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Effects of the COVID-19 pandemic on psychological health in a sample of Italian adults: A three-wave longitudinal study

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ABSTRACT

The COVID-19 pandemic and the resulting societal restrictions have had negative implications for mental health in the general population. The aims of the present longitudinal study were (i) to investigate changes in psychopathological symptoms and psychological well-being in a sample of Italian individuals surveyed at different points of the pandemic and (ii) to evaluate the potential risk and protective factors associated with the psychopathological outcomes. Self-reported data on psychiatric symptoms, and psychological well-being were collected in March 2020 (T0, the lockdown phase), in May 2020 (T1, the end of the lockdown phase), and in November 2020 (T2, the second wave of COVID-19 infection). 1258 participants ($M_{age}=23.43$, $SD_{age}=6.45$; 75.4% female) were recruited at T0. Of these, 712 also completed the T1 survey, and 369 also completed the T2 survey. A significant decrease in anxiety, depressive, posttraumatic, and obsessive-compulsive symptoms and a significant increase in psychological well-being were observed from T0 to T1. All psychopathological symptoms increased, and psychological well-being decreased significantly from T1 to T2. Several demographic, psychological and COVID-19-related factors emerged as predictors over the course of the pandemic. The current findings indicated that psychological health covaried with the intensity of the COVID-19 pandemic and the associated societal restrictions.

1. Introduction

Several authors (e.g., Guazzini et al., 2022) reported an increased risk of mental health problems among the general population in countries around the world in which the rapid spread of COVID-19 forced the government to put in place restrictive measures to limit disease dissemination. The Italian government introduced confinement measures from March 2020 to the beginning of May 2020, including a lockdown, contact restrictions, the closure of educational institutions, and the closure of nonessential workplaces. Before the beginning of the country-wide lockdown in March 2020, the most affected area was the North, in which some cities (e.g., Codogno in Lombardy) were already under quarantine from the end of February 2020; in that period, research was focused on analysing the impact of COVID-19 disease in the northern area of Italy (e.g., Lasalvia et al., 2020).

Several authors have highlighted the effects of social distancing measures on the mental health of the Italian population during the lockdown phase (from 8 March 2020 to 4 May 2020). For example, Amerio et al. (2021), in a study comparing the period before lockdown

with the lockdown phase in a representative sample of 6.003 Italian adults, found a significant increase in depression and anxiety symptoms, poor sleep quality, and a lower quality of life. In general, during the lockdown phase (also called the “first wave of infection”), many countries reported an increased incidence of psychopathological issues such as anxiety, depressive symptoms and posttraumatic stress disorder symptoms (e.g., Gonzalez-Sanguino et al., 2020; Mazza et al., 2020; McPherson et al., 2021; Pierce et al., 2020; Tian et al., 2020; Wang et al., 2020).

A recent meta-analysis showed a positive association between quarantine and anxiety, depression, and stress symptoms, with the longer quarantine time associated with the highest symptomatology (Jin et al., 2021). The effects of quarantine on the population’s mental health were previously studied during the outbreak of other diseases, such as Ebola, Middle East respiratory syndrome (MERS), and severe acute respiratory syndrome (SARS). For instance, a rapid review by Brooks et al. (2020) found the highest posttraumatic stress symptoms, psychological distress, irritability, insomnia, low mood, anxiety and depressive symptoms in individuals from the general population who

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were quarantined.

On May 4th, 2020, Italy started the “second phase”, coinciding with the end of the lockdown phase; in this phase, most working places were reopened, and open-air sports and social activities in small groups were allowed in combination with contact tracing and widespread testing activity. The reopening phase consequently led to a new rise in infections, which led Italy to the “second wave” of the pandemic that started in November 2020; in this phase, the government chose to divide the nation into “zones” based on the number of infections to avoid another generalized lockdown (for more, see [Chirico et al., 2021](#)).

A study on Italy’s infection incidence during the first and second waves of the pandemic showed that in those areas in which there was a high rate of infection in the first wave, the rate was lower during the second wave, and vice versa; the authors speculated on the possibility that individuals who lived in areas more severely hit by the pandemic during the lockdown phase may have significantly changed their behavior during the second phase ([Vinceti et al., 2021](#)).

Several risk factors for developing mental health issues during the pandemic have been identified. First, the populations identified as more vulnerable to developing psychological distress or having pre-existing conditions exacerbated were individuals with chronic or psychiatric illness ([Chatterjee et al., 2020](#); [Qiu et al., 2020](#)). For instance, a preliminary study on a sample of patients with obsessive-compulsive disorder showed that after the quarantine, the patients reported a significant increase in obsession and compulsion severity, and participants in remission reported symptoms related to a fear of contamination ([Prestia et al., 2020](#)). Additionally, hospital workers ([Lasalvia et al., 2020](#); [Lixia et al., 2022](#)), youths ([Amendola et al., 2020](#)) and elders ([Vinkers et al., 2020](#)) were considered at high risk. Additional socio-demographic variables that have been shown to be risk factors for COVID-19 were being female ([Qui et al., 2020](#); [Mazza et al., 2020](#); [Zhou et al., 2020](#)), having a low education level ([Qui et al., 2020](#); [Zhou et al., 2020](#)), family income instability ([Cao et al., 2020](#)), having infected or deceased family members ([Preti et al., 2021](#); [Rossi et al., 2020](#)), being in quarantine due to COVID-19 infection and other stressful events such as the loss of a job or finances ([Rossi et al., 2020](#)). Previous research also showed the impact of stressful events on quality of life (e.g., [Fernandez et al., 2015](#)), and recent research has reported the impact of quarantine during the COVID-19 pandemic on quality of life, showing that females and elderly individuals were the populations most at risk of experiencing a lower quality of life ([Ferreira et al., 2021](#)). Moreover, a three-wave panel survey of the population in Denmark showed a significant decrease in psychological well-being from April 2020 to December 2020 ([Sønderskov et al., 2021](#)) and a recent study identified the fear of contracting the virus as a strong risk factor in developing stress-related conditions during the COVID-19 pandemic ([Hagger et al., 2020](#)). Finally, a three-wave longitudinal study resulting in the three lockdowns in Slovenia showed a decrease in psychological well-being and an increase in COVID-19 related anxiety from wave 1 to wave 3 especially for those individuals who perceived wave 2 and wave 3 as more stressful than wave 1 ([Kozina et al., 2022](#)).

Meanwhile, a new phenomenon named the “infodemic” emerged during the COVID-19 pandemic, referring to a worldwide epidemic of misinformation and conspiracy theories disseminated through various media ([The Lancet Infectious Diseases, 2020](#)). Several studies have addressed the impact of the infodemic on psychological issues such as PTSD, anxiety, depressive symptoms, loneliness, and fear (e.g., [Dubey et al., 2020](#); [Pian et al., 2021](#); [Tagliabue et al., 2020](#); [Tasnim et al., 2020](#)). Moreover, frequently seeking health information contributes to the generation anxiety symptoms and worry ([Norr et al., 2014](#)). A study on 770 individuals infected with COVID-19 with clinically stable conditions showed that the predictors of depression and a lower quality of life were having a family member infected with COVID-19, being severely infected themselves, being male and frequently searching social media for information about COVID-19 ([Ma et al., 2020](#)).

Finally, confirming that the COVID-19 pandemic has caused

worldwide physical but also psychological health issues, systematic reviews and meta-analyses reported significant higher levels of depression, anxiety, insomnia, post-traumatic stress disorder and psychological distress as short-term consequences of the COVID-19 pandemic equally high across affected countries ([Cénat et al., 2021](#); [Salari et al., 2020](#)).

1.1. The current study

Various studies longitudinally explored the population’s mental health on successive time points from the beginning of the pandemic (e.g., [Kozina et al., 2022](#); [Sønderskov et al., 2021](#)). However, the vast majority of these studies focused on specific psychiatric symptoms (e.g., anxiety) or included samples with pre-existing mental health problems. Moreover, the vast majority of the studies conducted in Italy – even if very sound from a methodological point of view – included just two waves (e.g., [Benfante et al., 2022](#); [Guazzini et al., 2022](#); [Medda et al., 2022](#)). Furthermore, only few studies explored the impact of COVID-19 on the general population by also considering well-being (rather than the mere absence of psychiatric symptoms) on successive time points. For this reason the present study aimed to evaluate changes a broad range of psychopathological symptoms (i.e., anxiety, depressive symptoms, posttraumatic symptoms, obsessive-compulsive symptoms) and psychological well-being in a sample of Italian individuals between three different periods of the pandemic: (i) the lockdown phase (T0-March 2020) (ii) the second phase of the pandemic (T1-May 2020) in which there was a decrease of infections and the lockdown ceased, and (iii) the second wave of infection (T2, November 2020), where the number of cases raised again and Italy was divided in “zones” according to the numbers of infected people in each region. Consistently with previous studies ([Mazza et al., 2020](#), [Sønderskov et al., 2021](#)), we expected that psychopathological symptoms and psychological well-being would covary with the intensity of the COVID-19 pandemic and the associated societal restrictions. Specifically, anxiety, depressive symptoms, posttraumatic symptoms, and obsessive-compulsive symptoms were expected to decrease from T0 and T1 and increase from T1 and T2, whereas psychological well-being was expected to increase from T0 to T1 and decrease from T1 to T2.

Secondly, the present study aimed to investigate potential risk and protective factors of psychopathological outcomes at T0, T1 and T2. In line with previous evidence (e.g. [Amendola et al., 2020](#); [Dubey et al., 2020](#); [Guzi et al., 2020](#); [Hagger et al., 2020](#); [Lasalvia et al., 2020](#); [Mazza et al., 2020](#)) we hypothesized that age (lower or elder), gender (being females), being a healthcare worker, having ceased work, being concerned about contracting the virus and a high frequency of searching information about COVID-19 might act as risk factors for the increase of psychopathological symptoms and the decrease of psychological well-being at T0 and T2.

2. Methods

2.1. Participants and procedure

Data were collected from March 2020 to November 2020, resulting in an 8-month, three-wave, longitudinal, web-based survey of mental health outcomes in a sample of Italian people during the COVID-19 pandemic. At baseline, during the lockdown phase (T0; data collected from March 25th 2020 to April 1st 2020), we recruited 1258 participants aged between 18 and 70 years ($M_{\text{age}} = 23.43$, $SD_{\text{age}} = 6.45$; 75.4% female). Of these, 56.6% ($n = 712$; $M_{\text{age}} = 23.9$, $SD_{\text{age}} = 6.70$; 78.9% female) also completed the second survey at the beginning of phase 2, which coincided with the end of lockdown (T1, data collected from May 21st 2020 to June 9th 2020). Finally, 369 participants ($M_{\text{age}} = 24.65$, $SD_{\text{age}} = 7.20$; 79.1% female) completed the third survey at T2 (data collected from November 24th 2020 to January 21st 2021), when there was a significant increase in the number of cases in Italy (the second wave of infection). The sample characteristics are shown in [Table 1](#).

Table 1
Sample characteristics at T0, T1 and T2.

	T0 (n = 1258)	T1 (n = 712)	T2 (n = 369)
Mean Age	23.43 ± 6.45	23.90 ± 6.70	24.64 ± 7.20
%Female	75.4%	78.9%	79.1%
Geographical Area (Italy)			
% North	53.3%	54.2%	56.4%
% Center	24.2%	27.2%	27.9%
% South	22.5%	18.5%	15.7%
Sentimental status			
% Single	21.4%	26.5%	27.9%
% In a relationship	67.5%	60.1%	12.2%
% Having a cohabiting partner	6.5%	8.8%	48.8%
% Married	3.7%	3.8%	9.8%
% Divorced	0.7%	0.6%	1.4%
% Widowed	0.1%	0.1%	/
Occupation			
% Students	55.5%	52.1%	47.7%
% Working students	5.5%	16.4%	19.2%
% Workers	28.5%	20.8%	22.8%
% Healthcare workers	2.3%	2.2%	3.8%
% Unoccupied	8.1%	8.4%	6.0%
% Retired	0.1%	/	0.5%

Participants were recruited through advertisements on social network groups, and they were informed that participation was voluntary and anonymous and that confidentiality was guaranteed. A web link directed the participants to the study website, and after giving their informed consent, a unique alphanumeric code was created for each participant to ensure that they paired the answers to the posttest anonymously. Then, demographic information, information about their experience with COVID-19 (e.g., worry, seeking information, knowing people who have contracted the virus), and self-report questionnaires were collected. The survey has a completion time of approximately 30 min. No remunerative reward was given. T0 participants were contacted by email to complete the survey at T1 and T2. An automatic reminder was sent by email to minimize the risk of drop-out.

2.2. Measures

2.2.1. Information about COVID-19 experiences and the lockdown phase

Information about the participants' COVID-19 experiences was collected at T0, T1 and T2; the participants were asked if they lived alone during the quarantine, if they had ceased working due to the COVID-19 pandemic, if they knew people who had been infected with the virus, and if they felt safe. Moreover, they were asked about their level of fear of contracting the virus, the frequency of searching for information regarding COVID-19 (general research, disease symptoms, and the number of infected and deceased people), their beliefs about whether COVID-19 can lead to death, their concerns about the situation in Italy, and, finally, the pleasantness of cohabitation. Moreover, at T1 and T2, the participants were asked if they experienced economic difficulties due to the pandemic period, and only at T2 was it required to declare if they lived in the "red zone", which in Italy was considered the region at highest risk and with the most restrictions.

2.2.2. Anxiety symptoms

The Italian version (Sica and Ghisi, 2007) of the Beck Anxiety Inventory (BAI; Beck et al., 1988) was used to measure anxiety symptoms. The 21 items of this self-report measure rate a person's experiences over the past week on a Likert scale ranging from 0 ("Not at all") to 3 ("Severely – it bothered me a lot") and investigate the frequency of common symptoms of anxiety (e.g., an inability to relax, difficulty in breathing, nervousness). Higher scores indicate a higher level of anxiety symptoms (score range 0–63). The Italian BAI showed very good internal consistency (Sica and Ghisi, 2007). Cronbach's alphas for the current study were .92 (T0), .91 (T1) and .92 (T2).

2.2.3. Depressive symptoms

The Italian version (Sica and Ghisi, 2007) of the Beck Depression Inventory-II (BDI-II; Beck et al., 1996) was used to measure depressive symptoms. This self-report measure encompasses 21 items that measure the severity of depressive symptoms (e.g., sadness, a loss of pleasure, feelings of punishment) on a 4-point Likert scale. Higher scores indicate a higher severity of depression, with 17 considered as a cut-off score for clinical warning (score range 0–63). The Italian BAI showed good psychometric properties (Sica and Ghisi, 2007). Cronbach's alphas for the current study were .89 (T0), .92 (T1) and .92 (T2).

2.2.4. Obsessive-Compulsive symptoms

The Italian version (Melli et al., 2015) of the Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010) was used to assess obsessive-compulsive symptoms. The DOCS is a 20-item self-report measure that assesses four dimensions of OC symptoms: contamination, responsibility, unacceptable thoughts, and symmetry. All the answers are given on a four-point Likert scale ranging from 0 to 3. For each dimension, higher scores indicate the occurrence of more symptoms. The Italian DOCS showed good psychometric properties (Melli et al., 2014). Cronbach's alphas for the current study were .92 (T0), .93 (T1) and .93 (T2).

2.2.5. Posttraumatic Stress Disorder symptoms

The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5; Weathers et al., 2013) is a 20-item self-report measure used to assess posttraumatic stress disorder (PTSD) symptoms conceptualized within the four symptom clusters (intrusion; avoidance; cognition and emotions; hyperarousal) reported in the DSM-5 (American Psychiatric Association, 2013). Participants rated how much a problem described in the item statement bothered them over the past month using a 5-point Likert scale (0 = not at all; 5 = extremely). Item scores are summed to yield a total score ranging from 0 to 80. The PCL-5 appears to be an effective and reliable tool for screening PTSD symptoms (Brewin, 2005). Since an Italian version of the questionnaire was not available at the time of data collection, the Italian translation of the PCL-5 was obtained using a back-translation procedure. Cronbach's alphas for the current study were .94 (T0), .95 (T1) and .95 (T2).

2.2.6. Psychological well-being

The Italian version (De Sio et al., 2017) of the 5-item World Health Organization Five Well-Being Index (WHO-5; WHO, 1998) was used to measure participants' psychological well-being. Each item is rated on a 6-point Likert scale (1 = all the time; 6 = at no time), with higher scores indicating a higher sense of well-being (score range 0–25). The Italian version (De Sio et al., 2017) of the WHO-5 showed good psychometric properties. Cronbach's alphas for the current study were .83 (T0), .88 (T1) and .89 (T2).

2.3. Statistical analysis

Descriptive statistics were calculated for the baseline, first wave and second wave data. The data collected at T0, T1 and T2 were compared pairwise by repeated-measures ANOVA and *t*-tests. A series of multiple regression analyses was performed to examine the potential risk factors and protective factors for the mental health outcomes. All analyses were performed using SPSS 23 statistical software (IBM Corp.).

3. Results

3.1. Descriptive statistics

Descriptive statistics of information about the participants' COVID-19 experiences at T0, T1 and T2 are presented in Table 2, while those concerning anxiety, depressive symptoms, posttraumatic symptoms, obsessive-compulsive symptoms, and psychological well-being are

Table 2

Descriptive statistics concerning information about the participants' COVID-19 experiences at T0, T1 and T2.

	T0 (n=1258)	T1 (n=712)	T2 (n=369)
Living alone			
yes	4.4%	5.1%	4.90%
no	95.6%	94.9%	95.1%
Having ceased to work			
yes	47.1%	15.4%	24.6%
no	52.9%	84.6%	75.4%
Knowing people who had been infected			
yes	35.6%	56.3%	93.8%
no	64.4%	43.7%	6.2%
Feeling safe			
yes	70.7%	68.3%	5.7%
no	5.2%	3.2%	61.5%
not enough	24.1%	28.5%	32.8%
Concern regarding contracting the virus			
low (1-2)	35.6%	46.3%	15.8%
medium (3)	40.3%	37.8%	59.8%
high (4-5)	24.1%	15.8%	24.4%
Frequency of searching information about COVID-19			
low (1-2)	25.6%	64.2%	46.3%
medium (3)	23.3%	18.3%	32.5%
high (4-5)	51.2%	17.5%	21.1%
Worry for the Italian situation			
low (1-2)	1.5%	7.3%	2.7%
medium (3)	16.1%	32.3%	22.0%
high (4-5)	82.4%	60.4%	75.4%
Pleasantness of cohabitation			
low (1-2)	17.4%	14.7%	12.2%
medium (3)	31.6%	31.6%	33.3%
high (4-5)	51.8%	53.7%	54.5%
Economic issues at T1 and T2			
yes	/	26.7%	77.0%
no	/	73.3%	23.0%
Living in "Red zone" at T2			
yes	/	/	45.5%
no	/	/	66.7%

shown in Fig. 1.

3.2. Comparison of psychological health status between T0, T1, and T2

A repeated-measures ANOVA showed that the mean BAI, BDI, DOCS, PCL-5 and WHO-5 scores differed significantly across the three time points, as shown in Table 3. Regarding anxiety, depressive symptoms, posttraumatic symptoms and psychological well-being, there was a statistically significant difference between T0 and T1 (BAI: $t = 5.47$, $p < .001$, *Cohen's d* = .18; BDI: $t = 6.01$, $p < .001$, *Cohen's d* = .18; PCL-5: $t = 4.60$, $p < .001$, *Cohen's d* = .14; WHO-5: $t = -7.92$, $p < .001$, *Cohen's d* = .32) and between T1 and T2 (BAI: $t = -2.89$, $p = .004$, *Cohen's d* = .23; BDI: $t = -1.17$, $p < .001$, *Cohen's d* = .12; PCL-5: $t = -3.30$, $p < .001$, *Cohen's d* = .26; WHO-5: $t = 5.72$, $p < .001$, *Cohen's d* = .45), whereas there was no difference between T0 and T2.

Concerning obsessive-compulsive symptoms, there was a statistically significant difference between T0 and T1 ($t = 6.19$; $p < .001$; *Cohen's d* = .20) and T0 and T2 ($t = 2.81$; $p = .006$; *Cohen's d* = .22) but not between T1 and T2.

3.3. Predictors of psychopathological symptoms and psychological well-being at T0 and T2

A series of multiple regression analyses (Table 4) was performed to evaluate the ability of age, sex, living in northern Italy, being a health care worker, being in a relationship, living alone, having ceased to work due to the pandemic, being concerned about the possibility of

contracting the virus, knowing people who have been infected, worrying about the situation in Italy, the frequency of searching for information about COVID-19, the perception of being safe and the pleasantness of cohabitation to predict anxiety, depressive symptoms, obsessive-compulsive symptoms, posttraumatic symptoms and psychological well-being, based on data collected at T0 and T2. After performing preliminary analyses to ensure that there was no violation of the assumptions of normality, linearity and multicollinearity, significant regression equations were found for T0 and T2.

Concerning the predictors of anxiety symptoms, the model at T0 ($F = 5.512$, $p < .001$) predicted 33% of the variance. Anxiety symptoms were negatively predicted by age and the pleasantness of cohabitation and positively predicted by sex (female), concern about contracting the virus and the frequency of searching for information about COVID-19. At T2 ($F = 12.148$; $p < .001$; $R^2 = .32$), age and the pleasantness of cohabitation still negatively predicted anxiety symptoms, as did the perception of being safe, while being female, having ceased to work due to the pandemic, worrying about the situation in Italy and the frequency of searching for information regarding COVID-19 positively predicted higher anxiety symptoms.

Regarding depressive symptoms, the model at T0 ($F = 4.156$, $p < .001$) predicted 27% of the variance. Age and the pleasantness of cohabitation negatively predicted high depressive symptoms. At T2, the model continued to be significant ($F = 12.641$, $p < .001$), with an R^2 of .33, indicating that age, the perception of being safe and the pleasantness of cohabitation negatively predicted depressive symptoms, while being female, having ceased to work due to the pandemic and worrying about the situation in Italy positively predicted high depressive symptoms.

Obsessive and compulsive symptoms were positively predicted only by concerns about contracting the virus at T0 ($F = 2.521$; $p < .05$; $R^2 = .186$), while at T2 ($F = 10.570$; $p < .001$; $R^2 = .297$), the perception of being safe and the pleasantness of cohabitation negatively predicted high obsessive-compulsive symptoms, whereas having ceased to work and the frequency of searching for information regarding COVID-19 positively predicted high obsessive-compulsive symptoms.

Age and the pleasantness of cohabitation negatively predicted posttraumatic symptoms at T0 ($F = 4.106$; $p < .001$; $R^2 = .272$). Age, the pleasantness of cohabitation and the perception of being safe negatively predicted posttraumatic symptoms at T2 ($F = 9.631$; $p < .001$; $R^2 = .280$), while being female, having ceased to work, worrying about the situation in Italy and the frequency of searching for information regarding COVID-19 positively predicted posttraumatic symptoms.

Psychological well-being was positively predicted by the pleasantness of cohabitation at T0 ($F = 3.058$; $p < .05$; $R^2 = .218$). At T2 ($F = 10.309$; $p < .001$; $R^2 = .29$), it was negatively predicted by having ceased to work due to the pandemic, knowing people who had been infected with the virus and worrying about the situation in Italy, and it was positively predicted by being in a relationship, the perception of being safe and the pleasantness of cohabitation.

4. Discussion

The present study investigated the impact of COVID-19 on psychological health in a sample of Italian adults at three different points in the pandemic: the lockdown phase (T0, March 2020), the end of lockdown/beginning of the second phase (T1, May 2020) and the second wave of infection (T2, November 2020). Specifically, changes in the levels of anxiety, depressive symptoms, obsessive-compulsive symptoms, posttraumatic symptoms, and psychological well-being from T0 to T1 and from T1 to T2 were explored. We observed (i) a significant decrease in anxiety, depressive symptoms, posttraumatic symptoms and obsessive-compulsive symptoms and a significant increase in psychological well-being from March 2020 (T0, lockdown phase) to May 2020 (T1, end of lockdown); (ii) psychopathological symptoms (with the exception of obsessive-compulsive symptoms) significantly increased, and

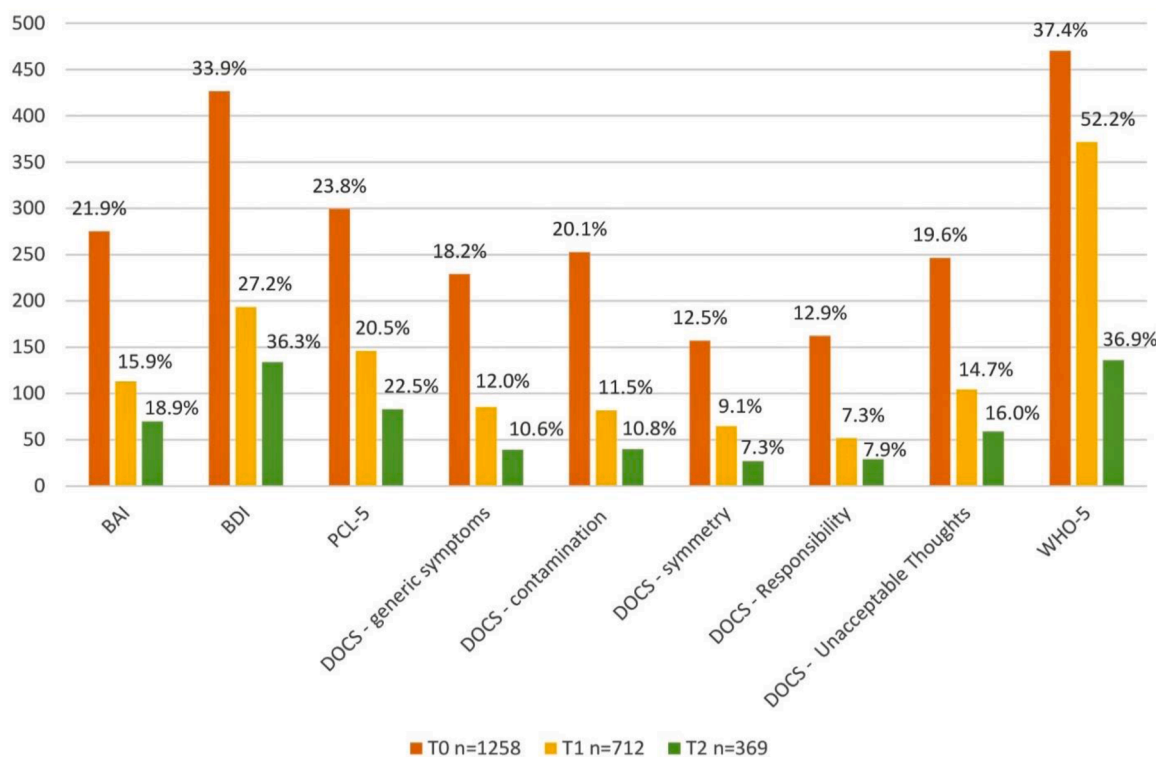


Fig. 1. Descriptive statistics of severe anxiety, depressive, posttraumatic, obsessive-compulsive symptoms, and low well-being at T0, T1 and T2.

Notes BAI = Back Anxiety Inventory; BDI = Beck Depression Inventory; PCL-5 = Posttraumatic Stress Disorder Checklist for DSM-5; DOCS = Dimensional Obsessive-Compulsive Scale; WHO-5 = World Health Organization Five Well-Being Index

Table 3

Comparisons of anxiety, depressive, obsessive-compulsive, posttraumatic symptoms and psychological well-being between T0, T1 and T2.

	T0 March 2020 n = 1258 M ± SD	T1 May 2020 n = 712 M ± SD	T2 November 2020 n = 369 M ± SD	F	p	ηp ²
Anxiety symptoms	13.85 ± 10.37	12.14 ± 10.27	13.81 ± 10.81	4.196	.016	.027
Depressive symptoms	11.29 ± 9.03	9.65 ± 8.26	12.34 ± 9.44	11.443	<.001	.069
Obsessive-Compulsive symptoms	15.47 ± 10.60	13.90 ± 10.80	13.64 ± 10.37	3.789	.024	.024
Posttraumatic Stress Disorder symptoms	20.84 ± 16.02	17.95 ± 15.00	21.06 ± 15.81	6.325	.002	.040
Psychological well-being	11.01 ± 5.05	12.89 ± 4.95	10.60 ± 4.72	18.735	<.001	.108

psychological well-being significantly decreased from May 2020 (T1, end of lockdown) to November 2020 (T2, second wave of infection); (iii) there were no changes between March 2020 (T0, lockdown phase) and November 2020 (T2, second wave of infection), except for obsessive compulsive symptoms, which significantly decreased. Consistent with previous studies (Mazza et al., 2020; Sønderkov et al., 2021), the current findings indicated that psychopathological symptoms and psychological well-being covaried with the intensity of the COVID-19 pandemic and the associated societal restrictions.

Previous studies using data collected during the lockdown phase in Italy showed high scores for anxiety, depression, and posttraumatic

symptoms and low scores for psychological well-being (Di Blasi et al., 2021; Forte et al., 2020; Mazza et al., 2020; Rossi et al., 2020; Somma et al., 2020) during the first weeks of the pandemic. These results were also confirmed by the international literature (e.g., Krishnamoorthy et al., 2020; Wang et al., 2020), demonstrating that the pandemic crisis produced similar responses in the populations around the world. The reduction in psychological well-being and the increase in psychopathological symptoms observed in the current study, although not in line with a previous study conducted in a sample of Italian women (Di Blasi et al., 2021), are compatible with the development of the COVID-19 pandemic. Indeed, a second wave of infection and the adoption of new societal restrictions (i.e., the creation of different “zones” in the country based on the number of infected individuals) started in November 2020. Based on our data, by November 2020, the psychological health of our sample of Italian people had dropped to the level observed at the spring apex of the pandemic in March 2020. This result is consistent with the data collected in Danish (Sønderkov et al., 2021) and English (Creswell et al., 2021) populations.

In the current study, several demographic, psychological and COVID-19-related factors emerged as predictors of psychological health over the course of the ongoing pandemic. As hypothesized, being female and younger predicted psychopathological symptoms both during the lockdown phase (March 2020) and during the “second wave” of COVID-19 (November 2020). These results are in line with those previously reported regarding age and sex (female) being risk factors for mental health problems during the COVID-19 pandemic (e.g., Amendola et al., 2020; Di Blasi et al., 2021; Huang and Zhao, 2020; Rossi et al., 2020). Consistent with previous evidence (Cao et al., 2020; Lades et al., 2020; Somma et al., 2020), the frequency of searching for information about COVID-19 was positively correlated with psychopathological symptoms in both of the examined pandemic periods. Some “time-specific” predictors of psychological health emerged. Whereas concerns about contracting COVID-19 predicted (anxiety) symptoms during the lockdown, having ceased to work and the general preoccupation with the situation

Table 4
Predictors of psychopathological symptoms and psychological well-being at T0 and T2.

Criterion variables	The first survey (T0, March 2020 – lockdown phase) N=1258			The third survey (T2, November 2020 – second wave of infection) N=369																
	Anxiety symptoms	Depressive symptoms	Obsessive-Compulsive symptoms	Posttraumatic Stress Disorder symptoms	Psychological well-being	Anxiety symptoms	Depressive symptoms	Obsessive-Compulsive symptoms	Posttraumatic Stress Disorder symptoms	Psychological well-being										
Age	β	-0.17*	-2.12	-0.25*	-2.94	0.01	0.08	-0.17*	-2.01	0.41	-0.15*	-2.91	-0.14*	-2.72	-0.05	-1.01	-0.14*	-2.57	-0.04	-0.80
Female	β	0.23*	3.04	0.09	1.26	0.00	0.06	0.07	0.95	-0.15	0.20**	4.10	0.11*	2.29	0.05	1.08	0.13*	2.53	0.06	-1.14
Living in Northern Italy	β	0.01	0.20	-0.12	-1.62	-0.00	-0.02	-0.02	-0.28	0.11	0.41	0.53	0.00	0.08	-0.04	-0.75	0.03	0.72	-0.05	-1.04
Healthcare worker	β	-0.13	-1.69	-0.00	-0.02	0.00	0.02	-0.04	-0.51	0.01	0.19	-0.02	-0.06	-1.24	-0.02	-0.34	-0.01	-0.28	0.06	1.12
Being in a relationship	β	-0.03	-0.37	-0.16	-1.89	-0.10	-1.10	-0.09	-1.00	0.13	1.46	-0.37	-0.03	-0.64	-0.06	-1.27	-0.09	-1.80	0.12*	2.33
Living alone	β	0.02	0.26	0.00	-0.00	-0.08	-0.92	0.03	0.41	-0.08	0.06	1.17	0.01	0.28	0.02	0.38	0.01	0.26	0.02	0.36
Having ceased to work	β	0.04	0.52	-0.06	-0.79	-0.15	-1.71	-0.08	-1.04	0.05	0.66	2.67	0.16*	3.40	0.13*	2.76	0.11*	2.33	-0.11*	-2.36
Concern about contracting the virus	β	0.27*	3.26	0.05	0.68	0.18	1.99	0.05	0.58	-0.07	-0.76	0.01	-0.03	-0.58	0.09	1.64	-0.08	-1.44	0.01	0.16
Knowing people who have been infected with the virus	β	0.13	1.76	-0.00	-0.04	0.09	1.14	0.08	1.10	-0.06	-0.76	0.03	0.03	0.76	-0.04	-0.76	0.05	1.07	-0.15*	-3.11
Worry for the Italian situation	β	0.06	0.82	0.15	1.89	0.13	1.51	0.12	1.53	-0.07	-0.81	0.16*	0.16*	3.24	0.08	1.68	0.12*	2.27	-0.10*	-1.92
Frequency of searching for information regarding COVID-19	β	0.17*	2.30	0.07	0.95	0.10	1.24	0.23*	2.97	-0.09	-1.19	0.12*	0.07	1.43	0.11*	2.11	0.11*	2.20	-0.04	-0.82
Perception of being safe	β	-0.07	-0.96	-0.00	-0.09	-0.15	-1.81	-0.07	-0.85	0.11	1.31	-0.30**	-0.27**	-5.29	-0.32**	-6.06	-0.31**	-5.72	0.22**	4.25
Pleasantness of cohabitation	β	-0.18	-2.50	-0.37**	-5.00	-0.06	-0.74	-0.31**	-4.18	0.30**	3.86	-0.14*	-0.27**	-5.70	-0.16*	-3.26	-0.19**	-3.77	0.32**	6.51

** p < .001
* p < .05;

in Italy (e.g., national economic and health care consequences) emerged as relevant predictors of psychopathological symptoms and psychological well-being during the “second wave” of COVID-19. These latter results were previously confirmed by studies on the first wave of the pandemic (Cao et al., 2020; Mehulić and Kamenov, 2021; Rossi et al., 2020). Regarding protective factors, the pleasantness of cohabitation was negatively associated with all psychopathological symptoms and positively associated with psychological well-being, both during the lockdown phase and during the “second wave” of COVID-19. It is plausible to assume that the pleasantness of cohabitation could be linked to perceived social support, which emerged as a protective factor for depressive symptoms during the pandemic (Mariani et al., 2020). Finally, the perception of being safe was a protective factor for psychopathological symptoms and psychological well-being specifically during the “second wave” of COVID-19.

Contrary to our hypothesis and to what was previously reported (e.g., Vizheh et al., 2020; for a systematic review, see Vindegaard and Benros, 2020), our research did not find that being a health care worker predicted having psychopathological symptoms. However, this population was underrepresented in the current study as only 3% of our participants were health care workers.

4.1. Limitations and future research

To the best of our knowledge, this is the first three-wave longitudinal study investigating the effects of the COVID-19 pandemic on psychological health in a sample of Italian people. Nevertheless, there are some limitations. First, the high dropout rate and the inclusion of respondents who completed the questionnaire in all three data collection periods may have produced a selection/survivorship bias. The low response rate could be explained by the fact that participants did not receive any compensation for participating in the study. Moreover, the long period considered (10 months) and the length of the survey (30 mins) might have influenced the participation rate. Future studies might implement more retention strategies (see for example Teague et al., 2018) in order to avoid a high dropout rate. Second, most of the participants were females, young adults and students, which is not representative of the entire Italian population. Third, our data are based only on self-reported questionnaires and referred only to the first year of the COVID-19 pandemic. Further longitudinal studies involving other types of populations, such as health care workers, elderly individuals, and individuals with psychiatric difficulties, are needed.

4.2. Conclusion

Overall, our study reported a rather prolonged negative impact of the COVID-19 pandemic on psychological health and well-being in a general population, based on prospectively collected data. Several important risk factors and protective factors emerged, suggesting some general population-based interventions to reduce the negative mental health impacts of COVID-19. These include providing reliable COVID-19 information to alleviate anxiety and fear, limiting loneliness, and promoting alternative forms of social interactions to increase perceived social support. Digital interventions focused on enhancing effective coping strategies and reducing stress that also take into account the timing of the interventions (i.e., at the start, middle or plateau stages of the pandemic) could be promising.

In general, the current findings suggested that the measures adopted by governments to contrast the pandemic in different periods (e.g., lockdown, social distancing) might need to be accompanied by psychological intervention in order to contain the long-term psychological health costs. For instance, psychoeducation about the potential short and long term negative effects of pandemics on psychological well-being could be provided. Moreover, implementing empirically supported strategies to assist in managing stress and minimizing concomitant mental health problems should become a priority. For example, digital

health strategies, especially mobile health technology, significantly support health care systems by promoting individuals' self-surveillance, self-monitoring, high quality freely available resources, and self-efficacy (e.g., Fagherazzi et al., 2020). Additionally, information about the pandemic might be distressing for certain individuals because both the content of such information (i. e., number of infected, deaths, ICU admissions, etc.) and the high rate of fake news might contribute to increased anxiety and depressive symptoms (Moghanibashi-Mansourieh et al., 2020; Zhou et al., 2020). Helping individuals in choosing institutional/trusted sources for finding information and avoiding negative and fake news could be important to promote healthy behaviors (Banerjee et al., 2020). In this vein, Health Beliefs Model (Becker and Maiman, 1975)-based interventions could be particularly relevant since they mitigate behaviors influenced by perceived health threats which provoke anxiety and fear, reinforcing individuals' perceived benefits and self-efficacy (e.g., Kim et al., 2012).

CRedit authorship contribution statement

Giulia Fioravanti: Conceptualization, Methodology, Formal analysis, Writing – review & editing. **Sara Bocci Benucci:** Formal analysis, Writing – original draft. **Alfonso Probstamo:** Conceptualization, Investigation. **Vanessa Banchi:** Conceptualization, Investigation. **Silvia Casale:** Writing – review & editing, Supervision.

Declaration of Competing Interest

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