Short-term psychological consequences of the COVID-19 pandemic: Results of the first wave of an ecological daily study in the Italian population

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ABSTRACT

COVID-19 pandemic involved several psychosocial consequences. We aimed at monitoring the mental health of Italian adults during the lockdown imposed by the government. We present here results from the baseline assessment of the "EmotionalThermometer [TermometroEmotivo] project on a sample of 1548 Italian adults. We assessed the socio-demographic conditions of participants, individuals' perception of the COVID-19-situation, psychological distress, emotion regulation strategies, and perceived social support. Having a worse representation of COVID-19 and consulting news more frequently, with higher anxiety and less credibility of different sources of information, were positively associated with psychological distress and post-traumatic responses. Being female, younger age, living in high-risk regions, having symptoms of COVID-19, and having relatives/friends with such symptoms represented risk factors for a worse perception of COVID-19 and distress. Social support and cognitive reappraisal represented protective factors for mental health.

Introduction

The novel Coronavirus disease 2019 (COVID-19) pandemic has already impacted economies, industries, and healthcare systems globally. At the moment[1], the COVID-19 pandemic involves about 210 countries or territories, with more than 68 million confirmed cases and more than 1,560,000 deaths globally.

The World Health Organization (WHO, 2020) has already indicated mental health and negative psychosocial consequences of COVID-19 as a matter of concern. Concerns for one's own health and for the health of family members, social isolation of children and adolescents, mourning of losses when the possibility to say goodbye is often denied, shortage of resources and misinformation, financial loss, and fear for the future represent only some of the major stressors for public mental health at this time (Brooks et al., 2020; Preti et al., 2020a, 2020b).

Research highlighted increasing levels of anxiety, depressive, and post-traumatic stress symptoms in the general population as a consequence of the COVID-19 pandemic (Cao et al., 2020; Casagrande et al., 2020; Liu et al., 2020; Ozdin and Ozdin, 2020; Qiu et al., 2020; Tang et al., 2020; Wang et al., 2020; Zhou et al., 2020). Moreover, specific risk and protective factors for psychological distress have been identified. They include socio-demographic variables such as sex (Liu et al., 2020; Ozdin and Ozdin, 2020; Qiu et al., 2020; Wang et al., 2020; Zhou et al., 2020), age (Qiu et al., 2020), education (Qiu et al., 2020; Zhou et al., 2020), and family income stability (Cao et al., 2020), and variables related to the level of exposure to the disease, such as the use of precautionary measures (Qiu et al., 2020; Wang et al., 2020), having affected family members (Cao et al., 2020), or living in urban or afflicted areas (Ozdin and Ozdin, 2020; Qiu et al., 2020; Tang et al., 2020). Other risk factors included the presence of chronic or psychiatric illnesses and frequent exposure to social media/news concerning COVID-19 (Gao et al., 2020; Horesh et al., 2020; Mazza et al., 2020).

Moreover, some studies have found that individual differences have an impact on negative psychological consequences of COVID-19

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[1] Data retrieved from the Coronavirus Research Center of the John Hopkins University and Medicine (December 9, 2020)

pandemic, as in the case of perceived social support (Cao et al., 2020; Tull et al., 2020; Xiao et al., 2020) and emotion regulation strategies (El Keshky et al., 2020; Xu et al., 2020). However, such variables have been less extensively studied in relation to the COVID-19 situation, despite evidence showing their protective role for mental health (e.g., Aldao et al., 2010; Prati and Pietrantoni, 2010; Aldao, Gee, De Los Reyes, and Seager, 2016; Kent de Grey et al., 2018; Price et al., 2018).

Perceived social support refers to "*how individuals perceive friends, family members and others as sources available to provide material, psychological and overall support during times of need*" (Ioannou et al., 2019, p.2). Many studies highlight the buffering role of social support in alleviating, moderating, or eliminating negative consequences of stressful and adverse events (Roy, 2011). Adequate social support positively affects psychological health and sleep function (Prati and Pietrantoni, 2010; Kent de Grey et al., 2018). In addition, adequate social support is associated with reduced symptoms of post-traumatic stress disorder (PTSD), major depressive disorder, and generalized anxiety disorder (Price et al., 2018). Moreover, a meta-analysis identified social support as the strongest protective factor for the onset of PTSD after traumatic events (Ozer et al., 2003). In line with studies on the psychological consequences of the Severe acute respiratory syndrome (SARS) epidemic (Wu et al., 2005; Yu et al., 2005; Chan et al., 2006; Bonanno et al., 2008), recent studies (Cao et al., 2020; Tull et al., 2020) have found that social support mitigates negative psychological consequences of the quarantine due to COVID-19. Moreover, detrimental effects of poor social support have been reported in healthcare workers during the COVID-19 pandemic: poor social support was associated with increased anxiety and stress levels, and reduced self-efficacy (Xiao et al., 2020; see Preti et al., 2020a for a review).

Along with social support, the impact of emotion regulation needs to be taken into account when examining negative psychological consequences of COVID-19 pandemic. Emotion regulation refers to conscious and unconscious processes aimed at modulating individuals' emotional responses (feelings, behaviors, and physiological reactions; Gross, 1998). Emotion regulation strategies can be adaptive or maladaptive depending on their efficacy in allowing individuals to cope with environmental demands (Gratz and Roemer, 2004). In particular, adaptive emotion regulation requires awareness and acceptance of one's own emotions, along with the ability to flexibly modulate emotional responses in order to meet personal goals and situational demands (Gratz and Roemer, 2004).

Adaptive emotion regulation strategies, such as cognitive reappraisal and problem-solving, protect against the onset of anxiety, depression, substance use, and eating disorders (Aldao et al., 2010, 2016), thus resulting in better mental health (Hu et al., 2014). In contrast, maladaptive emotion regulation strategies, such as emotional suppression, avoidance and rumination, are risk factors for high levels of depression, anxiety, PTSD, substance use, and eating disorders (Eftekhari et al., 2009; Aldao et al., 2010; Berking and Wupperman, 2012; Hu et al., 2014; Dixon-Gordon et al., 2015; Sheppes et al., 2015). However, the use of maladaptive emotion regulation strategies (i.e., suppression, avoidance, and rumination) seems more detrimental than the relative absence of adaptive emotion regulation strategies (i.e., cognitive reappraisal and acceptance), with the exception of problem-solving (Aldao et al., 2010). Moreover, difficulties in emotion regulation contribute to the maintenance of PTSD symptoms in trauma-exposed individuals (Tull, Barrett et al., 2007; Eftekhari et al., 2009; Ehring and Quack, 2010; Bardeen et al., 2013).

To our knowledge, only two studies specifically investigated the role of emotion regulation strategies on psychological consequences of COVID-19 pandemic, finding that adaptive emotion regulation strategies protect individuals from experiencing psychopathological symptoms (El Keshky et al., 2020; Xu et al., 2020).

1.1. Aims of the contribution

In this contribution, we present baseline results of the "Emotional Thermometer [Termometro Emotivo]" project. The project consists of three phases aimed at monitoring psychological health and emotional states in Italian adults during the COVID-19 pandemic outbreak. In Phase 1, we investigated short-term psychological consequences of COVID-19 pandemic. In Phase 2, we explored participants' real-time experiences of emotions, cognitions, and behaviors with a daily diary design. Phase 3 (follow-up) was conducted in November 2020 and aimed at investigating long-term psychological consequences of the COVID-19 pandemic.

In the present study, we focus on Phase 1. In particular, we aimed at testing differences in individuals' perception of the COVID-19 pandemic according to age, sex, location, and the presence of COVID-19 symptoms. In light of the results from previous studies (e.g., Broche-Pérez et al., 2020; Ceccato et al., 2020; Gerhold, 2020), we expect a worse perception of the COVID-19 pandemic in younger and female participants. Furthermore, although we could not find previous studies investigating the role of location (i.e., being in an area highly exposed to the pandemic) and presence of COVID-19 symptoms, we expect that these factors would result in a worse perception of the COVID-19 pandemic.

A second specific aim of Phase 1 was testing whether sociodemographic characteristics and the presence of COVID-19 symptoms affected levels of psychological distress and post-traumatic stress. In line with previous studies (e.g., Cao et al., 2020; Gao et al., 2020; Horesh et al., 2020; Liu et al., 2020; Qiu et al., 2020), we expect worse mental health outcomes for female participants, participants with affected family members, and participants living in high-risk areas.

Third, we examined whether psychological distress and posttraumatic responses to COVID-19 pandemic were associated with individuals' perception of the COVID-19 pandemic. Since previous studies found an association between the perception of the COVID-19 pandemic and psychological distress (e.g., Alatawi et al., 2020; Aqeel et al., 2020), we hypothesize that a worse perception of the emergency may be associated with worse mental health outcomes.

Finally, we examined the influence of individual differences (i.e., perceived social support and emotion regulation strategies) on psychological responses to COVID-19. In line with previous studies (e.g., El Keshky et al., 2020; Killgore et al., 2020; Xu et al., 2020), we expect that higher levels of perceived social support and adaptive (vs. maladaptive) emotion regulation strategies may play a protective role for mental health outcomes.

Methods

2.1. Participants and procedure

We carried out the study in accordance with the Declaration of Helsinki, and the Ethical Committee in charge (protocol n. 0024530/20) approved it.

We conducted Phase 1 between April 16 and May 3, 2020, during the outburst of the COVID-19 pandemic in Italy, and the lockdown imposed by the Italian government. After reading the informed consent, participants voluntarily completed an online survey administered through Qualtrics. We assessed participants' socio-demographic situation, individual perception of the COVID-19 situation, psychological distress, emotion regulation abilities, and perceived social support[2]. We spread information about the study (www.termometroemotivo.com) through campaigns on social networks and national media.

The initial dataset included 1568 participants. Given the length of

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[2] The baseline battery also included a measure of attachment style. However, we did not examine this variable in the current work.

Table 1

Descriptive statistics

Measures	*N* (%)
Age (Mean; SD)	33.36; 14.42
Emerging adults (18-30)	950 (61.4%)
Adults (31-59)	500 (31.3%)
Elderly (>60)	98 (6.3%)
Sex	
Female	1136 (73.4%)
Male	409(26.4%)
Others	3 (.2%)
Nationality	
Italian	1532 (99%)
Other	16 (1%)
In which region do you live in this period?	
High-risk regions	1317 (85.1%)
No high-risk regions	231 (14.9%)
Marital status	
Single	510 (32.9%)
Married	329 (21.3%)
Living with a partner	129 (8.3%)
Divorced/Separated	73 (4.7%)
Engaged	492 (31.8%)
Widowed	15 (1%)
Living arrangement in this period	
With someone	1421 (91.8%)
Alone	127 (8.2%)
Occupation	
Job	748 (48.3%)
No job	227 (14.17%)
Student	573 (37%)
Did you go to the office during the last week?	
Yes	198 (26.5%)
No	550 (73.5%)
Smart working	
Yes	453 (60.6%)
No	295 (39.4%)
Parenthood	
with children	407 (26.3%)
without children	1141 (73.7%)
Degree's Course	
Secondary school	50 (3.2%)
High school	687 (44.4%)
Bachelor's degree	335 (21.6%)
Master's degree	365 (23.6%)
PhD/Postgraduate	111 (7.2%)
Mental health support in the past	
Yes	783 (50.6%)
No *Symptoms of COVID-19*	765 (49.4%)
Yes	164 (10.5%)
No	1400 (89.5%)
Relatives with symptoms of COVID-19	
Yes	260 (16.6%)
No	1304 (83.4%)
Friends with symptoms of COVID-19	
Yes	664 (42.5%)
No	900 (57.5%)

N =1548

the survey, we used a final control item, asking participants to self-rate the reliability of their responses with a dichotomous choice. Non-reliable participants and those not residing in Italy were excluded from the analyses. These procedures resulted in a final sample of 1548 participants (75.4% females; *N* = 1136) with an overall mean age of 33.36 years (*SD* = 14.42, range = 18-81). In terms of occupation, 37% of our participants (*N* = 573) were students, 48.3% (*N* = 748) were employed, and 14.7% (*N* = 227) were unemployed. 52% of the sample (*N* = 811) had a university level of education or above, whereas 44% of participants (*N* = 687) had achieved a high-school diploma, and 3% a secondary school (N = 50). Most of participants (*N* = 1317, 85.1%) were located in one of the four regions most affected by the COVID-19 outbreak (i.e., Lombardy, Piedmont, Veneto, and Emilia-Romagna), while the remaining participants (*N* = 333, 14.9%) were located in other regions (Table 1).

2.2. Measures

COVID-19 knowledge questionnaire. We measured knowledge of COVID-19 through 9 items (e.g., "COVID-19 is a viral infection") rated on a three-option response format (true/false/I don't know). Wrong answers and "I don't know" answers were re-coded as 0, whereas correct answers were re-coded as 1. A sum score was then computed, with higher scores indicating sounder knowledge of COVID-19.

COVID-19 Behaviors Questionnaire. We measured the frequency with which participants enacted twelve mitigation behaviors. The scale was adapted from the directions of the WHO and the Italian Ministry of Health (e.g., "avoid gatherings"). Items were rated on a 5-point likert scale (1 = Never; 5 = Always). A total score of COVID-19-related behaviors was obtained by averaging items scores (α = .69).

COVID-19 Efficacy of Behaviors Questionnaire. We measured the perceived efficacy of the same COVID-19-related behaviors measured in the COVID-19 Behaviors Questionnaire in mitigating the pandemic. Items were rated on a 5-point likert scale (1 = Not at all effective; 5 = Extremely effective). A total score of COVID-19-related behaviors efficacy was obtained by averaging items scores (α = .79).

COVID-19 Severity Questionnaire. Participants rated the severity of six COVID-19-related aspects (e.g., COVID-19 spread rate), using a 5-point likert scale (1 = Not at all; 5 = Extremely). A total score of COVID-19 severity was obtained by averaging items scores (α = .59).

COVID-19 Probability of Negative Effects Questionnaire. Participants rated the probability of negative effects of the pandemic on 14 situations (e.g., probability of a negative economic impact). Items were rated on a 5-point likert scale (1 = Extremely unlikely; 5 = Extremely likely). A total score of COVID-19 negative effects was obtained by averaging items scores (α = .81).

Worries about COVID-19 infection. Participants were asked to rate their concerns for being infected or having friends and family members being infected, using a 5-point likert scale (1 = Not at all; 5 = Extremely). Scores of the two items were averaged to obtain a total score (α = .81).

Frequency, Credibility, Anxiety for, and Reassurance for News consultation. Four items asked about frequency of consultation of different sources of information (e.g., radio/TV, social media; α = .67). The same four sources of information were rated in terms of credibility (α = .53), anxiety (α = .84), and reassurance for consultation (α = .74).

COVID-19 Trust Questionnaire. We measured the level of trust towards institutions with 6 items (e.g., the Government, the Regional Authorities) in dealing with the pandemic. Questions were rated on a scale from 1 to 5 (α =.77).

The Symptom Checklist-90 – Revised (SCL-90-R - Derogatis, 1994; Prunas et al. (2012) is a 90-item self-report measuring psychopathological symptoms over the last week. Items are rated on a 5-point Likert scale (1 = "not at all"; 5 = "extremely"). For the purpose of the study, we considered only an overall index of psychological distress, the Global Severity Index (GSI) (α = .97).

The Impact of Event Scale – Revised (IES-R - Weiss & Marmar, 1997; Pietrantonio et al., 2003) is a 22-item self-report measuring the frequency of intrusive and avoidant thoughts and behaviors associated with a traumatic event. Items are rated on a 5-points Likert scale (0 = "not at all"; 4 = "extremely"). The IES-R consists of three subscales. Intrusion (8 items) measures intrusive thoughts, nightmares, intrusive feelings, and imagery associated with the traumatic event; Avoidance (8 items) measures avoidance of feelings, situations, and ideas; Hyperarousal (6 items) meaasures difficulty in concentrating, anger and irritability, psychophysiological arousal upon exposure to reminders, and hypervigilance (range α = .81 - .94).

The General Health Questionnaire-12 (GHQ-12 - Goldberg et al., 1976; Piccinelli et al., 1993) is a self-report measure of current mental health. Participants rate the intensity of five negative emotional states (i.e., anxiety, stress, depression, anger, need for help), using a 10-point likert scale (0 = not at all; 10 = extremely). Then, 12 items measure a global

Table 2
The effect of socio-demographic variables on individuals' perception of the COVID-19 situation

	Total (M ±DS)	Female (M ±DS)	Male (M ±DS)	t[1]	Age 18-30 (M ±DS)	Age 31-59 (M ±DS)	Age Over 60 (M ±DS)	F[2]	High risk Region (M ±DS)	Non-High-risk Region (M ±DS)	t[1]
COVID-19 Knowledge	7.63±1.07	7.63±1.04	7.61±1.17	.34	7.56±1.07[a]	7.70±1.10[b]	7.95±.91[c]	7.50**	7.59±1.08	7.82±1.04	-3.05**
COVID-19 behaviors	4.44±.44	4.47±.41	4.34±.49	4.85***	4.38±.42[a]	4.52±.43[b]	4.55±.54[b]	19.41***	4.43±.43	4.44±.44	-.22
Perceived of efficacy of behaviors	4.53±.42	4.56±.39	4.45±.47	4.36***	4.47±.43[a]	4.61±.39[b]	4.71±.33[c]	28.14***	4.53±.42	4.55±.43	-.87
Perceived COVID-19 severity	4.41±.36	4.43±.35	4.36±.39	2.97**	4.36±.36[a]	4.47±.35[b]	4.56±.34[c]	24.84***	4.40±.36	4.44±.38	-1.55
Probability of negative effects of COVID-19	2.90±.46	2.94±.44	2.79±.49	5.69***	2.90±.46[a]	2.91±.46[a]	2.80±.42[a]	2.67	2.92±.46	2.79±.44	3.89***
Worries about COVID-19	3.31±.69	3.36±.67	3.16±.12	5.09***	3.26±.67[a]	3.39±.72[b]	3.41±.72[b]	7.00**	3.31±.69	3.29±.72	.37
Frequency of news consultation	2.25±.74	2.24±.74	2.26±.75	-.36	2.25±.76[a]	2.26±.72[a]	2.18±.66[a]	.49	2.22±.74	2.39±.74	-3.10**
Anxiety for news consultation	2.57±.88	2.67±.87	2.28±.86	7.82***	2.56±.90[a]	2.59±.87[a]	2.52±.83[a]	.43	2.55±.88	2.68±.88	-2.03*
Credibility of news	2.62±.52	2.63±.51	2.59±.54	1.14*	2.60±.51[a]	2.65±.54[a]	2.64±.52[a]	1.62	2.60±.52	2.69±.47	-2.48*
Reassurance for news consultation	2.14±.66	2.12±.66	2.19±.65	-1.96	2.13±.66[a]	2.15.64[a]	2.13±.69[a]	.13	2.12±.66	2.24±.65	-2.46*
Trust towards institutions	3.17±.59	3.16±.59	3.20±.58	-1.18	3.24±.56[a]	3.07±.63[b]	3.11±.58[b]	13.80***	3.17±.58	3.21±.62	-.99

[1] $df = (1, 1543)$, 2 $df = (2, 1545)$, 3 $df = (1, 1562)$

* $p<.05$

** $p<.01$

*** $p<.000$

index of current mental health (GHQ total score). The GHQ total score was obtained by averaging the 12 item scores. The higher the GHQ total score the better the mental health ($\alpha = .83$).

The *Multidimensional Scale of Perceived Social Support* (MSPSS - Zimet, Dahlem, Zimet, & Farley, 1988; Di Fabio and Palazzeschi, 2015) is a 12-item instrument that measures perceived support from three sources: Family, Friends and a Significant Other. Items are scored on a 7-point rating scale (1 = very strongly disagree; 7 = very strongly agree) (range $\alpha = .91 - .94$).

The *Emotion Regulation Questionnaire* (ERQ - Gross & John, 2003; Balzarotti, John & Gross, 2010) is a 10-item self-report measuring emotion regulation strategies. Items are rated on a 7-point 1ikert scale (1 = strongly disagree; 7 = strongly agree), and they compose two scales: cognitive reappraisal (6 items) and expressive suppression (4 items). Cognitive reappraisal ($\alpha = .85$) is an adaptive emotion regulation strategy, while expressive suppression ($\alpha = .68$) reflects a maladaptive emotion regulation strategy.

Results

3.1. Effect of socio-demographic characteristics and presence of COVID-19 symptoms on individuals' perception of the COVID-19 pandemic

We conducted a series of independent samples t-test to examine the effects of sex, location, and direct or indirect experience of COVID-19 symptoms on individuals' perception of the COVID-19 pandemic. Moreover, a series of ANOVA models were performed to test the effect of location on individuals' perception of the COVID-19 pandemic (Table 2).

Compared to male participants, females reported to engage in mitigation behaviors more frequently. Moreover, compared with males,

females reported higher levels of perceived efficacy of behaviors to contrast COVID-19, higher levels of perceived severity of the pandemic, and a higher probability of adverse effects. Consistently, female participants were more worried about COVID-19 infection than male participants. Regarding news consultation, female participants reported higher anxiety for news consultation, higher credibility of different sources of information, and lower reassurance for news consultation.

Compared to adults (31-59 years old) and emerging adults (18-30 years old), elderlies ($\geq$ 60 years old) reported a sounder knowledge of COVID-19, higher levels of perceived efficacy of behaviors to contrast COVID-19, and higher levels of perceived severity of the pandemic. Compared to emerging adults, adults reported a sounder knowledge of COVID-19, higher levels of perceived efficacy of behaviors to contrast COVID-19, and higher levels of perceived severity of the pandemic.

Compared to both adults and elderlies, emerging adults showed to be less compliant with COVID-19-related behaviors and reported lower levels of worries about COVID-19 infection. Moreover, compared to adults and elderlies, emerging adults reported higher trust towards different institutions.

Participants living in high-risk regions reported lower levels of knowledge of COVID-19, frequency of news consultation, anxiety for news consultation, credibility of different sources of information, and reassurance for news consultation than participants living in low-risk regions. Moreover, participants in high-risk regions showed a higher perceived probability of negative effects of COVID-19 than those living in low-risk regions.

Participants with COVID-19 symptoms perceived a higher probability of negative effects of COVID-19 than those without COVID-19 symptoms. Moreover, participants with COVID-19 symptoms reported lower credibility of different sources of information, lower reassurance for news consultation, and lower levels of trust towards institutions,

compared to participants without COVID-19 symptoms. Participants having relatives with symptoms of COVID-19 perceived a higher probability of negative effects of COVID-19 pandemic than participants with relatives not showing COVID-19 symptoms. Consistently, participants having friends with symptoms of COVID-19 perceived a higher probability of negative effects of COVID-19 pandemic, higher anxiety for news consultation, lower reassurance for news consultation, and lower levels of trust towards institutions than participants with friends not showing COVID-19 symptoms.

3.2. The effect of socio-demographic characteristics and presence of COVID-19 symptoms on psychological responses to COVID-19 pandemic

3.2.1. General psychological distress

We performed a series of independent samples t-tests to examine the effects of sex, location, and direct or indirect experience of COVID-19 symptoms on individuals' psychological distress. Moreover, a series of ANOVA models were performed to test the effect of location on psychological distress (Table 3).

Compared to male participants, females reported higher levels of GSI and lower GHQ total scores. Moreover, females experienced more negative emotional states than males. In particular, female participants reported higher levels of stress, anxiety, depression, and need for help than males.

Young adults reported lower GHQ total scores than adults and elderlies. Compared to older participants, young adults also reported higher levels of GSI, and more negative emotional states, as shown by all the GHQ subscales. Adults reported higher levels of negative emotional states than elderlies, except for depressive feelings. Moreover, participants living in high-risk regions experienced higher levels of stress than participants living in low-risk regions.

Participants with COVID-19 symptoms and those with relatives or friends showing COVID-19 symptoms reported higher levels of GSI and lower GHQ total scores than other participants. Moreover, participants with COVID-19 symptoms and those with relatives showing COVID-19 symptoms reported higher levels of stress, anxiety than other participants. Finally, participants with relatives showing COVID-19 symptoms, and those with friends showing COVID-19 symptoms, reported high levels of need for help, compared to other participants. Finally, participants with COVID-19 symptoms showed higher levels of anger than participants without COVID-19 symptoms.

3.2.2. Post-traumatic responses

We conducted a series of independent samples t-tests and ANOVA analyses to test whether demographic characteristics (sex, age, location) and direct or indirect experience of COVID-19 symptoms affected individuals' post-traumatic responses to COVID-19 pandemic (Table 4).

Compared to male participants, females reported significantly higher levels of avoidance, intrusion, and hyperarousal symptoms.

Young adults showed higher scores in all the IES subscales than both adults and elderlies. Moreover, adults showed higher levels of post-traumatic symptoms than elderlies.

Participants with COVID-19 symptoms and those having relatives/friends with COVID-19 symptoms showed higher levels of intrusion and hyperarousal symptoms than other participants. Moreover, participants with COVID-19 symptoms also show higher levels of avoidance symptoms than participants without COVID-19 symptoms.

Finally, living in a high-risk region did not significantly affect post-traumatic responses.

3.3. The impact of individuals' perception of the COVID-19 pandemic on psychological responses to COVID-19 pandemic

3.3.1. General psychological distress

We performed correlation analyses to investigate whether psychological responses to COVID-19 pandemic were associated with

individuals' perception of the COVID-19 pandemic (Tables 5 and 6).

Results show that compliance with COVID-19-related behaviors was negatively associated with levels of GSI, feelings of depression and anger.

Moreover, perceived efficacy of COVID-19 related behaviors was negatively associated with GSI, depressive and anger feelings, and need for help.

Furthermore, perceived probability of COVID-19 negative effects and worries for COVID-19 were positively associated with levels of GSI and negative emotional states. Moreover, both perceived probability of COVID-19 negative effects and worries for COVID-19 were negatively associated with GHQ total scores. Both frequency in consulting news and anxiety for news consultation were positively associated with levels of GSI and of negative emotional states, and negatively associated with GHQ total scores.

Finally, reassurance for news consultation was positively associated with depressive symptoms but negatively associated with GHQ total scores. Moreover, trust towards institutions was negatively associated with levels of GSI, anxiety, depression, and anger feelings, and positively associated with GHQ total score.

Neither credibility of news nor perceived severity of COVID-19 situation were significantly associated with participants' psychological responses to COVID-19 pandemic.

3.3.2. Post-traumatic responses

We conducted correlation analyses to examine whether post-traumatic responses to COVID-19 pandemic were associated with individuals' perception of the COVID-19 pandemic (Tables 5 and 6).

Results show that perceived probability of negative effects of COVID-19 pandemic was positively associated with levels of avoidance, hyperarousal and intrusion symptoms. We found a similar pattern of associations for levels of worries about the COVID-19 situation, frequency of news consultation, and levels of anxiety for news consultation.

Conversely, we found that knowledge of COVID-19 was negatively associated with post-traumatic avoidance symptoms. Finally, perceiving behaviors to contrast COVID-19 as effective was negatively associated with hyperarousal symptoms.

3.4. Associations of individual differences with psychological responses to COVID-19 pandemic

3.4.1. Social support

We conducted correlation analyses to examine the associations of psychological responses to COVID-19 pandemic with dimensions of perceived social support (Table 7).

As shown, perceived social support from family members was negatively associated with GSI, negative emotional states and post-traumatic symptoms. Perceived social support from family members was also positively associated with GHQ total scores.

Perceived social support from friends was negatively associated with levels of GSI, feelings of depression, anger, and need for help.

Conversely, perceived social support from significant others was not significantly associated with individuals' psychological responses to COVID-19 pandemic.

3.4.2. Emotion regulation

We conducted correlation analyses to examine the associations of emotion regulation strategies with psychological responses to COVID-19 pandemic (Table 8).

Results show that the proneness to regulate emotions by cognitive reappraisal was negatively associated with levels of GSI and negative emotions (depression, anxiety, stress, anger, and need for help). Moreover, cognitive reappraisal was positively associated with intrusion and hyperarousal symptoms, while it was not associated with avoidance symptoms. Finally, we found that cognitive reappraisal was positively associated with GHQ total score.

Conversely, expressive suppression was positively associated with levels of GSI and negatively associated with GHQ total scores. Expressive suppression was also positively associated with negative emotions such as depression, anxiety, anger, and need for help, while it was not significantly associated with stress feelings. Finally, expressive suppression was positively associated with post-traumatic symptoms.

Discussion

The present study investigated short-term psychological consequences of the COVID-19 outbreak in a large sample of Italian adults. To the best of our knowledge, this is one of the few studies examining whether and how socio-demographic characteristics, individuals' perception of the COVID-19 pandemic, and individual differences affected individuals' psychological responses to the COVID-19 pandemic (e.g., Alkhamees et al., 2020; El Keshky et al., 2020; Qiu et al., 2020; Tang et al., 2020; Wang et al., 2020).

As a whole, some of our results confirm previous findings on the psychological impact of the COVID-19 pandemic. However, we also found results that afford new insight on this topic.

We found that women had a greater chance to experience negative psychological responses to COVID-19 pandemic. This result is in line with past studies showing that female sex was a risk factor for post-traumatic symptoms (Liu et al., 2020), anxiety (Alkhamees et al., 2020; Ozdin and Ozdin, 2020; Wang et al., 2020; Zhou et al., 2020), depression (Alkhamees et al., 2020; Wang et al., 2020; Zhou et al., 2020), and psychological distress (Alkhamees et al., 2020; Forte et al., 2020; Qiu et al., 2020; Wang et al., 2020).

Empirical literature on the effect of age on psychological consequences of COVID-19 outbreak showed mixed findings. On the one hand, Qiu et al. (2020) found that individuals aged between 18 and 30 years (i.e., emerging adults) and those above 60 years old (i.e., elderlies) experienced similar levels of psychological distress, and that these levels were higher than those showed by teenagers. However, another study on adults (Horesh et al., 2020) showed that younger participants (from 21

to 35 years old) were more vulnerable to psychological distress than older participants. Our study confirmed this result showing that the COVID-19 pandemic outbreak had more severe short-term psychological consequences in emerging adults than in adults or elderlies.

In line with some studies (Cerami et al., 2020; Qiu et al., 2020; Tang et al., 2020), our findings confirm that living in severely afflicted areas was associated with greater psychological distress and worse global mental health.

Our study also shows that individuals' perception of the COVID-19 pandemic situation has relevant effects on psychological well-being. Some studies show that receiving up-to-date and accurate health information (e.g., on treatments, on the local outbreak situation) and using precautionary measures (e.g., hand hygiene, wearing a mask) are associated with lower levels of stress, anxiety, and depression (Alkhamees et al., 2020; Wang et al., 2020). Conversely, experiencing high levels of fear (Tang et al., 2020) and uncertainty about the risk of contagion (Forte et al., 2020) showed to be associated with high levels of psychological distress.

In particular, our findings clarify that several factors related to individuals' perception of the COVID-19 situation affected their psychological responses. These factors refer to the role of mass media and news consultation, of individuals' trust in government institutions, engagement in behaviors mitigating the impact of COVID-19, and the perceived efficacy of these behaviors, as well as direct or indirect experiences of COVID-19 symptoms.

Cao et al. (2020) have recently shown that having relatives or acquaintances infected with COVID-19 was linked to greater anxiety in college students. Our results confirm these findings by showing that individuals with COVID-19 symptoms and those having relatives or acquaintances with COVID-19 symptoms experienced more severe negative psychological consequences during the COVID-19 outbreak. In particular, we found that direct and indirect experiences with COVID-19 symptoms are linked to higher levels of psychological distress, increasing negative emotional states, and a worse global mental health.

Being compliant with mitigation measures and perceiving ones' own

Table 2a

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	COVID-19 symptoms ($M \pm DS$)	No COVID-19 symptoms ($M \pm DS$)	t^3	Relatives with COVID-19 symptoms ($M \pm DS$)	No relatives with COVID-19 symptoms ($M \pm DS$)	t^3	Friends with COVID-19 symptoms ($M \pm DS$)	No friends with COVID-19 symptoms ($M \pm DS$)	t^3
COVID-19 Knowledge	7.63±1.02	7.63±1.08	.02	7.67±1.06	7.63±1.08	.54	7.68±.99	7.60±1.14	1.56
COVID-19 behaviors	4.43±.44	4.44±.44	-.17	4.42±.45	4.44±.44	-.83	4.46±.41	4.42±.46	1.65
Perceived of efficacy of behaviors	4.48±.43	4.54±.42	-1.79	4.51±.41	4.54±.43	-1.04	4.55±.41	4.52±.43	1.448
Perceived COVID-19 severity	4.39±.35	4.42±.37	-.79	4.42±.34	4.41±.37	.29	4.41±.34	4.42±.39	-.07
Probability of negative effects of COVID-19	3.12±.55	2.88±.44	5.50***	3.02±.44	2.88±.46	4.45***	2.99±.44	2.84±.47	6.05***
Worries about COVID-19	3.32±.72	3.31±.69	.17	3.30±.68	3.32±.70	-.53	3.35±.68	3.29±.71	1.53
Frequency of news consultation	2.26±.82	2.26±.74	.07	2.21±.73	2.27±.76	-1.05	2.27±.73	2.25±.77	.40
Anxiety for news consultation	2.63±.92	2.57±.89	.80	2.66±.84	2.56±.90	1.68	2.62±.87	2.53±.90	1.98*
Credibility of news	2.50±.52	2.64±.52	-3.17**	2.60±.51	2.63±.52	-.83	2.61±.51	2.63±.53	-.73
Reassurance for news consultation	2.00±.70	2.16±.65	-2.89**	2.11±.63	2.15±.67	-.93	2.10±.64	2.17±.67	-2.11*
Trust towards institutions	3.07±.62	3.19±.59	-2.43*	3.16±.62	3.18±.59	-.48	3.14±.59	3.21±.60	-2.30*

[3] $df = (1, 1562)$
* $p < .05$
** $p < .01$
*** $p < .000$

Table 3

The effect of socio-demographic variables on psychological responses to COVID-19 pandemic

	GSI M (SD)	GSI F	GHQ_Stress M (SD)	GHQ_Stress F	GHQ_Anxiety M (SD)	GHQ_Anxiety F	GHQ_Depression M (SD)	GHQ_Depression F	GHQ_Anger M (SD)	GHQ_Anger F	GHQ_Help M (SD)	GHQ_Help F	GHQ_TOT M (SD)	GHQ_TOT F
Sex[1]		51.62***		60.07***		92.94***		10.88**		1.65		13.73***		14.69***
Male	.66 (.50)		4.44 (2.72)		3.45 (2.79)		2.34 (2.60)		2.72 (2.76)		2.11 (2.64)		17.27 (5.01)	
Female	.89 (.57)		5.65 (2.69)		5.08 (2.99)		2.87 (2.88)		2.93 (2.87)		2.71 (2.85)		16.02 (5.85)	
Age[2]		49.12***		42.23***		34.36***		22.97***		18.02***		16.29***		21.98***
Young adults	.93a (.56)		5.77a (2.64)		5.10a (2.93)		3.10a (2.91)		3.17a (2.92)		2.84a (2.90)		15.61a (5.78)	
Adults	.71b (.53)		4.84b (2.78)		4.12b (3.05)		2.23b (2.63)		2.56b (2.72)		2.22b (2.65)		17.48b (5.59)	
Older adults	.48c (.40)		3.57c (2.47)		3.01c (2.73)		1.72b (2.16)		1.62c (2.17)		1.46c (2.11)		17.82b (3.35)	
Location[3]		3.72		4.56*		1.05		1.31		.98		1.27		
High-risk regions	.82 (.55)		5.27 (2.77)		4.62 (3.00)		2.70 (2.79)		2.85 (2.83)		2.52 (2.78)		16.43 (5.67)	
Low-risk regions	.90 (.62)		5.68 (2.63)		4.84 (3.15)		2.93 (2.96)		3.05 (2.90)		2.74 (2.96)		15.90 (5.67)	
COVID-19 symptoms[3]		7.22**		5.47*		6.77**		3.53		4.30*		3.56		6.06*
Yes	.94 (.59)		5.80 (2.78)		5.23 (2.99)		3.12 (2.95)		3.31 (3.19)		2.94 (2.87)		15.32 (5.90)	
No	.82 (.56)		5.27 (2.74)		4.58 (3.02)		2.68 (2.80)		2.83 (2.80)		2.51 (2.80)		16.47 (5.63)	
Relatives with COVID-19 symptoms[3]		9.13**		4.76*		5.71*		1.37		3.49		7.05**		9.08**
Yes	.93 (.58)		5.67 (2.76)		5.06 (2.97)		2.92 (2.78)		3.18 (2.86)		2.98 (2.99)		15.38 (5.86)	
No	.81 (.56)		5.26 (2.74)		4.57 (3.03)		2.69 (2.82)		2.82 (2.84)		2.47 (2.76)		16.54 (5.61)	
Friends with COVID-19 symptoms[3]		5.98*		1.18		2.91		2.16		.98		6.88**		4.77*
Yes	.87 (.56)		5.42 (2.75)		4.80 (3.00)		2.85 (2.83)		2.96 (2.85)		2.77 (2.87)		15.98 (5.55)	
No	.80 (.57)		5.26 (2.75)		4.54 (3.04)		2.64 (2.80)		2.82 (2.84)		2.39 (2.75)		16.62 (5.75)	

[1] $df = (1, 1543)$
[2] $df = (2, 1545)$
[3] $df = (1, 1546)$
* $p = .05$
** $p = .01$
*** $p = .001$

behaviors as effective in mitigating the impact of COVID-19 seem to protect people from experiencing psychological distress and some negative emotional states, as in the case of depression and anger. Conversely, strong concerns about the COVID-19 situation and its negative impact on individuals and the country's well-being seem to put people at risk for experiencing more severe negative psychological consequences.

Our findings stress the role of individuals' attitude towards mass media and news consultation in affecting their psychological responses to the COVID-19 pandemic. In fact, both individuals who spent more time consulting news and those experiencing feelings of anxiety while reading news showed to be particularly at risk for experiencing increased psychological distress, negative emotional states, and post-traumatic symptoms. As reported in a previous study (Stainback et al., 2020), greater media intake may amplify perceived threats about the virus and play a harmful effect on mental health. Indeed, since the last three weeks of March, television news ratings and social networks use exponentially increased, reaching peaks of more than 100% increase compared with 2019 (Morgan, 2020; Ohme et al., 2020), leading to a COVID-19 information overload (Stainback et al., 2020).

Finally, our findings on the role of government institutions show that lack of trust towards government institutions resulted in more severe psychological consequences during the COVID-19 outbreak. In fact,

individuals' trust towards government institutions was negatively associated with psychological distress, negative emotional states, and post-traumatic symptoms. Moreover, lack of trust towards government institutions showed to affect negatively individuals' global mental health.

We also investigated whether socio-demographic characteristics affected individuals' perceptions of the COVID-19 situation and their compliance with COVID-19-related behaviors. Previous studies reported lower levels of compliance with precautionary measures, especially among younger people and males (Almutairi et al., 2020; Qeadan et al., 2020; Solomou and Constantinidou, 2020). Overall, our results suggest that men are less compliant with COVID-19 mitigating measures than females. Furthermore, men have a more positive perception of the COVID-19 situation in terms of severity, probability of negative consequences on individuals and the country's well-being, and worries. Compared to men, women give more credibility to the news they read and experience high levels of anxiety while reading them.

Emerging adults are less compliant with COVID-19 mitigating measures and perceive these measures as less effective than adults and elderlies. Moreover, emerging adults perceived the situation as less severe than other participants, and they also feel little worries about it. Interestingly, however, they give higher credibility to the news they read than adults and elderlies.

Table 4

The effect of socio-demographic variables on post-traumatic responses to COVID-19 pandemics

	IES_I M (SD)	F	IES_A M (SD)	F	IES_H M (SD)	F
Sex[1]		46.40***		52.24***		55.08***
Male	.94[a]		.94[a]		.88[a]	
	(.84)		(.72)		(.79)	
Female	1.29[b]		1.25[b]		1.25[b]	
	(.90)		(.76)		(.90)	
Age[2]		32.40***		35.41***		53.13***
Young adults	1.33[a]		1.28[a]		1.32[a]	
	(.92)		(.76)		(.90)	
Adults	1.02[b]		1.02[b]		.94[b]	
	(.84)		(.74)		(.83)	
Older adults	.77[c]		.76[c]		.62[c]	
	(.71)		(.61)		(.64)	
Location[3]		.48		.53		.72
High-risk regions	1.19		1.16		1.15	
	(.89)		(.76)		(.88)	
Low-risk regions	1.24		1.20		1.20	
	(.96)		(.77)		(.95)	
COVID-19 symptoms[3]		19.03***		5.60*		14.09***
Yes	1.49		1.30		1.40	
	(.94)		(.76)		(.93)	
No	1.16		1.15		1.13	
	(.89)		(.76)		(.88)	
Relatives with COVID-19 symptoms[3]		12.38***		2.42		8.39**
Yes	1.38		1.23		1.30	
	(.96)		(.76)		(.94)	
No	1.16		1.15		1.13	
	(.88)		(.76)		(.88)	
Friends with COVID-19 symptoms[3]		8.88**		1.06		6.12*
Yes	1.28		1.19		1.22	
	(.93)		(.78)		(.92)	
No	1.14		1.15		1.11	
	(.87)		(.75)		(.87)	

[1] $df = (1, 1543)$
[2] $df = (2, 1545)$
[3] $df = (1, 1546)$
* $p = .05$
** $p = .01$
*** $p = .001$

Living in a high-risk region showed to affect individuals' perception of COVID-19 pandemic as well. Surprisingly, our findings suggest that people from high-risk regions perceived the COVID-19 pandemic situation as having negative consequences on individuals and the country's well-being with high probability. Also, they consulted news with less frequency and give less credibility to news than people living in low-risk regions. On the one hand, they experienced less reassurance while reading news, but also less anxiety than people from low-risk regions.

Overall, our findings also suggest that direct or indirect experiences of COVID-19 symptoms are related to particularly negative perceptions of COVID-19 pandemic in terms of probability of negative consequences on individuals and country's well-being and less trust towards government institutions (Table 2a).

Finally, the subjective experience of being supported by family and friends and the tendency to regulate emotions by cognitive reappraisal showed to protect individuals from experiencing greater negative psychological consequences such as psychological distress, negative emotions, and post-traumatic symptoms.

In line with our findings, cognitive reappraisal has been found to be a protective factor for anxiety symptoms and perceived stress in people isolated because of COVID-19 (Xu et al., 2020). Consistently, cognitive reappraisal (El Keshky et al., 2020) and perceived social support from friends (El Keshky et al., 2020; Killgore et al., 2020) reduced depression and stress in quarantine. Similar findings have been replicated in samples of healthcare workers, highlighting the protective role of family and social support against stress (Carmassi et al., 2020; Xiao et al., 2020).

Our findings have important implications for the development and management of outbreak control policies. When implementing such interventions, greater attention should be paid to vulnerable categories such as women, younger people, people living in high-risk regions, people with symptoms of COVID-19, and people who have relatives or friends with symptoms of COVID-19.

Moreover, promoting social support and adaptive emotion regulation strategies should be critical for fostering mental health in quarantined individuals. Specifically, policymakers should encourage virtual contacts (suggesting the use of social networks or video call platforms) and promote programs that foster emotional expression and the use of cognitive reinterpretation of the meaning of a situation to change its emotional impact. Another practical suggestion for quarantined people is to avoid consulting news too frequently and select the most reliable sources of information.

In conclusion, with this first baseline assessment of the EmotionalThermometer [TermometroEmotivo] project, we derived specific profiles of short-term psychological responses to the COVID-19 situation in the Italian population. Our study delineates risk and protective factors in terms of situation perception, socio-demographic characteristics, and differences in perceived social support and capacity for emotion regulation. With the project's next phases (i.e., Phase 2 and Phase 3), we will be able to link such profiles with daily experiences of emotions in response to the COVID-19 situation and with long-term psychological consequences. In this sense, we will evaluate psychological dynamics over time and how they relate to these baseline responses by moving from a snapshot-like to a movie-like angle. Moreover, we will assess the impact of a prolonged condition of risk and isolation dictated by the

Table 5

Associations of individuals' perception of the COVID-19 situation with psychological responses to COVID-19 pandemic

	COVID-19 Knowledge	COVID-19 Behaviors	Perceived of efficacy of behaviors	Perceived COVID-19 Severity	Probability of negative effects of COVID-19	Worries about COVID-19
GSI	-.05	-.06*	-.09**	.00	.22**	.18**
GHQ_Stress	-.04	.02	-.01	.02	.17**	.20**
GHQ_Anx	-.03	.03	.02	.04	.21**	.21**
GHQ_Dep	-.04	-.06*	-.10**	-.05	.13**	.09**
GHQ_Ang	-.04	-.06*	-.10**	-.02	.12**	.08**
GHQ_Help	.00	-.03	-.06*	-.01	.15**	.07**
GHQ_TOT	.01	.00	.03	-.04	-.14**	-.09**
IES_I	-.04	-.02	-.04	.04	.22**	.17**
IES_A	-.05*	.01	-.04	.00	.17**	.17**
IES_H	-.04	-.02	-.05*	.01	.22**	.19****

* $p = .05$
** $p = .01$
*** $p = .001$

Table 6

Associations of COVID-19-related information with psychological responses to COVID-19 pandemic

	Frequency of news consultation	Credibility of news	Anxiety for news consultation	Reassurance for news consultation	Trust towards institutions
GSI	.19**	-.01	.37**	-.04	-.09**
GHQ_Stress	.13**	-.02	.31**	-.05	-.05
GHQ_Anx	.15**	.02	.39**	-.03	-.06*
GHQ_Dep	.10**	.00	.25**	-.07**	-.08**
GHQ_Ang	.10**	-.03	.24**	-.03	-.11**
GHQ_Help	.07**	.01	.21**	-.04	-.03
GHQ_TOT	-.10**	.01	-.27**	.11**	.11**
IES_I	.17**	.01	.34**	-.02	-.04
IES_A	.11**	-.02	.30**	-.04	-.05
IES_H	.19**	.00	.36*****	-.02	-.04

* $p = .05$
** $p = .01$
*** $p = .001$

Table 7

Associations of psychological responses to COVID-19 pandemic with perceived social support
Regression models: the effect of social support on psychological distress

	SS_Significant others		SS_Family		SS_Friends		Model	
	β	T	β	t	β	t	F (3, 1544)	R^2
GSI	.01	.52	-.25***	-8.96	-.13***	-4.76	56.94***	.10
GHQ_Stress	.03	1.05	-.18***	-6.28	-.04	1.49	18.81***	.03
GHQ_Anx	.08	2.72	-.16***	-5.48	-.04	-1.42	12.98***	.02
GHQ_Dep	-.02	-.68	-.23***	-8.38	-.10***	-3.63	49.96***	.09
GHQ_Ang	.01	.21	-.17***	-5.81	-.06*	-2.07	20.09***	.04
GHQ_Help	.05	1.94	-.21***	-7.51	-.10**	-3.49	32.61***	.06
GHQ_TOT	.02	.67	.21***	7.46	.00	.05	26.35***	.05
IES_I	.03	1.18	-.19***	-6.50	-.03	-1.23	19.03***	.04
IES_A	-.03	-1.03	-.12***	-4.37	-.04	-1.51	14.29***	.03
IES_H	.04	1.42	-.21***	-7.47	-.06	-2.15	27.67***	.05

* $p = .05$
** $p = .01$
*** $p = .001$

Table 8

Associations of psychological responses to COVID-19 pandemic with emotion regulation strategies
Regression models: the effect of emotion regulation on psychological distress

	ERQ_CR		ERQ_ES		Model	
	B	t	B	t	F (2, 1545)	R^2
GSI	-.22***	-8.76	.25***	9.90	70.18***	.08
GHQ_Stress	-.12***	-4.72	.11	4.32	16.42***	.02
GHQ_Anx	-.15***	-5.94	.09***	3.35	19.51***	.02
GHQ_Dep	-.23***	-9.15	.20***	8.10	59.92***	.07
GHQ_Ang	-.15***	-5.88	.10***	3.90	20.48***	.03
GHQ_Help	-.17***	-6.77	.15***	6.00	32.85***	.04
GHQ_TOT	.18***	6.98	-.13***	-5.03	30.18***	.04
IES_I	-.13***	-4.85	16***	6.10	24.57***	.03
IES_A	-.01	-.38	.19***	7.54	29.61***	.04
IES_H	-.16***	6.11	15***	5.79	28.39***	.03

* $p = .05$
** $p = .01$
*** $p = .001$

pandemic on individuals' psychological well-being.

Author Contributions

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Declaration of Competing Interest

The authors declare that they have no kown competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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