Research paper

Predicting PTSS in general population during COVID-19 pandemic: The mediating role of health anxiety

Ainhoa Coloma-Carmona [*], José Luis Carballo

Center for Applied Psychology, Department of Health Psychology, Miguel Hernández University, Avenida Universidad s/n, Elche 03202, Spain

A B S T R A C T

Background: Despite health anxiety (HA) is associated with higher incidence of anxiety disorders, no studies have examined the association between this variable and the increased levels of Post-Traumatic Stress Symptoms (PTSS) reported during COVID pandemic.
Methods: This study was conducted online between April and May 2020. Data were collected from 468 men and women from the Spanish general population. Sociodemographic and COVID-19-related data, health anxiety, PTSS, fear of becoming infected, social support, sleep problems and past/current psychological/psychiatric history were assessed. The mediating effect of HA when predicting PTSS was explored with mediational analyses. Moderated mediational analyses were also performed to test if receiving psychological treatment during pandemic changes the mediating effect of HA.
Results: Prevalence of PTSS was higher in high-scorers in HA ($p<.01$). High HA was also more likely to be reported by women, individuals with sleep problems, frequently fear of getting infected, and those who have previously received psychological treatment ($p<.01$). HA mediates the relationship between PTSS and the following predictors of PTSS: sleep problems, psychiatric history and fear of getting infected. Being under psychological treatment did not moderate the mediating effect of health anxiety.
Limitations: Further longitudinal studies with bigger sample sizes are needed to examine the causal relationship between HA and PTSS after COVID-19 pandemic.
Conclusions: Our findings suggest that HA could influence the psychological consequences of the pandemic. Screening of HA could be useful to identify people with heightened risk of developing PTSS during pandemic.

1. Introduction

After the outbreak of coronavirus disease (COVID-19), the reduction of the spread of the coronavirus and the medical treatment of the severe cases has been, without a doubt, the first line of action against the pandemic. However, previous virus outbreaks (Ebola, Australian equine influenza, SARS epidemic, etc.) showed that exposure to these stressors and to quarantine situations not only produce physical health concerns but it also has an important psychological impact with extremely high social and economic costs (Brooks et al., 2020; Kleber, 2019; Van Bortel et al., 2016).

Recent studies (Casagrande et al., 2020; Forte et al., 2020; Liu et al., 2020) have considered COVID-19 outbreak as a traumatic event, according to DSM-5 criteria, since people are exposed to unexpected death of a loved one and threats of death due to the infectious disease. Exposure to traumatic events commonly lead to development of

post-traumatic symptoms, such as negative affect, insomnia, hypervigilance, fear or avoidance of traumatic triggers, a few weeks after the traumatic event (Kleber, 2019). If these symptoms cause a significant impairment in functioning and persist for more than one month after trauma exposure, the diagnosis of Post-traumatic Stress Disorder (PTSD) is considered (American Psychiatric Association, 2013). In the context of an ongoing pandemic, this PTSD diagnosis should be carefully considered since COVID-19 pandemic does not fit into the current diagnostic criteria for PTSD (Asmundson and Taylor, 2021; Bridgland et al., 2021; North et al., 2021). However, evidence supports that PTSD-like symptoms, or better called post-traumatic stress symptoms (PTSS), can also appear during the ongoing traumatic event and as a consequence of anticipating future stressors, such as becoming ill or losing a loved one (Bridgland et al., 2021).

During the past months, increased rates of PTSS and stress-related disorders have been found worldwide (Cai et al., 2020;

González-Sanguino et al., 2020; Liang et al., 2020; Luo et al., 2020; Pappa et al., 2020; Rodríguez-Rey et al., 2020; Xiao et al., 2020). PTSS have been observed in those who faced higher levels of exposure to the disease, such as survivors of COVID-19 or healthcare workers (Amerio et al., 2020; Park et al., 2020; Serafini et al., 2020; Tella et al., 2020; Xiao et al., 2020). But, surprisingly, anxiety and PTSS have progressively emerged also in general population subjected to restrictive measures such as social distancing or isolation (Forte et al., 2020).

Since empirical evidence indicates that early psychological interventions could minimize the risk of maintaining trauma symptoms (Roberts et al., 2019), there have been efforts to investigate which factors seem to be associated with these rates of psychiatric morbidity, in order to target them more effectively. Fear of becoming infected, lower social support, previous psychiatric illness, younger age, female gender, lower education levels, unemployment or infected relatives/friends with COVID-19 are some of the common risk factors (González-Sanguino et al., 2020; Taylor et al., 2020a; Serafini et al., 2020; Vindegaard and Benros, 2020; Xiong et al., 2020). Out of all of them, fear experienced during COVID-19 has received special attention (Ahorsu et al., 2020; Nikopoulou et al., 2020). Even it is an adaptive emotion, when it is excessive can also led to negative consequences at individual- and community-level, such as panic, stress and maladaptive behaviors like xenophobia or panic shopping (Mertens et al., 2020). Its importance is such that a lower ability to regulate fear responses has been associated with the development of PTSD (Gonzalez and Martinez, 2014; Maeng and Milad, 2017).

Moreover, fear of illness and death is the central feature of health anxiety, which is a vital variable in pandemic contexts (Stamu-O'Brien et al., 2020). Health anxiety is an excessive worrying about one's health, characterized by the interpretation of bodily sensations or changes as symptoms of a serious disease (Asmundson et al., 2010). The concept of health anxiety and hypochondriasis have been widely used interchangeably, since former DSM-IV-TR diagnoses (APA, 2002) conceptualized severe and persistent health anxiety as the somatoform disorder (Muse et al., 2010). However, this construct has been also theorized as a multidimensional phenomenon with variable intensity that does not necessarily indicate psychopathology (Asmundson and Fergus, 2019; Ferguson, 2009).

Health anxiety response to disease-related stress can vary between individuals and, whether if it is low or high, it has a crucial impact on the consequences of COVID-19 pandemic. Because of their tendency to misinterpret bodily sensations, individuals with high trait health anxiety tend to experience higher levels of fear of getting infected and, in turn, are at greater risk of developing psychological problems (Landi et al., 2020; Li et al., 2020; Rajkumar, 2020). To that regard, health anxiety has been pointed out as a risk factor for virus anxiety (Jungmann and Witthöft, 2020), COVID-19 distress (Landi et al., 2020) and COVID-19 Stress Syndrome (Taylor et al., 2020b). Previous studies also suggest that health anxiety influences people's behavior during pandemics (e.g. non-compliance of prevention measures or overuse of health services) and it is associated with a greater tendency to pay attention to threats (Asmundson and Taylor, 2020; Cannito et al., 2020; Özdin and Bayrak Özdin, 2020; Taylor, 2019).

Despite this evidence, there is a lack of studies that specifically examined the relationship between this variable and the presence of higher PTSS, according to DSM-5 criteria (Lebel et al., 2020; Vindegaard and Benros, 2020). Moreover, to the best of our knowledge, there are no studies that examine health anxiety as potential mediator of the relationship between risk factors (e.g. demographic or psychological variables) and PTSS.

Just as it is important to better understand the onset of these symptoms to develop preventive strategies and targeted interventions, the two main objectives of the present study were (1) to examine the relationship between health anxiety and PTSS during the current pandemic and (2) to explore factors associated with higher levels of health anxiety.

Based on the aforementioned evidence, the following exploratory hypotheses were tested:

Hypothesis 1: High-scorers in health anxiety and PTSS will be significantly associated with female gender, younger age, lower education levels, unemployment and higher levels of COVID-19 exposure compared to individuals with low scores in health anxiety.
Hypothesis 2: High-scorers in health anxiety and PTSS will be significantly associated with poor social support, previous or present psychological/psychiatric history and higher fear of becoming infected compared to individuals with low scores in health anxiety.
Hypothesis 3: Health anxiety levels would mediate the association between demographic, psychological and COVID-19-related variables and PTSS.
Hypothesis 4: Receiving psychological treatment during the pandemic would moderate the mediating effect of health anxiety on PTSS.

2. Methods

2.1. Participants and study design

Since, at the time of the study, there were no data available of prevalence of PTSS during COVID-19 pandemic, sample size was calculated with an estimated prevalence of 50%, a 5% margin of error and a 95% confidence level using SampSize program. Minimum sample size required was 385 participants. A total sample of 468 men and women from the Spanish general population participated in this cross-sectional study. Inclusion criteria were: (1) age above 17 years, and (2) living in Spain during COVID-19 crisis. Exclusion criteria were as follows: not living in Spain during the outbreak and not signing informed consent.

Participants were recruited between April and May 2020, while the country was under lockdown, through a two-phase sampling design. First, participants were recruited via the following social platforms: Facebook, Instagram, WhatsApp and LinkedIn. To avoid over- or under-representation of any specific group in the sample and to minimize the bias of non-probability sampling, 10 initial participants ("seeds") were selected to initiate the survey link distribution. Seeds were selected purposively to be diverse with regard to geographical, occupational status, age category and gender characteristics. In the second stage, sample was recruited via institutional electronic mailing lists. All participants were directed to an external survey website (*preventept.com),* which was created at the beginning of the research. The website host information about the aim of the study, the Participant Information Statement text and a link to the survey, which could be completed after signing the Informed Consent Form. The online questionnaire was displayed as a chat screen, simulating a conversation-like interaction, using chatbot technology. Previous studies have pointed out that the use of chatbots screening tools to assess health-related variables is cost-effective (Espinoza et al., 2020; Laranjo et al., 2018). Average time to complete the online questionnaire was about 5 min. The study was approved by the Committee of Research and Ethics of the Miguel Hernández University of Elche (reference number: DPS.JCC.01.20).

2.2. Measures

The following sociodemographic and COVID-19-related variables were assessed: age, gender, educational level, job status during the COVID-19 crisis, occupational risk of exposure to COVID-19 (e.g. frontline responders or healthcare workers), and self-reported COVID-19 symptoms or confirmed COVID-19 diagnosis. Fear of becoming infected by coronavirus was also assessed using a single item with a 5-point Likert scale ranging from "never" to "most of the time".

Health anxiety was evaluated with the Whiteley Index-7 (WI-7; Fink et al., 1999), which is a 7-item scale with dichotomous response format

(yes/no) that assess disease conviction, bodily preoccupation and disease fear. The WI-7 exhibited acceptable psychometric properties (Fink et al., 1999; Lee et al., 2011) and internal consistency in this study sample (examined by McDonald's coefficient omega) was ω=0.72. Higher scores in WI-7 indicate higher health anxiety and previous studies have used a sum score of ≥3–4 as indicative of relevant health anxiety (Clarke et al., 2008; Lee et al., 2011; Rosendal et al., 2007). Since there is no proper validation for the use of this cut-off in the context of COVID-19 pandemic, participants were grouped into lower or higher scorers using a cut-off of ≥4 (cut-off one standard deviation beyond the mean which was 1.87±1.78).

Previous studies (Bridgland et al., 2021; Casagrande et al., 2020; Forte et al., 2020; Liu et al., 2020) have considered COVID-19 outbreak as a traumatic event, according to DSM-5 criteria. Thus, in present study, post-traumatic stress symptoms related to COVID-19 were assessed with the PC-PTSD-5 for DSM-5 (Prins et al., 2016), which was completed in reference to this distressing event (e.g. In the past month, have you had nightmares about the coronavirus epidemic or thought about it when you did not want to?). The PC-PTSD screening tool was design to identify persons with probable PTSD (Prins et al., 2003) and has been widely used in online surveys (Contractor et al., 2019; Grant et al., 2016; Kolehmainen et al., 2015). The new DSM-5 version, which includes 5 items with binary answer (yes/no), has also demonstrated excellent diagnostic accuracy and clinical utility (Prins et al., 2016). A cut-off score of ≥3 is considered positive for PTSS (Prins et al., 2016). In this study sample, coefficient omega was ω=0.61.

Level of social support was evaluated with the Oslo 3-item Social Support Scale (OSSS-3; Dalgard et al., 2006), a widely used measure in health surveys which showed acceptable psychometric properties (Kocalevent et al., 2018). The scale is made up of three items with a Likert-type response format that assess the number of people the respondent feels close to, the sense of concern from other people, and ease of receiving practical help from neighbors. A score of ≤8 is considered as poor social support (Bøen et al., 2012). In this study sample, coefficient omega was ω=0.60.

Two ad-hoc items (yes/no) were used to detect participants who had undergone psychological treatment during the epidemic and participants with previous psychological or psychiatric history. Finally, sleep disturbance during the past month was assessed with a single-item measure with dichotomous answer (yes/no).

2.3. Statistical analyses

Data were analyzed using the SPSS 21.0 software. We performed bivariate analysis to assess differences in PTSS and health anxiety levels among selected demographic, psychological and COVID-19-related variables. The chi-squared test was used as the contrast statistic for non-continuous variables and Mann-Whitney U test in continuous variables (none of them follow a normal distribution, tested with the Kolmogorov-Smirnov test). Rosenthal's r and Cramer's phi effect sizes were also calculated.

Then, we tested if health anxiety mediates the relationship between PTSS and its significant predictors. For this purpose, we performed a simple mediation analyses using PROCESS Macro Model 4 (Hayes, 2017). Continuous variables were mean centered to avoid potential multicollinearity effects (Aiken et al., 1991). Additionally, a moderated mediation analysis was conducted. Early psychological interventions could minimize the risk of maintaining trauma symptoms (Roberts et al., 2019). Thus, receiving psychological or psychiatric treatment during COVID-19 pandemic was included as a moderator of the mediated relationship between PTSS and the predictor variables. PROCESS Macro Model 14 was used to estimate direct and indirect effects of the model. A bias-corrected bootstrapping procedure (10,000 random bootstrap resamples) was used for calculation 95% confidence intervals (CI) for mediation effects. As in previous researches (King et al., 2015), simple mediation and moderated mediation models were run separately for

each predictor variable, including the additional predictors as covariates. All analyses were performed at a confidence level of 95%.

3. Results

The total sample ($N = 468$) was composed of 333 women (71.2%) and 135 men (28.8%). Mean age was 36.98 (SD=13.47), ranging from 18 to 86. According to the WI-7 scores, 18.6% ($n = 87$) of the sample were high-scorers in health anxiety. Overall, 34% ($n = 159$) of the participants were screened as positive for PTSS. Eleven percent of the sample ($n = 51$) were working in a job with potential or direct exposure to COVID-19. Furthermore, 4.3% ($n = 20$) acknowledged that they were living with someone infected and 41.50% ($n = 194$) had friends or relatives with COVID-19 symptoms or diagnosis. Overall, 19.90% ($n = 93$) of the participants reported COVID-19 symptoms or diagnosis (Table 1).

More detailed data about psychological status, demographic and COVID-19-related characteristics of the sample are provided in Table 1.

3.1. Psychological status, COVID-19-related variables and demographic characteristics associated with health anxiety and post-traumatic stress symptoms

With respect to sociodemographic data, female gender was significantly associated with high scores in health anxiety (p=.046) and PTSS (p=.001). Sleeping problems and previous psychiatric/psychological history were also more prevalent in the group with high scores in health anxiety (p=.012) and those who screen positive in PTSS (p=.001). However, receiving psychiatric or psychological treatment during the pandemic was only significantly associated with PTSS (p=.001).

The largest effect sizes were found for PTSS and level of health anxiety. Around 28% ($n = 105$) of low-scorers in health anxiety met PTSS criteria, whereas 62% ($n = 54$) of participants with high-scores in health anxiety rated PTSS above cut-off points (p=.001). Moreover, health anxiety levels were significantly higher in the group with PTSS symptoms (p=.001).

Higher fear of becoming infected with coronavirus was also significantly associated with high scores in health anxiety (p=.001) and positive screening of PTSS symptoms (p=.001). In contrast, no significant

Table 1
Sample characteristics.

Variables	Total ($N = 468$)
Gender,% (n)	
Male	28.80 (135)
Female	71.20 (333)
Age, M±SD	36.98±13.47
Educational level,% (n)	
Elementary/primary	9.40 (44)
Secondary/technical	40 (187)
University or higher	50.60 (237)
Working during pandemic,% (n)	
On site	21.40 (100)
Work from home	20.10 (94)
Unemployed/temporary unemployed	32.90 (154)
Student	25.60 (120)
Level of COVID-19 exposure	
Potential/direct occupational exposure to COVID-19	10.9 (51)
Friends/relatives with COVID-19 symptoms/diagnosis	41.50 (194)
Living with someone infected	4.3 (20)
Reported COVID-19 symptoms/diagnosis	19.90 (93)
Sleep problems during pandemic,% (n)	58.80 (275)
Psychosocial variables	
Poor social support (OSSS-3 ≤ 8),% (n)	13.50 (63)
Previous psychiatric history,% (n)	35.30 (165)
Under current psychiatric/psychological treatment,% (n)	6 (28)
Fear of becoming infected, *M±SD*	2.52±1.019
Post-traumatic stress symptoms (PC-PTSD-5 ≥ 3),% (n)	34 (159)
Health anxiety, *M±SD*	1.88±1.78

M: mean; SD: standard deviation;%: percentage; n: number.

differences were found in the prevalence of poor social support between both groups of PTSS (p=.549) and health anxiety (p=.096). Any of the COVID-19-related variables were significantly associated with high health anxiety or PTSS symptoms (all p-values>0.05). Bivariate comparisons are described with more detail in Table 2.

3.2. Simple mediation and moderated mediation analyses

Fig. 1 shows the statistical diagram of the moderated mediation and simple mediation models. In step 1, we examined the mediating effect of health anxiety in the relationship between predictors variables (previous psychiatric history, fear of getting infected, age, gender and sleep problems) and PTSS. The total model accounted for 30% of the variance in PTSS symptomatology. Health anxiety was significantly correlated with sleep problems ($b = 0.331$, 95% CI [0.091, 0.652]), previous psychiatric history ($b = 0.430$, 95% CI [0.009, 0.859]) and fear of getting infected ($b = 0.500$, 95% CI [0.356, 0.644]).

Moreover, health anxiety was significantly associated with PTSS ($b = 0.149$, 95% CI [0.084, 0.213]). Gender and age variables also showed a negative relationship with PTSS, which indicates that younger age ($b = -0.015$, 95% CI [-0.024, -0.007]) and female gender ($b = -0.442$, 95% CI [-0.687, - 0.198]) are associated with higher PTSS scores. In addition, sleep problems ($b = 0.470$, 95% CI [0.242, 0.859]), psychiatric history ($b = 0.663$, 95% CI [0.431, 0.895]) and fear of getting infected ($b = 0.302$, 95% CI [0.195, 0.409]) were significantly associated with PTSS.

Indirect effects of sleep problems [95% CI = (0.003, 0.103)], psychiatric history [95% CI = (0.013, 0.129)], and fear of getting infected [95% CI = (0.036, 0.121)] on PTSS through health anxiety were significant.

Since PTSS group had a significantly higher percentage of individuals under psychological treatment, moderated mediation analyses were performed including psychological treatment as a moderator variable. Indexes of mediation moderation were non-significant (confidence intervals contained zero), indicating that being under psychological treatment did not moderate the mediating effect of health anxiety. Table 3 presents the main results of both analyses.

4. Discussion

Our findings show that participants with high scores in health anxiety had a significantly higher prevalence of PTSS. Although no studies were found with which to compare these results, recent studies published by Taylor et al. (2020a, 2020b) and Landi et al. (2020) found that health anxiety was associated with COVID Stress Syndrome, a concept which includes related symptoms of traumatic stress, and COVID-19

Table 2

Demographic characteristics, psychological status and COVID-19-related variables according to Post-Traumatic Stress Symptoms (PTSS) and health anxiety levels (N = 468).

Variables	PC-PTSD-5 Post-traumatic stress symptoms				IW-7 Health anxiety			
	No PTSS(n = 309)	PTSS[a](n = 159)	Z/χ^2 (p)[c]	r/Φ[d]	Low-scorer(n = 381)	High-scorer[b](n = 87)	Z/χ^2 (p)[c]	r/Φ[d]
Gender,% (n)								
Man	35.30 (109)	16.40 (26)	17.404 (0.001)**	0.20	31 (118)	19.50 (17)	3.969(0.046)*	0.10
Female	64.70 (200)	83.60 (133)			69 (263)	80.50 (70)		
Age, M±SD	38.04±13.39	34.92±13.43	−2.637 (0.008)**	0.12	36.85±13.41	37.53±13.78	−0.431 (0.666)	0.02
Educational level,% (n)								
Elementary/primary	9.10 (28)	10.10 (16)	1.161 (0.560)	0.05	8.70 (33)	12.60 (11)	2.085 (0.353)	0.07
Secondary/technical	38.50 (119)	42.80 (68)			39.40 (150)	42.50 (37)		
University or higher	52.40 (162)	47.20 (75)			52 (198)	44.80 (39)		
Working during pandemic,% (n)								
On site	21.70 (67)	20.80 (33)	4.269 (0.234)	0.10	22.80 (87)	14.90 (13)	6.279 (0.099)	0.12
Work from home	22 (68)	16.40 (26)			20.50 (78)	18.40 (16)		
Unemployed/temporary unemployed	33.30 (103)	32.10 (51)			30.40 (116)	43.70 (38)		
Student	23 (71)	30.80 (49)			26.20 (100)	23 (20)		
Level of COVID-19 exposure,% (n)								
Potential/direct occupational exposure to COVID-19	10.40 (32)	11.90 (19)	0.135 (0.713)	0.02	12.10 (46)	5.70 (5)	2.304 (0.129)	0.08
Friends/relatives with COVID-19 symptoms/diagnosis	39.20 (121)	45.90 (73)	1.704 (0.192)	0.07	41.20 (157)	42.50 (37)	0.011 (0.916)	0.01
Living with someone infected	3.6 (11)	5.7 (9)	0.677 (0.411)	0.05	5 (19)	1.10 (1)	1.698 (0.193)	0.07
Reported COVID-19 symptoms/diagnosis	17.20 (53)	25.20 (40)	3.737 (0.053)	0.10	19.90 (76)	19.50 (17)	0.001 (0.999)	0.01
Sleep problems during pandemic,% (n)	51.50 (159)	73.00 (116)	19.148 (0.001)**	0.20	55.90 (213)	71.30 (62)	6.275 (0.012)*	0.12
Psychosocial variables								
Poor social support (OSSS-3 ≤ 8),% (n)	12.60 (39)	15.10 (24)	0.359 (0.549)	0.03	12.10 (46)	19.50 (17)	2.278 (0.096)	0.09
Previous psychiatric history,% (n)	26.20 (81)	52.80 (84)	31.427 (0.001)**	0.26	32.30 (123)	48.30 (42)	7.251 (0.007)**	0.13
Under current psychiatric/psychological treatment,% (n)	2.30 (7)	13.20 (21)	20.017 (0.001)**	0.22	5.20 (20)	9.20 (8)	1.322 (0.250)	0.07
Fear of becoming infected, *M±SD*	2.33±1.01	2.88±1.55	−5.055 (0.001)**	0.23	12.90 (49)	31.00 (27)	15.888 (0.001)**	0.19
PTSS (PC-PTSD-5 ≥ 3),% (n)	–	–	–	–	27.60 (105)	62.10 (54)	36.080 (0.001)**	0.28
Health anxiety, *M±SD*	1.49±1.54	2.63±1.98	−6.184 (0.001)**	0.29	–	–	–	–

M: mean; SD: standard deviation;%: percentage; n: number; ES: effect size.

[a] Post-Traumatic Stress Symptoms (PTSS), based on PC-PTSD-5 score ≥ 3.

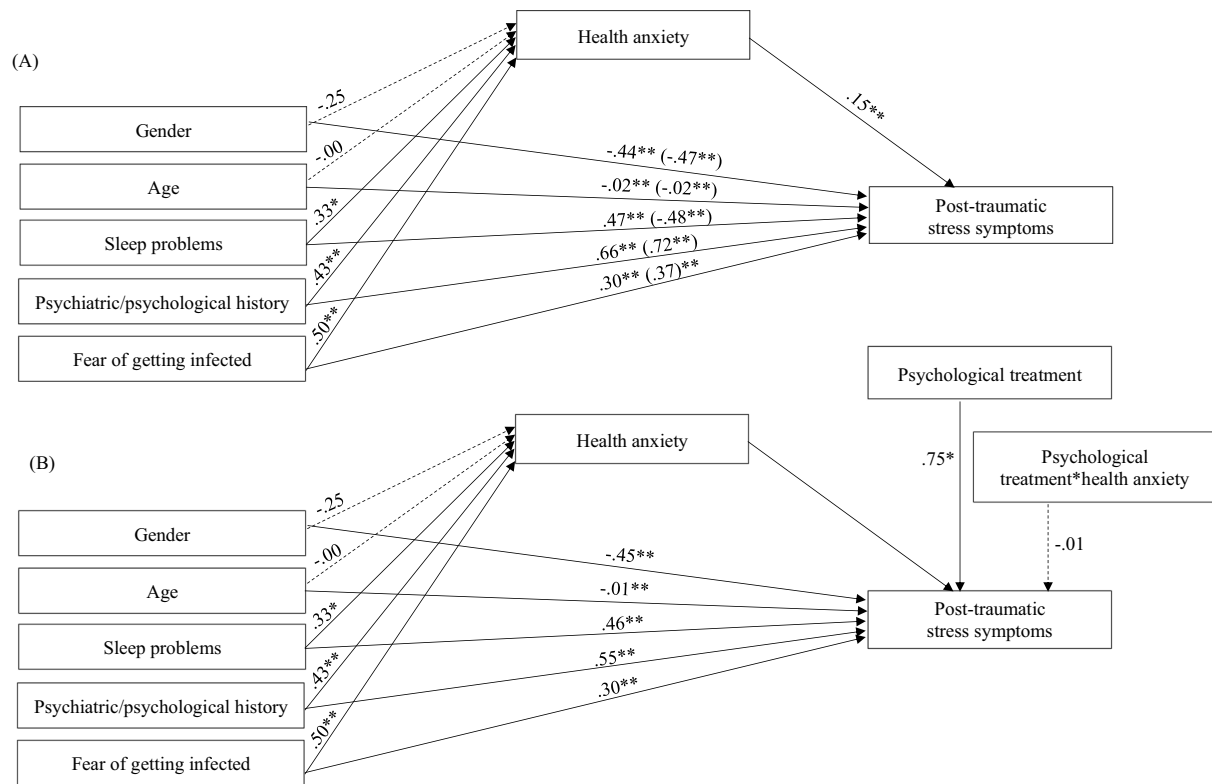[b] High-scorer in health anxiety, based on IW-7 score ≥ 4.

[c] The chi-squared and Mann-Whitney U were applied for independent samples (two-tailed) for the non-continuous and continuous variables, respectively.

[d] Rosenthal's r was applied for the continuous variables and Cramer's Phi was applied for the non-continuous variables.

* p<.05,.

** p<.01.

Fig. 1. Statistical diagrams of the simple mediation (A) and the moderated mediation (B) models. Dotted lines indicate non-significant paths. Total effects of predictors on Post-Traumatic Stress Symptoms are presented in parentheses.
*p<.05; **p<.01.

Table 3
Simple mediation and moderated mediation analyses.

	Step 1: Mediation						Step 2: MM
	Health anxiety (mediator)			Post-traumatic stress symptoms (Y)			
	B (SE)	95% CI	p	B (SE)	95% CI	p	Index of MM [95% CI]
Predictors (X)[a]							
Previous psychiatric history	0.430 (0.166)	[0.009, 0.859]	.010*	0.663	[0.431, 0.895]	.001**	−0.01 [−0.16, 0.13]
Fear of getting infected with coronavirus	0.500 (0.073)	[0.356, 0.644]	.001**	0.302	[0.195, 0.409]	.001**	−0.006 [−0.109, 0.098]
Age	−0.002 (0.006)	[−0.014, 0.010]	.754	−0.015	[−0.024, −0.007]	.001**	0.000 [−0.001, 0.015]
Gender (ref.=male)	−0.251 (0.176)	[−0.597, 0.095]	.154	−0.442	[−0.687, - 0.198]	.001**	0.003 [−0.069, 0.067]
Sleep problems	0.331 (0.164)	[0.091, 0.652]	.044*	0.470	[0.242, 0.859]	.001**	−0.005 [−0.081, 0,074]
Mediator (Health anxiety)	–	–	–	0.149	[0.084, 0.213]	.001**	–
Constant	1.605 (0.149)	[1.312, 1.898]	.001**	1.259	[1.027, 1.490]	.001**	–
	Bootstrap results for indirect effects						
	Effect (SE)	LL 95% CI	UL 95% CI				
Previous psychiatric history	**0.064 (0.030)**	**0.013**	**0.129**				
Fear of getting infected with coronavirus	**0.075 (0.022)**	**0.036**	**0.121**				
Age	−0.000 (0.001)	−0.002	0.002				
Gender (ref.=male)	−0.037 (0.027)	−0.093	0.011				
Sleep problems	**0.049 (0.026)**	**0.003**	**0.103**				

X: predictor variables. Y: outcome variable. MM: moderated mediation. *B* = unstandardized coefficients. SE: standard error. LL: lower level. UL: upper level. CI: confidence interval.

[a] Predictor variables were analyzed by running separate moderated mediation analysis, including remaining predictors as covariates.

* *p<.05,.*

** *p<.01.* Indicate effects are significant when 95% bias-corrected confidence intervals (10,000 bootstrap resamples) do not include zero. Significant mediations are displayed in bold.

distress.

Before mediation and moderated mediation analyses, we performed comparative analyses for assessing predictors of PTSS and health anxiety. Similar to previous studies, we found that high scores in health anxiety and PTSS were more likely to be reported by women (Pappa et al., 2020; Vindegaard and Benros, 2020), individuals with sleep problems, and those who have previously received psychological or psychiatric treatment (Mertens et al., 2020; Newby et al., 2020; Özdin

and Bayrak Özdin, 2020; Stojanov et al., 2020). In addition, although both groups of health anxiety and PTSS had similar percentage of participants with COVID-19 symptoms/diagnosis, frequently fear of getting infected was significantly higher in the group with higher health anxiety and PTSS above cut-off scores. This is consistent with prior evidence suggesting that health-anxious people experience more fear of the coronavirus (Mertens et al., 2020), which at the same time is directly associated with anxiety-related conditions (Taylor and Asmundson,

2020).

This study also shows that health anxiety plays a mediating effect when predicting PTSS. In particular, our results suggest that health anxiety levels mediate the relationship between PTSS and the following predictor variables: fear of getting infected, sleep problems and previous psychiatric history. Furthermore, we found that this mediating effect was not moderated by receiving psychological treatment during the pandemic.

While it is known that health anxiety shares overlap with other anxiety disorders, it has been also considered that conceptually and empirically represents a construct on its own (Asmundson and Fergus, 2019; Ferguson et al., 2013). In this regard, our findings demonstrate that individual differences in health anxiety could increase or attenuate the likelihood of reporting PTSS symptoms during COVID-19 pandemic. In our opinion, these findings have two important interpretations. First, screening of health anxiety seems to be useful to identify people with increased risk of PTSS. Second, the heightened prevalence of PTSS observed in high-scorers could be also represent a tendency to over-report symptoms which is a characteristic feature of health anxiety (Ferguson, 2009).

Both issues are especially relevant in the COVID-19 pandemic that has resulted in complete saturation of healthcare systems. Our study suggests that health anxiety could impact the heightened PTSS that have been reported worldwide during the pandemic. Moreover, since health anxiety is strongly associated with service overutilization (Asmundson and Taylor, 2020), it is important to delineate a profile of individuals with high levels of this psychological construct. Apart from Özdin and Bayrak Özdin (2020) research, practically no data has been published about the factors affecting health anxiety during COVID-19 pandemic. Thus, another strength of our study is that adds evidence to this area, which could be useful to develop preventive measures that target this population.

Several limitations are considered in the present study. First of all, the cross-sectional nature of the data did not allow us to draw a conclusion about the causal relationship between these variables and the representativeness of the sample could also be improved by using a random selection method. There are also limitations inherent to self-report measures, such as social desirability bias which was minimize with the anonymity of participants' responses. Moreover, reliability values of PC-PTSD-5 and OSSS-3 (tested with McDonald's ω) were low in our sample. The features of these measures (binary response format and very small number of items) could impact omega coefficient value (Hancock and An, 2020). Nevertheless, both coefficient's omega values were above the sufficient minimum for research purposes (Dunn et al., 2014). Lastly, we did not use any validated measure for the assessment of coronavirus fear, since, at the time of the study, there were no scales available for that purpose (Ahorsu et al., 2020).

However, to the best of our knowledge, this is the first study that specifically investigates the mediator effect of health anxiety between PTSS and common predictors of this symptomatology, during COVID-19 pandemic. Health anxiety has been pointed out as a very important factor in the response to viral outbreaks (Asmundson and Taylor, 2020) and has demonstrated a strong association with emotion and health-related behaviors during pandemics (Taylor et al., 2020a). Nonetheless, our findings highlight that health anxiety is also an important factor which could influence the psychological consequences of the pandemic. Further studies could examine other relevant variables in PTSS development such as temperamental characteristics. Longitudinal studies with larger samples are also needed to examine if health anxiety is also a predictor of long-term PTSS symptoms after the COVID-19 pandemic.

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6. Author statement

6.1. Contributors

All authors contributed to the design of the study. A. Coloma-Carmona designed the study and wrote the protocol, managed the literature searches, undertook the statistical analysis and participated in the writing of the whole manuscript. J.L. Carballo participated in the conception and design of the study, managed data collection and participated in the writing of the results and discussion section of the manuscript. All authors contributed to and have approved the final manuscript.

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