstances during *Phase 1*, the government demanded the closure of commercial activities, with the exception of those considered essential (e.g. supermarkets and pharmacies). There was also an imposed obligation to stay at home and avoid any social interaction with others, except cohabitants; movement was only allowed in three cases: for work reasons (e.g. health workers), for issues of proven necessity (e.g. grocery shopping) and for health reasons. In the last case, those who showed flu symptoms and/or fever, had the obligation to report their condition to the health services by telephone, and were

not allowed to go to the doctor or to a hospital. Any movement had to be justified through self-certification, to be carried and to be shown if requested by the police to check the veracity of the declaration.

During Phase 2, the measures became less restrictive, allowing the reopening of many businesses and the possibility to meet up with relatives in a first instance and, subsequently, also with close friends. The obligation to wear protective wear was still required, especially in public areas, as well as the maintaining of a social distance (1 meter) between people.

The consequence was that during this period people were forced to stay at home, an imposition that had severe consequences on people's physical health and psychological well-being (Kumar & Nayar, 2020).

Psychological consequences of pandemic

The results in literature, referring to previous epidemics, suggest that people who had been quarantined, reported a high prevalence of symptoms of psychological distress and disorders, such as depression, low mood, irritability, insomnia, post-traumatic stress symptoms and anger. In addition, after quarantine, many continued to engage in avoidant behavior (Brooks *et al.*, 2020). Previous episodes of acute severe respiratory syndrome (SARS) have shown substantial and long-lasting effects, well beyond the initial biological risk. Follow-up studies at short-term (1 month), medium-term (1 year) and long-term (4 years), on patients, their family members, caregivers and health professionals, have documented the presence and persistence, over time, of significant levels of anxiety, depression, panic attacks, psychomotor arousal and post-traumatic stress symptoms (Hawryluck *et al.*, 2004; Wu *et al.*, 2009).

Numerous studies were conducted during this period of quarantine to investigate its psychological consequences on people, first in China and then in the rest of the world. In general, results confirmed that lockdown and post-lockdown resulted in psychological pressure that might be expressed in terms of higher anxiety or lower mood (Ozamiz-Etxebarria, Dosil-Santamaria, Picaza-Gorochategui, & Idoiaga-Mondragon, 2020; Wang *et al.*, 2020a; Wang *et al.*, 2020b). A survey conducted in China, on over 52,000 individuals, showed that 5% reported severe psychological disorders and 35% reported psychological distress (Qiu *et al.*, 2020). The review of literature conducted by Serafini *et al.* (2020) showed that the most relevant psychological reactions to COVID-19 infection are: uncontrolled fears related to infection, pervasive anxiety, frustration and boredom, disabling loneliness. Another study showed that individuals during the first period of the COVID-19 pandemic reported elevated levels of depression (43.4%), anxiety (45.4%) and PTSD symptoms (31.8%) (Liu, Zhang, Wong, Hyun, & Hahm, 2020).

Higher levels of anxiety and depression during the COVID-19 lockdown seem to be linked to the female gender, young age and low annual income (Smith *et al.*,

2020). A longitudinal study conducted in China during the initial outbreak, and during the four weeks after the epidemic's peak, suggests levels of relative long-term stability in stress, anxiety and depression levels; it reports an absence of significant differences in these three domains and a statistically, but not clinically, significant temporal reduction in PTSD symptoms (Wang *et al.*, 2020b).

Protective factors

Several studies have found that protective factors, such as coping and social support, have a positive influence, reducing (during quarantine) negative effects due to previous health emergencies. During the SARS virus epidemic, some people reported finding comfort through distractions, thus avoiding thinking about the situation. This highlighted the importance of social support; in fact, many caregivers were relieved to be taking care of their family members (Chiang, Chen, & Sue, 2007).

With regard to the COVID-19 lockdown, literature suggests that resilience, coping and social support can mitigate the impact of quarantine on one's psychological well-being (Serafini *et al.*, 2020). The study by Liu *et al.* (2020) reports that high levels of resilience were linked with low levels of anxiety; additionally, high levels of perceived family support were linked with low depression and PTSD symptoms, although levels of perceived friend support were not linked with any psychological outcomes. Coping behavior can combat and alleviate stress and anxiety problems caused by COVID-19 (Fullana, Hidalgo-Mazzei, Vieta, & Radua, 2020). Among the coping strategies, those regarding care for one's personal daily life, such as time dedicated to hobbies or outdoors activities, were very effective. This simple behavior has proven to be predictive of lower levels of depression. It is also important to note how positive coping strategies can reduce stress; instead, negative coping strategies, such as guilt and avoidance, might increase levels of stress (Vinothkumar *et al.*, 2016). Positive coping, generally associated with a good quality of life and personal satisfaction, can alleviate some psychological symptoms (Chew, Wei, Vasoo, Chua, & Sim, 2020) and is significantly and negatively correlated with anxiety. Certainly, one of the most effective coping strategies is the desire for family support (Wang, Wang, & Yang, 2020).

In a study carried out on the Egyptian adult population (510 subjects) it was found that although 24.2% of people experienced an increase in support from friends, they sought more support from family members (40.6%). 46.5% shared their feelings with family members more often during the quarantine period; in fact 330 people reported an increase in family care (64.7%) (El-Zoghby, Soltan, & Salama, 2020).

Study aims

The present study has three main aims. First of all, we were interested in grasping the *affective status* of the sam-

ple recruited, by measuring levels of anxiety and depressive feelings during the period characterized by the rapid spread of the contagion and the recent imposition of restrictive measures (lockdown) by the Italian government. At the same time, we wanted to test the effect of protective factors, such as coping resources and support from family and friends. Specifically, we hypothesized that, at baseline, these protective factors might have an effect on reducing people's levels of anxiety and depression.

Regarding the course of the pandemic, and the consequent accumulation of psychological distress due to the prolongation of the emergency and the maintenance of lockdown, the second aim was to study the longitudinal trend of the levels of anxiety and depression and verify the effects of protective factors in a mid-term period (3 months). As regards this aim, we hypothesized that these effects would endure and be confirmed during and after lockdown.

Lastly, we were particularly interested in focusing on the transition between lockdown and post-lockdown. Considering the absolute novelty that the COVID-19 pandemic represents and the tremendous consequences that it has generated, we aimed to explore the kind of concerns and reactions that arose when people were allowed to return to their everyday existence. Given its exploratory nature, no hypothesis was set for this aim.

Method

Sampling procedure

The study was conducted with an online questionnaire, to which Italian adults were invited to participate through social networks (e.g., Facebook, Instagram) and WhatsApp. To recruit the initial sample, snowball sampling techniques were used; 40 initial units were selected, to whom the link was sent in order to participate in the online survey (T1 questionnaire) together with a request to indicate a further 10 units belonging to the same population. The same questionnaire link was then also sent to these subjects. The recruitment window for T1 was open from April, 2, 2020 to April, 9, 2020; the second administration (T2) was open from April, 20, 2020 to April, 29, 2020. The first two administrations were both carried out during *Phase 1* (total ban on not strictly necessary relocations) of the outbreak period, imposed by the Italian government to confine the health emergency. Similarly, the third administration (T3) was sent immediately after the sample survey from May, 4, 2020 to May, 11, 2020 and the last administration (T4) from May, 28, 2020 to June, 4, 2020. These administrations were carried out at the beginning and the end of *Phase 2* (gradual recovery of activities and social life), respectively. The four time points were selected to analyze the trend of the psychological impact caused by the outbreak and the COVID-19 pandemic. In order to participate in the online survey, sub-

jects had to sign their informed consent, and, regarding the aims of the study, agree to the confidentiality of the data, the possibility of withdrawing from the study at any moment and the fact that the data are protected by UE GDPR 679/2016 and Italian law 196/2003. The informed consent also indicated the possibility of receiving raw data at the end of the study. Participants were also informed of the longitudinal design of the study and, for this reason, they had to create an anonymous code as regards the possibility of matching their data at subsequent time-points of the survey; those who accepted were also asked to complete other administrations, to indicate a personal contact (i.e., e-mail address or phone number) in order to receive subsequent links to the questionnaires. The study was approved by the Ethic Committee of the University of Palermo, 'UNIPA-151 - Prot. 521-04/05/2020'.

Statistical strategy

Comparisons between groups were conducted through t-test, ANOVA, and nonparametric tests whenever necessary. Associations between continuous variables were tested by Pearson's r or linear regression. The Hierarchical Linear Model was used to test longitudinal data. The model includes two levels; level 1 was a within-subject level accounting for variance due to the repeated measuring of each participant, and level 2 a between-subjects level accounting for variance due to differences among subjects. Analyses were conducted separately for GAD-7 and PHQ-9 as dependent variable (DV). Time was centred to the first administration (T1=0) to facilitate the interpretation of the results. In the first model time effects were tested by introduction of linear and quadratic terms:

Level-1 Model

$$DV_{ii} = \pi_{0i} + \pi_{1i}*(time_{ii}) + \pi_{2i}*(time^2_{ii}) + e_{ii}$$

Level-2 Model

$$\pi_{0i} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

$$\pi_{2i} = \beta_{20} + r_{2i}$$

In the second model predictors (BRCS and MSPSS) were added as independent variables (IV) in the level-1 and level-2 equations:

Level-1 Model

$$DV_{ii} = \pi_{0i} + \pi_{1i}*(time_{ii}) + \pi_{2i}*(time^2_{ii}) + \pi_{3i}*(IV_{ii}) + e_{ii}$$

Level-2 Model

$$\pi_{0i} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + \beta_{11}*(IV_i) + r_{1i}$$

$$\pi_{2i} = \beta_{20} + \beta_{21}*(IV_i) + r_{2i}$$

$$\pi_{3i} = \beta_{30} + r_{3i}$$

Data collected through the 13 *ad-hoc* questions, relating to the transition between outbreak and post-outbreak,

were summarized by a principal component analysis (PCA) with Promax oblique rotation. Eigenvalues greater than 1 were considered in order to determine the number of components. Items with loadings below 0.40 or cross-loadings of 0.40 or higher on two or more factors were removed (Howard, 2016).

Measures

An online survey was used in order to collect demographic data (*i.e.*, age, gender, education and occupation), anxiety and depression levels, coping strategies, levels of perceived social support and worries about the post-outbreak phase.

The General Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams & Löwe, 2006), is a 7-items self-report questionnaire investigating worry and anxiety symptoms. Responses were rated on a 4-point Likert scale (0= “not at all”, 3= “nearly every day”). The total score is calculated by the sum of single items; scores equal to, or higher than 10, were considered a case of probable generalized anxiety. The questionnaire showed good reliability and construct validity (Kroenke, Spitzer, Williams, Monahan & Löwe, 2007; Lowe *et al.*, 2008). In our sample, Cronbach Alpha was 0.848.

The Patient Health Questionnaire-9 (PHQ-9; Spitzer, 1999), is a 9-item self-report questionnaire concerning depressive symptoms. Each item is scored on a 4-point Likert scale (0= “not at all”, 3= “nearly every day”). The total score is calculated by the sum of single items; scores greater than 10 were considered to be a case of probable depression. The questionnaire showed good psychometric properties (Kroenke, Spitzer & Williams, 2001). In our sample Cronbach Alpha was 0.841.

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet & Farley, 1988), is a 12-item inventory measuring the levels of perceived social support. The inventory is composed of three subscales: “family”, “friends” and “significant other”. We included, in the online survey, only the 8 items relative to the “family” and “friends” subscales. Each item is scored on a 7-point Likert scale (1= “very strongly disagree”, 7= “very strongly agree”). The total score is calculated by taking the mean of single items; a higher score corresponds to higher levels of perceived social support. The inventory showed good psychometric properties, with good internal reliability for subscales (Zimet *et al.*, 1988). In our sample Cronbach Alpha was 0.931 on the “family” subscale, and 0.956 on the “friends” subscale.

The Brief Resilient Coping Scale (BRCS; Sinclair & Wallston, 2004), is a 4-item self-report questionnaire investigating the ability to cope with stress in a highly adaptive manner. Each item is scored on the 5-point Likert scale (1= “does not describe me at all”, 5= “describes me very well”). The total score is calculated by the sum of single items; a higher score corresponds to higher ability to cope with stress. The BRCS has adequate in-

ternal consistency and test-retest reliability (Sinclair & Wallston, 2004). In our sample Cronbach Alpha was 0.649.

After the third administration, a set of 13 *ad-hoc* questions was introduced to explore post-lockdown anxiety and fear. An initial list of items was developed independently by two researchers (A.T. and I.M) based on the literature related to PTSD (Hofmann, Litz, & Weathers, 2003), GAD (Sigdel *et al.*, 2020), phobias (Cava, Fay, Beanlands, McCay, & Wignall, 2005) and concerns consequent either to the pandemic, traumatic events that caused the outbreak or social isolation. A final list of 13 items was selected by consensual agreement between researchers or with the aid of a third researcher (S.G.) in case of disagreement.

Each item was scored on 5-point Likert scale (1= “very strongly disagree”, 5= “very strongly agree”).

Results

Sample characteristics at the first survey

At baseline (T1), 411 subjects agreed to participate in the survey. Of those, 210 subjects (51.1%) also participated in the second administration (T2). At the third administration (T3) 167 subjects replied (40.63%). Lastly, 147 subjects (35.76%) completed the last administration (T4). The sociodemographic characteristics of the sample are presented in Table 1. Responders were mostly female (77% at baseline, 79% at T2, 82% at T3, 79% at T4) and resident in northern Italy (48.8%; 55.8%; 53.1%; 51.6%); about a third of participants were students (27,3%; 34,8%; 35,9%, 34,7%); the majority live with one family member or are cohabitants (at T1 = 33,8%; at T2 = 35,2%; at T3 = 37,7%, at the T4 = 36,1%); about one out of ten had a family member isolated due to COVID-19 (T1=13.6%, T2=12,9%, T3=12%, T4=9,5%).

At the first survey (baseline, T1), levels of depression measured through PHQ-9 were moderate (10-14) in 14%, moderately severe (15-19) in 6% and severe (+20) in 2% of the responders. Overall, 22% of the sample exceeded the cut-off score (10), and the PHQ-9 average was found to be significantly higher in the study sample in comparison with normative data ($t_{(411)}=15.03$; $P=0.000$; Cohen's $d=0.74$). Levels of anxiety measured through GAD-7 were moderate in 13% of the responders and severe in 3%. Overall, about 16% of participants exceeded the cut-off of 10, and on average our sample showed higher GAD-7 than scores reported for normative samples ($t_{(411)}=13.64$; $P=0.000$; $d=0.671$). The first set of analyses was conducted in order to test the effect of gender, education, occupation and geographical area categories on PHQ-9 and GAD-7. However, significant differences were found between gender in the levels of GAD-7 ($t_{(148)}=3.29$, $P=0.001$, $d=0.53$) and PHQ-9 ($t_{(154)}=2.98$, $P=0.001$, $d=0.40$) at the baseline, with higher levels of anxiety and

depression in females. Levels of GAD-7 ($F_{(9, 396)}=3.77$, $P=0.000$; $h^2=0.07$) and PHQ-9 ($F_{(9, 396)}=4.30$, $P=0.000$; $h^2=0.09$) were also significantly higher at the baseline for the unemployed ($P=0.010$, $d=0.61$; $P=0.015$, $d=0.56$) and students ($P=0.005$, $d=0.27$; $P=0.004$, $d=0.28$) in comparison with other work categories. There were no significant differences at T1 in GAD-7 and PHQ-9 scores for different levels of education ($F_{(3, 402)}=0.616$, $P=0.605$, $d=0.00$; $F_{(3, 402)}=0.837$, $P=0.474$, $d=0.01$), nor in the resident geographical area ($F_{(2, 403)}=0.19$, $P=0.826$, $d=0.00$; $F_{(2, 403)}=0.353$, $P=0.703$, $d=0.00$). Finally, age proved to be a

factor negatively associated with both GAD-7 ($r=-0.141$; $P=0.004$) and PHQ-9 ($r=-0.223$; $P=0.000$).

The association of coping strategy (BRCS), social support (MSPSS) and negative emotions (GAD-7 and PHQ-9) was also tested at T1, and showed a significant effect of MSPSS on both anxiety ($\beta=-0.280$, $P<0.001$) and depression ($\beta=-0.318$, $P<0.001$) with higher perceived social support associated with less negative emotions, whereas no significant effects were found for coping ($\beta=0.003$, $P=0.95$; $\beta=-0.014$, $P=0.77$, respectively).

Longitudinal changes in anxiety and depression during the different phases of the COVID-19 outbreak

The following analysis was only conducted on the subsample of participants that had completed at least two out of the three administrations post-baseline. More specifically, 106 subjects completed all four administrations, 31 subjects only the T1, T2 and T3, 20 subjects only the T1, T2 and T4 and, finally, 12 subjects completed only T1, T3 and T4 administrations. Attrition analysis showed that the 169 subjects who continued to participate in the research (with at least 3 data points) did not differ from those who quit after the first survey or had less than 3 time points on GAD ($t=-1.92$, $P=0.06$), PHQ ($t=-1.05$, $P=0.29$), MSPSS ($t=-1.29$, $P=0.19$), whereas the age factor (higher in baseline, $t=2.56$, $P<0.05$) and BRCS (higher in participants who continued, $t=-4.56$, $P<0.01$) were significantly different between groups. Distribution of gender, level of education and occupation were similar for the two samples.

23% of the 169 participants showed levels of depression above the cut-off at T1; the percentage remained stable in the two following surveys and then decreased to 16% at T4. 17% of participants showed levels of anxiety that exceeded the cut-off; the percentage increased to 23% at T2 and decreased in the two following surveys (19% at T3 and 14% at T4). GAD and PHQ trends were depicted in Figure 1 (see also Supplementary Table A).

Results from the 2-level hierarchical linear model (hlm) showed that PHQ-9 had a significant linear decrease ($\beta_{10}=-0.26$, $P<0.05$) and a negative quadratic slope ($\beta_{20}=-0.51$, $P<0.01$) across time; GAD-7 showed a non-significant linear change but a significant negative quadratic slope ($\beta_{20}=-0.28$, $P<0.01$). BRCS showed a significant change over time, with a positive quadratic slope ($\gamma_{20}=0.13$, $P<0.05$). Finally, social support did not change significantly ($\gamma_{20}=0.03$, $P>0.05$).

To test the effects of coping and social support on the longitudinal change in anxiety and depression, BRCS and MSPSS were added to the hlm level-1 and level-2 equations. Results showed that coping reduces levels of depression ($\beta_{30}=-0.24$, $P<0.001$), but not the level of anxiety ($\beta_{30}=-0.01$, $P=0.87$). Moreover, BRCS did not show significant effects on linear or quadratic slopes for GAD ($\beta_{11}=-0.16$, $\beta_{21}=-0.02$, $P>0.05$) nor for PHQ ($\beta_{11}=-0.21$, $\beta_{21}=-0.02$, $P>0.05$). When MSPSS was added to

Table 1. Sociodemographic characteristics of the sample at the first survey (N=411).

Sociodemographic characteristics	%	Mean (SD)
Age		34,52 (12,71)
Gender		
Male	23	
Female	77	
Geographic area		
Northern Italy	48.8	
Central Italy	36.7	
Southern Italy	14.5	
Occupation		
Student	27.3	
Unemployed	5.4	
Manual Work	1.9	
Intellectual Work	12.2	
Housewife	2.7	
Retired	2.7	
Social operator	3.2	
Healthcare worker	3.4	
Freelance	19.5	
Other	21.9	
Education		
Elementary/Middle school	5.6	
High school	29.2	
University	65.2	
Household size		
One person	12.4	
Two people	33.8	
Three people	27.0	
Four or more people	23.4	
Other	3.4	
Family member isolated due to COVID-19		
Yes	13.6	
No	86.4	

the equation, social support negatively predicted both the level of depression ($\beta_{30} = -0.91$, $P < 0.001$) and anxiety ($\beta_{30} = -0.57$, $P < 0.001$). Moreover, MSPSS did not have any significant effect on the linear or quadratic slopes of PHQ ($\beta_{11} = -0.12$, $\beta_{21} = -0.14$, $P > 0.05$), nor on the slopes for GAD ($\beta_{11} = -0.15$, $\beta_{21} = -0.03$, $P > 0.05$) (Table 2).

Transition between outbreak (T1-T2) and post-outbreak (T3-T4)

Concerns related to the transition between outbreak and post-outbreak were explored with a set of *ad-hoc* questions. The PCA, used to summarize the answers in fewer principal categories, yielded four factors with eigenvalues exceeding one, accounting for 69% of the total variance (see Supplementary Table B). None of the 13 items had loadings below 0.40, while three items showed cross-loadings higher than 0.40 on two factors, thus these 3 items were removed (Table 3). Based on the content of the 10 remaining items included in each of the four categories identified, we labeled the first cluster “*social withdrawal*” because it contained three items that focus on the possible decrease in intention to return to social activities, e.g. “*I prefer to continue my activities online even if it is possible to do it in presence*”; the second cluster was labeled “*fear of contagion*” because it collected two affirmations about the increased level of fear in contracting a disease, e.g. “*I think that I will have more chance to fall ill*”; the third cluster was labeled “*worry about wasting free time*” because it includes two items referring to the fear of not being able to have enough time to do things during the outbreak, e.g. “*I think that I’ll go back to not having time for my passions*”; finally, the fourth cluster was labeled “*fear of confrontation with the outside*” because it contained three items regarding the

fear of having to reconnect with the social world, e.g. “*I’m worried that I will have to show my physical appearance again*”. The total score for each category comes from the sum of the scores of related items.

Comparison between T3 and T4 found significant reduction of “*social withdrawal*” ($F=11.72$; $P=0.001$; Cohen’s $d=0.039$) and “*fear of contagion*” ($F=4.03$; $P=0.046$; Cohen’s $d=0.014$) (T3, $M=10.38$, $SD=2.91$; $M=6.01$, $SD=2.09$, respectively; T4 $M=9.17$, $SD=3.14$; $M=5.52$, $SD=2.05$, respectively), whereas no differences were detected in the other two factors, which were “*fear of confrontation with the outside*” ($F=0.27$, $P=0.604$, Cohen’s $d=0.001$) and “*worry of waste free time*” ($F=0.12$, $P=0.732$, Cohen’s $d=0.001$) (T3 $M=6.38$, $SD=2.77$; $M=5.21$ $SD=2.36$, respectively; T4 $M=6.55$ $SD=2.89$; $M=5.12$ $SD=2.38$, respectively). The GAD-7 was associated with the “*fear of confrontation with the outside*” at the T3 ($r=0.379$; $P=0.000$) and at T4 with “*social withdrawal*” ($r=0.185$; $p=.029$), “*fear of contagion*” ($r=0.218$; $P=0.010$) and “*fear of confrontation with the outside*” ($r=0.373$; $P=0.000$). The PHQ-9 was correlated with “*social withdrawal*” ($r=0.209$; $P=0.010$), “*worry about wasting free time*” ($r=0.159$; $P=0.053$) and with “*fear of confrontation with the outside*” ($r=0.380$; $P=0.000$) at the T3, and with all the four factors (“*social withdrawal*”: $r=0.254$; $P=0.003$, “*fear of contagion*”: $r=0.274$; $P=0.001$, “*worry about wasting free time*”: $r=0.164$; $P=0.054$, and “*fear of confrontation with the outside*”: $r=0.540$; $P=0.000$) at the T4.

Discussion

A growing body of evidence in literature suggests that the COVID-19 pandemic is increasing depression, anxiety

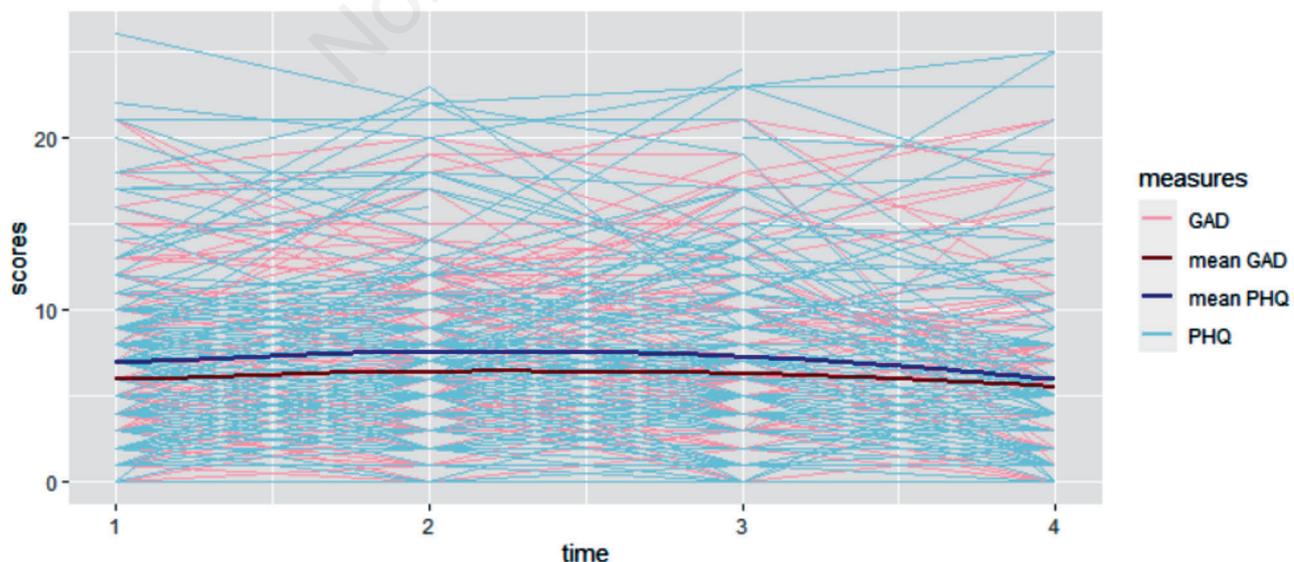


Figure 1. Longitudinal trends for GAD-7 and PHQ-9.

and other psychological difficulties in the general population and in specific groups (for example, Barzilay *et al.*, 2020; Gualano, Lo Moro, Voglino, Bert, & Siliquini, 2020; Wang & Zhao, 2020). In line with results reported by these studies, in our sample of Italian subjects, a high percentage reported clinically relevant levels of anxiety and depression and, on average, these levels remained significantly higher than normative data throughout the three months that we were observing. Interesting findings also emerged from an analysis of the trends of these negative emotions; in fact, the results highlighted the fact that both anxiety and depression had a curvilinear quadratic slope with an increasing at T2 (about three weeks later) and subsequent decreasing at T3 and T4 (about five and eight weeks later, respectively). The linear trend, however, showed that, across time, there was a significant decrease in levels of depression but not of anxiety; this is also confirmed by the fact that the levels of anxiety at the last time point (T4) were similar to the initial ones. These results are substantially in line with the findings of Wang *et al.* (2020b), who reported non-significant change over time

in the levels of depression and anxiety, when observations took place at a short time from each other and during the lockdown period.

Apart from common conditions, younger age, female gender, and unemployed or student categories in our sample were found to be more sensitive to negative emotions. The association between age, student condition and anxiety or depression related to the pandemic has already been reported (*e.g.*, Cao *et al.*, 2020; Gualano *et al.*, 2020; Palgi *et al.*, 2020) and it has been suggested that this relationship could be caused by additional stress or generated by the need to have to adapt to the new online educational environment (Ozamiz-Etxebarria *et al.*, 2020). More controversial is COVID-19-related literature regarding gender differences; in fact, despite several studies reporting higher levels of anxiety and depression in females (for example Wang *et al.*, 2020a; Palgi *et al.*, 2020; Rossi *et al.*, 2020), other authors found this association solely with regard to anxiety levels (Gualano *et al.*, 2020); others did not find this association at all (Cao *et al.*, 2020), or found an opposite association, with higher

Table 2. Hierarchical linear model results, fixed effects (N=169).

Fixed effect	Coefficient	SE	t-ratio	Approx. d.f.	P-value
DV: GAD-7					
time slope, π_1					
Intercp, β_{10}	-0.512	1.877	-2.994	167	0.008
BRCS, β_{11}	-0.157	0.128	-1.225	167	0.222
time ² slope, π_2					
Intercp, β_{20}	-0.656	0.720	-0.911	167	0.364
BRCS, β_{21}	0.024	0.049	0.515	167	0.607
BRCS slope, π_3					
Intercp, β_{30}	-0.013	0.083	-0.167	168	0.868
time slope, π_1					
Intercp, β_{10}	1.585	1.334	1.188	167	0.236
MSPSS, β_{11}	-0.150	0.260	-0.578	167	0.564
time ² slope, π_2					
Intercp, β_{20}	-0.152	0.448	-0.341	167	0.734
MSPSS, β_{21}	-0.030	0.089	-0.339	167	0.735
MSPSS slope, π_3					
Intercp, β_{30}	-0.565	0.190	-2.967	168	0.003
DV: PHQ-9					
time slope, π_1					
Intercp, β_{10}	-0.256	1.859	2.225	167	0.027
BRCS, β_{11}	-0.212	0.126	-1.673	167	0.096
time ² slope, π_2					
Intercp, β_{20}	-0.743	0.789	-0.942	167	0.348
BRCS, β_{21}	0.019	0.053	0.358	167	0.721
BRCS slope, π_3					
Intercp, β_{30}	-0.241	0.096	-2.499	168	0.013
time slope, π_1					
Intercp, β_{10}	0.640	1.535	0.417	167	0.677
MSPSS, β_{11}	0.122	0.293	0.418	167	0.677
time ² slope, π_2					
Intercp, β_{20}	0.182	0.527	0.346	167	0.729
MSPSS, β_{21}	-0.138	0.100	-1.373	167	0.171
MSPSS slope, π_3					
Intercp, β_{30}	-0.908	0.255	-3.537	168	<0.001

anxiety and depression in the male sample (Wang *et al.*, 2020a). Solomou & Constantinidou (2020) indicated a possible explanation for the negative association with depressive symptoms (repeatedly found in the studies) in the lower compliance with precautionary measures exhibited by men. The relationship between being unemployed and anxiety and depression levels that we found is in line with other studies (Solomou & Constantinidou, 2020). Unexpectedly, we found no difference in levels of mental health between healthcare workers and non-healthcare workers; although this result was also found by Barzilay *et al.* (2020), many other studies showed the presence of a relationship between these two domains (Cimerman, Chebabo, Cunha, & Rodríguez-Morales, 2020; Pappa *et al.*, 2020; Que *et al.*, 2020); we may not have detected this relationship because of the low presence, in our sample, of healthcare workers (3.4%). Overall, our results suggest that negative emotions related to Coronavirus are persistent and that certain categories of people (young people, women, the unemployed) are particularly vulnerable to this stress.

The present study also investigated the role of protective factors such as coping resources and interpersonal support in reducing people's levels of depression and anxiety over time. It is interesting to note that we found a significant longitudinal increase in coping strategies, while

the levels of perceived social support did not change over time. However, we found that interpersonal support facilitates the longitudinal reduction of both depression and anxiety, whereas coping strategies showed a significant protective effect only for depression. Other studies dealing with psychological aspects related to the Coronavirus have gathered similar evidence; a positive effect of social support on anxiety has been found by Cao *et al.* (2020) and this seems to be confirmed by the findings of Palgi *et al.* (2020), who identified loneliness as one of the main risk factors for the development of anxious and depressive symptoms during lockdown. Similarly, an association between coping and negative emotions has recently been found in relation to the Coronavirus; for example, Ran *et al.* (2020) found an inverse association between resilience and anxiety or depression symptoms during the peak of the COVID-19 epidemic in China.

By comparing our longitudinal findings with those found in literature some interesting implications emerge (Maunder *et al.*, 2006). Psychological strategies (*e.g.* coping and resilience) confirmed their protective effect against a negative mental health condition. However, in the initial phase of the pandemic, people often experienced a sense of helplessness, not feeling ready to confront the pandemic, which reduced the possibility of feeling well psychologically. Although, over time, people

Table 3. Items loadings and label components of ad-hoc items (N=169).

Items	Components				Component label
	1	2	3	4	
1. I prefer to continue my activities online (study, work, shopping, gaming <i>etc.</i>) even if it is possible to do it in presence	0.969	-0.144	-0.123	0.101	Social withdrawal
2. I will try to limit attendance in public places (public transport, bars, restaurants, <i>etc.</i>) more than before the emergency	0.910	-0.090	-0.085	0.028	
7. I think it is safer to continue to carry out only the strictly necessary activities foreseen in "phase 1"	0.574	0.261	0.193	-0.245	
5. I'd rather continue to manage my relationships from home	0.692	0.653	0.355	0.062	Removed
4. I feel that I will have more chance to fall ill	0.481	0.395	0.073	-0.115	Fear of contagion
3. I am worried that compliance with hygiene rules will not be enough to guarantee me adequate protection	-0.164	0.944	-0.012	0.066	
6. I am worried about having to go back to working in contact with others	0.658	0.728	0.425	0.330	Removed
8. I feel that I'll go back to not having time for my passions	0.001	0.845	-0.080	0.043	Worry of waste free time
9. I'm afraid that I won't have, as before the lockdown, enough time to cultivate my social relationships	0.350	0.504	0.041	0.171	
10. I am afraid that the return to normal will coincide with the return of problems	0.252	0.147	0.714	0.547	Removed
11. I'm worried that I will have to make my physical appearance again	-0.144	0.086	0.960	-0.114	Fear of confrontation with the outside
12. I fear that I will no longer be able to indulge in sexual intimacy	0.010	-0.068	0.912	0.049	
13. I am terrified of having to face the problems and the crisis caused by this emergency	0.144	0.099	0.102	0.603	

seem to partially recover greater confidence in their resources and feel more able to adapt to difficulties, it seems that by themselves they cannot achieve a sufficiently high level of resource to be able to neutralize the high levels of anxiety resulting from the pandemic. Therefore, it seems appropriate to point out that psychological support aimed at enhancing people's cognitive resources is an essential goal for psychological intervention in a public health emergency.

This reflection is linked to the need that we felt during our research to understand more deeply the experience that our interviewees were having and which led us to develop a short *ad-hoc* questionnaire focused on the reactions related to the transition from lockdown to post-lockdown taking place at that time. Therefore, as a third aim of the present study, we explored the kinds of concerns and anxiety that characterized people's return to their normal everyday routine. Data that we collected a few days after the government lifted the lockdown in Italy showed that responses to the items included in the study identified four main areas into which our participants' concerns were organized: social withdrawal, fear of contagion, fear of confrontation with the outside, and worry about wasting free time. These concerns resulted positively significant when associated with the negative emotions explaining the 20% variance for anxiety and the 30% for depression, reported by participants.

Interestingly, three weeks after the first administration, "social withdrawal" and "fear of contagion" were reduced significantly, whereas "fear of confrontation with the outside" and "worry about wasting free time" did not significantly decrease. Literature does not provide enough research similar to ours, about the third aim, but some similarity can be found with the attitudes of avoidance and social withdrawal after stressful events such as PTSD (Hofmann *et al.*, 2003). The research that comes closest to our hypothesis concerns what Cava *et al.* (2005) found after the SARS epidemic, as a result of which, individuals, for fear of being infected, reported a need to remain in quarantine even when government regulations allowed them to go out, or the need to distance themselves from people, to wash themselves often, and wear protective clothing even when the danger was over. In our research, fears decreased in the second part of *Phase 2*; this could have been the result of less fear on a renewed encounter with the outside world that could have been reassuring for the subjects.

Overall, the results of this study suggest that experiences due to the COVID-19 outbreak have brought on psychological distress to many people, the level of which has remained relatively stable even after the lockdown ended. Anxiety may represent a normal initial response to a significantly stressful event, but when normal life begins to be perceived as more and more remote and difficult, then feelings of depression, loneliness and despair can become more pronounced, especially among the most vul-

nerable individuals in society. This challenge to the psychological well-being in society will certainly be launched in increasing proportion to the ability to intervene and handle the symptoms of anxiety among the general public (Gurvich *et al.*, 2020). It is therefore necessary to prepare suitable interventions to tackle the presumed growing psychological malaise and to carry out research that may provide important information for the mental health services (Alves *et al.*, 2020). Interventions regarding the consequences of the COVID-19 outbreak can be interpreted as interventions to tackle the crisis (Dong & Bouey, 2020; Zgueb *et al.*, 2020). The main objective of the intervention in the crisis is to eliminate the feeling of helplessness and despair present in the patient and to develop a feeling of self-control. The timeliness of taking charge of people's psychological health, focusing in particular on reducing anxiety and depressive phenomena, can help prevent consequences related to various types of long-term psychological disorder that may emerge without such interventions. Further studies should be conducted to confirm, extend, and examine the present results in greater depth. In particular, other longitudinal studies on the progress of difficulties and resources in the long term would be useful. Moreover, the results from our third aim show that post-lockdown re-opening entails rapid changes with certain psychological aspects but not in others; it would be interesting to investigate more thoroughly which aspects improve (and under which conditions) and which others remain problematic. More specifically, our study does not investigate the psychological aspects related to the stigma of having been infected or having had close acquaintances infected. It would be interesting to explore this point, which we believe might have important effects on people's mental health.

Despite the relevance of these data to public health, this study has several limitations. First, the study was conducted on a relatively small sample size, with a high mortality rate between the four time points. Furthermore, a relatively short period of time elapsed between the four administrations. Online self-assessments and non-rigorous random sampling might also have reduced the representativeness and reliability of the results. Besides, the third aim of the study was based on a set of *ad-hoc* questions, which, therefore, were not standardized and for which there were no normative data, thus making comparison impossible.

Conclusions

The Coronavirus pandemic and its socio-economic consequences are having a great impact on the psychological well-being of Italians. It is not unreasonable to imagine that this could increase the number of requests for help from the mental health services in the near future. The results of studies such as the present one are strongly recommending the investment of additional resources for

preventive psychological support for the general public. This could avoid or reduce the aggravation of difficulties, which might subsequently lead to the need for longer and more expensive interventions.

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