Research paper

# A longitudinal study on clinically relevant self-reported depression, anxiety and acute stress features among Italian community-dwelling adults during the COVID-19 related lockdown: Evidence of a predictive role for baseline dysfunctional personality dimensions

Antonella Somma [a], Robert F. Krueger [b], Kristian E. Markon [c], Giulia Gialdi [a], Miriana Colanino [a], Danila Ferlito [a], Chiara Liotta [a], Claudia Frau [d], Andrea Fossati [a,*]

[a] *Vita-Salute San Raffaele University, Milan, Italy*
[b] *University of Minnesota, Minneapolis, MN, United States*
[c] *University of Iowa, Iowa City, IA, United States*
[d] *ISIPSÈ, Rome, Italy*

## ARTICLE INFO

## ABSTRACT

*Background:* Although necessary for public health, quarantine has been documented to cause post-traumatic stress symptoms, anxiety, and depression. We designed the present longitudinal study to evaluate the psychological impact of quarantine in Italian community-dwelling adult participants.

*Methods:* A sample of 304 Italian community-dwelling adult participants (75.7% female; mean age = 35.28 years) was administered self-reported measures of depression, anxiety and acute stress symptoms at the beginning and at the end of the lockdown. Potential predictors of clinically relevant symptoms at the end of the lockdown were assessed. Specifically, data on gender, civil status, education level, occupation, and area of residence, as well as maladaptive personality domains were collected.

*Results:* More than 43% of participants suffered from the early impact of the lockdown; at the end of the lockdown roughly 32% of participants still reported any clinically relevant depression anxiety, and/or acute stress disorder condition. Clinically relevant acute stress reaction at the beginning of lockdown was a particularly important risk factor for experiencing clinically relevant acute stress, depression, and anxiety at the end of the lockdown. Maladaptive personality domains represent non-trivial predictors of participants' self-reports of clinically relevant depression, anxiety, and acute stress conditions at the end of the lockdown.

*Limitations:* Excess of female participants and the impossibility of evaluating if participants suffered from any internalizing disorder before the COVID-19 quarantine represent major limitations of our study.

*Conclusions:* Our findings suggest assessment of internalizing disorder symptoms during quarantine may be helpful in identifying people who may benefit from early treatment interventions.

## 1. Introduction

In 2019, a novel coronavirus named SARS- CoV-2, causing a clinical disease called COVID-19 by the World Health Organization (WHO, 2020), emerged in Wuhan, China (Lake, 2020). COVID-19 spread worldwide and is now causing a pandemic (WHO, 2020); by May 31th, the COVID-19 pandemic has resulted in more than 5.9 million cases and over 360,000 deaths worldwide (WHO, 2020).

As cases of COVID-19 rapidly increased worldwide, swift action was necessary to mitigate the worst of the outbreak (Evans, 2020). Moreover, governments had to implement extraordinary physical distancing interventions to slow the spread of the virus (e.g., ; Tull et al., 2020), and many European countries, including Italy (Percudani et al., 2020), have imposed major restrictions on meetings, travel, and everyday life (e.g., Ljungman et al., 2020).

Mitigation strategies such as stay-at-home orders, social distancing and quarantine, although necessary, have been documented to produce a negative psychological impact, such as causing post-traumatic stress

symptoms, anxiety, and depression (e.g., Brooks et al., 2020). Notably, studies of past outbreaks have provided some insight into the detrimental effect of similar crises on population-wide mental health (e.g., Kisely et al., 2020; Razai et al., 2020). Not surprisingly, recent studies have showed that COVID-19 social distancing and quarantine measures led to psychological consequences in Chinese (e.g., Tang et al., 2020; Wang et al., 2020a), Spanish (e.g., Losada-Baltar et al., 2020), American (e.g., Tull et al., 2020), and Italian (e.g., Moccia et al., 2020; Somma et al., 2020a) community samples.

The recognition of the importance of global action aiming at mapping the longitudinal effects of COVID-19 on mental health across the various stages of the pandemic led the US National Institute of Mental Health (NIMH, 2020) to start a study on the effect of COVID-19-related stressors on mental health over time. Indeed, as the crisis caused by the COVID-19 epidemic shifts from acute to protracted, it is essential to focus on the potentially devastating effects on population-wide mental health in order to mitigate the long-term mental-health consequences of the pandemic (Nature Medicine, 2020). Moreover, it should be observed that the COVID-19 pandemic has affected the provision of psychiatric care across the world (e.g., Bojdani et al., 2020). From this perspective, it may be particularly useful to gain some insights into the number of community participants who may be affected by psychiatric symptoms and need psychiatric care. Indeed, one approach to prevent a crisis due to mental-health problems on already overburdened healthcare systems might be represented by population-wide screening aiming at identifying people at elevated risk (Nature Medicine, 2020). Moreover, providing an estimate of the prevalence and nature of COVID-19-related mental-health challenges may be particularly important in order to evaluate the pervasiveness and complexity of these problems, as well as to enable early, targeted intervention (Nature Medicine, 2020). Notably, recognizing the risk factors for mental health problems may be crucial in order to make plans to address the most relevant problems and to implement preventive programs aiming at mitigating long-term mental-health issues of the population at most risk (Nature Medicine, 2020).

Based on these considerations, we designed the present study to evaluate the impact of the quarantine in a sample of Italian community-dwelling adult participants who agreed to take part in this online longitudinal study on the effects of the social distancing and quarantine measure in Italy. Specifically, the aims of the present study is twofold. First, it was designed to assess the percentages of participants who scored above the thresholds for clinically relevant depression, anxiety and acute stress symptoms (i.e., moderate severity; see Pilkonis et al., 2014; Schalet et al., 2016a) during the first week of lockdown and at the end of lockdown in Italy. Secondly, the present study aimed at identifying significant predictors of clinically relevant depression, anxiety, acute stress at the end of the lockdown. Based on the results of previous cross-sectional studies (e.g., Lai et al., 2020; Mazza et al., 2020; Wang et al., 2020b; Somma et al., 2020a), we considered gender, civil status, education level, occupation, and area of residence, as well as maladaptive personality domains as potential risk factors.

## 2. Methods

### 2.1. Participants

Data were part of an online longitudinal study of emotional response to COVID-19 quarantine measures in Italy (see also Somma et al., 2020b). Participants responded to advertisements requesting potential volunteers for psychological research on the web (e.g., newsgroups, universities web, social media). Specifically, the online study started on March 14, 2020, i.e., five days after the quarantine had been enforced in Italy and ended after two months (i.e., at the end of the Italian quarantine).

Participants completed the study online using Google Forms; participants volunteered to take part in the study receiving no economic incentive or academic credit for their participation. To be included in

the sample, participants had to document that they were of adult age (i. e., 18 years of age or older), and to agree to online written informed consent in which the study was extensively described. Institutional Review Board approval was obtained.

A detailed description of study procedures is provided in Somma and colleagues (2020b). It should be observed that Somma and colleagues' (2020b) study aimed at evaluating the trajectories of change in psychological distress dimensions; thus, the current results represent a novel use of the data.

### 2.2. Measures

2.2.1 DSM-5 Level 2 Depression (APA, 2013b). The DSM-5 Level 2 Depression measure is the 8-item PROMIS Depression Short Form that assesses the domain of depression in individuals age 18 and older. Items are rated on a 5-point scale, and higher scores on the DSM-5 Level 2 Depression indicate greater severity of depression (APA, 2013b). For clinical purposes, the DSM-5 Level 2 Depression T-score table should be used to identify the T-score associated with the individual's total raw score (APA, 2013b). The DSM-5 Level 2 Depression could be used to track changes in the severity of the individual's depression over time (2013b). In line with the APA guidelines (2013b) and previous studies (e.g., Pilkonis et al., 2014), in the present study we considered T-scores equal of higher than 60 are indicative of 'Moderate' depression (i.e., clinically relevant). Indeed, depression of some clinical significance has been linked to a DSM-5 Level 2 Depression T-score of 60 (e.g., Pilkonis et al., 2014). The Italian translation of the DSM-5 Level 2 Depression has been published (Fossati et al., 2015a).

2.2.2 DSM-5 Level 2 Anxiety (APA, 2013c). The DSM-5 Level 2 Anxiety measure is the 7-item PROMIS Anxiety Short Form; it was designed to assess anxiety in subjects of age 18 and older. Items are rated on a 5-point scale; a higher total score indicates greater severity of anxiety (APA, 2013c). For clinical purposes, the DSM-5 Level 2 Anxiety T-score table should be used to identify the T-score associated with the individual's total raw score (APA, 2013c). In line with the APA guidelines (2013c) and previous studies (e.g., Pilkonis et al., 2014; Schalet et al., 2016b), in the present study we considered T-scores equal of higher than 60 are indicative of 'Moderate' anxiety (i.e., clinically relevant). The DSM-5 Level 2 Anxiety measure has been published in its Italian translation (Fossati et al., 2015b).

2.2.3 DSM-5 Severity of Acute Stress Symptoms (APA, 2013d). The DSM-5 Severity of Acute Stress Symptoms (National Stressful Events Survey Acute Stress Disorder Short Scale) is a 7-item measure that assesses the severity symptoms of acute stress disorder in individuals age 18 and older. Each item is rated on a 5-point scale; items are summed to obtain a total score ranging from 0 to 28, with higher scores indicating greater severity of acute stress disorder symptoms (APA, 2013d). In addition to the raw scores, the average total score was computed for clinical purposes (2013d). The average total score reduces the overall score to a 5-point scale, which allows to think of the severity of the individual's acute stress disorder; in line with the APA guidelines (2013d), in the present study we considered average score equal to '2' or greater as indicative of 'Moderate' acute stress disorder symptoms (i.e., clinically relevant; e.g., Segal, 2019). The Italian translation of the DSM-5 Severity of Acute Stress Symptoms measure has been published (Fossati et al., 2015c).

2.2.4 Personality Inventory for DSM-5-Brief Form+ Modified (PID-5–36; Bach et al., 2020; Kerber et al., 2020). The PID-5–36 is a 36-item self-report instrument developed by Bach and colleagues (2020) to assess the combined DSM-5 and ICD-11 domains (i.e., negative affectivity, detachment, antagonism, disinhibition, anankastia, and psychoticism). The original 34-item version of the PID-5-BF+ has been developed from the original PID-5 item pool relying on ant colony optimization algorithms (Kerber et al., 2020). Recently, Bach and colleagues (2020) relied on the initial 37-facet version of the DSM-5 trait model and considered facets of orderliness, rigidity, and perfectionism

from the rigid perfectionism trait in order to provide a broader representation of the ICD-11 domain of anankastia (Bach et al., 2020). The PID-5–36 psychometric properties have been tested in an international collaborative study, which includes the Italian translation of the PID-5–36 (Bach et al., 2020). The PID-5–36 showed to be provided with adequate factor validity; moreover, the six PID-5–36 domain scales were provided with good discriminant validity and meaningful continuity with interview-rated PD across 13 languages, including Italian (Bach et al., 2020).

### 2.3. Measure translation procedures

In the present study, all measures were administered to participants in their Italian translations. In the translation process, the authors closely followed Denissen, Geenen, van Aken, Gosling, and Potter's (2008) indications. The translation procedures are detailed elsewhere (Bach et al., 2020; Fossati et al., 2013; Fossati et al., 2015a,b,c).

### 2.4. Data analysis

Cronbach $\alpha$ coefficient was used to assess scale internal consistency reliability; Pearson r correlation coefficient was used as a rank-order consistency measure. The presence of within-wave significant differences among the base rates of clinically relevant depression, anxiety, and acute stress was tested by Cochran's Q test, followed by Bonferroni McNemar $\chi^2$ tests. The Cohen's h statistic was used as effect size for difference between proportions.

Odds ratios (OR) were computed to assess the presence of significant associations among clinically relevant depression, anxiety, and acute stress diagnoses within each wave of our study. McNemar $\chi^2$ test was used to evaluate the presence of significant differences in the proportion of participants who scored above the threshold for clinical significance during the first week of lockdown and at the end of lockdown, respectively. The relative risk (RR) statistic was used to evaluate the relevance and significance of reporting clinically relevant depression, anxiety, and acute stress during the first week of lockdown as a risk factor for reporting clinically relevant depression, anxiety, and acute stress also at the end of lockdown. Cohen's $\kappa$ statistic was computed to evaluate the temporal consistency of the individual clinically relevant diagnoses. The nominal significance level (i.e., $p < 0.05$) was corrected according to the Bonferroni procedure for multiple comparisons.

Hotelling $T^2$ tests, followed by Bonferroni simultaneous independent sample t-tests, were computed to test the hypothesis of equal PID-5–36 profile levels between participants who scored above the threshold for clinical relevance and participant who scored below the threshold for clinical relevance on depression, anxiety, and acute stress self-reports (as well as on any internalizing disorder) at the end of lockdown, respectively. Box M test was used to test the assumption of between-group covariance matrix homogeneity. Mahalanobis $D$ statistic (i.e., the multivariate analogue of Cohen's d) was used as multivariate effect size measure; Cohen's d statistic was used to evaluate the effect size of the individual Bonferroni t-tests.

Ordinal logistic regression analyses were carried out to evaluate the role of demographic variables (i.e., participant's gender, age, civil status, education level, occupation, and Italy's area of residence), and the PID-5–36 domain scale scores that were measured during the first week of lockdown in Italy as significant predictors of the presence of clinically relevant depression, anxiety, acute stress, and any internalizing disorder diagnosis, respectively, at the end of lockdown in Italy. Ordinal logistic regression models were relied upon because for each participant the dependent variables were coded as clinically relevant if the participant scored above a threshold score. Akaike information criterion (AIC), finite sample corrected AIC (AIC$_C$), and Bayesian information criterion (BIC) were used for initial model selection; the model with the minimum AIC, AIC$_C$, and BIC values was retained as best fitting model. The individual contribution of the PID-5–36 domain scale scores taking into account their overlap was evaluated by computing the exp(b) coefficients, which represent OR estimates. Within each regression equation, the significance of the OR estimates was assessed by computing Bonferroni simultaneous 95% confidence intervals for the OR values.

All statistical analyses were carried out using R statistical software (R Core Team, 2020).

## 3. Results

### 3.1. Participants description

The sample was composed of 304 Italian community-dwelling adult participants, with a mean age of 35.28 years ($SD = 14.50$ years; age range: 18 years – 78 years). Seventy-four (24.3%) participants were male and 230 (75.7%) participants were female; 161 (53.0%) participants were unmarried, 117 (38.4%) were married, 20 (6.6%) participants were divorced, and six (2.0%) participants were widowed/-ers. Fourteen (4.6%) participants had junior high school degree, 106 (34.9%) participants had high school degree, 150 (49.3%) participants had university degree, and 34 (11.2%) participants had doctoral degree. One hundred (32.9%) participants were students, 14 (4.6%) participants were blue collars, 96 (31.6%) participants were white collars, 38 (12.5%) were freelance professionals, five (1.6%) participants were retailers, four (1.3%) participants were managers, and nine (3.0%) participants were housekeepers; finally, 15 (4.9%) participants were unemployed and 18 (5.9%) participants were retired, whereas one (0.4%) participant declined to report his/her occupation. In our sample, 202 (66.4%) participants were living in Northern Italy, 41 (13.5%) participants lived in Central Italy, 39 (12.8%) participants were living in Southern Italy, and 21 (6.9%) participants were living in Italian Islands (i.e., Sardinia and Sicily); one (0.3%) participant refused to report the region where he/she was living.

A detailed description of missing data analysis is provided in Somma and colleagues' (2020b) manuscript. .

### 3.2. Prevalence

Descriptive statistics, Cronbach's $\alpha$ values, mean comparisons, and rank-order consistency (i.e., Pearson r) coefficient values, for the DSM-5 Level 2 Depression and Anxiety Scale and DSM-5 Acute Stress Symptom Severity Scale total scores during the first week of lockdown and at the end of lockdown, respectively, are summarized in Table 1.

Base rate estimates and within-wave and between-wave diagnosis co-occurrence statistics (i.e., co-occurrence rates and odd ratio/relative risk values) for clinically relevant depression, anxiety, and acute stress based on DSM-5 Level 2 Depression and Anxiety Scale and DSM-5 Acute Stress Symptom Severity Scale threshold scores during the first week of lockdown and at the end of lockdown are summarized in Table 2. Cohen's $\kappa$ values for temporal consistency of depression, anxiety and acute stress diagnoses are listed between brackets on the main diagonal of the first week of lockdown–end of lockdown diagnosis co-occurrence matrix. The percentages of participants who scored above the thresholds for clinically relevant symptoms on the DSM-5 Level 2 Depression, DSM-5 Level 2 Anxiety Scale, and DSM-5 Acute Stress Symptom Severity Scale total scores were based on the APA guidelines (2013b) and previous studies (see Pilkonis et al., 2014; Schalet et al., 2016a). Accordingly, a 'Moderate' (i.e., clinically relevant) cut-off score was applied.

At the beginning of the lockdown, the proportions of clinically relevant depression, anxiety, and acute stress diagnoses were significantly different, Cochran's $Q(2) = 100.78$, $p < 0.001$, $\eta^2_Q = 0.17$. McNemar post-hoc comparisons with Bonferroni-corrected nominal p-level (i.e., $p < 0.0167$), showed that the proportion of participants who scored above the threshold for clinically relevant anxiety was significantly higher than the proportion of subjects who scored above the threshold for clinically relevant depression, percentage difference = 18.75%, McNemar $\chi^2(1) = 39.70$, $p < 0.0167$, Cohen's $h = 0.60$, and

**Table 1**

Descriptive Statistics, Cronbach's $\alpha$ Values, Mean Comparisons, and Rank-Order Consistency (i.e., Pearson $r$) Coefficient Values, for the DSM-5 Level 2 Depression and Anxiety Scale and DSM-5 Acute Stress Symptom Severity Scale Total Scores During the First Week of Lockdown and at the End of Lockdown In Italy, Respectively ($N = 304$).

| DSM-5 Measure Total Scores | Beginning of the Lockdown | | | End of the Lockdown | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | α | M | SD | α | t(303) | d | r |
| DSM-5 Level 2 Depression Scale | 53.18 | 7.48 | .88 | 51.32 | 9.17 | .94 | 4.93* | 0.28 | .70* |
| DSM-5 Level 2 Anxiety Scale | 57.47 | 7.56 | .91 | 54.27 | 9.68 | .94 | 7.46* | 0.43 | .65* |
| DSM-5 Acute Stress Symptom Severity Scale | 0.78 | 0.69 | .82 | 0.69 | 0.74 | .88 | 2.59* | 0.15 | .64* |

Note. $d$: Cohen's d effect size measure; the nominal significance level (i.e., $p < 0.05$) was corrected according to the Bonferroni procedure and set at $p < 0.0167$.

\* $p < 0.0167$.

**Table 2**

Clinically Relevant Depression, Anxiety, and Acute Stress Based on DSM-5 Level 2 Depression and Anxiety Scale and DSM-5 Acute Stress Symptom Severity Scale Threshold Scores at the Beginning of the Lockdown and at the End of the Lockdown: Base Rate Estimates and Within-Wave and Between-Wave Diagnosis Co-occurrence Statistics (i.e., Co-Occurrence Rates and Odd Ratio/Relative Risk Values). Cohen's $\kappa$ Values for the Temporal Consistency of Depression, Anxiety and Acute Stress Diagnoses Are Listed Between Brackets on the Main Diagonal of the Beginning of Lockdown-End of the Lockdown Diagnosis Co-Occurrence Matrix ($N = 304$).

Diagnostic Co-Occurrence Rates

| L. Beginning | Base Rate | Beginning of the Lockdown | | | End of the Lockdown | | |
|---|---|---|---|---|---|---|---|
| | | Depression | Anxiety | Acute Stress | Depression | Anxiety | Acute Stress |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Depression | 19.1% (58) | – | 81.3% (47) | 20.7% (12) | 53.4% (31) | 62.1% (36) | 25.9% (15) |
| Anxiety | 37.8% (115) | 40.9% (47) | – | 16.5% (19) | 40.0% (46) | 54.8% (63) | 16.5% (19) |
| Acute Stress | 8.6% (26) | 42.6% (12) | 73.1% (19) | – | 69.2% (18) | 88.5% (23) | 53.8% (14) |
| **L. End** | | | | | | | |
| Depression | 19.4% (59) | 52.5% (31) | 78.0% (46) | 30.5% (18) | – | 89.8% (53) | 37.3% (22) |
| Anxiety | 29.6% (90) | 40.0% (36) | 70.0% (63) | 25.6% (23) | 58.9% (53) | – | 27.8% (25) |
| Acute Stress | 8.6% (26) | 57.7% (15) | 73.1% (19) | 53.8% (14) | 84.6% (22) | 96.2% (25) | – |

Odd Ratio (Within Waves) and Relative Risk (Between Waves) Estimates

| L. Beginning | Beginning of the Lockdown | | | End of the Lockdown | | |
|---|---|---|---|---|---|---|
| | Depression | Anxiety | Acute Stress | Depression | Anxiety | Acute Stress |
| Depression | – | | | 4.70 [b]* (0.42 [c]*) | 2.83 [b]* | 5.78 [b]* |
| Anxiety | 11.18 [a]* | – | | 5.82 [b]* | 3.83 [b]* (0.42 [c]*) | 4.46 [b]* |
| Acute Stress | 4.32 [a]* | 5.15 [a]* | – | 4.69 [b]* | 12.47 [b]* | 12.47 [b]* (0.50 [c]*) |
| **L. End** | | | | | | |
| Depression | – | – | – | – | | |
| Anxiety | – | – | – | 49.66 [a]* | – | |
| Acute Stress | – | – | – | 35.82 [a]* | 81.92 [a]* | – |

Note. L. Beginning: Lockdown Beginning; L. End: Lockdown End; a: Odds ratio; b: Relative risk; c: Cohen's $\kappa$; –: Statistic not computed; because a total of 18 coefficients was computed, the nominal significance level (i.e., $p < 0.05$) was corrected according to the Bonferroni procedure and set at $p < 0.0028$.

\* $p < 0.0028$.

acute stress, percentage difference $= 29.28\%$, McNemar $\chi^2(1) = 75.18$, $p < 0.0167$, Cohen's $h = 0.89$. Similarly, the percentage of participants who scored above the threshold for clinically relevant depression at the beginning of the lockdown was significantly higher than the percentage of participants who scored above the threshold for clinically relevant acute stress during the first week of lockdown, percentage difference $= 10.53\%$, McNemar $\chi^2(1) = 16.02$, $p < 0.0167$, Cohen's $h = 0.37$. Similar considerations held for the comparisons among base rate estimates (reported as percentages) of clinically relevant depression, anxiety, and acute stress at the end of lockdown in Italy; Cochran's $Q(2) = 81.95$, $p < 0.001$, clinically relevant anxiety vs. clinically relevant depression. percentage difference $= 10.20\%$, McNemar $\chi^2(1) = 20.93$, $p < 0.0167$, Cohen's $h = 0.43$; clinically relevant anxiety vs. clinically relevant acute stress, percentage difference $= 21.05\%$, McNemar $\chi^2(1) = 60.14$, $p < 0.0167$, Cohen's $h = 0.89$; clinically relevant depression vs. clinically relevant acute stress, percentage difference $= 10.86\%$, McNemar $\chi^2(1) = 24.98$, $p < 0.0167$, Cohen's $h = 0.42$.

No significant change over time occurred in the base rate estimates of clinically relevant depression, percentage difference $= 0.03\%$, McNemar $\chi^2(1) = 0.02$, $p = .893$, Cohen's $h = 0.01$, and acute stress, percentage difference $= 0.00\%$, McNemar $\chi^2(1) = 0.00$, $p = 1.000$, Cohen's $h = 0.01$. Rather, a significant decrease in clinically relevant anxiety base rate estimates was observed during the first week of lockdown and at the end of lockdown, percentage difference $= 8.2\%$, McNemar $\chi^2(1) = 7.91$, $p = .005$, Cohen's $h = 0.25$.

As a whole, 43.4% ($n = 132$) of our participants reported any clinically relevant internalizing pathology at the beginning of the lockdown, whereas at the end of the lockdown in Italy) 31.9% ($n = 97$) of our participants reported being affected by any clinically relevant internalizing pathology; the difference between the two matched proportions was highly significant, percentage difference $= 11.5$, McNemar $\chi^2(1) = 15.91$, $p < 0.001$, Cohen's $h = 0.24$. Fifty-six (18.4%) participants who reported any clinically relevant internalizing pathology at the beginning of the quarantine did not report any clinically relevant internalizing pathology at the end of the lockdown, whereas 21 (6.9%) participants who did not report any clinically relevant internalizing pathology at the beginning of the lockdown reported any clinically relevant internalizing pathology at the end of the lockdown. The Cohen's $\kappa$ value for the temporal consistency of any clinically relevant internalizing pathology from the first week of lockdown to the end of lockdown in Italy was 0.47, $p < 0.001$, whereas the relative risk value was 4.72, 95% confidence interval $= 3.08$, 7.23.

### 3.3. Demographic characteristics and maladaptive personality domains

In the full sample, mean scores during the first week of lockdown in Italy were 1.29 (SD = 0.67, Cronbach's $\alpha$ = 0.85), 0.79 (SD = 0.49, Cronbach's $\alpha$ =0.74), 0.57 (SD = 0.46, Cronbach's $\alpha$ = 0.74), 0.69 (SD = 0.48, Cronbach's $\alpha$ = 0.74), 0.80 (SD = 0.60, Cronbach's $\alpha$ = 0.83), and 1.35 (SD = 0.68, Cronbach's $\alpha$ = 0.89) for the PID-5–36 Negative Affectivity, Detachment, Antagonism, Disinhibition, Psychoticism, and Anankastia scales, respectively. On average, the six PID-5–36 domain scale scores were non-negligibly intercorrelated, with a median Pearson $r$ value of 0.32, 25th percentile of $r$ values = 0.28, 75th percentile of $r$ values = 0.37. Descriptive statistics, homogeneity of covariance matrix (i.e., Box $M$ test) statistics, multivariate mean comparisons (i.e., Hotelling $T^2$ and Mahalonobis $D$ tests) statistics are listed in Table 3. Table 3 also show Bonferroni multiple contrasts for the PID-5–36 domain scale mean scores at the baseline between diagnostic groups based on DSM-5 Level 2 Depression and Anxiety Scale and DSM-5 Acute Stress Symptom Severity Scale threshold scores for clinical relevance at the end of lockdown.

Model selection results for ordinal logistic regression models for demographic variables and PID-5–36 domain scale scores during the first week of lockdown in Italy, respectively, as predictors of diagnostic groups based on threshold scores for clinical relevance of the DSM-5 Level 2 Depression Scale, DSM-5 Level 2 Anxiety Scale, and DSM-5 Acute Stress Symptom Severity Scale at the end of lockdown are listed in Table 4. The odds ratio values and corresponding Bonferroni simultaneous 95% confidence intervals for the PID-5–36 domain scale scores at the beginning of lockdown in Italy as predictors of the end of lockdown in Italy diagnostic groups based on threshold scores for clinical relevance of the DSM-5 Level 2 Depression Scale, DSM-5 Level 2 Anxiety Scale, and DSM-5 Acute Stress Symptom Severity Scale in ordinal

logistic regression models are summarized in Table 5. The Bonferroni correction of the 95% confidence intervals for the odds ratio values was applied within each regression equation, leading to 99.17% confidence interval (i.e., $p <0.0083$) for the individual PID-5–36 domain scale score OR values.

## 4. Discussion

Confirming and extending available evidence (Wang et al., 2020a,b), our findings suggested that a substantial minority of participants reported clinically relevant depression, anxiety, and/or acute stress symptoms at the beginning and at the end of the lockdown in Italy. Although the majority of our participants showed some resilience to quarantine measures, more than 43% of our participants suffered from the early impact of the lockdown; notably, at the end of the lockdown roughly 32% of our participant still reported any clinically relevant depression anxiety, and/or acute stress disorder condition. This finding was consistent with previous reports on the impact of quarantine measures on the psychological well-being, while providing data on the expected need for psychiatric and psychological consultations (e.g., Razai et al., 2020).

In both waves of our study, clinically relevant anxiety reactions were significantly and non-negligibly more frequently reported than both clinically relevant depression and acute stress reactions; however, clinically relevant depression was more frequently reported than clinically acute stress at both measurement occasions (Tang et al., 2020; Wang et al., 2020b). Mostly, in our sample the three clinically relevant conditions showed significant and non-negligible co-occurrence rates, particularly at the end of the lockdown. This finding supports the hypothesis that practitioners will be likely to observe complex clinical pictures of internalizing spectrum disorders in subjects who were

**Table 3**
Personality Inventory for DSM-5 36-Item Form Domain Scale Total Scores: Descriptive Statistics, Homogeneity of Covariance Matrix (i.e., Box M Test) Statistics, Multivariate Mean Comparison (i.e., Hotelling T² and Mahalonobis D Tests) Statistics, and Bonferroni Multiple Contrasts Between Diagnostic Groups Based DSM-5 Level 2 Depression and Anxiety Scale and DSM-5 Acute Stress Symptom Severity Scale Threshold Scores for Clinical Relevance at the End of Lockdown (N = 304).

| PID-5 | Depression - (n = 245) M | SD | Depression + (n = 59) M | SD | Anxiety - (n = 214) M | SD | Anxiety + (n = 90) M | SD | Acute Stress - (n = 278) M | SD | Acute Stress + (n = 26) M | SD | Internalizing - (n = 207) M | SD | Internalizing + (n = 97) M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NA | 1.18 a | 0.63 | 1.73 b | 0.62 | 1.13 a | 0.62 | 1.67 b | 0.61 | 1.24 a | 0.65 | 1.84 b | 0.64 | 1.11 a | 0.61 | 1.66 b | 0.62 |
| Det | 0.77 a | 0.48 | 0.89 a | 0.52 | 0.77 a | 0.49 | 0.84 a | 0.48 | 0.77 a | 0.48 | 1.03 a | 0.54 | 0.76 a | 0.48 | 0.86 a | 0.51 |
| Ant | 0.54 a | 0.45 | 0.70 a | 0.48 | 0.55 a | 0.45 | 0.62 a | 0.48 | 0.56 a | 0.45 | 0.73 a | 0.55 | 0.55 a | 0.45 | 0.63 a | 0.47 |
| Dis | 0.64 a | 0.45 | 0.90 b | 0.51 | 0.64 a | 0.46 | 0.80 b | 0.50 | 0.66 a | 0.46 | 0.99 b | 0.52 | 0.63 a | 0.46 | 0.81 b | 0.49 |
| Psy | 0.79 a | 0.59 | 1.19 b | 0.55 | 0.78 a | 0.57 | 1.10 b | 0.61 | 0.82 a | 0.58 | 1.40 b | 0.57 | 0.77 a | 0.58 | 1.08 b | 0.59 |
| Ank | 1.29 a | 0.66 | 1.57 a | 0.69 | 1.27 a | 0.66 | 1.53 b | 0.68 | 1.33 a | 0.68 | 1.49 a | 0.61 | 1.26 a | 0.66 | 1.53 b | 0.68 |
| Box M | 18.05 | | | | 11.13 | | | | 13.78 | | | | 10.93 | | | |
| p | .689 | | | | .966 | | | | .923 | | | | 0969 | | | |
| T² | 48.62 | | | | 61.31 | | | | 41.37 | | | | 63.42 | | | |
| F(6297) | 7.96*** | | | | 10.04*** | | | | 6.77*** | | | | 10.37*** | | | |
| DM | 1.01 | | | | 0.98 | | | | 1.32 | | | | 0.98 | | | |

Note. PID-5: Personality Inventory for DSM-5 36-Item Form; NA: Negative Affectivity; Det: Detachment, Ant: Antagonism; Dis: Disinhibition; Psy: Psychoticism; Ank: Anankastia; -: No clinical relevance; +: Clinically relevant; Internalizing: Any internalizing disorder; $T^2$: Hotelling $T^2$ statistic for multivariate mean comparison; $D_M$: Mahalanobis $D$ multivariate effect size statistic. The nominal significance level (i.e., $p <0.05$) for mean comparisons was corrected according to the Bonferroni procedure and set at $p <0.0125$ for $T^2$ tests, and at $p <0.0021$ for Bonferroni mean contrasts. Within each set of mean comparisons, means with different superscripts were significantly different in Bonferroni multiple t-tests. Bold highlights significant Bonferroni multiple t-test results. *** $p <0.001$.
Bonferroni multiple t-test for groups based on DSM-5 Level 2 Depression Scale: **1. Negative Affectivity: t(302) = 5.98, p <0.0021, d = 0.69**; 2. Detachment: t(302) = 1.77, p = .078, d = 0.20; 3. Antagonism: t(302) = 2.44, p = .015, d = 0.28; **4. Disinhibition: t(302) = 3.96, p <0.0021, d = 0.46; 5. Psychoticism: t(302) = 4.71, p <0.0021, d = 0.54**; 6. Anankastia: t(302) = 2.81, p = .005, d = 0.32.
Bonferroni multiple t-test for groups based on DSM-5 Level Anxiety Scale: **1. Negative Affectivity: t(302) = 6.98, p <0.0021, d = 0.80**; 2. Detachment: t(302) = 1.23, p = .221, d = 0.14; 3. Antagonism: t(302) = 1.15, p = 0.252, d = 0.13; 4. Disinhibition: t(302) = 2.68, p = .008, d = 0.31; **5. Psychoticism: t(302) = 4.38, p <0.0021, d = 0.50; 6. Anankastia: t(302) = 2.81, p = .005, d = 0.32.**
Bonferroni multiple t-test for groups based on DSM-5 Level Acute Stress Symptom Severity: **1. Negative Affectivity: t(302) = 4.56, p <0.0021, d = 0.52**; 2. Detachment: t(302) = 2.56, p = .011, d = 0.30; 3. Antagonism: t(302) = 1.84, p = .067, d = 0.21; **4. Disinhibition: t(302) = 3.47, p <0.0021, d = 0.40; 5. Psychoticism: t(302) = 4.92, p <0.0021, d = 0.57**; 6. Anankastia: t(302) = 1.12, p = .264, d = 0.13.
Bonferroni multiple t-test for groups based on any Clinically Relevant Internalizing Disorder: **1. Negative Affectivity: t(302) = 7.20, p <0.0021, d = 0.83**; 2. Detachment: t(302) = 1.61, p = .108, d = 0.19; 3. Antagonism: t(302) = 1.53, p = .128, d = 0.18; **4. Disinhibition: t(302) = 3.12, p <0.0021, d = 0.36; 5. Psychoticism: t(302) = 4.38, p <0.0021, d = 0.50; 6. Anankastia: t(302) = 3.40, p <0.0021, d = 0.39.**

**Table 4**
Ordinal Logistic Regression Model Selection Results for Demographic Variables and Personality Inventory for DSM-5 36-Item Form Domain Scale Scores at the Beginning of Lockdown in Italy, Respectively, as Predictors of the End of Lockdown in Italy Diagnostic Groups Based on the Threshold Scores for Clinical Relevance of the DSM-5 Level 2 Depression Scale, DSM-5 Level 2 Anxiety Scale, and DSM-5 Acute Stress Symptom Severity Scale (N = 304).

| | Dependent Variables | | | | | | | | | | | |
| | Clinically Relevant Depression | | | Clinically Relevant Anxiety | | | Clinically Relevant Acute Stress | | | Any Clinically Relevant Internalizing Disorder | | |
| Predictors | AIC | AIC$_C$ | BIC | AIC | AIC$_C$ | BIC | AIC | AIC$_C$ | BIC | AIC | AIC$_C$ | BIC |
| Demographic Variables | | | | | | | | | | | | |
| Model 1 | | | | | | | | | | | | |
| Intercept Only | 264.47 | 264.49 | 268.18 | 330.51 | 330.52 | 334.22 | 161.71 | 161.72 | 165.42 | 334.36 | 334.38 | 338.07 |
| Model 2 | | | | | | | | | | | | |
| Participant's Gender, Age, Civil Status, Education Level, Occupation, and Area of Residence | 277.68 | 280.98 | 355.60 | 344.07 | 347.37 | 421.99 | 164.49 | 167.79 | 242.41 | 347.42 | 350.72 | 425.34 |
| PID-5–36 Domain Scale Scores | | | | | | | | | | | | |
| Model 1 | | | | | | | | | | | | |
| Intercept Only | 301.19 | 301.20 | 304.90 | 371.35 | 371.36 | 375.07 | 179.57 | 179.59 | 183.29 | 382.71 | 382.73 | 386.43 |
| Model 2 | | | | | | | | | | | | |
| Negative Affectivity, Detachment, Antagonism, Disinhibition, Psychoticism, and Anankastia | **269.11** | **269.49** | **295.13** | **328.81** | **329.19** | **354.83** | **154.53** | **154.91** | **180.55** | **338.26** | **338.64** | **364.28** |

Note. AIC: Akaike information criterion; AIC$_C$: Finite sample corrected AIC; BIC: Bayesian information criterion. For each set of predictors, bold highlights the best fitting model.

**Table 5**
Ordinal Logistic Regression Analysis Results for the Personality Inventory for DSM-5 36-Item Form Domain Scale Scores at the Beginning of Lockdown in Italy as Predictors of the End of lockdown in Italy Diagnostic Groups Based on Threshold Scores for Clinical Relevance of the DSM-5 Level 2 Depression Scale, DSM-5 Level 2 Anxiety Scale, and DSM-5 Acute Stress Symptom Severity Scale: Omnibus Significance Test, Odds Ratio Values and Corresponding Bonferroni Simultaneous 95% Confidence Intervals (N = 304).

| | Dependent Variables | | | | | | | | | | | |
| | Clinically Relevant Depression | | | Clinically Relevant Anxiety | | | Clinically Relevant Acute Stress | | | Any Clinically Relevant Internalizing Disorder | | |
| | Bonferroni 95% CI | | | Bonferroni 95% CI | | | Bonferroni 95% CI | | | Bonferroni 95% CI | | |
| Predictors | OR | LL | UL | OR | LL | UL | OR | LL | UL | OR | LL | UL |
| PID-5–36 Domain Scale Scores | | | | | | | | | | | | |
| Negative Affectivity | **3.03** | 1.42 | 6.49 | **3.78** | 1.90 | 7.50 | **3.83** | 1.28 | 11.44 | **3.69** | 1.88 | 7.24 |
| Detachment | 1.21 | 0.46 | 3.17 | 1.23 | 0.53 | 2.85 | 2.29 | 0.59 | 8.86 | 1.33 | 0.58 | 3.05 |
| Antagonism | 0.77 | 0.28 | 2.14 | 0.52 | 0.20 | 1.33 | 0.48 | 0.12 | 2.02 | 0.56 | 0.22 | 1.41 |
| Disinhibition | 1.50 | 0.56 | 4.01 | 0.97 | 0.39 | 2.38 | 1.34 | 0.34 | 5.25 | 1.07 | 0.44 | 2.59 |
| Psychoticism | 1.93 | 0.91 | 4.13 | 1.93 | 0.97 | 3.85 | **3.54** | 1.18 | 10.59 | 1.76 | 0.89 | 3.46 |
| Anankastia | 1.15 | 0.59 | 2.24 | 1.13 | 0.63 | 2.05 | 0.71 | 0.28 | 1.78 | 1.19 | 0.66 | 2.13 |
| Omnibus Significance $\chi^2$(6) | 44.08*** | | | 54.54*** | | | 37.04*** | | | 56.45*** | | |
| McFadden pseudo-$R^2$ | .15 | | | .15 | | | .21 | | | .15 | | |
| McFadden adjusted $R^2$ | .11 | | | .12 | | | .14 | | | .12 | | |

Note. PID-5–36: Personality Inventory for DSM-5 36-Item Form; OR: Odds ratio; LL: Lower limit; UL: Upper limit. The Bonferroni correction of the 95% confidence intervals for the odds ratio values was applied within each regression equation, leading to 99.17% confidence interval (i.e., $p < 0.0083$) for the individual PID-5–36 domain scale score odd ratio values. Bold highlights significant odds ratio values.

exposed to COVID-19 quarantine measures (e.g., Razai et al., 2020).

Although we observed a significant, albeit small (Cohen, 1988) decline in the average self-repot scores of depression, anxiety, and acute stress from the beginning to the end of the lockdown, it should be observed that non-negligible rank-order consistency of the scores over time was also observed. Indeed, when we considered threshold scores for clinical relevance, no significant change in the proportion of participants who reported clinically relevant features between the first measurement occasion and the end of lockdown was observed for depression and acute stress. A significant, albeit modest (Cohen, 1988) decline in base rate estimates over time was observed only for self-reported clinically relevant anxiety. In our study, moderate temporal stability was observed for the self-reports of clinically relevant depression, anxiety, and acute stress. As a whole these findings suggested that a decrease in continuous measures of depression, anxiety, and acute stress during the COVID-19 related lockdown is unlikely to result in actual clinical improvement. Although a trend towards spontaneous reduction in symptom severity may take place particularly for anxiety features (Wang et al., 2020b), it may be slow and last longer than the quarantine measures themselves. Moreover, although some participants reported spontaneous "remission" of previous clinically relevant conditions over time, other participants developed clinically relevant problems. It should be observed that in our study experiencing self-reported clinically relevant depressive, anxious, and acute stress symptoms during the first week of lockdown was a significant and non-negligible risk factor for experiencing clinically relevant problems

at the end of the lockdown; in this respect, experiencing clinically relevant acute stress reaction at the beginning of lockdown seemed to represent a particularly important risk factor (Chen et al., 2010) for experiencing not only clinically relevant acute stress at the end of the lockdown, but also clinically relevant depression and, to a lesser extent, anxiety.

As a whole these findings suggest the necessity of providing early assessment of internalizing disorder symptoms during quarantine measures in order to provide early treatment interventions for anxiety, as well as for depression and acute stress. The availability of short measures which could be easily administered and scored using on-line platforms or mobile phone applications may represent a resource for future interventions (e.g., Razai et al., 2020). Moreover, the non-negligible frequency of perceived clinically relevant anxious, depressive, and acute stress condition during the lockdown that was observed in our sample highlights the potential risk for self-medication of these extreme emotional conditions, which may lead to anxiety-relieving drug misuse and/or alcohol abuse problems.

To the best of our knowledge, our study represents the first attempt at providing data on risk factors associated with the presence of clinically relevant depression, anxiety, acute stress, and overall internalizing symptom conditions at the end of the lockdown. Based on our ordinal logistic regression analysis results, participant's gender, age, civil status, occupation, and area of residence in Italy did not seem to be significant predictors of perceived clinically relevant internalizing problems at the end of lockdown. Although previous findings showed that female gender may be associated with higher risk for emotional problems (e.g., Somma et al., 2020a) or greater symptomatology (Wang et al. 2020b), it should be observed that these studies examined the impact of the lockdown measures at the early stage of their implementation.

DSM-5 Alternative Model of Personality Disorder Criterion B/ICD-11 dysfunctional personality domains, at least as they were operationalized in the PID-5–36 at the beginning of the lockdown in Italy, were non-trivial predictors of participants' self-reported depression, anxiety, and acute stress at the end of the lockdown. Although all participants were exposed to the same quarantine measures to contrast the COVID-19 pandemic, their individual differences in dysfunctional personality domains seemed to play a non-negligible role in shaping the severity of their internalizing symptoms at the end of the lockdown. Marginally, multivariate mean difference analysis results indicated that the PID-5–36 domain scale profile elevation (i.e., the linear combination [weighted sum] of the PID-5–36 domain scale scores; Morrison, 1990) significantly discriminated all clinically relevant symptom groups from the corresponding non-clinically relevant symptom groups, with Mahalanobis D values that were suggestive of large effect size (Cohen, 1988).

Consistent with previous studies on the role of Neuroticism for mental health outcomes (Cuijpers et al., 2010), our ordinal logistic regression analysis results suggested that Negative Affectivity – i.e., the propensity towards experiencing frequent and intense levels of a wide range of negative emotions (APA, 2013a) – was the only significant, and at least moderate (Chen et al., 2010), predictor of clinically relevant depression, anxiety, and overall internalizing pathology at the end of the lockdown. Although Bonferroni bivariate mean comparisons suggested a possible role of Disinhibition on clinically relevant depression, acute stress, and overall internalizing psychopathology, this finding was not confirmed in multivariate ordinal logistic regression analyses. Rather, the PID-5–36 Psychoticism domain scale score was a significant predictor of clinically relevant acute stress at the end of lockdown, along with Negative Affectivity. Although other explanations may be possible, this finding seemed to suggest that the dissociation-proneness that is involved in the dysfunctional cognitive and perceptual process which characterize the Psychoticism domain may play a role in making subjects vulnerable to experience clinically relevant acute stress reaction to quarantine measures, at least at the end of the lockdown.

The availability of short self-report measures to assess dysfunctional personality could allow their future use for online assessment of dysfunctional personality dimension in the early phases of quarantine measures to identify subjects potentially at risk for clinically relevant emotional distress reactions.

## 5. Limitations

Of course, the results of our study should be considered in the light of several limitations. Our sample was composed mostly by female participants; although online samples are characterized by an excess of female participants, this aspect limits the generalizability of our data. Moreover, it may be possible that participants who were particularly distressed during the first week of lockdown were more inclined to participate in our longitudinal study than participants who were not particularly distressed, thus leading to biased estimates of the base rates of clinically relevant conditions. On the other hand, online sampling may fall short in reaching people more exposed to important risk factors for psychiatric distress. Furthermore, we were able to evaluate neither if participants suffered from any internalizing disorder before the COVID-19 breakdown, nor whether they had sought medical advice and received pharmacological and or psychological treatment (maybe through telemedicine services; Kalin et al., 2020). We relied exclusively on self-report measures; our association statistics may have been inflated by shared method variance. In our study, we were not able to assess the presence of any medical problems, and we did not ask participants if any acquaintances or loved ones had been infected with COVID-19 (see Mazza et al., 2020). Moreover, self-reporting of anxiety, depression and stress symptoms, as well as maladaptive personality traits may not always be aligned with assessment by mental health professionals. We were forced to rely only to a single measure for each construct; using different measures may possibly lead to different results. However, these characteristics are common to all COVID-19 available literature (e.g., Mazza et al., 2020; Wang et al., 2020a,b); moreover, the lockdown did not allow to track the reason why participants dropped the study after agreeing to participate in the study (Wang et al., 2020a).

## Declaration of Conflicting Interests

All the authors declare that they have no conflicts of interest.

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