Brief Report: Covid-19

The mediating role of fear of COVID-19 in the relationship between intolerance of uncertainty and depression

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Objectives. Living during the COVID-19 pandemic is characterized by the emergence of great uncertainty surrounding multiple aspects of daily life. This study explored the relationship between intolerance of uncertainty (IU) and depression, as well as the potential mediation effect of COVID-19-related fear.

Design and methods. A cross-sectional study was conducted through an online survey from 10 April until 13 April 2020, three weeks after a national lockdown had been imposed in Greece. The convenience sample used in this study consisted of 2,827 adults. Participants voluntarily provided sociodemographic data and completed the following scales: the Intolerance of Uncertainty Scale (IUS-12), the Fear of COVID-19 Scale (FCV-19S), and the Brief Patient Health Questionnaire (PHQ-9) Depression Scale.

Results. Participants appeared to be moderately depressed ($M = 14.75, SD = 4.52$). There was a significant indirect effect of IU to depressive symptoms ($b = 0.058$, CI (0.051–0.066)). FCV-19S was tested as a mediator in the relationship between IUS-12 (independent variable) and PHQ-9 (dependent variable). Partial mediation of fear of COVID-19 was supported ($b = 13$, CI (0.051–0.066), Sobel $z$-value = 14.93).

Conclusions. Depressive symptomatology affected study participants at a moderate level. IU was shown to be a significant predictor of depressive symptomatology with higher levels of IU being associated with more severe depressive symptoms. Fear of COVID-19 partially mediated this association. The mediation effect may be explained by the uncertainty around COVID-19-related health issues, which are reflected in the FCV-19S and cause worry and/or anxiety. Uncertainty related with other factors, such as the impact on the economy and education, not assessed by the FCV-19S, may explain part of the relationship between IU and depressive symptoms that is not mediated by FCV-19S.

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Practitioner Points

- Intolerance of uncertainty is related to depressive symptomatology, and fear of COVID-19 explains part of the relation.
- Fear of COVID-19 indicates worry and anxiety related to health issues.
- Psychotherapeutic interventions enhancing individuals’ capacity to endure uncertainty could be beneficial.
- Provision of simple and clear information by the authorities should be a priority issue.

The emergence of COVID-19 unexpectedly changed the lives of millions of people. A series of measures were stepwise imposed by the Greek government, after the first COVID-19 case had been detected on 26 February 2020, in Thessaloniki, the second largest city in Greece. On the very next day, the cancellation of the upcoming Carnival festivals was announced. From there on, gradual closure of all educational institutions, movie theatres, cafes, and all stores, except for food-supplying stores and pharmacies, was enforced. Finally, after the first COVID-19-related death had been recorded on March 12, a nationwide lockdown was imposed. Restriction of movement and travelling lasted from 23 March until 4 May, a period including the Orthodox Easter holiday (EODY, 2020b; Naftemporiki, 2020). A total of 2,145 cases and 99 COVID-19-related deaths were recorded while this study was being conducted (EODY, 2020a).

Based on experience from previous infectious disease outbreaks (SARS, MERS, Ebola), living in quarantine has a negative impact on mental health. Psychological responses range from distress reactions to more severe depressive symptoms, while fear of infection is also common (Brooks et al., 2020). Fear is a negatively valenced emotion, accompanied by high levels of arousal. Fear was the primary focus of research from 1953 to about 1975. Perceived threat and perceived efficacy were first identified as important variables by Rogers in 1975 and 1983. Perceived threat is composed of two dimensions: perceived susceptibility to the threat and perceived severity of the threat. While fear and threat are conceptually distinct (the former is emotion, and the latter is cognition), they are intricately and reciprocally related, in such the higher the perceived threat, the greater the experience of fear (Nabi & Myrick, 2019; Witte & Allen, 2000). In addition, inadequate information about the impact of the current pandemic on multiple aspects of daily life, such as on health, economy, and duration of restriction measures, has caused great uncertainty. Intolerance of uncertainty (IU), a trait-like construct, has been defined as ‘an individual’s dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty’ (Carleton, 2016; Carleton, Desgagné, Krakauer, & Hong, 2019). IU has been steadily associated with a variety of clinical conditions, originally with anxiety disorders and especially with generalized anxiety disorder (GAD), following the observation that anxiety involves uncertainty about a possible threat (Carleton, 2016; Jensen, Cohen, Mennin, Fresco, & Heimberg, 2016).

Depression has also been linked to IU (Carleton, 2016). However, this association has not been fully elucidated and remains therefore in dispute (Khawaja & McMahon, 2011). One line of research supports the view that when anxiety is accounted for, the association between depression and IU does no longer maintain statistical significance due to the high comorbidity between depression and anxiety (Jensen et al., 2016). According to another view, based on the fact that depression has diachronically been linked to an opposite cognitive status, that is pessimistic certainty (Dupuy & Ladouceur, 2008), it has been suggested that the relationship between depression and IU may be mediated by repetitive cognitive processes such as worry and rumination (Yook, Kim, Suh, & Lee, 2010).
The current pandemic has undoubtedly led people to a great amount of worrying related to fear of COVID-19 infection and the associated consequences. In a recent study, fear of COVID-19 was found to mediate the relationship between IU and mental well-being (Satici, Saricali, Satici, & Griffiths, 2020). The aim of this study was to further explore the relationship between IU and depression, especially under the aspect of this novel, universally dominant fear. In this respect and according to the available literature, the following hypotheses were formulated: i) IU would be positively associated with depressive symptomatology and ii) the relationship between IU and depressive symptomatology would be mediated by fear of COVID-19.

Methods

Participants
This cross-sectional study comprised part of a larger survey, conducted online during the acute phase of the pandemic (from 10 April until 13 April 2020), that is three weeks after a national lockdown had been imposed in Greece. The convenience sample used in this study consisted of 2,827 adults over the age of 18. Ethical approval was received from the Scientific Committee of the Review Board of the General Hospital 'Papageorgiou' (563/2020), prior to data collection. Participation was voluntary, anonymous, and confidential. A detailed information sheet was presented to the participants before entering the study. Informed consent was obtained by all participants before their enrolment.

Measures
In addition to the basic sociodemographic questions, participants completed the Greek versions of the following self-administered tools:

1. Intolerance of Uncertainty Scale (IUS-12): This 12-item scale constitutes a shorter version of the original Intolerance of Uncertainty scale assessing reactions to uncertainty, ambiguous situations, and the future (Carleton, Norton, & Asmundson, 2007; Mantzios, Wilson, Linnell, & Morris, 2015 Simou, Mpouzouka, Graikou, & Simos, 2016). Items are scored on a Likert scale ranging from 1 (not at all characteristic of me) to 5 (entirely characteristic of me). The IUS-12 demonstrated a stable two-factor structure, representing both anxious and avoidance components of IU. The first factor was named 'prospective anxiety' and the second 'inhibitory anxiety'. The Greek version’s confirmatory factor analysis resulted to the following parameters: \( \chi^2(54) = 1176.40, p < .001, \) RMSEA = 0.09, 90% CI = [0.08, 0.09], CFI = 0.86, TLI = 0.83, and SRMR = 0.05. Convergent validity was established by correlating IUS-12 with the Generalized Anxiety Disorder 7-item (GAD-7) scale \([r_p = .58, p < .001, 95\% CI (0.56, 0.61)]\). The items for IUS-12 had Cronbach’s alpha coefficient based on standardized items of 0.90.

2. Fear of COVID-19 Scale (FCV-19S): This is a 7-item scale assessing fear of COVID-19 (e.g., item 1, ‘I am most afraid of coronavirus-19’) based on a 5-point scale (1 = strongly disagree to 5 = strongly agree). Total scores range between 7 and 35. Higher scores reflect greater fear of COVID-19 (Ahorsu et al., 2020; Tsipropoulou et al., 2020). The items for FCV-19S had Cronbach’s alpha coefficient based on standardized items of 0.87.
3. Brief Patient Health Questionnaire (PHQ-9) Depression Scale: This is a 9-item scale used for the diagnosis of both major depression and subthreshold depressive disorder in the general population (Hyphantis et al., 2011; Kroenke, Spitzer, & Williams, 2001). The scale assesses depressive symptoms’ severity over the past two weeks on a 4-point severity scale (0 = not at all to 3 = nearly every day). Total scores range between 0 and 27 (cut-off scores: 0–4 = minimal or none; 5–9 = mild; 10–14 = moderate; 15–19 = moderately severe; 20–27 = severe). The items for PHQ-9 had Cronbach’s alpha coefficient based on standardized items of 0.84.

**Statistical analyses**

All analyses were performed by the Statistical Package of Social Science software version 26 (IBM Corp. Released, 2017). Demographic and clinical data were compared using ANOVA and t-tests for continuous variables and χ² for categorical variables. All needed transformation was completed before the analyses, and relevant statistical assumptions were met. Mediation analysis was used to test the mediation effect of FCV-19S on how IU affects depression.

**Results**

The majority of the study participants belonged in the age category of 18-30 years, had a university degree, and lived in a big city. Women reported greater IU compared with men.

### Table 1. Participants’ sociodemographic characteristics and IUS-12 mean scores

| Sociodemographic characteristics | Overall N | % | IUS-12 M | SD | Statistic |
|----------------------------------|----------|---|---------|----|-----------|
| **Gender**                       |          |   |         |    |           |
| Male                             | 697      | 25.3 | 30.33   | 9.01 | t = −8.58, df = 2750, p = .000, d = .00 |
| Female                           | 2055     | 73.7 | 33.94   | 9.79 |           |
| Total                            | 2752     | 100 | 33.02   | 9.75 |           |
| **Age**                          |          |   |         |    |           |
| 18–30                            | 1496     | 53.1 | 33.77   | 9.833| F(4,2813) = 5.12, p = .000, η²p = .01 |
| 31–45                            | 709      | 25.2 | 32.39   | 9.787|           |
| 46–60                            | 516      | 18.3 | 31.84   | 9.443|           |
| 61–75                            | 87       | 3.1 | 31.97   | 8.413|           |
| >75                              | 10       | 0.4 | 33.40   | 12.195|           |
| Total                            | 2818     | 100 | 33.02   | 9.748|           |
| **Educational level**            |          |   |         |    |           |
| Elementary school                | 12       | 0.4 | 34.17   | 10.39| F(5,2811) = 2.67, p = .020, η²p = .00 |
| Middle school                    | 30       | 1.1 | 32.90   | 10.27|           |
| High school                      | 837      | 29.7 | 32.65   | 9.75 |           |
| University                       | 1287     | 45.7 | 33.50   | 9.84 |           |
| MSc                              | 585      | 20.8 | 32.80   | 9.49 |           |
| PhD                              | 66       | 2.3 | 29.52   | 9.08 |           |
| Total                            | 2817     | 100 | 33.01   | 9.74 |           |
| **Residential area**             |          |   |         |    |           |
| Urban                            | 2167     | 77.3 | 33.17   | 9.68 | p = .239 |
| Small city                       | 306      | 10.9 | 32.21   | 9.81 |           |
| Rural                            | 330      | 11.8 | 32.77   | 10.06|           |
| Total                            | 2803     | 100 | 33.02   | 9.74 |           |

IUS-12 = Intolerance of Uncertainty Scale; M = mean; SD = standard deviation.
With regard to age, the highest IUS-12 scores derived from the youngest and the oldest participants. Individuals who did not complete but elementary school had the highest scores among other education groups. Finally, people living in big cities had higher IUS-12 mean scores, but without a statistical significance (Table 1).

According to the PHQ-9 scores, participants appeared to be moderately depressed \[ M = 14.75, SD = 4.52 \]. Based on PHQ-9 cut-off scores, 35.4% of the participants \( N = 1,002 \) reported none or minimal depressive symptoms, while 41.4% \( N = 1,169 \) reported mild, 18.2% \( N = 515 \) moderate, 4.5% \( N = 128 \) moderately severe, and 0.5% \( N = 13 \) severe depressive symptoms.

### Mediation analysis

In this analysis, the independent variable was IUS-12, the mediator was FCV-19S, and the dependent variable was PHQ-9. The mediation model started with the regression of IUS-12 on PHQ-9, ignoring the mediator FCV-19S \[ b = .54, t (2825) = 34.55, p < .001 \]. The second regression showed that IUS-12 significantly predicted FCV-19S \[ b = 0.42, t (2825) = 24.66, p < .001 \]. Next regression with IUS-12 and FCV-19S predicting PHQ-9 revealed that IUS-12 was a significant predictor of PHQ-9 when FCV-19S was included in the model \[ b = .41, t (2825) = 25.44, p < .001 \]. The standardized regression coefficient between IUS-12 and PHQ-9 was statistically significant, as was the standardized regression coefficient between FCV-19S and IUS-12. The standardized indirect effect was .03. We tested the significance of this indirect effect using bootstrapping procedures. Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was .058, and the 95% confidence interval ranged from 0.051 to 0.066. Thus, the indirect effect was statistically significant. Concluding, there was a significant indirect effect of IU to depressive symptoms. Partial mediation was supported \((.54)(.41) = 13, CI (0.051–0.066), \text{Sobel } z\text{-value} = 14.93\) (Table 2, Figure 1).

### Discussion

The COVID-19 pandemic constitutes a novel situation forcing people to deal with great uncertainty. Under these unpredictable conditions, studies of IU are of particular interest.

### Table 2. Mediation results for IUS-12 predicting PHQ-9 mediated by FCV-19S

| Regression 1* | Dependent | Independent | b   | SE  | CI              | t      | p      |
|--------------|-----------|-------------|-----|-----|-----------------|--------|--------|
| Intercept    | IUS-12    | .54         | 0.03| [14.674, 16.731] | 34.55  | <.001  |
| Regression 2**| Intercept | FCV-19S    | .42 | 0.02| [8.064, 9.222]  | 24.66  | <.001  |
| Regression 3***| Intercept | PHQ-9      | .41 | 0.04| [11.207, 13.498]| 25.44  | <.001  |
|              | IUS-12    | .30         | 0.03| [0.324, 0.452]  | 11.89  | <.001  |

Note. \(^* R^2 = .297; \ ^{* *} R^2 = .227; \ ^{* * *} R^2 = .331.\)
Apart from its general association with anxiety and depression (Carleton, 2016), IU was shown to predict health-related anxiety and inadequate use of problem-focused coping mechanisms during previous pandemics (Taha, Matheson, Cronin, & Anisman, 2014). Fear of infections has historically imposed a major psychological burden on humans. Being invisible, life-threatening, and possibly socially stigmatizing, viruses induce great discomfort to individuals (Pappas, Kiriaze, Giannakis, & Falagas, 2009). The emergence of COVID-19 led to the development of new psychometric instruments, such as the FCV-19S that was correlated with the Hospital Anxiety and Depression Scale (HADS), the Severity Measure for Specific Phobia-Adult scale (SMSP-A), and the Perceived Vulnerability to Disease Scale (PVDS) (Ahorsu et al., 2020; Soraci et al., 2020), indicating an association between COVID-19-related fear and anxiety/worry due to coronavirus.

Depression constitutes a major health issue with a lifetime risk of about 15-18% (Malhi & Mann, 2018). The distress posed on individuals during the pandemic is expected to exacerbate depressive symptomatology. According to studies conducted during the initial stage of the COVID-19 pandemic, about 16.5% of the population in China (C. Wang, Pan, et al., 2020) and about 23% of the population in Greece reported moderate-to-severe depressive symptoms (Parlapani et al., 2020). In our study, IU was shown to be a significant predictor of depressive symptomatology with higher levels of IU being associated with more severe depressive symptoms. It was suggested that IU may constitute a transdiagnostic factor contributing to a range of emotional disorders (McEvoy & Mahoney, 2011). Although the majority of studies reported a positive association between IU and depression (Carleton, 2016), this finding was not always confirmed (Khawaja & McMahon, 2011). Therefore, while IU has been systematically related to anxiety disorders, mainly GAD, the relationship between IU and depression remains inconsistent (Carleton, 2012) and may be more complex, since depression often manifests with anxious features and vice versa, clinical anxiety may emerge comorbid with depression (Malhi & Mann, 2018). Originally, IU had been related to worry, a cognitive strategy used by individuals with high IU to confront the unknown. Over time,
worry, as well as other types of repetitive negative thinking, such as rumination, has been considered possible underlying mechanisms that may not be limited to the emergence of GAD (Carleton, 2012). IU and depression were found to be indirectly related through trait anxiety and worry (Dar, Iqbal, & Mushtaq, 2017; Jensen et al., 2016; Swee, Olino, & Heimberg, 2019). Rumination has also been identified as a mediator, supporting the theory of pessimistic certainty. According to this view, individuals deal with IU by ruminating about negative outcomes and finally accepting them as a certainty, a mechanism leading to depression (Yook et al., 2010).

Recently, fear of COVID-19 was found to mediate the relationship between IU and mental well-being (Satici et al., 2020). To the best of our knowledge, this was the first study attempting to investigate the role of COVID-19-related fear as a mediator in the relationship between IU and depression. Contrary to our hypothesis, COVID-19-related fear was found to mediate this relation only partially. Taking into account that fear of COVID-19 involves worry and anxiety about contracting the virus and the COVID-19-related health consequences, it seems that the predictive value of IU upon depressive symptomatology during the pandemic is partly explained by the uncertainty around COVID-19-related health issues, causing worry and/or anxiety. Factors such as the long incubation period of the virus, the potential transmission from asymptomatic individuals, and the great number of confirmed cases and deaths compared with previous infectious disease outbreaks contribute to health-related uncertainty (Lauer et al., 2020; Wang, Wang, Chen, & Qin, 2020). However, the FCV-19S does not encompass negative thinking about other major issues caused by the pandemic. Great economic uncertainty, increasing unemployment, deregulation of the educational system, concerns about possible food and other product shortages, together with the uncertainty about the duration of restriction measures, and the possibility of reexperiencing a nationwide quarantine anytime soon pose additional stress (Baker, Bloom, Davis, & Terry, 2020; Nicola et al., 2020). All of the aforementioned COVID-19-related implications may be difficult for a person with high IU to tolerate, explaining part of the direct relationship between IU and depressive symptomatology that is not mediated by fear of COVID-19, assessed by the FCV-19S.

Conclusions
The COVID-19 outbreak has led to paramount levels of uncertainty around different aspects of daily life. In this study, high levels of IU were associated with more severe depressive symptoms. Moreover, fear of COVID-19 was found to partially mediate this association. The FCV-19S possibly reflects the uncertainty about COVID-19-related health issues causing worry and/or anxiety. Uncertainty around other important aspects of daily life, such as economy and education, crucial factors that are not evaluated by the FCV-19S, may explain part of the direct relationship between IU and depressive symptomatology that is not mediated by fear of COVID-19-related fear.

Conclusively, during crises such as the current pandemic, psychotherapeutic interventions aiming to augment individuals’ capacity to endure uncertainty could be beneficial. Meanwhile, the information provided by the authorities should not only aim at raising fear alone, but also aim at augmenting health-promoting behaviours (Nabi & Myrick, 2019).

Limitations
Due to the study’s cross-sectional design, correlations may be estimated, but attribution of causality was not possible. Administration of self-reported questionnaires may have
resulted in response bias. Lastly, convenience sampling used in this study may have limited results’ generalizability due to a ‘volunteer-effect’ and the potential under-representation of older, less educated, and socially disadvantaged individuals.

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**Author contributions**

Panteleimon Voitsidis (Writing – original draft; Writing – review & editing) Vasiliki Aliki Nikopoulou (Writing – original draft) Vasiliki Holeva (Investigation; Methodology; Supervision) Eleni Parlapani (Supervision; Writing – review & editing) Konstantinos Sereslis (Investigation) Virginia Tsiropoulou (Supervision) Panayiota Karamouzi (Investigation) Aikaterini Giakoulioudou (Methodology) Nektaria Tsopaneli (Writing – original draft) Ioannis Diakogiannis (Supervision)

**Conflict of interest**

The authors declare that they have no conflict of interest.

**Data availability statement**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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