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Unrealistic pessimism and obsessive-compulsive symptoms during the COVID-19 pandemic: Two longitudinal studies

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Objective. Unrealistic pessimism (UP) is an aspect of overestimation of threat (OET) that has been associated with obsessive-compulsive disorder/symptoms (OCD/OCS). During the COVID-19 pandemic, UP may have played an important role in the course of OCD. To investigate the relationship, we conducted two longitudinal studies assuming that higher UP predicts an increase in OCS.

Method. In Study 1, we investigated UP in the general population (N = 1,184) at the start of the pandemic asking about overall vulnerability to infection with SARS-CoV-2 and UP regarding infection and outcome of severe illness. Further, OCS status (OCS+/−) was assessed at the start of the pandemic and 3 months later. In Study 2, we investigated UP in individuals with OCD (N = 268) regarding the likelihood of getting infected, recovering, or dying from an infection with SARS-CoV-2 at the start of the pandemic and re-assessed OCS 3 months later.

Results. In Study 1, UP was higher in the OCS+ compared to the OCS− group, and estimates of a higher overall vulnerability for an infection predicted a decrease in OCS over time. UP regarding severe illness predicted an increase in symptoms over time. In Study 2, UP was found for a recovery and death after an infection with SARS-CoV-2, but not for infection itself.

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Conclusions. Exaggeration of one's personal vulnerability rather than OET per se seems pivotal in OCD, with UP being associated with OCD/OCS+ as well as a more negative course of symptomatology over the pandemic in a nonclinical sample.

Practitioner points

- Unrealistic optimism, a bias common in healthy individuals, is thought to be a coping mechanism promoting well-being in the face of danger or uncertainty.
- The current study extends findings that its inversion, unrealistic pessimism, may play an important role in obsessive-compulsive disorder and may also be involved in the development of the disorder.
- This study highlights the importance that prevention programs during a pandemic should include targeting unrealistic pessimism.

Theoretical background

Obsessive-compulsive disorder (OCD) is defined by intrusive obsessions and repetitive compulsions that are often centered around potential harm to oneself and others, such as through contagion. These key symptoms have been linked to cognitive biases in cognitive models of OCD and/or obsessive-compulsive symptoms (OCS; Salkovskis, 1985, 1989). The Obsessive Compulsive Cognitions Working Group (OCCWG) has identified overestimation of threat (OET) – along with inflated responsibility, perfectionism, intolerance of uncertainty, and importance and control of thoughts – as a central cognitive bias in OCD (OCCWG, 1997, 2001, 2003, 2005).

OET is comprised of different aspects. Items on the Obsessive Beliefs Questionnaire (OBQ; OCCWG, 2001), a self-rating measure of cognitive biases related to OCD, capture general overestimation of the likelihood of negative events as well as overestimation of the personal likelihood of experiencing negative events, but it measures OET as a single entity. To assess overestimation of the *personal* (as opposed to the *general*) likelihood of experiencing threats and other negative events, researchers (e.g., Moritz & Jelinek, 2009; Niemeyer, Moritz, & Pietrowsky, 2013) have employed the paradigm of 'unrealistic optimism' (e.g., Weinstein, 1980), thus allowing more detailed insights on mechanisms in models of and interventions for OCD.

Unrealistic optimism

The term 'unrealistic optimism' (UO) refers to the human tendency to overestimate the probability of positive events and to underestimate the probability of negative events happening to oneself in the future. UO has been found not only in student samples and in the general population (e.g., Weinstein, 1980, 1982, 1987) but also in populations at enhanced health risk such as smokers with respect to lung cancer (Weinstein, 2005) or homosexual men with respect to infection with HIV (Gold, 2004, 2006). First publications on UO during the COVID-19 pandemic hint at a UO bias regarding infection with SARS-CoV-2 in the general population (e.g., Dolinski, Dolinska, Zmaczynska-Witek, Banach, & Kulesza, 2020; Druică, Musso, & Ianole-Călin, 2020; McColl et al., 2022; Salgado & Berntsen, 2021). In contrast, studies report lower proneness to positive cognitive biases such as UO in several clinical populations (see, e.g., Moore & Fresco, 2012, for an overview). An opposite pattern to UO, which is referred to as inverse UO or unrealistic pessimism (UP), has been reported. As such, UP summarizes the overestimation of the likelihood of negative or the underestimation of positive events happening to oneself compared to others (e.g., Butler & Mathews, 1983; Thimm, Holte, Brennen, & Wang, 2013).

Unrealistic optimism and unrealistic pessimism in OCD

UP has been shown to be relevant for patients with OCD. Moritz and Pohl (2009) asked individuals with OCD to estimate the probability of various hypothetical scenarios happening to themselves in the future in direct comparison to other people. While there were no differences between individuals with OCD and healthy controls regarding positive events, a weaker UO (i.e., lower optimism regarding one's personal vulnerability) was found for washing-relevant and negative events in individuals with OCD compared to the control group. Interestingly, there were no significant group differences in the estimation of the statistical probability of these events per se (see also Moritz & Pohl, 2006).

In a follow-up study, Moritz and Jelinek (2009) used a direct, explicit assessment and added an indirect assessment of vulnerability (implicit comparison). This involved asking participants with OCD, healthy controls, and psychiatric controls about the probability of the events occurring to themselves (first block of questions) and separately to an average person of the same age and sex (second block of questions). Afterward, results of both blocks were compared. In this study and other follow-up studies (Niemeyer et al., 2013; Zetsche, Rief, & Exner, 2015), individuals with OCD showed (1) UP in the indirect, implicit comparison and no systematic bias for the direct, explicit comparison (Moritz & Jelinek, 2009), (2) a lack of UO in the implicit comparison and attenuated UO in the explicit comparison compared to healthy controls (Niemeyer et al., 2013), or (3) a lack of UO in the indirect, implicit comparison and no systematic bias for the direct, explicit comparison (Zetsche et al., 2015) of OCD-related or negative events. Regarding positive events, results showed a tendency toward UP in individuals with OCD.

Studies tentatively suggest more pessimistic judgment in individuals with OCD compared to healthy controls. During the few studies that have so far been conducted, individuals with OCD have usually been considered a monolithic group (independent of the content of OC symptomatology). Related to this, Niemeyer et al. (2013) and Zetsche et al. (2015) point out that the composition of the group of individuals with OCD in terms of OCD symptom content might have an influence on study results. Beyond that, the impact of UP on the development of OCS over time has not yet been investigated. Furthermore, UP and UO have rarely been examined in the context of real-life stressors that pose an objective risk.

OCD during the COVID-19 pandemic

Although hypothetical scenarios (including washing-related events such as suffering from a life-threating disease) have been used to study UP in individuals with OCD in the past, a typical fear of individuals with contamination-related OCS (C-OCS) became a reality in 2020 as SARS-CoV-2 had far-reaching consequences for everyday life worldwide (Porcher, 2020). In Germany, as elsewhere, numerous public measures such as social distancing, wearing of face masks, and closures of schools and stores were taken to counteract the spread of the virus (Steinmetz, Batzdorfer, & Bosnjak, 2020). Soon, it was predicted that the pandemic could lead to an increase in mental disorders or to the deterioration of existing symptoms, including OCS and especially C-OCS (Banerjee, 2020; Fiorillo & Gorwood, 2020; Fritzsche & Wirsching, 2006; Rivera & Carballea, 2020). For example, increased emphasis on the importance of frequent, prolonged, and ritualized handwashing and information in the media about the survivability of viruses on surfaces and thus increased mental attention paid to washing and hygiene issues have been discussed as possible factors influencing the worsening of OCS (Banerjee, 2020). However, studies have shown mixed results, with some studies reporting a worsening of OCS in their participants (Abba-Aji et al., 2020; Caldiroli et al., 2022; Fontenelle et al., 2021; Højgaard, Duholm, Nissen, Jensen, & Thomsen, 2021; Jelinek, Göritz, Miegel, Moritz, & Kriston, 2021; Jelinek, Moritz, Miegel, & Voderholzer, 2021; Jelinek, Voderholzer, et al., 2021; Kaveladze, Chang, Siev, & Schueller, 2021; Khosravani, Aardema, Samimi Ardestani, & Sharifi Bastan, 2021; Prestia et al., 2020) and other studies not (Chakraborty & Karmakar, 2020; Quittkat et al., 2020; Schwartz-Lifshitz et al., 2021).

As cognitive biases are at the core of models of OCD, they are assumed to play an important role in the course of OCS/OCD during pandemics. For instance, in Wheaton, Messner, and Marks (2021), intolerance of uncertainty (IU) partially accounted for the link between OCS and COVID-19-related anxiety in a community sample (also see Inozu, Gök, Tuzun, & Haciomeroglu, 2022, for the relation between IU and other psychological symptoms). Darvishi, Golestan, Demehri, and Jamalnia (2020) found that several cognitive errors, such as catastrophizing and all-or-nothing thinking, were more pronounced in individuals with compared to those without OCS. Regarding contamination-related OET, Waqas, Hania, and Hongbo (2020) found that overestimation of severity of contamination was a predictor of COVID-19-related fear and corresponding safety behavior in a student sample. However, to our knowledge, virus-related UP has not been studied in an OCD sample during past pandemics. Studies in healthy samples, however, support a link between OET and anxiety during pandemics. Regarding fear of infection (which is a special concern of individuals with C-OCS; Rachman, 2004), in a student sample (Wheaton, Abramowitz, Berman, Fabricant, & Olatunji, 2012), the overestimation of the likelihood and severity of contamination predicted swine flu-related anxiety during the swine flu pandemic in 2009/10. Likewise, OET regarding severity of contamination predicted virus-related anxiety during the Ebola and Zika virus outbreaks (Blakey & Abramowitz, 2017; Blakey, Reuman, Jacoby, & Abramowitz, 2015).

The present studies

Preliminary results point to the relevance of cognitive factors including biases associated with OCS during the COVID-19 pandemic (Darvishi et al., 2020; Waqas et al., 2020; Wheaton et al., 2021). However, to our knowledge, our study is the first to investigate virus-related UP during a virus outbreak using a longitudinal design to explore the association between UP and development of OCS over time. We conducted two studies at the start of the COVID-19 pandemic and investigated the relation between UP and OCS development over time. In Study 1, we recruited a sample of the general population, and in Study 2, we recruited individuals with OCD.

We predicted virus-related UO in the general population and an inverse pattern, or UP, in individuals with OCD. We assumed that higher optimism would be associated with lower OCS (as well as contamination-related OCS) in the general population. We also predicted that UP would be more severe in individuals with OCD suffering from C-OCS compared to those without C-OCS as fear of contamination and resulting behavior such as excessive cleaning is a core symptom in individuals with C-OCS (Rachman, 2004). We assumed that higher UP at the start of the pandemic would be associated with an increase in OCS over the course of the pandemic in both the nonclinical (Study 1) and the clinical (Study 2) samples.

Material and methods

Design

Both studies used a longitudinal design measuring OCS with the German version of the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002; Gönner, Leonhart, & Ecker, 2007) at the first and second assessments. The OCI-R measures the emotional distress associated with OCS with 18 items and six subscales (checking, obsessions, ordering, washing, neutralizing, and hoarding). The washing subscale was used to measure contamination-related OCS. The OCI-R has excellent psychometric properties (Foa et al., 2002; Gönner et al., 2007) and has also been shown to be sensitive to change (Abramowitz, Tolin, & Diefenbach, 2005).

Study 1

Materials and methods

Recruitment and procedure

As described in Jelinek, Göritz, et al. (2021), participants from the adult general population in Germany were recruited via WisoPanel® (Göritz, 2007, 2014). The study consisted of two online assessments. The first assessment took place between March 21 and March 30, 2020 (t1). During this period, a lockdown due to COVID-19 had been announced (e.g., contact restrictions, closures of restaurants). The second assessment (t2) was performed between June 22 and June 30, 2020 after lockdown restrictions were eased. The study was approved by the local ethics committee (#LPEK-0129). As compensation for participation, participants were given the opportunity to download a manual on techniques to improve self-esteem (t1) and a manual on cognitive-behavioral strategies to improve mental health during the pandemic (t2). Participants were excluded if they affirmed that they had not filled out the questionnaire diligently or if they had a stereotypical response pattern (i.e., same score apart from 0) in the OCI-R.

Participants

The sample and the selection process have been described before (Jelinek, Göritz, et al., 2021). Of the previously described 1,207 participants, an additional 23 participants were excluded because 21 participants did not answer the questions on UP and two participants estimated their likelihood of getting infected as >100%, resulting in a final sample of 1,184 participants. Mean age was 55.97 years (SD = 13.59) and included more women (n = 6,652, 55.1%) than men and more people with a university entrance qualification (A-level degree, n = 679; 57.3%) than not. The OCI-R total score was M = 11.92 (SD = 11.07) at t1 and M = 13.09 (SD = 11.29) at t2.

Assessment of direct comparative unrealistic pessimism (explicit)

We asked participants three questions to assess UP regarding infection with SARS-CoV-2. First, we asked participants to estimate the overall vulnerability, that is, the likelihood that a person of their same age, sex, residency, and health status would get infected with SARS-

CoV-2 on a scale from 0% (*not likely at all*) to 100% (*definite*). Similar to previous studies (Moritz & Jelinek, 2009; Niemeyer et al., 2013), we inquired about the participant's likelihood in direct comparison to other individuals of the same age, sex, residency, and health status (*direct comparative unrealistic pessimism*) to experience the following two negative events: (1) becoming infected with SARS-CoV-2 and (2) becoming severely ill after an infection with SARS-CoV-2. For both questions, responses were made on a 5-point Likert scale ranging from 1 = *yes, I am more vulnerable* to 5 = *no, I am less vulnerable*, with 3 = *equally vulnerable* as the midpoint.

Strategy of data analysis

Participants were allocated to two groups (OCS+/–) according to their score on the OCI-R at t1 using the clinical cut-off score of $\geq$ 18 for the German OCI-R. T tests and ANCOVAs were planned (to control for potential sociodemographic differences between samples) to examine UO and UP. To investigate predictors of OCS change by UP measured at the start of the pandemic, we calculated multiple hierarchical regression models. Models A1–A3 analyzed change in OCS over time (OCI-R total scores at t1 minus OCI-R total scores at t2) as the dependent variable. Demographics (age, gender, education) were entered as first-block predictors (model A1) and psychopathology at t1 (OCI-R total score) as the second-block predictors (model A2). Vulnerability estimates (overall vulnerability for infection, UP regarding infection and severe illness) were included as predictors in the third block (model A3). Level of significance was adjusted to control for multiple comparisons (Bonferroni correction). As measures of effect size, Cohen's d (with $d \approx .2$, $d \approx .5$, and $d \approx .8$, corresponding to small, medium, and large effects) was calculated. Standardized regression weights (β) of .1, .3, and .5 were considered weak, medium, and strong effects, respectively.

Results

In total, 904 participants were in the OCS– and 280 in the OCS+ group (see Table 1 for OCI-R scores). On average, the OCS+ group (M = 54.32, SD = 14.10) was younger than the OCS– group (M = 56.49, SD = 13.40), and numerical differences in gender (OCS+: n = 142, 50.7% female, OCS–: n = 510, 56.4% female) and education (OCS+: n = 148, 52.9% with A-level, OCS–: n = 531, 58.7% with A-level) were nonsignificant (gender: $\chi^2 = 2.809.\ p = .094$, A-level: $\chi^2 = 3.024.\ p = .082$).

Group comparisons

At t1, participants estimated the overall vulnerability to infection with SARS-CoV-2 at 44% on average (M = 44.12, SD = 26.71, range 0–100). Estimation of vulnerability to infection was significantly but weakly associated with OCS (r = .092, p = .002) and the OCI-R washing subscale (r = .146, $p < .001$) at t1 (see Table 1). ANCOVA (correcting for differences in age) showed that the OCS+ group estimated overall vulnerability higher, than the OCS– group at a very small effect size, $F(1, 1181) = 4.572, p = .033, d = 0.13$.

For the direct comparative assessment of UP regarding infection with SARS-CoV-2, the ANCOVA (correcting for differences in age) showed that the OCS+ group estimated their personal vulnerability higher (see Table 1 for means) than the OCS– group at a small effect size, $F(1, 1181) = 9.310$, $p = .002$, $d = 0.18$, indicating UP. For direct comparative assessment of UP regarding severe illness after infection with SARS-CoV-2, results were

Table 1. Means (*M*), standard deviations (*SD*) and zero-order correlations between obsessive compulsive symptoms (OCS) and unrealistic pessimism ($N = 1,184$)

	Mean (*SD*)			Zero-order correlation (*p*-value)						
	OCS+ ($n = 280$)	OCS− ($n = 904$)	Total sample ($N = 1,184$)	1.	2.	3.	4.	5.	6.	7.
OCI-R total, t1	28.19 (9.73)	6.88 (4.89)	11.92 (11.07)		.773 (<.001)	.725 (<.001)	.586 (<.001)	.092 (.002)	−.126 (<.001)	−.141 (<.001)
OCI-R total, t2	26.11 (11.97)	9.06 (7.36)	13.09 (11.39)			.522 (<.001)	.742 (<.001)	.043 (.142)	−.143 (<.001)	−.167 (<.001)
OCI-R washing, t1	4.93 (2.70)	1.48 (1.75)	2.29 (2.49)				.600 (<.001)	.146 (<.001)	−.121 (<.001)	−.153 (<.001)
OCI-R washing, t2	4.03 (2.91)	1.37 (1.73)	2.00 (2.36)					.112 (<.001)	−.138 (<.001)	−.187 (<.001)
Overall vulnerability[a], t1	47.55 (27.30)	43.06 (26.45)	44.12 (26.71)						−.315 (<.001)	−.172 (<.001)
Unrealistic pessimism for infection with SARS-CoV-2[b], t1	3.08 (0.97)	3.30 (0.94)	3.24 (0.95)							.488 (<.001)
Unrealistic pessimism for severe illness after infection with SARS-CoV-2[b], t1	3.08 (0.99)	3.27 (0.95)	3.23 (0.97)							

Note. OCI-R = obsessive-compulsive inventory-revised.
[a]0% (*not likely at all*) to 100% (*definite*); [b]Likert scale: 1 = *yes, I am more vulnerable* to 5 = *no, I am less vulnerable*; 3 = *equally vulnerable;* a smaller number corresponds to higher personal vulnerability. Level of significance was adjusted ($p < .002$) to control for multiple comparisons (Bonferroni correction).

similar to infection with a higher UP in the OCS+ than in the OCS– group at a small effect size, $F(1, 1181) = 9.550$, $p = .002$, $d = 0.18$.

Prediction of OCS over the course of the pandemic

Correlations are shown in Table 1. The correlations between OCI-R total scores and vulnerability estimates ($|r| = .043$–$.167$) were generally small in magnitude. Results of the regression models A1–A3 are presented in Table 2.

Table 2. Predictors of change in obsessive-compulsive symptoms (outcome: change in OCI-R From t1 to t2), $N = 1,184$

Step 1	B [$CI_{95\%}$] Model A1	β	p
Constant	−0.903 [−3.041,1.236]		.408
Age	−0.020 [−0.052, 0.013]	−0.035	.240
Gender[a]	0.515 [−0.375, 1.405]	0.034	.257
A-level[b]	0.148 [−0.737, 1.034]	0.010	.742
Step 2	**Model A2**		
Constant	−4.223 [−6.340, −2.106]		<.001
Age	<0.001 [−0.031, 0.032]	0.001	.977
Gender[a]	0.180 [−0.669, 1.029]	0.012	.678
A-level[b]	0.422 [−0.422, 1.266]	0.028	.327
OCI-R total score (t1)	0.212 [0.175,0.249]	0.311	<.001
Step 3	**Model A3**		
Constant	−8.605 [−11.576, −5.634]		<.001
Age	0.005 [−0.027, 0.037]	0.009	.749
Gender[a]	0.179 [−0.668, 1.025]	0.012	.679
A-level[b]	0.201 [−0.644, 1.047]	0.013	.641
OCI-R total score (t1)	0.219 [0.182, 0.257]	0.322	<.001
Overall vulnerability, t1	0.021 [0.004,0.037]	0.073	.013
Unrealistic pessimism for infection with SARS-CoV-2, t1[c]	0.433 [−0.083, 0.949]	0.054	.100
Unrealistic pessimism for severe illness after infection with SARS-CoV-2, t1[c]	0.573 [0.081, 1.065]	0.073	.023

Note. $R^2 = .002$, $F = 0.858$ ($p = .463$) for step 1; $\Delta R^2 = .097$, $F = 31.807$ ($p < .001$) for step 2, $\Delta R^2 = .110$, $F = 20.801$ ($p < .001$) for step 3; B = unstandardized regression coefficient, β = standardized regression coefficient. Significant results are bolded. OCI-R = Obsessive-Compulsive Inventory-Revised.

[a]1 = female, 2 = male; [b]0 = without A-level (i.e., university entrance qualification), 1 = with A-level; [c]0% (*not likely at all*) to 100% (*definite*); [c]Likert scale: 1 = *yes, I am more vulnerable* to 5 = *no, I am less vulnerable*, and 3 = *equally vulnerable*.

Study 2

Materials and methods

Recruitment and procedure

People with OCD were recruited via the German Society for Obsessive Compulsive Disorders, psychiatric institutions, and an existing database of patients with diagnosed OCD (for more details, see Jelinek, Moritz et al., 2021). Only people aged between 18 and 80 years and with a self-reported diagnosis of OCD by a mental health expert (e.g., psychiatrist, psychotherapist) were included in the study. Additional inclusion criteria were: no stereotypical answer patterns and completion of the OCI-R and the assessment of UP. The first assessment was conducted at the beginning of the COVID-19 pandemic in Germany between March 23, 2020 and May 18, 2020 (t1). During this period, numerous public health measures such as contact restrictions, facility closures, and special hygiene measures were established (Steinmetz et al., 2020). Three months after the first assessment, participants were invited to participate in the second assessment (t2). Data collection at t2 took place between June 23, 2020 and September 20, 2020. As compensation, participants could download a PDF manual after each survey (t1: a manual to improve self-esteem, t2: a manual with cognitive-behavioral self-help techniques to improve mental health during the COVID-19 pandemic). The study was approved by the local ethics committee (#LPEK-0131).

Participants

The sample at t1 ($n = 268$) corresponded to Jelinek, Voderholzer, et al. (2021), with predominantly female participants ($n = 193$, 72%), a mean age of approximately 40 years ($M = 39.62$, $SD = 11.75$), a mean illness duration of 19 years ($M = 19.38$, $SD = 12.88$), and moderate to severe severity of OCD (OCI-R score: $M = 27.78$, $SD = 11.58$) as well as depression (PHQ-9: $M = 12.10$, $SD = 6.37$). Of these, $n = 151$ (56.3%) were experiencing C-OCD. Three months later (t2), $n = 179$ (66.8%) of the participants were reassessed.

Assessment of indirect comparative unrealistic pessimism (implicit)

In Study 2, UP was assessed in two blocks comprising questions regarding a possible future infection with SARS-CoV-2 and its consequences. In block 1, participants estimated the likelihood that they themselves would experience the following three events: (1) getting infected with SARS-CoV-2, (2) recovering after having the disease, and (3) dying after having the disease (personal vulnerability). In block 2, participants estimated the likelihood that these three events would happen to an average person of the same age, sex, residence, and health status as themselves (overall vulnerability). Participants answered all six questions on 7-point Likert scales ranging from *very low* (1) to *very high* (7), with *medium* (4) as the midpoint. As suggested by Moritz and Jelinek (2009), personal and overall vulnerability were compared to index UP.

Strategy of data analysis

Participants were allocated to two groups, either with (C-OCD) or without (nC-OCD) C-OCD. Group membership was based on the participants' responses at the beginning of the assessment regarding their predominant OCS. For group comparisons, a $3 \times 2 \times 2$ mixed ANOVA was planned, with Event (infection, recovery, death), Perspective (self, other) as within-subject factors, Group as between-subject factor (C-OCD, nC-OCD), and likelihood as the dependent variable.

Multiple hierarchical regression was used to investigate whether UP predicts the course of OCS over the pandemic. Change in OCS over time (OCI-R total scores at t1 minus OCI-R total scores at t2) were used as the dependent variable. Demographics (age, gender)[1] were entered as the first-block predictors (model A1) and psychopathology at t1 (OCI-R total score) as the second-block predictors (model A2). These results were previously reported by Jelinek, Voderholzer, et al. (2021). For the first time, vulnerability estimates (overall vulnerability to infection, unrealistic comparative pessimism regarding infection, and severe illness) were included as predictors in the third block (model A3) by calculating difference scores for each event between the estimated likelihood for oneself versus others (self minus others). Level of significance was adjusted to control for multiple comparisons (Bonferroni correction).

Results

Indirect comparative unrealistic pessimism

The ANOVA showed significant main effects for Event ($F(2, 266) = 285.071$, $p < .001$, $d = 2.31$) and Perspective ($F(1, 266) = 10.024$, $p = .002$, $d = 0.39$), which were qualified by a significant Event × Perspective interaction ($F(2, 266) = 10.380$, $p < .001$, $d = 0.40$), indicating UO (i.e., higher likelihood of a positive outcome for oneself than for others) regarding the event of infection with SARS-COV-2 but UP (i.e., higher likelihood of a negative outcome for oneself than for others) for the events of recovery and death after COVID-19. The main effect of Group was also significant ($F(1, 266) = 4.265$, $p = .040$, $d = 0.26$), with a generally higher rating in C-OCD than nC-OCD with a small effect size. None of the interactions involving Group were significant (all *Fs* < 1.0, all *p*s > .3). For means, see Figure 1.

Prediction of OCS over the course of the pandemic

Correlations are given in Table 3. They were generally small in magnitude between OCI-total scores and vulnerability estimates ($|r| = .016–.111$). Results of the regression models A1–A3 are shown in Table 4.

Discussion

This study aimed to investigate the impact of OET and UP on OCS and symptom course in the context of the COVID-19 pandemic. UP, as a specific aspect of OET, was studied in terms of possible infection with SARS-CoV-2 and severe outcome in the general population (Study 1) and in patients with OCD (Study 2) using a longitudinal design.

In line with previous studies (Moritz & Jelinek, 2009; Moritz & Pohl, 2009; Niemeyer et al., 2013; Zetsche et al., 2015), OET per se was not associated with OCD, but negative estimations of one's personal vulnerability (lack of UO, UP) were associated with OCS in a clinical and nonclinical sample (Study 1 and 2). Moreover, Study 1 suggested that a more negative course of OCS was associated with UP regarding getting severely ill in the nonclinical sample. In contrast, overall higher estimates of vulnerability to infection with

[1] *In contrast to Study 1, level of education was not assessed.*

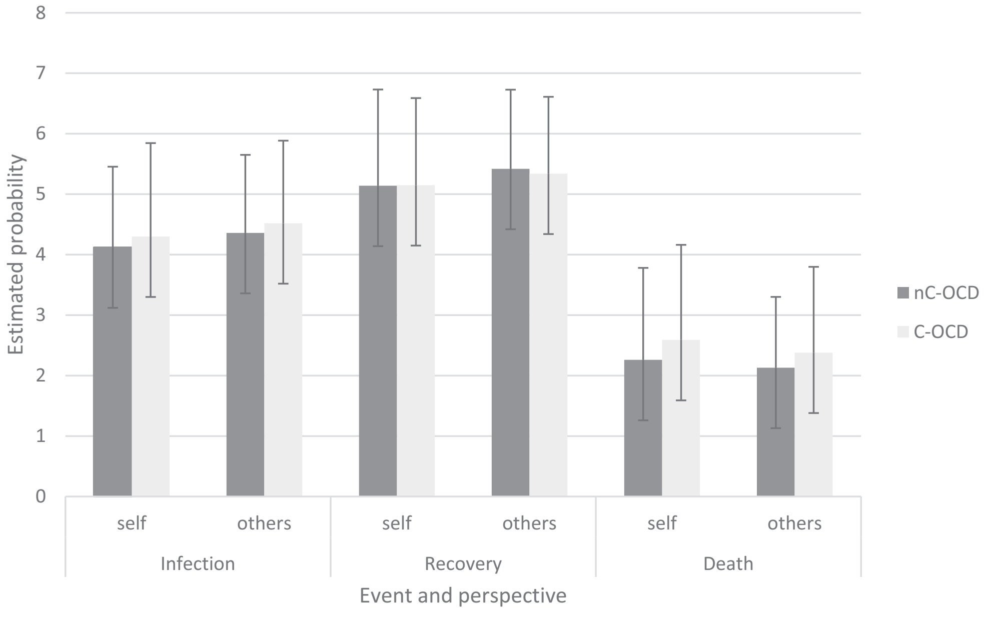

Figure 1. Probability of infection, recovery, or death due to COVID-19 (self vs. others) as rated on a 7-point Likert scale ranging from *very low* (1) to *very high* (7).

SARS-CoV-2 were associated with a decrease in OCS over time in Study 1. In the following, we will first discuss the cross-sectional results of the two studies at the start of the pandemic, and then we provide the longitudinal results.

Unrealistic pessimism and OCS at the start of the pandemic (cross-sectional)

Both individuals of the general population with elevated OCS (OCS+) as well as patients with OCD showed unrealistic pessimism. In Study 1, participants with high level of OCS (OCS+) estimated the overall vulnerability to infection with SARS-CoV-2 as higher than participants with low OCS (OCS–). This result is largely in line with claims that OET, and thus attenuated UO or UP, is a cognitive mechanism in OCD (Carr, 1974; Obsessive Compulsive Cognitions Working Group, 1997, 2001, 2003, 2005; Rachman, 2003). Still, the effect size for group differences in the estimated overall vulnerability was small (η^2_{part} = .004). As described in the introduction, UP has been assessed differently across the existing studies; some used a direct and explicit assessment, whereas others used an indirect and implicit assessment (Moritz & Jelinek, 2009). Thus, in the following discussion, we contrast the results of each of our studies with studies using a similar methodology to our study.

In Study 1 using a direct assessment of UP, the OCS+ group assessed their personal vulnerability for infection with SARS-CoV-2 and a severe course of COVID-19 illness as higher than the OCS– group did. This is in line with Moritz and Pohl (2009) as well as Niemeyer et al. (2013), which both showed attenuated UO in OCD compared to healthy controls. Differences in the estimates of the overall probability of the assessed events (independent of the personal risks) were not detected in Moritz and Pohl (2009) and Niemeyer et al. (2013). However, our results are inconsistent with Moritz and Jelinek

Table 3. Means (*M*), standard deviations (*SD*) for unrealistic pessimism and zero-order correlations between obsessive compulsive symptoms (OCS) and unrealistic pessimism in patients with OCD with available data at t1 and t2, $N = 179$

	Mean (*SD*)			Zero-order correlations (*p*-value)						
	C-OCD $n = 104$	nC-OCD ($n = 75$)	Total ($N = 179$)	1.	2.	3.	4.	5.	6.	7.
OCI-R total, t1	-[b]	-[b]	-[b]		.862 (<.001)	.453 (<.001)	.360 (<.001)	−.081 (.280)	−.107 (.155)	.027 (.721)
OCI-R total, t2	-[b]	-[b]	-[b]			.498 (<.001)	.502 (<.001)	−.049 (.511)	−.086 (.253)	−.001 (.989)
OCI-R washing, t1	-[b]	-[b]	-[b]				.907 (<.001)	−.042 (.578)	−.039 (.601)	.111 (.139)
OCI-R washing, t2	9.19 (2.61)	3.00 (2.99)	6.60 (1.11)					−.017 (.820)	−.016 (.834)	.060 (.426)
Unrealistic pessimism for infection with SARS-CoV-2, t1[a]	-0.23 (1.14)	-0.24 (1.06)	-0.24 (1.08)						−.026 (.733)	.052 (.486)
Unrealistic pessimism for recovery after infection with SARS-CoV-2, t1[a]	-0.14 (1.07)	-0.28 (1.09)	-0.20 (1.01)							−.598 (<.001)
Unrealistic pessimism for death after infection with SARS-CoV-2, t1[a]	0.17 (0.91)	0.07 (1.13)								

Note. OCI-R = Obsessive-Compulsive Inventory-Revised.
[a]Difference scores (block 1 minus block 2) for each event between the estimated likelihood on a 7-point Likert scale ranging from *very low* (1) to *very high* (7) for oneself (block 1) versus others (block 2); [b]For means and standard deviation on OCS please see Jelinek, Voderholzer, et al. (2021). Level of significance was adjusted ($p < .002$) to control for multiple comparisons (Bonferroni correction).

Table 4. Predictors of change in obsessive-compulsive symptoms (outcome: change in OCI-R from t1 to t2), $n = 177$

Step 1	B [$CI_{95\%}$] Model A1	β	p
Constant	−2.05 [−6.07, 1.97]		.316
Age	<0.01 [−0.08, 0.08]	<0.01	.985
Gender[a]	2.57 [0.30, 4.83]	0.17	.026
Step 2	**Model A2**		
Constant	−4.98 [−9.39, −0.57]		.027
Age	0.01 [−0.08, 0.09]	0.01	.918
Gender[a]	2.22 [−4.15, 0.33]	0.15	.051
OCI-R total score, t1	0.11 [0.04, 0.19]	0.21	.004
Step 3	**Model A3**		
Constant	−5.10 [−9.55, −0.64]		.025
Age	0.01 [−0.08, 0.09]	0.014	.852
Gender[a]	2.17 [−0.08, 4.42]	0.145	.059
OCI-R total score, t1	0.11 [0.03, 0.19]	0.211	.005
Unrealistic pessimism for infection with SARS-CoV-2, t1[b]	−0.21 [−1.05, 0.63]	−0.036	.627
Unrealistic pessimism for recovery after infection with SARS-CoV-2, t1[b]	0.06 [−1.02, 1.14]	0.010	.910
Unrealistic pessimism for death after infection with SARS-CoV-2, t1[b]	0.37 [−0.79, 1.52]	0.058	.532

Note. $R^2 = .030$, $F = 2.646$ ($p = .074$) for step 1; $\Delta R^2 = .045$, $F = 8.465$ ($p = .004$) for step 2, $\Delta R^2 = .004$, $F = 0.232$ ($p = .874$) for step 3. b = unstandardized regression coefficient, β = standardized regression coefficient. Significant results are bolded. OCI-R = Obsessive-Compulsive Inventory-revised.
[a]1 = female, 2 = male.; [b]Difference scores (block 1 minus block 2) for each event between the estimated likelihood on a 7-point Likert scale ranging from *very low* (1) to *very high* (7) for oneself (block 1) versus others (block 2).

(2009) as well as Zetsche et al. (2015), both of which reported no group difference in the direct assessment of UO but did report a difference when an indirect assessment was used (i.e., comparing two separate estimates for oneself and a person of the same age and sex).

In Study 2, we used an indirect assessment that not only asked for estimates of vulnerability to infection and a severe course of illness but also to death due to COVID-19. Similar to previous studies also using an indirect assessment (Moritz & Jelinek, 2009; Niemeyer et al., 2013; Zetsche et al., 2015), UP was found in estimates of the likelihood of recovery and death after COVID-19 in OCD. However, UP was not found regarding infection with SARS-CoV-2; instead, we found signs of UO. These seemingly diverging results may be explained by the differences in the events and the general situation in which the study was conducted: During the pandemic, recovery (positive event) and death (negative event) after a COVID-19 infection is less controllable by individuals in comparison to infection. People may reduce the risk of a SARS-CoV-2 infection by wearing a mask, maintaining social distancing, etc. People with OCD, who are also often socially isolated, may rightly deem their risk of infection lower compared to people of the same sex and age at the start of the pandemic and may actually have reduced risk through their heightened precautions. For the first time, however, we compared UO between people with C-OCD versus other OC dimensions (nC-OCD). Contrary to our hypothesis, no group differences were apparent. Obsessions related to contamination and/or cleaning compulsions do not seem to be the driving force for UO regarding infection with SARS-CoV-2. Potentially, other OCD content, such as checking (e.g., correct fit of mask), may be as relevant. Future studies should investigate different OC dimensions and also include a healthy control group to verify this interpretation.

The association between UP and OCS development over the course of the pandemic (longitudinal)

Regarding the longitudinal results, Study 1 and Study 2 are the first to investigate the relationship between virus-related OET and UP, respectively, and the course of OCS over time. In Study 1, estimates of a higher overall likelihood of infection with SARS-CoV-2 at the start of the pandemic in 2020 predicted a decrease in OCS over time. UP at the start of the pandemic regarding a severe course of COVID-19 predicted an increase in OCS over time. In Study 2, UP at the start of the pandemic was not related to the course of OCS over time.

In terms of OCS, a higher estimate of the overall likelihood of infection at the beginning of the pandemic seemed to promote a functional adaption to the pandemic in the nonclinical sample as it is associated with a stronger decrease in OCS (Study 1). At first glance, this result is surprising and needs explanation. Potentially, nonclinical participants with higher estimates of infection took the pandemic situation more seriously than participants with lower estimates and were able to prepare for the distress of the following months more adequately. They may have shown greater compliance with and relief due to the restrictions and interventions (i.e., the German lockdown), leading to a decrease in OCS over time.

Alternatively, higher estimates of the overall threat of infection at the start of the pandemic might have accompanied an increase in OCS as indicated by the correlations between OCS and estimates of overall vulnerability to infection, enabling a large decrease in OCS over time (regression to the mean) or a stronger adaptation after initial adjustment difficulties. Everyday life during the pandemic might even resemble a sort of exposure treatment for individuals with a subjective higher probability of being infected, combined with the (potential) experience of not being infected (due to the low numbers at the start of the pandemic[2]), leading to a stronger violation of expectations compared to individuals who rated the risk of an infection as low. However, no prepandemic baseline was available. In regression analyses, we controlled for OCS level at t1, controlling for regression to the mean.

Moreover, if valid, this explanation should also apply to UP regarding infection and severe illness at the start of the pandemic. However, UP regarding a severe course of COVID-19 illness predicted an increase in OCS over time in nonclinical participants (Study 1). For UP regarding the likelihood of an infection, the results were in a similar direction but did not reach significance (p = .100). Thus, instead of estimates of the overall

[2] *Germany had 57,298 COVID-19 cases and 455 related deaths as of March 30, 2020, according to the Robert Koch Institute (2020).*

likelihood of infection, which captures OET, UP regarding infection seems to be important in the increase of OCS and thus development of OCD in the context of the pandemic. Accordingly, and as shown previously (e.g., Moritz & Jelinek, 2009), it is not OET in general but the estimation of personal risk that is important for symptom development and course. This is in line with Rachman (1998), who proposed that intrusions only progress to obsessions in cases of personal significance and threat. This also has clinical implications and points to the need to always consider the patient's etimated individual risk and not to target general probabilities of adverse events only.

Initially surprising to us, we were not able to support the association between UP at the start of the pandemic and the course of OCS in participants with OCD (Study 2). As reported previously (Jelinek, Moritz, et al., 2021), an increase in distress was particularly high in participants with OCD at the start of the pandemic. One could therefore assume that the pandemic acted as such a strong stressor that no further modulation by UP became apparent, similar to a ceiling effect. Instead, and in line with the explanation given above focusing on adaptation and exposure, a decrease in OCS was observed over time. While we have previously shown that this decrease in OCS over the pandemic is less likely in C-OCD Jelinek, Voderholzer, et al. (2021), we did not find evidence that UP explains this difference between OCD participants with and without contamination-related symptoms. In addition to this possible ceiling effect, it could also be that cognitive biases are particularly relevant in explaining the development of symptoms and that UP was therefore associated with symptom worsening only in nonclinical individuals (Study 1), whereas other factors such as avoidance or obsessive-compulsive behaviors may have had a stronger influence on the maintenance and progression of the disorder in clinical OCD).

Limitations

Like all studies, this study has limitations. First, comparability between Study 1 and Study 2 is limited as the UP assessment differed in the two studies and – consistent with other online studies during the COVID-19 pandemic (e.g., Qiu et al., 2020) – more women than men participated in both studies. Thus, generalizability may be limited. On the positive side, however, both studies had a large sample, and we used a clinical as well as a nonclinical population, which raises the potential of generalizability. Moreover, our results showed rather small effects, which is typical for multifactorial, complex processes such as the development of psychopathology, but this result emphasizes that other relevant influences need to be considered. We conducted both studies via the Internet. On the one hand, while we took several precautions aimed at good data quality, such as using cookies to prevent multiple entries by the same person and excluding suspicious data sets (e.g., systematic response patterns), we did not assess the participants in person. On the other hand, this enabled fast and timely data collection at the beginning of the pandemic during a time when video-based assessments were not well disseminated in Germany or were banned by data security restrictions on research. Future studies should consider in-person examination to support the OCD diagnosis and to use clinician-based assessments.

Conclusion

We were able to support that UP – a specific aspect of OET – plays an important role in OCD (Study 2) as well as the increase of OCS in the general population (Study 1). Thus, our study was able to support cognitive models positing that UP is relevant to the development of OCD and that prevention programs during a pandemic should include targeting UP.

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Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Lena Jelinek: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Funding acquisition (equal); Investigation (equal); Methodology (equal); Project administration (equal); Resources (equal); Software (equal); Supervision (equal); Writing – original draft (equal); Writing – review & editing (equal). **Gloria Röhrig:** Conceptualization (equal); Project administration (equal); Writing – review & editing (equal). **Steffen Moritz:** Conceptualization (equal); Methodology (equal); Resources (equal); Supervision (equal); Writing – review & editing (equal). **Anja S. Göritz:** Data curation (equal); Resources (equal); Software (equal); Writing – review & editing (equal). **Ulrich Voderholzer:** Conceptualization (equal); Investigation (equal); Methodology (equal); Resources (equal); Writing – review & editing (equal). **Anja Riesel:** Formal analysis (equal); Supervision (equal); Writing – review & editing (equal). **Amir H. Yassari:** Conceptualization (equal); Resources (equal); Writing – review & editing (equal). **Franziska Miegel:** Conceptualization (equal); Investigation (equal); Methodology (equal); Project administration (equal); Writing – review & editing (equal).

Ethical approval

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Data transparency

Findings from the data collections have been reported in separate manuscripts. MS 1 (published) focuses on an increase in OCS in the general population. MS 2 and MS 3 (both published) on OCS in a clinical population. While data on symptomatology has been published before, data on overestimation of threat (OET) and unrealistic pessimism (UP) has not been published yet (including publication as a preprint or a website post) and has not been submitted elsewhere. They may offer insights on OCD beyond the current COVID-19 pandemic.

Data availability statement

Data are available upon request.

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