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Do patients with pathological health anxiety fear COVID-19? A time-course analysis of 12 single cases during the “first wave” of the COVID-19 pandemic in Germany

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ABSTRACT

Objective: Pre-existing health anxiety is associated with an intensified affective response to the novel COVID-19 pandemic in the general population. Still, results on the reaction of people with a diagnosis of pathological health anxiety (i.e., hypochondriasis) are scarce.

Methods: In the present study, we investigated the course of (health) anxiety related to SARS-CoV-2/COVID-19 in comparison to (health) anxiety related to other severe diseases (e.g., cancer) in a sample of 12 patients with the diagnosis of pathological health anxiety during the “first wave” of the COVID-19 pandemic in Germany. Both SARS-CoV-2 related anxiety and anxiety related to other severe diseases were assessed weekly over 16 measurement points (30.03.-19.07.2020) and primarily analyzed with fixed effects regression analyses.

Results: Unexpectedly, SARS-CoV-2 related anxiety was on average significantly lower than anxiety related to other severe diseases (d = −0.54, p < .001) and not significantly associated with anxiety related to other severe diseases or pre-COVID-19 health anxiety.

Conclusion: It therefore appears premature to assume that SARS-CoV-2 related anxiety and other health worries are necessarily strongly interrelated and comparably high in people with pathological health anxiety.

1. Introduction

The COVID-19 (SARS-CoV-2) pandemic and related measures to reduce virus spreading (e.g., quarantine) are known to trigger and partly intensify mental distress (e.g., anxiety) in the general population [1,2]. Current research increasingly focuses on investigating risk factors for an elevated response to the COVID-19 pandemic [3] and on identifying vulnerable groups suffering from higher mental distress. Research in this area gained further importance and urgency, as recent large-scale studies found a bidirectional association between mental disorders and the risk and severity of COVID-19 [4,5]. So far, the research on risk factors for higher COVID-19 related mental distress has highlighted effects of e.g., sociodemographic (e.g., age [1]), psychological (e.g., intolerance of uncertainty [6]), personality (e.g., neuroticism [7]), and COVID-19-risk-related (e.g., pre-existing somatic conditions [8]) factors, and has promoted the development of theoretical frameworks on the response to the pandemic (e.g., [9]). Several large-scale studies in the general population have furthermore confirmed the association between increasing levels of health anxiety and intensified COVID-19 related mental distress (e.g., virus anxiety), and cognitive (e.g., attention to virus-related stimuli) and behavioral responses (e.g., reassurance-seeking) [10–16].

People with pre-existing mental disorders are thought to be prone to increased COVID-19 related stress as they are at risk of showing an elevated response to external stressors [17] due to psychopathological factors (e.g., anxiety sensitivity [18]), processes (e.g., cognitive evaluation of stressors), and coping strategies (e.g., avoidance). These mechanisms could promote an intensification of symptomatology or...
even a recurrence of previously remitted symptoms [17]. Results so far indicate that current and pre-existing unspecified mental disorders and specific anxiety-related and mood disorders are associated with higher levels of COVID-19- or isolation-related distress [17,19–22]. An intensification of pre-existing symptomatology was partly reported as well (e., g., for OCD: [23]).

People with pre-existing pathological levels of health anxiety (e.g., a diagnosis of hypochondriasis) are also considered as a high-risk group for increased mental distress in the context of the COVID-19 pandemic [24,25]. In line with the cognitive-behavioral model of hypochondriasis [26] and current models of somatic symptom perception (e.g., [27]), illness-/health-related schemata or symptom expectations (priorities) could be activated by the pandemic threat and lead to heightened awareness for and catastrophic (mis-)interpretation (somatosensory amplification; [28]) of benign body sensations (posterior). Thereby triggered hypochondriacal safety (e.g., reassurance-seeking) and virus-preventive (e.g., hoarding) behavior [10,11,24] may further contribute to the maintenance of COVID-19 related anxiety. The detrimental association between health anxiety and COVID-19 related mental distress, which was observed in the general population [10–15], should be especially pronounced in people with pathological health anxiety. We further hypothesized that SARS-CoV-2 related anxiety and parable to levels of anxiety in relation to other severe diseases (e.g., cancer). Two previously used items [10,11] were adapted and included participants sought for help because of health worries typical for people with pathological health anxiety (e.g., cancer and cardio-vascular diseases; [36,37]).

Data collection was carried out from the 30th of March (calendar week 14) to the 19th of July 2020 (calendar week 29) in the “first wave” of the COVID-19 pandemic in Germany. More specifically, we were interested in whether the intensity of SARS-CoV-2 related anxiety and anxiety related to other severe diseases (e.g., cancer) are comparable and whether they do reciprocally reinforce each other. We hypothesized that patients with pathological health anxiety report constantly high levels of SARS-CoV-2 related anxiety, which are comparable to levels of anxiety in relation to other severe diseases (e.g., cancer) and which are further intensified by pre-COVID-19 health anxiety. We further hypothesized that SARS-CoV-2 related anxiety and anxiety related to other severe diseases would be strongly positively correlated both (a) simultaneously and (b) time-lagged. In detail, we assumed that they mutually intensify (or weaken) each other both in the same week and across weeks (e.g., from week 3 to week 4).

2. Materials and methods

2.1. Participants

Participants were patients of two psychotherapy outpatient clinics (with specialized treatment units for pathological health anxiety) at the Johannes Gutenberg-University (JGU) of Mainz (cases 1–7, 9–12) and at the Central Institute of Mental Health (CI MH) in Mannheim (case 8).

Cases 1–5, and 8 were treated as part of a study in which a new cognitive-behavioral treatment approach to pathological health anxiety [32] was piloted. These participants were recruited via press releases and social media (e.g., Twitter) and were screened for eligibility in a personal psychological consultation. Minimum age of 18 years, a diagnosis of a DSM-5 Illness Anxiety Disorder/Somatic Symptom Disorder with predominant health worries (diagnosed with the structured Diagnostic Interview for Mental Disorders (DIPS; [33,34])), and no current severe major depression, no substance use while having a substance use disorder, no acute suicidality, no acute psychotic symptoms, no indications for organic brain disorders and/or intellectual disabilities and no somatic disorders which exclude exposure-based approaches were required as eligibility criteria. All six patients provided informed consent to participate in the study.

Besides, patients, who were already treated in the outpatient clinic specialized in the treatment of pathological health anxiety of the JGU, were also asked to participate in the weekly assessment. All of these patients had a current ICD-10 Hypochondriacal Disorder (diagnosed with the Structured Clinical Interview for DSM-IV (SCID; [35])), and were neutrally informed about the purpose of the study by their therapist without indicating any benefits of participating and any disadvantages of non-participation. Of the N = 55 patients being treated on behalf of a diagnosis of an ICD-10 Hypochondriacal Disorder in the outpatient clinic of the JGU in calendar week 14, N = 7 provided informed consent to participate in the weekly assessment prior to participation. One participant was excluded, as he participated only in one measurement point.

Of the total N = 12 included patients, N = 8 had missing data on the weekly anxiety ratings (missing data rate: about 19% [case 6], 25% [case 7], about 38% [case 8], 50% [cases 9, 10], about 56% [case 12], about 69% [case 11]), which leads to a total sample missing data rate of 25.52% each for anxiety related to SARS-CoV-2 and to other severe diseases. Case 5, furthermore, lacked a value for pre-COVID-19 health anxiety (total sample missing data rate of 8.33% for pre-COVID-19 health anxiety). As this study was conducted in a naturalistic setting, all patients were in different treatment phases and treated by different therapists (for information on sample characteristics see Table 1). All included participants sought for help because of health worries typical for people with pathological health anxiety (e.g., cancer and cardio-vascular diseases; [36,37]).

All procedures were performed in accordance with the 1964 Helsinki Declaration and its later amendments. Written informed consent was obtained from all participants. An approval by the local ethics committee of the Johannes Gutenberg-University of Mainz was obtained in relation to the study in which a new cognitive-behavioral treatment approach to pathological health anxiety [32] was piloted (2019-JGU-psychEK-011).
administered with a seven-point scale from not afraid at all (0) to very much afraid (6): “Last week, I was not afraid at all (0) / very much afraid (6) to have another severe disease (not COVID-19; e.g., cancer).”.

2.3. Statistical analyses

A dependent (paired) samples t-test with bias-corrected and accelerated (BCa) bootstrap intervals was performed to test for a difference between SARS-CoV-2 related anxiety and anxiety related to other severe diseases.

The association between (t-1 lagged) SARS-CoV-2 related anxiety and (t-1 lagged) anxiety related to other severe diseases, and a further intensification of SARS-CoV-2 related anxiety by pre-COVID-19 health anxiety were analyzed with panel data analysis methods, i.e., fixed effects regression models divide the unobserved, individual heterogeneity in two error terms, one for the intra-individual varying unobserved variables ($\epsilon_i$), and one for the unobserved variables, which are time-invariant and allowed to correlate with the observed variables (= fixed; $\mu_i$) [46]. By including a fixed error term, the fixed effects regression model can adjust for differences between cases and thus quite accurately and statistically robustly model the within-person effects, i.e., the association between (t-1 lagged) anxiety related to SARS-CoV-2 and other severe diseases within one person. The effect of time-invariant variables (e.g., age) cannot be separately analyzed. The equations for the fixed effects regression models on SARS-CoV-2 related anxiety with (t-1 lagged) anxiety related to other severe diseases (Eqs. (1) and (2)) as main predictors, and on anxiety related to other severe diseases with (t-1 lagged) SARS-CoV-2 related anxiety (Eqs. (3) and (4)) as main predictors are provided in the following (measurement $t$, person $i$). As shown in Eqs. (2) and (4), the t-1 lagged dependent variables were included in the fixed effects regression models with the t-1 lagged main predictors.

$$\text{Anxiety}_{\text{SARS}} = \beta_1 \text{Anxiety}_{\text{Diseases}} + \mu_i + \epsilon_i$$  
$$\text{Anxiety}_{\text{SARS}} = \beta_1 \text{Anxiety}_{\text{SARS},t-1} + \beta_2 \text{Anxiety}_{\text{Diseases},t-1} + \mu_i + \epsilon_i$$  
$$\text{Anxiety}_{\text{Diseases}} = \beta_1 \text{Anxiety}_{\text{SARS}} + \mu_i + \epsilon_i$$  

A further intensification of SARS-CoV-2 related anxiety by pre-COVID-19 levels of health anxiety was examined with a hybrid model, again based on the recommendations by Allison [46]. In this hybrid model, both time-invariant (i.e., pre-COVID-19 health anxiety) and time-varying predictors (i.e., anxiety related to other severe diseases), the latter both as person-specific means and as deviations from person-specific means, are included.

All models were examined for heteroscedasticity (via a Stata module by Baum [47]), and serial correlation (based on Drukker [48], which uses the test for serial correlation by Wooldridge [49]). If indications for heteroscedasticity or serial correlation were found, robust standard errors according to Heclohe [50] (based on specifications by White [51]) were calculated. All analyses were performed with Stata. Both the data and the script of the fixed effects and hybrid regression models are provided on OSF (osf.ia/cmkb5).

3. Results

3.1. Level and variability of SARS-CoV-2 related anxiety

Fig. 1 depicts the course of anxiety related to SARS-CoV-2 and other severe diseases during the studied period both on individual and sample level. Participants reported significantly less anxiety (difference BCa 95% CI $[-1.23, -0.53]$; $t = 14.831$, $p < .001$, $d = -0.54$, d BCa 95% CI $[-0.77, -0.30]$) related to SARS-CoV-2 ($M = 1.75$, $SD = 1.85$) than related to other severe diseases ($M = 2.67$, $SD = 1.61$). As shown in the visual analysis, both SARS-CoV-2 related anxiety ($SD = 0.83$) and anxiety related to other severe diseases ($SD = 1.01$) showed some intrapersonal variability over the study period, which was descriptively higher for anxiety related to other severe diseases.

3.2. Mutual associations of anxiety related to SARS-CoV-2 and other severe diseases

No significant effect of anxiety related to other severe diseases (non-lagged: $b = 0.05$, $SE = 0.08$, $b$ 95% CI $[-0.11, 0.22]$, $p = .50$; t-1 lagged: $b = 0.06$, $SE = 0.06$, $b$ 95% CI $[-0.07, 0.19]$, $p = .33$) on SARS-CoV-2 related anxiety and vice versa of SARS-CoV-2 related anxiety (non-p
Fig. 1. The course of anxiety related to SARS-CoV-2 (incl. COVID-19) and other severe diseases (all cases and cases 1–12).
Anxiety were no significant associations between (t-1 lagged) SARS-CoV-2 related anxiety and other severe diseases in the weekly assessed predictors (anxiety related to SARS-CoV-2/other severe diseases). Conversely, no significant associations between current and t-1 lagged values were found (b = 0.19, SE = 0.14, b 95% CI [−0.11, 0.49], p = .19). Accordingly, SARS-CoV-2 related anxiety and anxiety related to other severe diseases were not significantly associated in the same week. Furthermore, SARS-CoV-2 related anxiety in the previous week did not significantly predict changes from the previous to the current week in anxiety related to other severe diseases. Likewise, anxiety related to other severe diseases in the previous week did not significantly predict changes from the previous to the current week in SARS-CoV-2 related anxiety. Current week anxiety related to other severe diseases was significantly predicted by last week SARS-CoV-2 related anxiety. By contrast, there was no significant association between current and previous week’s SARS-CoV-2 related anxiety.

3.3. Robustness and sensitivity of results

As sensitivity analyses, we repeated the fixed effects regression analyses as shown in Eqs. (2) and (4), but this time excluded the t-1 lagged dependent variables from analyses. Furthermore, all fixed effects regression models were calculated again with a reduced sample of participants without any missing data or with 50% of missing data on the weekly assessed predictors (anxiety related to SARS-CoV-2/other severe diseases). All previously reported results were confirmed: there were no significant associations between (t-1 lagged) SARS-CoV-2 related anxiety and (t-1 lagged) anxiety related to other severe diseases in these additional sensitivity and robustness analyses. The results of the sensitivity analyses are reported and compared with the results of the previous analyses on the original data set in Supplementary Fig. 1.

3.4. Associations of anxiety related to SARS-CoV-2 with pre-COVID-19 health anxiety

The hybrid model on SARS-CoV-2 related anxiety confirmed the previously reported non-significance regarding the effect of anxiety related to other severe diseases on SARS-CoV-2 related anxiety, now both on between (b = 0.77, SE = 0.59, b 95% CI [−0.38, 1.93], p = .19) and within level (b = 0.02, SE = 0.07, b 95% CI [−0.12, 0.16], p = .77). There was no significant association between pre-COVID-19 health anxiety and SARS-CoV-2 related anxiety (b = −0.30, SE = 0.22, b 95% CI [−0.73, 0.13], p = .18).

We also calculated a hybrid model on anxiety related to other severe diseases, which again showed no significant association between SARS-CoV-2 related anxiety and anxiety related to other severe diseases (between: b = 0.24, SE = 0.18, b 95% CI [−0.12, 0.59], p = .19; within: b = 0.04, SE = 0.12, b 95% CI [−0.21, 0.28], p = .77). In contrast to SARS-CoV-2 related anxiety, a significant positive effect of pre-COVID-19 health anxiety on anxiety related to other severe diseases was found (b = 0.29, SE = 0.09, b 95% CI [0.12, 0.47], p = .001).

In conclusion, while for anxiety related to other severe diseases a significant effect of pre-COVID-19 health anxiety was detected, no significant association with pre-COVID-19 health anxiety was found for SARS-CoV-2 related anxiety.

4. Discussion

The present study investigated the course of anxiety related to SARS-CoV-2 and to other severe diseases (e.g., cancer) among 12 patients, currently being treated for pathological health anxiety, during the “first wave” of the COVID-19 pandemic in Germany (end of March – mid-July 2020). Against our assumptions, SARS-CoV-2 related anxiety was on average lower than anxiety regarding other severe diseases and fluctuated in the lower section of the given scale (M = 1.75 on a scale ranging from 0 to 6). Descriptively, there was some indication of between-person heterogeneity regarding SARS-CoV-2 related anxiety, with some people reporting (almost) no SARS-CoV-2 related anxiety (e.g., cases 1, 2, and 6), while others (e.g., cases 5 and 9) were affected by higher levels of virus anxiety. At the same time, intrapatient variability over the studied period was at the same time lower than for anxiety related to other severe diseases.

Unexpectedly, we did not detect any significant associations between SARS-CoV-2 related anxiety and anxiety related to other severe diseases regarding both directions (from “SARS-CoV-2" on “other diseases” and vice versa), and both temporal relations (simultaneous and t-1 lagged).
Interesting to notice, pre COVID-19 health anxiety neither did show off as significant risk factor for SARS-CoV-2 related anxiety in the present sample, whereas corresponding associations of pre-COVID-19 health anxiety with anxiety related to other severe diseases were indeed found. The latter result again undermines the stability of health worries in individuals with pathological health anxiety [52].

The results on SARS-CoV-2 related anxiety seem to contradict assumptions on risk groups for heightened mental distress during COVID-19 (e.g., [24,25]) and predictions based on previously found strong associations between health anxiety and SARS-CoV-2 related anxiety in large-scale world-wide samples (e.g., [10–15]). Considering the small and naturalistic sample with many missing data, which was not balanced for any variables (e.g., age), all conclusions must be drawn carefully. Nevertheless, our findings challenge the assumption that results from the general population can be easily transferred to the “high-risk” group of people with pathological health anxiety, or, at least, to the majority of this group.

Hypotheses on the observed divergences could be derived from a theoretical and an empirical perspective. People with pathological health anxiety, pre-pandemic, reported less fear of infections than of other diseases (esp. cancer and cardiovascular diseases) and assessed their risk of succumbing to infections as comparably high as people without a diagnosis of hypochondriasis [36,37]. Likewise, the studied sample was, pre-pandemic, mostly concerned with other diseases (e.g., cancer) and not with (virus) infections. Speaking in terms of the predictive processing framework [27,53], it is reasonable to assume that – pre COVID-19 – precise prior expectations regarding sensations existed, which drove active inference (e.g., body checking), and determined posterior perception (sensation = disease), especially when sensory input (bottom-up) was unprecise. The present study proposed that the COVID-19 pandemic due to its existential threat would trigger the building of new or the adaptation of old priors (e.g., breathing difficulties = COVID-19) and provoke a fearful reaction in people with pathological health anxiety. However, the opposite assumption would be likewise worth considering and would better fit the results of the present study. Thus, one could also argue that old priors remain dominant and dampen COVID-19 related affective responses.

First, especially highly precise priors (as seen in people with pathological health anxiety) would need many prediction errors to change. People with pathological health anxiety are known to have difficulties to disengage from a previous health threat [54,55], which is a core characteristic of the diagnosis and pathogenesis of pathological health anxiety and led to several attention bias modification approaches (e.g., [56,57]). Possibly COVID-19 related sensations could, therefore, still be attributed to other diseases (e.g., breathing difficulties = lung cancer, headache = brain tumor), be unrealistically assessed as notable, but not “that severe” (in relation to one’s own risk), or even be neglected, which would dampen affective responses. Although only few studies have used ideographical stimuli so far, there is still some support of a stronger affective and cognitive response to personally relevant health threat in pathological health anxiety [38]. Supporting the hypotheses of a realistic assessment or neglect, people with pathological health anxiety do not differ regarding the assessment of “minor” diseases from people with anxiety disorders or “healthy” controls [59–61] and seem to partly neglect current medical disease burden in favor of other diseases [62]. Pathological health anxiety is, furthermore, mainly driven by catastrophic disease-related and little by non-catastrophic disease-related interpretations [53].

Second, a limited cognitive and emotional capacity could hinder the building/adaptation of priors or the mutual triggering of health worries. The majority of people with pathological health anxiety only fear one major disease and not many diseases simultaneously [36]. Neuroimaging studies also highlight the symptom-related activation of brain regions relevant for cognitive control in people with pathological health anxiety [64,65].

Third, the response to the COVID-19 pandemic could be affected by a self-focusing bias in pathological health anxiety. Individuals with pathological health anxiety are known to have a more restrictive health concept only regarding themselves and not regarding other people [66]. Although (pathological) health anxiety is linked to key mechanisms of contamination fears, such as disgust sensitivity and proneness (e.g., [70,71]), these results seemed to be less specific for hypochondriasis [68,69] and could be again attributed to concerns about one’s own health rather than about the health of others [70]. The severity of COVID-19 related mental distress, however, is also significantly affected by the risk assessment regarding other, e.g., loved people [13,21,71,72].

Fourth, the crucial importance of (external) triggers in the activation/exacerbation of pathological health anxiety could be partly questioned [36,59] in favor of top-down processes [73]. Marcus [59], e.g., found that health-related triggers did not intensify anxiety in people with pathological health anxiety, but led to an approximation of the anxiety levels of less health anxious people to the levels of pathologically health anxious people. The COVID-19 pandemic as a global health crisis could, therefore, lead to a “global health anxiety pandemic” that is not that specific to people with pathological health anxiety.

4.1. Limitations

Some limitations of the present study should be mentioned. A non-validated, but previously used [10,11] instrument for the weekly assessment of anxiety was administered, which could have reduced convergent validity with related instruments (e.g., WI). The study was a single case study (with only 12 included participants and therefore limited power) and was carried out in a naturalistic setting and mainly during psychotherapeutic treatment. The fixed effects regression model adjusts for time-invariant unobserved variables but does not control for time-varying (unobserved) variables, which are not included in the statistical model. Regarding the COVID-19 pandemic, both external (e.g., development of the COVID-19 pandemic [e.g., increase/decrease of infection rates]) and internal (e.g., increase of reported somatic sensations) time-varying factors could have affected weekly anxiety ratings, but were not assessed or included in the analyses. Influences of a potentially more successful management (regarding death rates and in comparison with highly affected countries such as Italy) of the “first wave” of the COVID-19 in Germany on SARS-CoV-2 related anxiety should be likewise taken into consideration and could also reduce the representativeness and transferability of results. Additionally, we lacked a control group of people with no diagnosis of pathological health anxiety to compare the given results. Furthermore, we had a rather high missing data rate for certain participants, why we decided to repeat all analyses with a reduced sample comprising only patients with a maximum missing data rate of 50% (cases 1–10) or with no missing data (cases 1–5) on the weekly anxiety ratings. Previously drawn conclusions were confirmed in these analyses.

5. Conclusion

People with pathological health anxiety have been assumed to form a high-risk group for heightened mental distress during the COVID-19 pandemic [24]. The present study, therefore, investigated the intensity and time course of SARS-CoV-2 related anxiety (compared to other health anxieties) in a naturalistic sample of 12 patients with pathological health anxiety throughout the “first wave” of the COVID-19 pandemic in Germany. The studied sample on average did not suffer from high levels of SARS-CoV-2 related anxiety. No significant associations between SARS-CoV-2 related anxiety and concurrent and (t-1) lagged anxiety related to other severe diseases, and pre-COVID-19 health anxiety were found. It appears therefore premature to assume that the significant association between health anxiety and SARS-CoV-2 related anxiety, which was observed in the general population (e.g., [10,11]), can easily be transferred to people with pathological levels of health anxiety. The present study rather provided some indication of a
still persistent focus on pre-pandemically feared diseases. Considering the small and naturalistic sample of the present study, further research in bigger samples is needed to confirm the presented findings.

Declarations of Competing Interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jspychores.2021.110687.

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