Article


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Abstract: The COVID-19 pandemic, a period of uncertainty and risk, has presented a threat to people’s physical and mental health worldwide. Previous research has shown that pandemic-related uncertainty can contribute to individuals’ psychological distress and coping responses. Therefore, the aim of this study was to investigate the relationship between intolerance of uncertainty and risk perception (i.e., individual’s perceived likelihood of becoming infected both for themselves and people in one’s own country and perceived severity of the infection), and the mediating role of fear of COVID-19. This two-wave longitudinal study (T1 = April 2020; T2 = May 2020) involved 486 young adults (age range = 18–29 years; M_{age} = 23.84 ± 2.94). Participants provided demographic data as well as measures of intolerance of uncertainty, fear of COVID-19, and risk perception. Structural equation modeling showed that intolerance of uncertainty was indirectly related to risk perception through fear of COVID-19. The study confirms the central role of IU in fear management and, consequently, in determining individuals’ risk estimates.

Keywords: intolerance of uncertainty; risk perception; COVID-19; fear; young adults

1. Introduction

A worldwide health threat, such as the COVID-19 pandemic, generates heavy worries about one’s own and others’ health, concerns related both to one’s own income and the economic stability of entire countries, and even worries of everyday life, including habits and plans for the future. Specifically, regarding the COVID-19 pandemic, health-related worries have been exacerbated by the difficulty to control the spread of the virus and the wide diffusion of vehicles of infection in everyday life [1–5]. In addition, the social isolation imposed by the quarantine has heavily tested individuals’ abilities to tolerate uncertainty [6,7].

Intolerance of uncertainty (IU) refers to a negative disposition toward uncertain situations and events, with a pervasive and dysfunctional effect on the assessment of stressors and threats characterized by unpredictability, uncertainty and ambiguity. Intolerance of uncertainty is correlated with a difficulty to employ effective emotion regulation strategies and with adverse coping responses to threats [8–10].

In this sense, distress produced by uncertainty is an understandable reaction that is still extremely susceptible to degenerations [11] and thus requires high attention by researchers, clinicians and all the operators promoting mental health. Coping strategies undertaken in response to threats that are relatively predictable and confined, such as a diagnosis of a particular type of cancer or heart disease, can differ from those adopted in response to an ambiguous and uncertain threat, such as the possibility of a pandemic infection [10]. Additionally, despite a pandemic is a paradigmatic context of uncertainty, characterized by the impossibility to predict and program future events [5], uncertainty is not tolerated by everyone in the same way [9,10]. Evidence shows that these assumptions fit perfectly with...
strategies and responses observed yet in the face of the 2009 H1N1 pandemic [10] and now towards COVID-19 pandemic [5,11].

Previous literature underlined the role of IU as a vulnerability factor for the development of negative feelings (e.g., stress, anxiety and fear), destructive beliefs and appraisals about the risk and maladaptive ongoings in the individual process of coping with COVID-19 [3,12–14]. More specifically, previous studies found evidence of correlation between IU and fear, the prevailing negative emotion under threatening conditions and one of the strongest motivations to behavior changes [15–17]. This assumption is corroborated by studies showing that fear plays a role as a fundamental mediator between the dispositional condition of IU and the development of mental health issues during the COVID-19 pandemic [18–20]. Consequently, individuals with high levels of IU feel more fear toward the pandemic threat and this may foster psychological stress and maladaptive changes in health behaviors, in response to the highly uncertain phenomenon of COVID-19.

Moreover, many studies remark the strong connection between IU and risk perception as well as the psychological reaction to COVID-19 as a threatening situation [2,20–22]. This relationship is supported by the evidence toward the role of IU in compromising an adequate evaluation of a threat [10,23].

Furthermore, previous research has found that individuals with elevated healthy anxiety are more likely to cognitively overestimate their risk for illness [24], and this relationship was also confirmed for higher fear levels and higher risk perception during the COVID-19 pandemic [25]. Several theoretical perspectives attempted to explain the relationship between emotional response and assessment of risk. For example, the risk-as-feelings hypothesis [26] suggests that emotional responses (e.g., worry and anxiety) can influence cognitive evaluations about the probability of potential outcomes and can override cognitive, or rational, assessments of risk. Moreover, according to the appraisal-tendency framework [27], fearful people may tend to express pessimistic risk estimates and risk-averse choices.

Moreover, the consequences on decision making are complex: it is known that low risk perception related to a pandemic discourages health promoting behaviors [17], but, at the same time, many studies showed that people with high health anxiety and a severe risk perception also tend to report a variety of other maladaptive safety behaviors [2,3,28,29].

A special focus is needed on the examination of vulnerable groups that can be at risk of high stress reactions in response to the unpredictability events due to the pandemic, such as young adults, people in lower-income groups or facing job loss, and those with pre-existing health conditions [30–33]. It is worth noting that previous research reports have shown that the COVID-19 pandemic has affected women’s mental health more than men. Women reported higher levels of depression, anxiety and PTSD, and worse psychological adjustment than men, which also persisted after the earlier phase of the pandemic [34–36].

Previous literature explored the role of IU in psychological reactions to COVID-19 among children and adolescents’ population [2,22,37] and even the psychological consequences of COVID-19 among the young adults [7,38]. Nevertheless, there is still limited research attention to the impact of IU on young adults’ fear, worry and anxiety in response to COVID-19 and their subjective perception of risk related to the virus.

This study aims to fill this knowledge gap by investigating the relationship between IU and risk perception, and the mediating role of fear of COVID-19 among a sample of young adults. We hypothesized that higher IU would be related to higher fear of COVID-19 and in turn to higher risk perception.

2. Materials and Methods
2.1. Participants and Procedure

This study is part of a longitudinal three-wave (1 month apart) study with a follow up measure at one year [31]. It aimed at investigating the psychological distress during the COVID-19 pandemic and involved 3864 community participants (73.3% females, \(M_{\text{age}} = 36.55 \pm 4.76\) years). For the purposes of the current study, we examined a two-
wave panel data (i.e., T1 = between the 7 and 24 April 2020; during the first phase of the COVID-19 outbreak in Italy and T2 = between the 18 and 31 May 2020; during the second phase when the Italian restrictive measures were eased). Only young adults (age range: 18–29 years) who provided data both on T1 and T2 were included in the present study (n = 486). Participants’ demographic and health-related information is reported in Table 1. Participants completed an online survey on the Google Form web platform. The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of the University of Palermo. Informed consent was obtained from all subjects involved in the study.

Table 1. Participants’ demographic and health-related data (n = 486).

<table>
<thead>
<tr>
<th>Variables</th>
<th>M (SD)/n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>23.84 (2.94)</td>
</tr>
<tr>
<td>Gender, females</td>
<td>398 (81.9)</td>
</tr>
<tr>
<td>Level of education,</td>
<td></td>
</tr>
<tr>
<td>8 years of school</td>
<td>2 (0.4)</td>
</tr>
<tr>
<td>13 years of school</td>
<td>197 (40.5)</td>
</tr>
<tr>
<td>Degree/post-degree</td>
<td>287 (59.1)</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
</tr>
<tr>
<td>Unoccupied/student/retired</td>
<td>378 (77.8)</td>
</tr>
<tr>
<td>Occupied</td>
<td>108 (22.2)</td>
</tr>
<tr>
<td>Own COVID-19 diagnosis, yes</td>
<td>3 (0.6)</td>
</tr>
<tr>
<td>COVID-19 diagnosis among relatives, yes</td>
<td>100 (20.6)</td>
</tr>
</tbody>
</table>

2.2. Measures

IU was measured at T1 using the Intolerance of Uncertainty Scale-Revised (IUS-R) [8,39]. The IUS-R consists of 12 items (e.g., I can’t stand it when things happen suddenly). Participants are asked to rate the extent to which each statement applies to themselves on a five-point Likert scale ranging from 1 (not at all characteristic of me) to 5 (entirely characteristic of me). The IUS-R provides scores on two domains (i.e., prospective and inhibitory) and a total score. Only the total score has been used in this study. Higher scores correspond to a higher IU. In the current study, the IUS-R showed good internal consistency (α = 0.880).

Fear of COVID-19 was measured at T1 using the Fear of COVID-19 Scale [40]. This scale includes 7 items (e.g., When I watch news and stories about Corona on social media, I become nervous or anxious). Participants indicate their level of agreement with the statements using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This scale provides a total score, and higher scores correspond to higher fear of COVID-19. In the current study, this scale showed good internal consistency (α = 0.871).

Risk perception was evaluated at T2 using three questions: “How likely do you think you will be directly and personally infected with the coronavirus in the next 6 months?”; “How much do you agree or disagree with the following statement: getting sick with coronavirus can be very serious”, and “How much do you agree or disagree with the following statement: the coronavirus will not affect a great many people in the region where I currently live”. Participants indicate their level of agreement with the statements using a seven-point Likert scale ranging from 1 (not at all likely/totally disagree) to 7 (very likely/strongly agree). A total score was created by averaging responses across the three items (mean inter-item correlation = 0.177).

2.3. Plan of Data Analysis

As a preliminary step in data analysis, univariate distributions (i.e., skewness and kurtosis) were examined. The internal consistency of the scales (Cronbach’s α and mean inter-item correlation. Mean inter-item correlations between 0.15 and 0.50 indicate adequate
internal consistency [41]), as well as descriptive statistics and bivariate correlations (i.e., Pearson correlations) were computed.

In order to test the hypotheses of the study, structural equation modeling (SEM) with ML estimation was used. The indirect effect (i.e., mediated effect) of IU on COVID-19 risk perception through fear of COVID-19 was assessed using a bootstrapping procedure with 5000 resamples [42]. 95% confidence interval (CI) for the estimate that does not include the zero value indicates a significant indirect effect at the $p < 0.05$ level. Data analyses were conducted using SPSS v. 22 and Mplus v. 7.0.

3. Results
3.1. Preliminary Analyses

All variables had a normal distribution ($|Sk| < 1$ and $|Ku| < 1$). Descriptive statistics and correlations between variables are reported in Table 2.

Table 2. Descriptive Statistics and Correlations Between the Variables of the Study.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intolerance of Uncertainty</td>
<td>36.79</td>
<td>9.38</td>
<td>0.096</td>
<td>-0.307</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2. Fear of COVID-19</td>
<td>14.86</td>
<td>5.68</td>
<td>0.903</td>
<td>0.375</td>
<td>0.316**</td>
<td>-</td>
</tr>
<tr>
<td>3. COVID-19 Risk Perception</td>
<td>4.55</td>
<td>1.02</td>
<td>-0.320</td>
<td>-0.061</td>
<td>0.078</td>
<td>0.287**</td>
</tr>
</tbody>
</table>

Note: ** $p < 0.01$.

3.2. Testing the Hypotheses

The hypothesized model accounted for 10% ($R^2 = 0.100$) and 8% ($R^2 = 0.082$) of the variance in fear of COVID-19 and COVID-19 risk perception, respectively. IU significantly predicted fear of COVID-19, and fear of COVID-19 significantly predicted COVID-19 risk perception. The direct path from IU to COVID-19 risk perception was not significant. There was a significant indirect effect through fear of COVID-19 (indirect effect = 0.092, $p < 0.001$, 95% CI: 0.062–0.122), indicating that fear of COVID-19 mediated the association between IU and COVID-19 risk perception (Figure 1).

Figure 1. Mediation Analysis. Standardized estimates are reported. Solid lines represent significant paths, whereas dotted lines represent non-significant paths. T1 = between 7 and 24 April 2020. Time 2 = between 18 and 31 May 2020. *** $p < 0.001$.

4. Discussion

The current longitudinal study examined the relationship between IU and COVID-19 risk perception, and the mediating role of fear of COVID-19 among young adults. The results of the study showed that IU was indirectly related to risk perception through fear of COVID-19. However, we did not find a significant direct path from IU to COVID-19 risk perception.

These results showed that the young adults who reported higher levels of IU also reported high fear of COVID-19 and, consequently, greater COVID-19 risk perception. As suggested by previous studies, the COVID-19 unpredictability was considered one of the most stressful aspects of the actual pandemic especially for specific, vulnerable groups, such as young adults [30,33,38]. Lockdown was considered a life condition which heavily
tested the individual levels of tolerance of uncertainty and triggered negative emotions such as fear, anger, nervousness, sadness, and boredom [7,43].

Higher levels of IU can lead individuals to overwhelming emotions, by perceiving more problems than actually exist [10,23]. In this sense, as previously described, the IU is linked to how individuals interpret future uncertain situations [8–10,44] and it is related to distress management difficulties, anxiety and fear [45,46].

Many authors suggest that the construct of IU can be explained as a transdiagnostic factor contributing to negative affects [2,47,48] and our results seem to potentially corroborate this claim. More precisely, IU has been associated with dysfunctional fear and anxiety as related to a cognitive strategy used by individuals with high IU to manage the unknown; various studies confirm that IU is one of the main predictors of fear and anxiety also in the context of COVID-19 [3,12,14].

Our findings are in line with those reported in recent studies that examined the mediational role of fear of COVID-19. For example, Satici and colleagues [20] found that the relationship between IU and mental well-being was mediated by the fear of COVID-19, whereas Voitsidis and colleagues [18] found that fear of COVID-19 influenced the association between IU and depression.

As previously mentioned, young adults with difficulties in their emotional regulation ability can be considered a vulnerable group more exposed to develop several psychological problems [49,50]. In addition to the threat of the pandemic, they are also experiencing prolonged isolation, home confinement and family conflicts, which can lead to serious emotional problems [7,51–54]. Therefore, it is of great significance to explore the mechanism by which negative emotions are generated in youths during the pandemic in order to help them regulate their emotions.

On the other hand, in our model COVID-19 risk perception corresponds to an emotional experience and consequent behavior as explained by the higher levels of fear of COVID-19 [55]. In this study, the COVID-19 risk perception variable was evaluated considering the real chance of being personally infected by COVID-19 and to what extent this risk can be a serious problem for personal health and for the Italian region where participants are currently living. In this context, the COVID-19 risk perception is linked to subjective assessment of the likelihood that a specified health problem can occur and to the awareness about its consequences [17,56,57]. In line with our findings, the uncertainty of the pandemic can trigger an exacerbation of negative emotions and especially fear which might lead to an increase in COVID-19 risk perception [15–17]. Recent studies have supported the assumptions about a significant correlation between uncertainty and fear for one’s own or loved ones’ health [3,12,20,21].

In conclusion, considering the central role of IU in distress management [45,46], anxiety and fear, as well as the power of IU to compromise fear extinction learning [58] and its ability to amplify risk estimates [17,55], the current results provide a potentially useful new path for future investigations: monitoring the levels of IU within the context of the pandemic in order to prevent the chronic irrational fear of COVID-19, and to stimulate adequate/realistic risk perceptions, in line with the actual status of the spread of the virus. This may encourage flexibility and adaptability in reacting to the fluctuating trend that characterizes the spread of a viral infection.

The study has several strengths. First, the contribution represents a prospective two-wave panel study, which is temporally consistent with the first two COVID-19 phases of lockdown in Italy. Secondly, modifiable psychological factors, such as fear of COVID-19 and risk perception were assessed. Thirdly, the recruitment of participants was conducted in several regions of Italy, a country dramatically affected by COVID-19 in 2020. However, the results of this study should be considered in light of its limitations. To our knowledge it is the first study which examined the impact of IU and fear of COVID-19 on risk perceptions, and therefore further research is needed to replicate the findings in a larger and more cross-cultural sample of the general population [59]. Further limitations of this study include the short time-lag between the two data collections, so the findings of the study need to
be verified by a longitudinal design with longer time interval between measurements. Additionally, COVID-19 risk perception was evaluated by three questions specifically developed for this study. Future studies should use more valid and reliable COVID-19 risk perception measures. Finally, as data were collected through self-report measures, it may be possible that the data may be influenced by social desirability bias. Finally, the data were collected in 2020 and the findings cannot generalize to risk perceptions in 2021, when COVID-19 vaccines became available [60].

5. Conclusions

The results from this longitudinal study highlighted that intolerance of uncertainty was indirectly related to risk perception through fear of COVID-19, so confirming the key role of IU in fear management and in individuals’ risk evaluation.

These findings have some clinical and social implications to take into account. By dealing with the constructs of tolerance of uncertainty and negative emotions we might help youngsters to cope more promptly with all negative consequences due to a worldwide emergency or economic dissatisfaction, fostering empowerment and problem-solving skills. Interventions focused on improving effective emotional coping strategies might strengthen people’s resilience towards the unpredictable adverse events on psychological wellbeing. Moreover, policymakers should provide appropriate psychological and social support services to improve youngsters’ emotional well-being, aimed at organizing and increasing resources to support individuals and families both during and after any lockdown measure and in the definition of their future.

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Institutional Review Board Statement: The study was conducted according to the ethical standards of the Italian Psychological Association (AIP), as well as the Declaration of Helsinki. It received the approval of the Ethics Committee of the University of Palermo (protocol code n. 3/2020-25 May 2020).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data available on request from the authors.

Conflicts of Interest: The authors declare no conflict of interest.

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