What drives beliefs in COVID-19 conspiracy theories? The role of psychotic-like experiences and confinement-related factors

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ABSTRACT

Rationale: The COVID-19 pandemic is a worldwide threat to public health and the global economy. The climate of fear and uncertainty associated with the pandemic has fostered the emergence of a wide range of COVID-19 conspiracy theories that have the potential to shape public opinion and hinder the effective dissemination of valid information. Beliefs in conspiracy theories have been associated with maladaptive personality traits such as schizotypy and paranoia, as well as other non-psychotic psychological characteristics (e.g., social isolation, stress).
Methods: An online survey was conducted to examine the associations between beliefs in COVID-19 conspiracy theories and psychotic-like experiences in a Portuguese community sample ($N = 438$), while also addressing the role of sociodemographic variables, psychological outcomes (e.g., stress, affective states), confinement-related factors (e.g., confinement conditions/behaviors), and pandemic-related factors (e.g., health concerns, financial issues).
Results: Findings suggest that psychotic-like experiences are associated with beliefs in COVID-19 conspiracy theories, particularly perceptual abnormalities and persecutory ideation. Moreover, increased health-related concerns and reduced education levels also seem to be liability factors for these conspiracy beliefs.
Conclusion: These results add important insights into how the adherence to illogical and erroneous disease-related arguments can be related to psychotic-like experiences. COVID-19 conspiracy theories are yet another major challenge that governments and policymakers must contemplate when defining strategic directions to manage the current and future pandemics.

1. Introduction

COVID-19 is a potentially serious acute respiratory disease caused by the new SARS-CoV-2 coronavirus, which first appeared in Wuhan (China) at the beginning of December 2019. On March 11, 2020, the World Health Organization (WHO) declared this disease as a pandemic, due to the alarming transmission rates and the lack of action, with no vaccines or biological therapies available at that time proven to be efficient to fight the virus (World Health Organization, 2020). With the exponential increase in the number of affected individuals, COVID-19 became a significant threat to public health and the global economy, which lead to the introduction of diverse contention measures as a strategy to fight virus propagation (Habibzadeh and Stoneman, 2020; Wang and Zhang, 2020).

According to WHO, government-mandated lockdown and its impact on people's habits and routines may lead to an increase in the prevalence of depressive disorders, anxiety, and post-traumatic stress (Chew et al., 2020; Ho et al., 2020; Jakovljevic et al., 2020; World Health Organization, 2020; Shigemura et al., 2020; Wang et al., 2020). Generally, these disorders last for a long time and can be exacerbated or first experienced due to the uncertainties caused by the lack of knowledge regarding the disease, as well as due to the lack of transparency by the

government and health professionals (Assari and Habibzadeh, 2020; Brooks et al., 2020; Dong and Bouey, 2020; Lei et al., 2020).

In the case of the COVID-19 pandemic, and unlike other pandemics in the past, there was constant dissemination of sensationalist reports regarding the new coronavirus, mostly because of social media, thus intensifying public doubts as well raising fear, panic, and distrust (Depoux et al., 2020; Kelly, 2020; Mash et al., 2018; Mian and Khan, 2020; Pfefferbaum et al., 2014; Smith et al., 2020). This climate of uncertainty leaves an open door for alternative explanations of pandemic-related events, ultimately leading to the emergence of conspiracy theories associated with the COVID-19 pandemic. These theories mainly result from the actions of a wide, insidious, and efficient international conspiratorial network, conceived to perpetrate acts that are harmful, intentionally deceiving, and aim to manipulate the public opinion for its self-benefit (Douglas et al., 2017). Recently, an existential threat model of conspiracy theories has been proposed. This model draws from the fact that empirical literature states that conspiracy theories tend to surge particularly following distressing societal events that threaten our existence. (van Prooijen and Douglas, 2017) Thus, an existential threat can be defined as *'feelings of anxiety or uncertainty following events that call one's values, one's way of life, or even one's existence into question'* (van Prooijen, 2020). An unknown and fast-spreading pandemic with uncertain outcomes is a perfect candidate for a significant existential threat.

Beliefs in conspiracy theories are related to maladaptive personality traits, schizotypy, and paranoia (Darwin et al., 2011; Stieger et al., 2013). Previous evidence suggests that psychotic experiences are positively related to conspiracy theories receptivity and ontological fantastic stories, as these experiences potentiate the development of bizarre or abnormal thoughts and non-conventional logic, which in turn might be associated with impaired perceptive decision-making as well as causal, probabilistic, and logical thinking (Mækelæ et al., 2018; McLean et al., 2017; Swami et al., 2014; van Elk, 2015). Psychotic-like experiences are reduced forms of hallucinatory perceptions and illusory beliefs that are similar to the symptoms of psychotic disorders, yet not reaching the limit of clinical significance considering its lower intensity and persistency, not being associated with clear incapacity or significant psychological suffering (Demmin et al., 2017; Linscott and van Os, 2013; Seiler et al., 2020). Recent studies emphasize that these experiences are present in a substantial proportion of the general population, with a prevalence of approximately 7%, from which 80% are transitory psychotic experiences and 20% represent persistent experiences (Kaymaz et al., 2012; van Os and Reininghaus, 2016). It is important to highlight that from the individuals who experience persistent psychotic-like experiences, 7% develop a psychotic disorder, with an annual transition rate below 1% (Kaymaz et al., 2012). Moreover, several researchers demonstrated that psychotic experiences are also a risk factor for several psychiatric disorders such as depression, anxiety, post-traumatic stress, and personality disorders (DeVylder et al., 2015; Kirli et al., 2019), as well as poor mental health outcomes such as attempted suicides (Yates et al., 2019), psychological suffering (Kelleher et al., 2015), functional impairment (Oh et al., 2018), chronic physical conditions (Oh et al., 2019), higher need for psychiatric intervention, and higher mortality risk (Kelleher et al., 2012). For all these reasons, understanding the interaction between psychotic-like experiences in community samples and beliefs in conspiracy theories may be critical to tackle the ongoing growth of conspiracy theory believers, which truly may hinder societal efforts to manage the pandemic, including the generalization of treatment and vaccines.

Other non-psychotic psychological characteristics have also been linked to beliefs in conspiracy theories, namely the lack of self-esteem, social isolation, and a higher susceptibility to stress and anxiety, jointly with the feelings of uncertainty, uneasiness, and helplessness (Barron et al., 2014; Bentall et al., 2014; Freeman and Bentall, 2017; Goreis and Voracek, 2019; Raihani and Bell, 2018). Moreover, confinement-related experiences and behaviors may also play a role in conspiracy theory beliefs. The confinement experience during the pandemic was largely dependent on additional factors such as housing conditions, the caregiver role, health-related concerns, among others. The pandemic produced significant changes in work-related variables, as several people had changes in their monthly income or started teleworking during this period (Bennett et al., 2019; Michalska da Rocha et al., 2018). Thus, it is also important to understand how these variables may contribute to COVID-19 conspiracy theory beliefs.

The current study aimed to examine the association between beliefs in COVID-19 conspiracy theories and psychotic-like experiences within the community, while also addressing the role of sociodemographic variables, psychological outcomes (e.g., stress, affective states), confinement-related factors (e.g., confinement conditions/behaviors), and pandemic-related factors (e.g., health concerns, financial issues).

2. Methods

2.1. Participants

A community sample of Portuguese residents, aged 18 or older, was recruited during the first COVID-19 pandemic lockdown to complete an online survey. Participant recruitment for this survey was completed using a non-list-based, non-probability sample. The essential sampling design recommendation is to spread the recruitment as broadly as possible, which requires several recruitment channels to be used to reach different online communities (Callegaro et al., 2015). Thus, subjects were recruited using advertisements on social media (mainly Facebook), personal contacts (snowball sampling; Bindah, 2019), and mailing lists. The survey was advertised in several communities and groups to create a sample as heterogeneous as possible. A total of 547 participants completed the questionnaire, but only 438 participants were included for the full analysis as we decided to exclude participants who were not in full confinement (e.g., due to their profession or any other factor). Non-confined subjects did not fully experience the restrictions related to lockdown which would constitute a major confounding factor in the results. Recruitment was only performed after the consent and approval of the Ethics Committee of ESS-P. PORTO. All participants agreed with the electronic consent form, prepared according to the Declaration of Helsinki (Associação Médica Mundial, 2013). The survey was anonymous, and the participants did not receive any sort of compensation.

2.2. Measures

The online survey had an estimated length of 15–20 min and included the following: sociodemographic questionnaire (age, sex, education levels, employment status); questions addressing behaviours and events related to the COVID-19 pandemic, including confinement experience; COVID-19 Conspiracy Theories Questionnaire, developed by the research team; control question regarding general conspiracy theories (Lantian et al., 2016); standardized questionnaires to assess psychotic-like experiences in the community as well as other constructs of interest (e.g., perceived stress, satisfaction with activities, etc.). Participants were instructed to provide answers regarding their confinement period (i.e., "since you started your confinement did you experience …"). Reliability coefficients for the included questionnaires were assessed using Cronbach's alpha and previously recommended cut-off criteria (Kline, 2016). The survey could only proceed if all the questions were properly answered to prevent missing values and a biased dataset. With this information in mind, the current study has no missing values to report.

Questionnaire for behaviors and events related to the COVID-19 pandemic: a survey developed by the research team to understand confinement-related behaviors (outings during confinement, telework, online social contacts, tobacco, and alcohol consumption), conditions (confinement experience, confined alone or not, caregiver for children

and/or elderly, available outdoor spaces), as well as pandemic-related factors (information about the pandemic, health-related concerns, having/not having an infected relative, employment status, and budget changes).

COVID-19 Conspiracy Theories Beliefs Questionnaire: 11-item survey conceived by the research team to assess the degree of belief in conspiracy theories related to COVID-19. In this questionnaire, the higher the score, the higher are conspiracy theories beliefs. Each item refers to a conspiracy theory about the pandemic. An online search was conducted by the research team to identify the most common conspiracy theories that were being debated after the start of the pandemic (e.g., COVID-19 is a biologic weapon created in a laboratory setting, big pharmaceutical companies created COVID-19 to achieve huge profits from vaccines). The Portuguese and English versions of this questionnaire can be found at https://osf.io/c82gs/. Participants rated each statement on a 7-point scale, ranging from "completely false" (1) to "completely true" (7). A total score was computed by adding the rating for each individual item, with higher scores representing stronger beliefs in COVID-19 conspiracy theories. Cronbach's alpha for this questionnaire indicated good internal consistency ($\alpha = 0.886$). Furthermore, the COVID-19 Conspiracy Theories Beliefs Questionnaire was highly correlated with ratings of overall belief in conspiracy theories, $r(436) = 0.582$, $p < 0.001$, 99% CI [0.493, 0.658], proving evidence for construct validity.

Community Assessment of Psychotic Experience (CAPE): a self-report questionnaire that assesses the frequency of psychotic-like experiences in the general population (Brenner et al., 2007). It is composed of 15 items, framed within three domains: persecutory ideation (5 items), bizarre experiences (7 items), and perceptive abnormalities (3 items). Each item is rated on a 4-point Likert scale, with 0 representing "never" and 3 meaning "almost always". Items were summed to compute a total score that can range from 0 to 45, with higher scores representing a larger frequency of psychotic experiences. CAPE is a promising screening tool and has been assessed in different validations across several settings. It has shown good reliability and evidence confirming its correlated three-factor model as well as the alternative bi-factor model (Bukenaite et al., 2017). In the current sample, CAPE- Total Score displayed good internal consistency ($\alpha = 0.867$). Moreover, the Cronbach's alpha for the CAPE Bizarre Experiences also indicated good internal consistency ($\alpha = 0.824$), although internal consistency was only acceptable for CAPE Persecutory Ideation and CAPE Perceptive Abnormalities ($\alpha = 0.773$ and $\alpha = 0.766$, respectively).

Perceived Stress Scale (PSS): 13-item questionnaire to assess self-perceived global stress, that is, how frequently certain life events might induce stress (Cohen et al., 1983; Trigo et al., 2010). Each item is rated on a 5-point Likert scale, ranging from "never" to "many times". On this scale, the higher the score, the higher is the self-perceived stress. In the current sample, Cronbach's alpha for the PSS indicated good internal consistency ($\alpha = 0.870$).

Emotional Regulation Questionnaire (ERQ): 10-item questionnaire to assess the degree to which any given individual uses certain strategies to regulate his/her emotions, namely cognitive reappraisal and expressive suppression strategies which are scored separately (Gross and John, 2003; Vaz et al., 2008). Each item is rated on a 7-point Likert-type scale, ranging from "I totally disagree" to "I totally agree". In this questionnaire, higher scores equate to larger usage of the strategies within each domain. In the current sample, Cronbach's alpha was poor for the Cognitive Reappraisal domain ($\alpha = 0.532$) and unacceptable for the Expressive Suppression ($\alpha = 0.426$). Thus, results regarding this questionnaire should be interpreted with caution.

Personal Well-Being Index (PWBI): 8-item self-report survey to measure subjective well-being, which is achieved by assessing individuals' satisfaction regarding several life domains (e.g., health, life goals, safety, future, spiritual connection, etc; Ribeiro and Cummins, 2008). Each question is rated from 0 to 10, with 0 corresponding to "Totally unsatisfied" and 10 representing "Totally satisfied". In this index, the higher the score, the higher is the subjective well-being. In the current sample,

Cronbach's alpha for the PWBI indicated good internal consistency ($\alpha = 0.858$).

Activities Questionnaire: 4-items developed by the research team to assess participation and satisfaction regarding productive, leisure, and self-care activities during confinement. Each item was rated using a 7-point Likert scale, ranging from "totally disagrees" to "totally agrees". In this questionnaire, the higher the score, the higher is the participation in different activities. In the current sample, internal consistency for this questionnaire was acceptable ($\alpha = 0.730$).

Positive and Negative Affect Schedule (PANAS): 10-item self-report measure assessing positive and negative affective states (5 items for each domain; Galinha and Pais-Ribeiro, 2005). Each item is rated on a 5-point scale and a total score is computed for each domain. In this scale, the scoring is divided into two categories, namely the positive affect score and the negative affect score. Better scores equate to higher positive or negative affective states, respectively. In the current sample, internal consistency was acceptable for the PANAS Positive domain ($\alpha = 0.769$) and good for the PANAS Negative domain ($\alpha = 0.840$).

Three-Item Loneliness Scale: 3-item scale to quantitatively measure isolation/loneliness by evaluating relational connection, social connection, and self-perception of isolation. This measure is scored using a scale with three answer categories, namely "almost never/never" (1 point), "sometimes" (2 points), and "frequently/always" (3 points). The higher the total score (adding item-level scores), the greater the degree of isolation/loneliness (Hughes et al., 2004; Russell et al., 1980). In the current sample, internal consistency for this questionnaire was acceptable ($\alpha = 0.739$).

Satisfaction, Alertness, Timing, Efficiency and Duration Questionnaire (SATED): a self-report measure assessing sleep-related health by considering sleep satisfaction, alert state during waking hours, as well as sleep length and efficiency (Dalmases et al., 2019; Martins, 2017). This scale includes 6 items, assessed using a 5-point scale. In this questionnaire, higher scores indicate better sleep-related health. In the current sample, Cronbach's alpha was questionable for this scale ($\alpha = 0.695$).

2.3. Statistical analysis

Regarding descriptive statistics, absolute and relative frequencies were computed for categorical variables, while mean and standard deviation are reported for continuous variables. For inferential analysis, independent samples t-tests were used to compare several groups (e.g., males vs. females, caregivers vs. non-caregivers during confinement) regarding COVID-19 Conspiracy Theories Beliefs. For this test, the homogeneity of variance assumption was also examined using the Levene's F test. When this assumption was not met, the Welch's *t*-test was used instead. Zero-order correlations were also used to test the association between scores on the COVID-19 Conspiracy Theories Beliefs and other continuous variables (e.g., COVID-19 information levels, confinement experience ratings, scores on other scales). According to the guidelines of Gignac and Szodorai (2016), the magnitude of zero-order correlations was classified as small (≥ 0.10), moderate (≥ 0.20), and large (≥ 0.30). Finally, as the normality assumption was not met for several analyses, bootstrapping (bias-corrected accelerated, 1000 samples) was used to estimate test statistics and confidence intervals for the independent samples t-tests and zero-order correlations.

Contingent on the results found in the previous inferential tests, a regression model was prepared including all variables significantly and marginally associated with COVID-19 Conspiracy Theories Beliefs. Before implementing the regression model, the following assumptions were tested: normally distributed residuals (examination of the distribution of standardized residual and identification of influential cases); homoscedasticity (Koenker test and visual inspection of the scatter plot of absolute standardized residuals by standardized predicted values); collinearity (correlation matrix between independent variables); multicollinearity (tolerance and variance inflation factor). The regression model was adjusted after assumption testing if required. All analyses

were implemented using IBM SPSS (version 26). To control for multiple analyses, significance levels were set at 0.01, although *p*-values between 0.01 and 0.05 were considered marginally significant. Finally, a post hoc power analysis was conducted in GPower version 3.1.9.7 (Faul et al., 2009) to examine whether the final regression model had adequate power to detect the effect size for the association between psychotic-like experiences and COVID-19 Conspiracy Theories Beliefs.

3. Results

3.1. Sociodemographic variables and COVID-19 conspiracy theories

Sample characteristics are described in Table 1. Sex was not associated with differences on COVID-19 Conspiracy Theories Beliefs, *t* (436) = 0.031, *p* = 0.969, M$_{diff}$ 99% CI [−2.886, 3.321], as both males and females displayed quite similar scores (*M* = 21.51, *SD* = 9.77 vs. *M* = 21.54, *SD* = 10.38, respectively). COVID-19 Conspiracy Theories Beliefs were negatively and moderately associated with education years, *r* (436) = −0.203, *p* < 0.001, 99% CI [−0.328, −0.069]. There was no significant correlation between COVID-19 Conspiracy Theories Beliefs and age, *r* (436) = 0.076, *p* = 0.114, 99% CI [−0.061, 0.218]. Also, the family budget (before the pandemic) was not associated with differences on COVID-19 Conspiracy Theories Beliefs, *r* (436) = −0.041, *p* = 0.352, 99% CI [−0.156, 0.066].

3.2. Psychotic-like experiences, psychological distress, and COVID-19 conspiracy theories

Results addressing how psychotic-like experiences, psychological distress, and other clinical measures are related to COVID-19 Conspiracy Theories Beliefs are presented in Tables 2 and 3.

There was a statistically significant moderate and positive association between CAPE Total score and COVID-19 Conspiracy Theories Beliefs, *r* (436) = 0.271, *p* < 0.001, 99% CI [0.132, 0.412]. Moreover, each CAPE domain was also positively and moderately related to COVID-19 Conspiracy Theories Beliefs, namely CAPE Bizarre Experiences, *r* (436) = 0.227, *p* < 0.001, 99% CI [0.090, 0.360], CAPE Persecutory Ideation, *r* (436) = 0.223, *p* < 0.001, 99% CI [0.086, 0.365], and CAPE Perceptive Abnormalities, *r* (436) = 0.271, *p* < 0.001, 99% CI [0.071, 0.451].

Besides psychotic-like experiences, there was also a marginally significant positive and small association between COVID-19 Conspiracy Theories Beliefs and PANAS Negative score, *r* (436) = 0.120, *p* = 0.024, 99% CI [- 0.010, 0.255], meaning that negative affect may be linked to beliefs in COVID-19 Conspiracy Theories. Higher ERQ Cognitive Reappraisal was also marginally associated with COVID-19 Conspiracy Theories Beliefs, *r* (436) = 0.117, *p* = 0.017, 99% CI [−0.005, 0.244]. Other scale scores such as ERQ Expressive Suppression, PSS, and PANAS

Table 1
Sample characteristics (*n* = 438).

	Mean ± SD	Min - Max
Age	34.79 ± 14.41	18–83
Education Years	15.20 ± 3.54	1–25
	Groups	**n (%)**
Sex	*Female*	343 (78.3%)
	Male	95 (21.7%)
Education Level	*Elementary School*	2 (0.5%)
	Middle School	10 (2.3%)
	High School	127 (29%)
	College Education	299 (68.3%)
Employment Status (before the pandemic)	*Unemployed*	15 (3.4%)
	Student	161 (36.8%)
	Stay at home	6 (1.4%)
	Employed	242 (55.2%)
	Retired	14 (3.2%)

Table 2
Zero-order correlations.

Psychotic-Like Experiences and Psychological Distress - Correlation Analysis			
	r	**p**	**99% CIs**
CAPE Total	0.271	<0.001	[0.132, 0.412]
CAPE Bizarre Experiences	0.227	<0.001	[0.090, 0.360]
CAPE Persecutory Ideation	0.223	<0.001	[0.086, 0.365]
CAPE Perceptive Abnormalities	0.271	<0.001	[0.071, 0.451]
PSS	-0.010	0.848	[-0.127, 0.121]
ERQ Cognitive Reappraisal	0.117	0.017	[-0.005, 0.244]
ERQ Expressive Suppression	0.057	0.255	[-0.076, 0.183]
PANAS Positive	-0.021	0.681	[-0.153, 0.103]
PANAS Negative	0.120	0.024	[-0.010, 0.255]

Confinement-Related Factors - Correlation Analysis			
	r	**p**	**99% CIs**
Confinement Rating	0.034	0.596	[-0.121, 0.196]
Smoking Frequency During Confinement	0.129	0.024	[-0.014, 0.273]
Alcohol Consumption During Confinement	0.052	0.387	[-0.085, 0.193]
Activities Questionnaire	0.073	0.153	[-0.069, 0.193]
3-item Loneliness Scale	0.078	0.149	[-0.048, 0.190]
Sleep Quality (SATED)	-0.072	0.207	[-0.234, 0.064]

Pandemic-Related Factors –- Correlation Analysis			
	r	**p**	**99% CIs**
COVID-Related Health Concerns	0.158	0.003	[0.012, 0.292]
COVID-Related Information Levels	-0.091	0.143	[-0.244, 0.076]
Pandemic-Related Financial Concerns	0.189	<0.001	[0.057, 0.328]
Pandemic-Related Degree of Budget Reductions*	0.149	0.054	[-0.045, 0.347]
Concern for Family Member with COVID-19**	0.219	0.090	[-0.163, 0.491]

p-value corrected due to heterogeneity of variances; **n = 59 (only included participants that had a family member with COVID-19).

Positive were not significantly related with COVID-19 Conspiracy Theories Beliefs, as well as psychiatric history, psychological treatment, and psychiatric family history (*p* > 0.05 for all).

3.3. Confinement-related factors and COVID-19 conspiracy theories

Although participants that reported not being in confinement (*n* = 109) were not included in the full analysis, it was still relevant to compare them with participants in confinement (*n* = 438) regarding COVID-19 Conspiracy Theories Beliefs. There were no significant differences between both groups, *t* (545) = 1.593, *p* = 0.108, M$_{diff}$ 99% CI [−1.258, 5.351], although descriptive statistics suggest that participants in confinement displayed slightly lower scores in the COVID-19 Conspiracy Theories Beliefs Questionnaire in comparison to non-confiners (*M* = 21.53, *SD* = 10.24 vs. *M* = 23.50, *SD* = 11.37, respectively).

Results regarding the role of confinement-related factors in COVID-19 Conspiracy Theories Beliefs are presented in Tables 2 and 3. There was a marginally significant difference in COVID-19 Conspiracy Theories Beliefs regarding leaving the house during the confinement, *t* (436) = −2.218, *p* = 0.025, MD 99% CI [−6.982, 0.638]. More specifically, participants that left their house during the confinement displayed higher scores in the COVID-19 Conspiracy Theories Beliefs Questionnaire in comparison to participants that reported not leaving (*M* = 21.75, *SD* = 10.37 vs. *M* = 18.48, *SD* = 7.56, respectively). Finally, there was also a statistical trend for a small positive association between

Table 3
Group comparisons.

Psychotic-Like Experiences and Psychological Distress - Group Comparison						
	Yes *Mean ± SD (n)*	*No* *Mean ± SD (n)*	*t*	*p*	*Mean Difference*	*99% CIs*
Psychiatric History	22.12 ± 12.73 (n = 34)	21.48 ± 10.02 (n = 404)	-0.274	0.797	-0.635	[-7.1754.365]
Psychiatric Family History	20.64 ± 9.12 (n = 53)	21.65 ± 10.39 (n = 385)	0.770	0.434	1.013	[-2.350, 4.185]
Psychological Treatment	19.70 ± 9.39 (n = 43)	21.73 ± 10.32 (n = 395)	1.326	0.186	2.034	[-2.105, 5.565]
Confinement-Related Factors - Group Comparison						
	Yes *Mean ± SD (n)*	*No* *Mean ± SD (n)*	*t*	*p*	*Mean Difference*	*99% CIs*
Leaving the House	21.75 ± 10.37 (n = 409)	18.48 ± 7.56 (n = 29)	-2.218	0.025	-3.265	[-6.982, 0.638]
Living Alone	24.49 ± 14.17 (n = 35)	21.28 ± 9.80 (n = 403)	-1.302	0.213*	-3.210	[-10.706, 2.87]
House with Outdoors Space	21.74 ± 10.21 (n = 330)	20.91 ± 10.33 (n = 108)	-0.735	0.458	-0.829	[-4.061, 2.354]
Caring of Children	21.93 ± 9.97 (n = 104)	21.41 ± 10.33 (n = 334)	-0.469	0.622	-0.526	[-3.329, 2.271]
Caring of Elderly	21.95 ± 9.44 (n = 58)	21.47 ± 10.36 (n = 380)	-0.369	0.705	-0.480	[-3.875, 3.051]
Telework*	20.67 ± 8.67 (n = 165)	23.74 ± 11.20 (n = 77)	2.120	0.036	3.074	[-0.507, 7.123]
Pandemic-Related Factors – Group Comparisons						
	Yes *Mean ± SD (n)*	*Yes* *Mean ± SD (n)*	*t*	*p*	*Mean Difference*	*99% CIs*
Pandemic-Related Unemployment*	31.50 ± 16.28 (n = 12)	21.13 ± 9.06 (n = 230)	-2.165	0.070**	-10.37	[-23.742, 2.661]
Pandemic-Related Budget Reductions	22.68 ± 10.32 (n = 200)	20.57 ± 10.09 (n = 238)	-2.174	0.036	-2.104	[-4.552, 0.462]
Family Member with COVID-19	24.10 ± 11.76 (n = 59)	21.13 ± 9.94 (n = 379)	-1.880	0.061	-2.970	[-7.267, 0.880]

*n = 242 (included only employed participants before the pandemic); **p-value corrected due to heterogeneity of variances.

COVID-19 Conspiracy Theories Beliefs and smoking frequency during confinement, r (436) = 0.129, p = 0.024, 99% CI [−0.014, 0.273]. Several confinement-related variables were not associated with COVID-19 Conspiracy Theories Beliefs, namely confinement experience rating, alcohol consumption, activities questionnaire scores, loneliness and living alone, housing with outdoor space, caring of children or elderly, and sleep quality (p > 0.05 for all).

Finally, participants that transitioned to telework showed marginal differences in COVID-19 Conspiracy Theories Beliefs when compared with those who did not, t (240) = 2.120, p = 0.036, MD 99% CI [−0.507, 7.123]. Teleworkers displayed less beliefs in COVID-19 Conspiracy Theories in comparison to participants that did not work from home (M = 20.67, SD = 8.67 vs. M = 23.74, SD = 11.20, respectively).

3.4. Pandemic-related factors and COVID-19 conspiracy theories

Findings addressing the role of pandemic-related factors in COVID-19 Conspiracy Theories Beliefs are presented in Tables 2 and 3. There was a statistically significant positive and small correlation between COVID-Related Health Concerns and COVID-19 Conspiracy Theories Beliefs, r (436) = 0.158, p = 0.003, 99% CI [0.012, 0.292]. Conversely, COVID-related information levels, having a family member diagnosed with COVID-19, and concern levels for that family member were not associated with scores on COVID-19 Conspiracy Theories Beliefs (p > 0.05 for all).

Moreover, there was also a statistically significant small and positive association between pandemic-related financial concerns and COVID-19 Conspiracy Theories Beliefs, r (436) = 0.189, p < 0.001, 99% CI [0.057, 0.328]. There was also a marginally significant difference in COVID-19 Conspiracy Theories Beliefs regarding pandemic-related budget reductions, t (436) = −2.174, p = 0.036, MD 99% CI [−4.552, 0.462]. More specifically, participants that experienced budget reductions displayed higher scores in the COVID-19 Conspiracy Theories Beliefs Questionnaire in comparison to participants that did not (M = 22.68, SD = 10.32 vs. M = 20.57, SD = 10.09, respectively).

Other financial variables such as pandemic-related unemployment and pandemic-related degree of budget reductions were not associated with COVID-19 Conspiracy Theories Beliefs (p > 0.05 for all).

3.5. Control analysis: time of questionnaire completion and government-imposed lockdown

As data collection lasted 2 months, between April and June of 2020, participants completed the questionnaire in different stages of government-imposed restrictions to manage the pandemic: during the emergency state (until the 2nd of May; n = 285) and post-emergency state (started on the 3rd of May; n = 153). The emergency state in Portugal started on the 22nd of March. During this state, the government imposed a lockdown where citizens saw some of their rights suspended such as the right to freely move in national and international territories, giving the government control over individual circulation. Citizens still had the right to move for professional purposes, healthcare, taking care of others, and getting food supplies. This law had other implications such as cult freedom, private economic initiative control, and resistance rights, as citizens were not allowed to resist government policies (e.g., the government was allowed to implement movement restrictions, such as preventing people from travelling outside their local area or leaving home without a "reasonable excuse", that is, work-related reasons or taking care of others). The emergency state was renovated 2 times, until the 2nd of May. The post-emergency state (calamity) started with a "deconfinement" plan composed of three phases: 4th of May, 18th of May, and 1st of June. During this time citizens still had several restrictions in Portugal, but they could already move freely as long as preventive strategies to reduce disease spreading were fulfilled. Telework was applied to everyone who gathered all the requirements to work from home. There were restrictions in public transportation (2/3 of the occupation), stores could only take five persons per square meter, and there was a mandatory use of masks. Thus, it was important to test whether our variables of interest were influenced by the timing when participants completed the questionnaire (during vs. post-emergency state). The major finding in this analysis was a trend for statistically significant differences between timepoints regarding COVID-19 Conspiracy Theories Beliefs questionnaire, t (436) = 2.718, p = 0.013, M$_{diff}$ 99% CI [−0.18, 5.163]. During the emergency state, participants displayed higher scores in the COVID-19 Conspiracy Theories Beliefs questionnaire in comparison to the post-emergency state period (M = 22.46, SD = 10.51 vs. M = 19.80, SD = 9.51, respectively). Similarly, COVID-19 related financial concerns were significantly different between both stages, t (436) = 2.800, p = 0.004, MD 99% CI [0.040,

0.856], as participants displayed higher financial concerns during the emergency state then post-emergency state ($M = 4.36$, $SD = 1.73$ vs. $M = 3.90$, $SD = 1.64$, respectively). Thus, the timing for completion (during vs. post-emergency state) was also added to the subsequently tested regression model.

3.6. Regression model for predictors of COVID-19 conspiracy theories beliefs

A regression model was prepared including as predictors all the variables significantly associated with COVID-19 Conspiracy Theory Beliefs from the previous analyses (education years, COVID-related health concerns, pandemic-related financial concerns, CAPE subscales) as well as variables that were only marginally significant (leaving the house, smoking frequency during confinement, pandemic-related budget reductions, ERQ Cognitive Reappraisal, PANAS Negative, timing for questionnaire completion).

Before proceeding with the final model, several assumptions were tested. Regarding the normally distributed residuals assumption, standardized residuals displayed an approximately normal distribution (skewness = 1.126; kurtosis = 1.867). Although Cook's distance did not suggest any influential cases (max. value = 0.099), 2 participants presented standardized residuals greater than |4.0|, suggesting that the regression equation did not accurately predict the dependent variable for these cases. Thus, these subjects were excluded from the analysis. The independence of errors assumption was not violated (Durbin-Watson statistic = 2.029). Furthermore, there was no evidence of collinearity (highest correlation between predictors was 0.577) or multicollinearity (lowest tolerance value was 0.535). Finally, the scatter plot with absolute standardized residuals by standardized predicted values suggested some degree of heteroscedasticity, which was further validated by the Koenker test, $\chi^2 (12) = 38.105$, $p < 0.001$. Thus, the regression model was run using the wild bootstrap, which does not assume homoscedasticity (Flachaire, 2005; Wu, 1986).

Results from the final regression model are presented in Table 4. A significant regression equation was found, $F (12,423) = 8.931$, $p < 0.001$, with an R^2 of 0.202. Education years was a significant predictor of COVID-19 Conspiracy Theory Beliefs, $B = -0.510$, $p = 0.001$, 99% CI

[-0.854, -0.204], meaning that for each less year of education, the COVID-19 Conspiracy Theories Beliefs score was 0.510 points higher. CAPE Perceptual Abnormalities was also a significant predictor of COVID-19 Conspiracy Theory Beliefs, $B = 3.041$, $p = 0.007$, 99% CI [0.062, 5.857], while CAPE Persecutory Ideation was only a marginally significant predictor, $B = 0.607$, $p = 0.034$, 99% CI [-0.158, 1.348]. Other marginally significant predictors included COVID-related health concerns, $B = 0.709$, $p = 0.041$, 99% CI [-0.067, 1.617], and smoking frequency during confinement, $B = 1.073$, $p = 0.039$, 99% CI [-0.229, 2.359], as well as timing for questionnaire completion, $B = 1.992$, $p = 0.025$, 99% CI [-0.202, 4.227], as completers during the emergency state scored 1.992 points higher in the COVID-19 Conspiracy Theories Beliefs questionnaire in comparison to participants that participated in the study post-emergency state.

A post hoc power analysis (for 12 predictors, $n = 436$) indicated that the R^2 change when CAPE subscores were added last to the model (R^2 change = 0.059) could be detected at alpha level of 0.01 and power of 0.981. Thus, there was more than adequate power to detect the effect size regarding the association between psychotic-like experiences and COVID-19 Conspiracy Theory Beliefs.

4. Discussion

Conspiracy theories related to the COVID-19 pandemic have become a worldwide issue that hinders the effectiveness of governments and health authorities in managing the spread of this virus. Thus, understanding which factors may predispose individuals to believe and act on these theories may be extremely useful for policymakers, health professionals, and even media outlets, allowing to develop more precise communication strategies and identifying high-risk individuals for non-compliance with disease-preventing measures. The current study aimed to assess how proneness to psychotic-like experiences is related to beliefs regarding conspiracy theories, whilst simultaneously accounting for other psychological outcomes (e.g., stress), confinement-related factors (e.g., confinement conditions), and pandemic-related factors (e.g., health concerns). This is a novel hypothesis for dealing with the current and future pandemics that adds important insights into how the adherence to illogical and erroneous disease-related arguments may be contingent on proneness to psychotic-like experiences.

Most conspiracy theories are not based on credible evidence but rather on inaccurate thoughts and frequently illogical ones. Psychotic experiences enhance the development of these types of thoughts (Andrade, 2020; Mækelæ et al., 2018; McLean et al., 2017). For instance, Barron et al. (2018) suggested that there are positive and direct correlations between the belief in conspiracy theories and schizotypy domains, namely strange beliefs, magical thinking, and reference ideas (Barron et al., 2014, 2018; March and Springer, 2019; Swami et al., 2014; van der Tempel and Alcock, 2015). The current results are in line with this previous evidence as we found positive associations between psychotic-like experiences and beliefs in conspiracy theories related to COVID-19. More specifically, the most strongly associated domain was psychotic perpetual abnormalities, followed by persecutory ideation experiences.

According to previous evidence, a stronger association with persecutory ideation would be expected, since this psychotic domain is widely linked to conspiracy thinking styles (Joseph and Siddiqui, 2020). A recent systematic review identified two major groups of predictors for conspiracy beliefs, those being pathological (e.g., paranoia) or socio-political focus (Goreis and Voracek, 2019). Paranoid tendencies are associated with cognitive bias that negatively influences causal and probabilistic thinking, as well as the flexibility of beliefs (Barron et al., 2018; Freeman et al., 2020). A very interesting investigation conducted by Larsen et al. (2021) emphasizes the relationship between delusion-proneness and paranoia, which can predict conspiracy theories when controlling facets of schizotypy (Larsen et al., 2021). Similarly, conspiracy theories have also been associated with highly rigid belief

Table 4
Predictor of Beliefs in COVID-19 Conspiracy Theories: Regression Model.

	B	SE B	B 99% CIs	β
Time of Questionnaire Completion (During vs. Pos-Emergency State)	1.992	0.867	[-0.202, 4.227]	0.096*
Education Years	-0.510	0.130	[-0.854, -0.204]	-0.182**
Leaving the House (Yes/No)	3.043	1.728	[-1.229, 6.839]	0.077
COVID-Related Health Concerns	0.709	0.335	[-0.067, 1.617]	0.117*
Smoking Frequency During Confinement	1.073	0.503	[-0.229, 2.359]	0.109*
Pandemic-Related Financial Concerns	1.300	0.878	[-0.899, 3.552]	0.066
Pandemic-Related Degree of Budget Reductions	0.266	0.307	[-0.639, 1.100]	0.046
CAPE Persecutory Ideation	0.607	0.288	[-0.158, 1.348]	0.130*
CAPE Bizarre Experiences	0.030	0.228	[-0.568, 0.675]	0.008
CAPE Perceptive Abnormalities	3.041	1.224	[0.062, 5.857]	0.179**
QRE Cognitive Reappraisal	0.150	0.080	[-0.071, 0.327]	0.082
PANAS Negative	-0.064	0.125	[-0.360, 0.207]	-0.028
R^2			0.202	
F			8.931**	

*$p < 0.05$; **$p < 0.01$.

systems that are not very permeable to change. Wood et al. (2012) linked conspiracy beliefs to a broad ideologic system, which justifies any belief associated with it, constituting a base ground to understand and assimilate new social conditions. It seems that beliefs in conspiracy theories follow a single-logic approach, through which beliefs on any given theory constitute a way of sustaining other theories (Galliford and Furnham, 2017; Swami et al., 2011). Thus, persecutory ideation and beliefs in conspiracy theories may share an underlying vulnerability for biased thinking styles, which ultimately leads to an increased likelihood of producing inaccurate working models of real-world events, especially when there is information (even if false) supporting these misrepresentations.

Perceptual abnormalities were the psychotic domain more clearly associated with COVID-19 conspiracy theories. Dagnall et al. (2015) merged perceptual abnormalities into a mixed domain called cognitive-perceptual measures, which were reported through three questionnaires (Schizotypal Personality Questionnaire, Delusions Inventory and The Launay–Slade Hallucination Scale; Dagnall et al., 2015). The authors found that beliefs in conspiracies, within the sub-clinical population, were mostly associated with delusional thinking style, although the pooled cognitive-perceptual factor still explained 32% of the variance. One can argue that the role of perceptual abnormalities on conspiracy theories may also be mechanistically related to other psychotic-like experiences. Langdon and Coltheart (2000) proposed that there must be some damage to sensory and/or attentional-orienting mechanisms which causes aberrant perception, arguing that this same process underlies not only perceptual abnormalities but also persecutory ideation, bizarre experiences, or other types of delusional thinking . Ben-Zeev et al. (2011) examined a cognitive model of persecutory ideation that suggested that negative emotions, perceptual anomalies, and recent life events are important predictors of experiencing persecutory ideation. Hence, the current results regarding perceptual abnormalities may not be interpreted separately from the complete psychotic architecture, as this domain is intrinsically connected to delusional experiences. A recent study, conducted in Germany, also indicates that endorsement in conspiracy theories is associated with reasoning bias in delusions (Kuhn et al., 2021).

Another important insight is that confinement due to the COVID-19 pandemic may have also played a role in the clear association between perceptual abnormalities and beliefs in conspiracy theories. Confinement-related social isolation may have led to feelings of loneliness that could increase human agency detection, therefore making people more prone to hear voices or perceive human agency in nonhuman stimuli (Epley et al., 2008). As participants were requested to report on psychotic-like experiences during confinement, it is feasible to postulate that these abnormal perceptual experiences were enhanced throughout this period, ultimately leading to a more critical role in their association with beliefs in conspiracy theories.

Besides the clear association between psychotic-like experiences, the current work also unveiled additional factors that seem to play a critical role in COVID-19 conspiracy theories. For instance, concern with one's own health was associated with beliefs in conspiracy theories. The lack of effective responses to tackle the pandemic as well as the difficulty in transmitting clear and consistent information regarding a widely unknown disease may have enhanced feelings of uncertainty and concern in the general population. Consequently, this could potentiate the lack of trust in governmental authorities and the health system, which may eventually foster the vulnerabilities that make people believe in conspiracy theories (Douglas et al., 2017). Evidence suggests that reduced knowledge about any given topic increases the probability of beliefs in conspiracy theories (Lukić et al., 2019; Nyhan, 2010; Warner and Neville-Shepard, 2014). When exposed to highly complex and ambiguous situations, individuals who do not have sufficient knowledge regarding a topic have a tendency to use a heuristic processing to formulate their opinions, which raises the likelihood for conspiracy-related beliefs (Gilens, 2001; Kuklinski and Quirk, 2000;

Lupia et al., 1998). Consistently, when faced with different perspectives and arguments, individuals tend to use a directional bias to strengthen their pre-existing visions (Kahneman et al., 2005; Taber and Lodge, 2006).

In 2020, van Prooijen wrote about a new theoretical model of conspiracy theories in which he explains how life/existence-threatening events lead to beliefs in conspiracy theories. People want to make sense of their social and physical environment and that is why this model articulates that existential threat is at the root of conspiracy theories. van Prooijen goes further and claims that once a conspiracy theory is set, it can be a source of existential threat in itself, stimulating further conspiracy theorizing and contributing to a generalized conspiracist mindset (van Prooijen, 2020).

Another important although expected finding was the negative association between education levels and beliefs in COVID-19 conspiracy theories. Previous evidence clearly suggests that beliefs in conspiracy theories are positively related to lower analytic thinking, open-mindedness, and, consequently, intuitive thinking. Individuals who are less educated tend to attribute agency and intentionality where it does not exist (Douglas et al., 2016; Ståhl and van Prooijen, 2018; van Prooijen, 2018). Despite the role of education on beliefs in conspiracy theories being expected, this is particularly relevant during a pandemic outbreak. Decision-makers and other critical societal agents should be aware of this issue and implement communication strategies that can be easily understood across all education levels. This approach would be extremely valuable not only to increase knowledge about the virus, its treatment, and required preventive measures, but also to demystify misinformation whenever necessary.

Interestingly, the current results also indicated that the timing of response played a role on beliefs in COVID-19 conspiracy theories, as levels were higher during the government-mandated emergency state. There are two major factors that may explain these findings. First, in the initial stage of the pandemic, information was far more inconsistent, which left more room for the proliferation of conspiracy theories. Secondly, the emergency state in Portugal introduced a wide set of restrictions that led to a lack of structured routine and loss of (in-person) social interaction, which may have consequently played a role on psychological well-being (e.g., loss of motivation, meaning, and self-worth; Dubey et al., 2020; Swami et al., 2014; Williams et al., 2020). Taking together, it is easy to understand how these factors, which were most likely at their peak during the emergency state, contributed to feelings of threat and insecurity, increasing the likelihood for beliefs in conspiracy theories (DiGrazia, 2017).

Finally, there was also a positive association between tobacco consumption and beliefs in COVID-19 conspiracy theories. Although the current work is cross-sectional and it is not possible to infer any sort of causality between constructs, it can be postulated that it is more likely that the intrinsic vulnerability to believe in conspiracy theories may drive the increase in tobacco consumption and not the other way around. Some authors suggest that nicotine may reduce anxiety and depressive-like behavior (Choi et al., 2015; Xiao et al., 2018), although this is much more a common-sense idea that most people have ((Lawless et al., 2015). Thus, as suggested by the "self-medication" hypothesis of drug abuse (Chilcoat and Breslau, 1998; Henningfield et al., 2016; Robinson et al., 2009), accentuated depressive/anxiety symptomatology inherently leads to an increase in tobacco consumption. Moreover, it is also fairly well known that tobacco consumption is very high in patients with psychotic disorders (Sagud et al., 2019). Thus, it is possible to postulate that individuals more likely to believe in conspiracy theories may also display an increased vulnerability for tobacco consumption, especially in high-stress situations where tobacco is seen by its users as a tool to reduce negative affective states.

5. Limitations

There are several limitations regarding the present study. Recent

research has shown that although conspiracy theories about COVID-19 may load on one common factor, their predictors and consequences may differ depending on the specific content of the conspiracy theories. For instance, conspiracy theories can be focused on increasing vs. downplaying the COVID-19 threat (Imhoff and Lamberty, 2020). Our COVID-19 Conspiracy Beliefs Questionnaire was developed using theories that were widely spread at the time of data collection, only a few months after the pandemic outbreak in Portugal. More recently, some studies started to raise emerging topics such as conspiracy theories regarding vaccines or mask wearing impact (Suthaharan et al., 2021; Ullah et al., 2021). However, it is without a doubt very important to have future studies that weigh the same number of items addressing conspiracy theories increasing vs. downplaying the COVID-19 threat, and even creating subscales within this instrument. Data collection was conducted using an online survey which ultimately does not allow to represent the whole population. There are potential participants that do not have access to the Internet or were not exposed to our online recruitment/advertising endeavors, not allowing them to be recruited for this study, which reduces sample heterogeneity. Furthermore, the questionnaire was fairly extensive which might have predisposed participants to be less engaged at times and produce less reliable answers. Most importantly, this cross-sectional study does not allow to establish causal relationships between the measured constructs. Ideally, it would be necessary to assess how psychotic-like experiences evolved across time (e.g., pre- and post-confinement). Additional longitudinal studies would be valuable to understand how different stages of pandemic control and government management influence psychotic-like experiences as well as other outcomes related to psychological well-being. It would also be relevant to understand these phenomena in clinical populations, including people diagnosed with psychotic disorders. Finally, the initial correlation analysis also indicated a trend for a positive association between beliefs in conspiracy theories and COVID-related budget changes and financial concerns, although these associations were not significant in multiple regression analysis. The working-age population is particularly facing uncertainties and constant concerns due to pandemic-related economic changes, which potentiates negative future perspectives that affect their mental health and well-being (Creed and Klisch, 2005). Thus, future studies should further assess how work-related factors may moderate the vulnerability to beliefs in COVID-19 conspiracy theories, psychotic-like experiences, and other psychological distress factors, as this likely produces indirect costs that can be lessened through effective social protection systems.

6. Conclusions

COVID-19 conspiracy theories are yet another major challenge that governments and policymakers must contemplate when defining strategic directions to manage the current pandemic. The current study suggests that psychotic-like experiences are clearly associated with beliefs in COVID-19 conspiracy theories, particularly perceptual abnormalities and persecutory ideation. This finding is particularly interesting as it is focused on psychotic experiences in the community, assessed with an instrument specifically designed for this purpose. Moreover, increased health-related concerns and reduced education levels also seem to be liability factors for valuing these theories. These findings also contribute to the understanding of COVID-19 conspiracy theories in a Portuguese sample, a country where information about this topic is lacking. Future studies should further refine the role of psychotic-like experiences on these beliefs and explore additional factors (e.g., financial and work-related factors) that can help us to understand how COVID-19 conspiracy theories have become a major worldwide misinformation source, hindering the transmission of factful and meaningful information to the community.

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