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Research Article

Coronaphobia – What Do Coronaphobia Scales Measure? An Analysis of 12 Open Instruments and their Correlates

Luna Radević [1]✉, Marko Milošević [1], Miroslav Milosavljević [1] and Bojana M. Dinić [1]

[1] *Department of Psychology, Faculty of Philosophy, University of Novi Sad, Serbia*

ABSTRACT

Previous studies confirmed the psychological, psychosomatic, and economic consequences of the COVID-19 outbreak, which lead to the introduction of a new concept of coronaphobia as a persistent and excessive fear of the novel coronavirus. With the beginning of the pandemic, the interest in coronaphobia-related measurement began and until 2021, 12 instruments were created, with a total of 28 (sub)scales. The first aim of this study was to explore the joined factor structure of these measurements. The second aim was to explore a wide range of correlates of coronaphobia (sociodemographic characteristics, general anxiety disorder, Big Five traits, knowledge about coronavirus, and political orientation). The sample included 347 participants (42.1% male) from the general population of Serbia and data were collected in April 2021. Results showed that only one component could be extracted based on 28 (sub)scales of coronaphobia, meaning that physiological, cognitive, emotional, and behavioral aspects of coronaphobia are rather intercorrelated. Furthermore, among explored correlates, general anxiety disorder had the highest contribution to the explanation of coronaphobia. Additionally, Openness showed a negative, and age showed a positive contribution to the explanation of coronaphobia. Our results suggest that coronaphobia should be understood as a syndrome that captures physiological, cognitive, behavioral, and emotional aspects, and that individuals who are already prone to anxiety disorders are more prone to coronaphobia as well.

Keywords: coronaphobia, factor structure, COVID-19, general anxiety disorder

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✉ Corresponding email: luna.radevic@ff.uns.ac.rs

Introduction

In late 2019 in China, several cases of pneumonia with an unknown etiology appeared (Hui et al., 2020). Later, the new virus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been identified as the cause of the illness now known as coronavirus disease 2019 (COVID-19). The World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic on March 11, 2020. The infection quickly spread around the globe (Hui et al., 2020) and so far (March 19, 2023), there have been 760 million confirmed cases of the disease with nearly 6 million deaths (source: https://covid19.who.int).

In addition to physical health consequences, the outbreak of the COVID-19 pandemic also had important psychological consequences for people's lives, such as fear, moderate to severe anxiety, depression, anger, social isolation, exaggerated interpretation of minor symptoms; then psychosomatic consequences such as insomnia; and economic consequences such as job losses and scarcity due to panic buying (Asmundson & Taylor, 2020; Cao et al., 2020; Lee, 2020; Lin 2020; Liu et al., 2020; Wang et al., 2020). Such circumstances led to the coining of a new concept – coronaphobia. Arpaci et al. (2020, pp. 1) define coronaphobia as "a persistent and excessive fear of the novel coronavirus, which can be classified as a particular type of the DSM-V specific phobia", given the presence of unique triggers and fear of the unknown. The main specific characteristic of coronaphobia is that fear comes primarily from physical contact with other people (Arora et al., 2020). Another important characteristic that should be taken into account when exploring coronaphobia is that it represents a maladaptive, excessive fear that interferes with daily functioning as it is the case with all phobias (Arora et al., 2020). Based on a literature review, Arora et al. (2020, pp. 2) defined coronaphobia as "an excessive triggered response of fear of contracting the virus causing COVID-19, leading to accompanied excessive concern over physiological symptoms, significant stress about personal and occupational loss, increased reassurance and safety seeking behaviors, and avoidance of public places and situations, causing marked impairment in daily

life functioning". They further identified three main components of coronaphobia: 1) physiological, which encompasses symptoms such as palpitations, tremors, difficulty in breathing, dizziness, change in appetite, and sleep due to excessive concern and worry; 2) cognitive, which refers to the fear of coronavirus that involving preoccupation with threat-provoking cognitions and could further trigger emotional reactions (e.g., sadness, guilt, anger); 3) behavioral, which refers to avoidance behavior in order to prevent the infection (e.g., avoidance of public transportation and gathering) as well as reassurance behaviors such as constantly checking body vitals, confirming the absence of illness, self-medicating, or excessive hygiene (Arora et al., 2020). It should be noted that the emotional aspect of coronaphobia is not recognized as the main component, but rather as a response to them.

The need for a more specific concept like coronaphobia stems from the unique circumstances surrounding the COVID-19 pandemic. This includes the worldwide scope of the crisis, the extensive media coverage, rapid changes in daily life due to lockdowns and social distancing, and the prevailing uncertainty regarding the future. These factors have resulted in a distinct type of fear and anxiety that differs from generalized anxiety disorder (GAD) or other established concepts. In fact, the inclusion of coronaphobia in psychological discourse is important for accurately describing and studying the unique psychological reactions to the COVID-19 pandemic. It does not replace existing concepts but rather adds a new facet to our comprehension of anxiety and fear responses. For instance, although both generalized anxiety disorder (GAD) and coronaphobia encompass anxiety, there are notable distinctions. GAD typically manifests as a chronic and all-encompassing condition, with individuals experiencing worry across various domains of life. On the other hand, coronaphobia is more specific in nature, centering around e.g. fears associated with contracting the virus, the well-being of loved ones, and the societal consequences of the pandemic (Ahorsu et al., 2020; Schimmenti et al., 2021; Muller et al., 2021).

The first measurement instruments of coronaphobia were soon developed after its importance was recognized. Although the first instruments

were unidimensional (such as The Obsession with COVID-19 Scale from Lee, 2020; Coronavirus Anxiety Scale from Lee et al., 2020; The fear of COVID-19 scale from Ahorsu et al., 2020), subsequent instruments consisted of multiple factors. For example, there are instruments that capture the difference between somatic and nonsomatic factors (Bernardo et al., 2020), fear and somatic concern (Silva et al., 2020), while Dilbaz et al. (2020) distinguish worry, mood, reassurance seeking, and avoidance as coronaphobia dimensions. In a meta-analysis of fear of COVID-19 measures, Muller et al. (2021) identified four instruments only 10 months after the pandemic began. They found that no study validated more than one instrument and that overall study quality was generally low due to the sampling strategy. To the best of our knowledge, until 2021 we found 12 created instruments related to various aspects of coronaphobia (e.g., physiological, cognitive...). Considering a variety of coronaphobia instruments, the first aim of this study was to explore common factor structure of existing coronaphobia instruments to get a better insight into its main dimensions or aspects.

Results from previous research indicate that coronaphobia aspects are related to health-responsible behaviors, i.e., to positive attitudes towards the COVID-19 vaccine (Erdem & Karaman, 2022; Turan et al., 2022) and willingness to vaccinate (Šorgo et al., 2022). The effect of coronaphobia on willingness to vaccinate has been shown to be long-term, over 14 months (Mertens et al., 2022). Thus, coronaphobia plays an important role in public health and can lead to increased vigilance and adherence to public health guidelines. On the other hand, coronaphobia clearly can lead to significant distress and impairment in daily life. Specifically, it can lead to avoidance behaviors that disrupt normal life, such as refusing to leave the house even for essential activities and can also cause significant psychological distress. Therefore, all the consequences and impacts of coronaphobia urges a better understanding of its correlates.

To predict coronaphobia and create preventive strategies, many studies focused on factors related to coronaphobia. In this study, we focused on individual characteristics as predictors of coronaphobia. The first group of

factors comprises demographic characteristics – gender, age, and education level. Regarding gender, results are not consistent across studies, with some studies showing that women are more prone to intense fear of coronavirus compared to men (e.g., Silva et al., 2020; Lippold et al., 2020), and others find no gender differences (e.g., Cao et al., 2020; Perz et al., 2022; Zhang & Ma, 2020). Similar inconsistencies are observed for age, with one group of studies showing that age does not play a significant role in fear of coronavirus (Silva et al., 2020; Evren et al., 2020; Lee, 2020), and another group showing that age is positively (Jain & Jha, 2020; Schweda et al., 2021) or negatively (Lippold et al., 2020) related to fear associated with COVID-19. Although there is limited research regarding the effect of education level, it seems to be positively related to coronaphobia (Lippold et al., 2020).

The second group of factors includes those factors that are corona-specific, such as knowledge about the coronavirus. Even in prior cases of pandemics, such as the Ebola virus outbreak, studies revealed the significant role of knowledge and its negative relation to anxiety and fear (e.g., Mishra et al., 2016). The same findings were noted in the case of the ongoing pandemic, with the knowledge about COVID-19 being negatively related to the fear of COVID-19 (Roy et al., 2020; Terzić-Šupić et al., 2021). However, in some studies, a non-significant correlation was found between knowledge about COVID-19 and fear and stress related to coronavirus (Medina Fernández et al., 2021).

The third group of factors comprises personality characteristics and we differentiate the tendency towards general anxiety disorder (GAD) from the basic personality traits. Previous research showed that coronaphobia was positively related to generalized anxiety among middle school students (Yang et al., 2023) and adults, in which it was the main correlate besides demographics, neuroticism, and health and death anxiety (Lee et al., 2020). Thus, it is expected that GAD will show a significant relation with coronaphobia. Given that GAD is highly related to neuroticism and shares a common genetic basis with it (Hettema et al., 2004), it is not surprising that neuroticism is the strongest predictor of coronaphobia among Big Five personality traits (Lippold et al., 2020; Nikčević & Spada, 2020). Additionally, some studies have identified a negative

relation between coronaphobia and extraversion and conscientiousness, suggesting that these traits might play a role as protective factors (Nikčević & Spada, 2020).

Finally, the fourth group of factors refers to political orientation. It should be noted that only few studies examined the ideological differences in response to the pandemic. Some previous research has shown that individuals who are more conservative and right-orientated tend to report lower levels of fear of COVID-19 (Winter et al., 2023) as well as less general concern about the virus (Ruisch et al., 2021). However, Lippold et al. (2020) reported contrary findings from a longitudinal study on a German sample but also stated that the effect of political orientation changes over time and it is not a stable predictor of COVID-19-related fear as personality traits (especially neuroticism) are.

The main aim of this research was to explore the structure of coronaphobia. Although there are different conceptualisations of coronaphobia, in line with the definition provided by Arora et al. (2020), we expected to detect three main dimensions - physiological, cognitive, and behavioral. For this purpose, we examined the common factor structure of existing instruments that measure all or some of coronaphobia aspects (e,g., only cognitive aspect). Up until 2021, we found 12 created instruments related to various aspects of coronaphobia, all of which were included in this study. The second aim was to explore a wide range of correlates of coronaphobia. First, predictors of coronaphobia were explored, including demographic characteristics, knowledge about the coronavirus, personality traits, and political orientation. Demographic characteristics were the most explored factors of coronaphobia (e.g., age, see Evren et al., 2020; Jain & Jha, 2020; Lee, 2020; Silva et al., 2020; Schweda et al., 2021), thus we included them in the first step of predictors, followed by corona-related predictor such as knowledge of coronavirus, and then we included more general factors that were highlighted in the previous studies (GAD, personality traits, political orientation; e.g., Lee et al., 2020; Lippold et al., 2020; Winter et al., 2023; Yang et al., 2023). In this study, the effects of all these predictions were explored in one model, which could give us better

insight into the most important predictors of coronaphobia. We expect to find strong evidence of relations between coronaphobia and GAD (e.g., Lee et al., 2020). However, considering that previous studies showed mixed results regarding the importance of other characteristics as well as the direction of relations in some characteristics (e.g., Lippold et al., 2020; Winter et al., 2023), we do not have an assumption regarding their effects. Second, we explored the relations between coronaphobia and compliance with preventive behaviors and vaccination status. We expect that coronaphobia is positively related to the practice of preventive behaviors as well as to the willingness to vaccinate as the most effective preventive measure (e.g., Mertens et al., 2022).

Method

Participants and procedure

The sample included 347 participants (42.1% male) from the general population of Serbia (aged between 19 and 54 years; $M = 29.98$, $SD = 9.42$). The majority (45%) were students or had Bachelor's or Master's degree (24.2%) or Ph.D. (1.4%), while 21.3% finished high school and 8.1% finished higher school. The inclusion criterion for the sample was that the participant was over 18 years old and the sample size was determined in accordance with similar research. The data were collected online in April of 2021 by trained psychology students for course credit. The students' task was to collect data from 5 participants in line with predetermined quotas (e.g., one male and one female aged 18-30, one male and one female older than 31 years, etc.), to distribute link to the questionnaires and to inform participants about the main objectives of the study. The study was approved by the Ethical Committee for the Psychological Research of the Department of Psychology, Faculty of Philosophy, University of Novi Sad, Serbia (No. 202103300011_f4Tx).

Measures

In this study several scales for a measure of coronaphobia aspects were adapted to Serbian (see https://osf.io/rnmqh/ for original and adapted items).

Adaptation was done by two independent translators, and then the third translator compared the translations and chose one or adapted existing ones.

Coronavirus Anxiety Scale (CASa; Evren et al., 2020)

The CAS is a 5-item measure of probable cases of dysfunctional anxiety associated with the COVID-19 crisis. The participants were asked to rate the frequency of these symptoms over the past two weeks (0 = *not at all*, 4 = *nearly every day*).

Obsession with COVID-19 Scale (OCS; Lee, 2020)

The OCS is a 4-item scale that measures persistent and disturbed thinking about COVID-19. Participants were asked to rate the frequency of the symptoms during the past two weeks (0 = *not at all*, 4 = *nearly every day*).

COVID-19 Anxiety Scale (C19AS; Chandu et al., 2020)

The C19AS is a 7-item measure of two aspects of COVID-19 anxiety: fear of social interaction (5 items) and illness anxiety (2 items). A semantic differential response scale was given. Respondents were asked to rate given items along a continuum, between two extreme evaluations (*Extremely afraid - Not at all afraid; Always - Never; Extremely worried - Not at all worried; Extremely anxious - Not at all anxious; Extremely concerned - Not at all concerned*), with 4 points in between.

COVID-19 Anxiety scale (CASb; Silva et al., 2020)

The CAS-7 is a 7-item measure (0 = *does not apply to me*, 3 = *very applicable to me*) assessing how participants felt towards the threat of the new coronavirus in the previous days.

COVID-19 Phobia Scale (C19P-S; Arpaci et al., 2020)

The C19P-S is a 20-item measure of coronaphobia as a persistent and excessive fear of the novel coronavirus and includes four subscales: social factors (5 items), psycho-somatic factors (5 items), psychological factors (6 items), and economic factors (4 items). Participants were asked to indicate their

level of agreement with the statements (1 = *strongly disagree*, 5 = *strongly agree*).

Fear of COVID-19 Scale (FCV-19S; Tzur Bitan et al., 2020)

FCV-19S is a 7-item (1 = *strongly disagree*, 5 = *strongly agree*) measure of emotional fear reactions toward the COVID-19 pandemic. Although the original scale was proposed to be unidimensional (Ahorsu et al., 2020), a recent evaluation of the instrument (Tzur Bitan et al, 2020) provided support a two-factor structure which includes emotional fear reactions (4 items) and symptomatic expressions of fear (3 items).

Fear of the Coronavirus Questionnaire (FCQ; Mertens et al., 2020)

The FCQ is an 8-item (1 = *strongly disagree*, 5 = *strongly agree*) measure of experiencing the fear of the coronavirus.

Coronavirus Disease Concern Scale (COVID-19CS; Dadfar & Lester, 2020)

The COVID-19CS is an 18-item (0 = *definitely false*, 3 = *definitely true*) measure of three distinct types of concerns over COVID-19: infection/unsafety (6 items), instability/fear of social isolation (6 items), and insecurity/death fear (5 items).

COVID Stress Scale (CSS; Taylor et al., 2020, for Serbian adaptation see Mihić et al., 2022)

This 36-item scale measures 6 distress domains related to COVID-19 (6 items per each, from 0 = *not at all* to 4 = *extremely*): danger, socio-economic consequences, xenophobia, contamination, traumatic stress symptoms, and compulsive checking and reassurance seeking.

Coronavirus Pandemic Anxiety Scale (CPAS-11; Bernardo et al., 2020)

The CPAS-11 is an 11-item measure of symptoms of anxiety related to the COVID-19 pandemic and includes two subscales: somatic symptoms (5 items) and non-somatic symptoms (6 items). Participants are asked to rate how frequent these symptoms have been for the past two weeks (*0 - never/not at all; 3 - nearly every day in the past two weeks*).

COVID-19 Pandemic Anxiety Scale (COVID-19 PAS; Kumar et al., 2020)

The COVID-19PAS is a 10-item scale (0 = *did not apply to me at all*, 3 = *applied to me very much or most of the time*) that measures anxiety related to the coronavirus pandemic. It consists of two subscales: fear - fear of going out and meeting strangers, listening to news updates, and possible death due to the coronavirus (6 items) and somatic concerns - perceived bodily concerns regarding COVID-19 (4 items).

COVID-19 Phobia Scale (Dilbaz et al., 2020)

This is a 22-item scale (1 = *strongly disagree*, 5 = *strongly agree*) that measures emotions and behaviours related to the COVID-19 pandemic, grouped into 4 domains: mood (3 items), precaution (5 items), avoidance (2 items), and worry (10 items). It's important to note that due to technical issues, two items (in the original paper labeled as 36 and 39 - "I need to talk to others after learning about coronavirus" and "I care to pay attention to healthy food" from Dilbaz et al., 2020) were omitted from the online form.

Besides coronaphobia instruments, other measures were also used:

Knowledge About the Coronavirus

This is a 12-item test (0 = *False*, 1 = *True*) that assesses knowledge about coronavirus regarding the virus, symptoms, protective behaviors, and treatment. From 12 items, 8 which were still held were used from the Teovanović et al. (2021) and 4 were added in line with new knowledge about the coronavirus announced on the WHO website.

General Anxiety Disorder-7 (GAD-7; Spitzer et al, 2006, for Serbian adaptation see Rokvić, 2019)

The GAD-7 is a 7-item measure (0 = *not at all*, 1 = *several days*, 2 = *more than half the days*, 3 = *nearly every day*) of a generalized anxiety disorder (GAD) and assesses symptom severity, describing the most prominent diagnostic features for GAD. Participants are asked if they were bothered by anxiety symptoms over the past two weeks.

Mini IPIP-6 (Goldberg, 1999, for Serbian adaptation see Međedović & Bulut, 2017)

Mini IPIP is a 20-item measure of Big Five personality traits (neuroticism, extraversion, agreeableness, conscientiousness, and openness), each per 4 items (1 = *totally disagree*, 5 = *totally agree*).

Political orientation

Political orientation was measured via one item with the description of economic left and right orientation. According to Kroh (2017), an 11-point scale produces the highest validity and this response format was used (0 = *strongly left*, 5 = *center*, 10 = *strongly right*).

The COVID-19 Protective Behaviors Scale (Dinić & Bodroža, 2021)

This is a 5-item measure of various COVID-19 protective behaviors (e.g., handwashing, physical distancing). Participants rated the frequency of each behavior (0 = *never*, 4 = *all the time*) in the last 3 months.

Vaccination status

Participants were asked whether they: 1) are not planning to be vaccinated against COVID-19 (n = 157 or 45.2%); 2) didn't apply for vaccination yet but planning to do so (n = 123 or 35.4%); 3) applied for or already vaccinated against COVID-19 (n = 67 or 19.3%).

Descriptives and alpha reliability for all instruments were presented in Table 1.

Results

Descriptives and alpha reliability

Several scales showed normality violation (> ±2 for skewness and kurtosis, see Dinić, 2019 and Table 1) and their scores were normalized by *rankit* transformation. Alpha reliability was satisfactory, except for the Mood subscale from the Phobia Scale COVID-19 and Knowledge about coronavirus.

Overall, mean scores for the majority of the scales and subscales are relatively low, which is not surprising, given that coronaphobia encompasses an excessive and maladaptive forms of fear, anxiety and other aspects related to coronavirus. Moreover, according to our results, the lowest mean scores were observed on the Anxiety of COVID Scale and the subscale of Illness Anxiety from The Covid-19 Anxiety Scale, indicating that these (sub)scales likely capture more extreme variants of coronaphobia expressions than others.

Additionally, most of these scores are also lower when compared to the scores obtained in the original studies (e.g. Arpaci et al., 2020; Chandu et al., 2020; Evren et al., 2020; Silva et al., 2020; Tzur Bitan et al., 2020). One possible explanation for this outcome could be related to the timing of our testing. Precisely, all the original papers that introduced newly developed coronaphobia scales which we subsequently used in our study were published during the first year of the pandemic. Since the data for our study was gathered in April, 2021, it could be assumed that by then people learned more about the virus and got somewhat adapted to living in new circumstances which likely resulted in lower levels of fear and anxiety in comparison to the early stage of the pandemic.

Table 1

Descriptive statistics and Cronbach's alpha for all scales

Scale	*M*	*SD*	Skewness	Kurtosis	α	Min	Max	No. items	Scale range
Anxiety of COVID Scale (CAS; Evren et al., 2020)	1.03	2.72	3.70	15.82	.93	0	20	5	0-4
Obsession with COVID-19 Scale (OCS; Lee, 2020)	1.79	2.72	2.35	6.72	.81	0	16	4	0-4
COVID-19 Anxiety Scale (C19AS; Chandu et al., 2020)	3.44	3.91	1.67	3.14	.89	0	21	7	0-3
Illness anxiety	0.76	1.05	2.02	5.29	.62	0	6	2	
Fear of social interaction	2.68	3.05	1.47	2.14	.86	0	15	5	

COVID-19 Anxiety scale (Silva et al., 2020)	3.67	4.70	1.66	2.40	.92	0	21	7	0-3
COVID-19 Phobia Scale (C19PS; Arpaci et al., 2020)	34.49	14.14	1.58	2.83	.95	20	100	20	1-5
Social factors	10.88	4.95	0.72	-0.22	.88	5	25	5	
Psycho-somatic factors	6.37	3.10	3.29	12.07	.90	5	25	5	
Psychological factors	11.75	5.62	1.10	0.60	.90	6	30	6	
Economic factors	5.49	2.61	2.50	7.30	.85	4	20	4	
Fear of COVID-19 Scale, (FCV-19S; Tzur Bitan et al., 2020)	9.94	4.69	2.67	8.59	.90	7	35	7	1-5
Emotional fear reaction	6.31	3.23	1.88	3.70	.85	4	20	4	
Symptomatic expression of fear	3.63	1.76	3.94	17.93	.90	3	15	3	
Fear of the Coronavirus Questionnaire (FCQ; Mertens et al., 2020)	18.30	6.73	0.56	0.03	.84	8	40	8	1-5
Coronavirus Disease Concern Scale (COVID-19CS; Dadfar & Lester, 2020)	11.00	9.66	1.28	1.72	.91	0	48	18	0-3
Unsafety	5.80	4.69	0.63	-0.39	.86	0	18	6	
Fear of social isolation	3.93	4.05	1.28	1.37	.80	0	18	6	
Fear of death	1.85	2.74	2.21	5.79	.82	0	15	5	
COVID Stress scales (CSS; Taylor et al., 2020)	25.09	22.35	1.48	2.49	.96	0	120	36	0-4
Danger	8.86	6.21	0.31	-0.73	.89	0	24	6	
Socio-economic consequences	2.75	4.65	2.11	4.45	.94	0	24	6	

Xenophobia	3.70	5.23	1.76	2.84	.92	0	24	6	
Contamination	4.64	5.43	1.39	1.53	.93	0	24	6	
Compulsive checking and reassurance seeking	5.14	5.37	1.25	1.18	.88	0	24	6	
Coronavirus Pandemic Anxiety Scale (CPAS-11; Bernando et al., 2020)	5.57	6.17	1.81	3.52	.91	0	33	11	0-3
Somatic symptoms	2.07	3.22	1.89	3.20	.90	0	15	5	
Non-somatic symptoms	3.51	3.52	1.48	2.27	.83	0	18	6	
COVID-19 Pandemic Anxiety Scale (COVID-19 PAS; Kumar et al., 2020)	5.00	5.51	1.79	3.49	.88	0	30	10	0-3
Somatic concerns	1.97	2.61	1.60	2.12	.82	0	12	4	
Fear	3.02	3.41	1.74	3.33	.81	0	18	6	
COVID-19 Phobia Scale (Dilbaz et al., 2020)	39.54	15.70	1.30	1.58	.94	20	100	22	1-5
Mood	6.98	2.67	0.51	-0.05	.47	3	15	3	
Precaution	9.74	4.28	1.09	0.91	.81	2	25	5	
Avoidance	4.74	2.40	0.52	-0.81	.79	2	10	2	
Worry	18.09	8.87	1.44	1.34	.94	10	50	10	
COVID-19 protective behaviors	14.00	4.58	-0.02	-0.90	.80	5	24	5	0-4
Knowledge about coronavirus	8.64	1.51	-0.44	0.64	.49	3	12	12	0-1
General anxiety disorder (GAD-7)	0.69	0.80	1.22	0.55	.94	0	3	7	0-3
Neuroticism	2.86	0.87	0.25	-0.18	.67	1	5	4	1-5
Extraversion	3.14	0.90	-0.08	-0.34	.72	1	5	4	1-5
Agreeableness	3.80	0.74	-0.41	-0.25	.61	1.50	5	4	1-5
Conscientiousness	3.63	0.89	-0.45	-0.46	.71	1.25	5	4	1-5
Openness	3.81	0.88	-0.54	-0.21	.55	1	5	4	1-5
Political orientation	5.21	2.37	-0.22	-0.27	-	0	10	1	0-10

Horn's parallel analysis under the principal component analysis on 28 (sub)scales of coronaphobia resulted in one component that could be extracted ($\lambda_1 = 16.46$, $\lambda_2 = 1.33$, whereas in parallel analysis $\lambda_1 = 1.64$, $\lambda_2 = 1.53$) which explained 58.79% of the total variance. The highest loadings on this component have scales referring mostly to what could be categorized as the cognitive aspect of coronaphobia (e.g., worry, fear, and anxiety, see Table A in Supplement for loadings), but it should be noted that all scales have high loadings (in a range from .57 to .90). The lowest loadings had scales referring to economic consequences. The component score was calculated through the regression method and used in further analyses. Preliminary, we conducted principal component analysis on item-level, however it also resulted in a one-component solution (the 1st component explained 42.97% and the 2nd only 5.44% of the total variance). Items with the highest loadings belong to different instruments but capture mostly (increased) fear of getting infected and catching coronavirus, persistent concern and worry about one's health, as well as preoccupation with thoughts about the disease which mostly refers to the cognitive aspect of coronaphobia. Results from analysis on item-level could be seen in Table A at https://osf.io/rnmqh/.

Correlations between coronaphobia component and the rest of the correlates indicated that women had higher level of coronaphobia compared to men and that there was a positive correlation with age (Table 2, for the rest of correlations between all variables see Tables B, C, D at https://osf.io/rnmqh/). GAD showed the highest and positive correlation with coronaphobia, followed by neuroticism, while extraversion and openness showed significant negative correlations. Other variables (e.g., knowledge about coronavirus, political orientation) showed no significant correlations with coronaphobia.

In the hierarchical regression analysis of the prediction of coronaphobia, demographic characteristics were included in the 1st block (gender, age, and education), knowledge about the coronavirus in the 2nd block, GAD and basic personality traits in the 3rd block, and political orientation in the 4th block. Results showed that the 1st and the 3rd blocks of predictors had significant contributions

to the explanation of coronaphobia (Table 2), with the total $R^2 = .44$, $p < .001$. In the final model, the highest significant contribution had GAD and then age in positive and openness in a negative direction.

Table 2

Predictors of coronaphobia component in hierarchical regression analysis

Predictors	Step 1	Step 2	Step 3	Step 4	*r*
Gender	.12*	.12*	.002	.003	.15***
Age	.17**	.17**	.16***	.16***	.16**
Education	-.01	-.01	.004	.004	.01
Knowledge about coronavirus		.06	.05	.05	.07
General anxiety disorder			.64***	.64***	.61***
Neuroticism			-.05	-.05	.28***
Extraversion			-.03	-.03	-.15**
Agreeableness			.05	.05	.08
Conscientiousness			.04	.04	.08
Openness			-.15**	-.15**	-.16**
Political orientation (higher scores indicate right-wing orientation)				.01	-.07
ΔR^2	.04**	.004	.40***	.000	

Note. In the case of gender, point biserial correlation (r_{pb}) was calculated. Gender coded as 1 = male, 2 = female. ***$p < .001$, **$p < .01$, *$p < .05$.

Finally, preventive behaviors showed a significant positive correlation with coronaphobia component (r = .44, p < .001), as well as vaccination status (r_{pb} = .17, p < .001), with those who plan to apply for and applied for/have already been vaccinated showed higher coronaphobia[1].

Similarities between the coronaphobia and GAD

Based on their correlations with the variables included in this research (knowledge about coronavirus, Big Five traits, political orientation, preventive behaviors, and vaccination status), we calculated profile similarity[2] between the coronaphobia component and GAD and it was .28, indicating a similar to moderately similar profile. The main distinction between the coronaphobia and GAD is in correlations with protective measures. Thus, GAD does not show significant correlation with vaccination status (.099) and correlation with protective behaviors is lower (.28), compared to coronaphobia component. In addition, we tested incremental predictive validity of coronaphobia component over and above GAD in prediction of vaccination status. Overall model was significant ($\chi^2(2)$ = 18.26, p < .001), explaining from 5% (Cox & Snell R^2) to 7% (Nagelkerke R^2) of vaccination status. Results showed that GAD was not significant predictor (Exp(B) = 0.90, p = .441), even when it is the only predictor in the model (Exp(B) = 1.23, p = .067), while coronaphobia component was

[1] One-way ANOVA was conducted to test the differences in coronaphobia based on the vaccination status of participants (F (2,344) = 8.93, p < .001). The *LSD* post-hoc test's results showed no significant differences between the group of participants who planned to apply for vaccination (2) and the group of participants who have already applied for/have already been vaccinated (3) (M_{diff} = -0.10, p = .486), which is why these two groups were merged into one. Further, both of these two groups significantly differed from the group of those who were not planning to get vaccinated (1) (M_{diff12}= -0.40, p = .001; M_{diff13} = -0.51, p = .001).

[2] Profile similarity was calculated as Cronbach and Gleser's D statistic, which represents (dis)similarity with lower values indicating smaller distance or higher similarity. D statistic could be interpeted in terms of Cohen's d effect size measure (Cohen, 1988), with values 0.20, 0.50, and 0.80 indicating high, medium, and low-profile similarity.

(Exp(B) = 1.74, p < .001). Therefore, coronaphobia is related to corona-specific outcomes which is expected based on its conceptualization, while GAD showed lower association with these specific aspects.

Discussion

The main aim of this research was to explore the structure of coronaphobia aspects based on 12 available measures with a total of 28 (sub)scales. Contrary to our expectation, we extracted one component instead of several components referring to different aspects of coronaphobia (physiological, cognitive, and behavioral). The first component captures a large amount of the total variance (58.79%) with the scales having the highest loadings referring mostly to what could be classified as cognitive aspect of coronaphobia (e.g., worry, fear). The highest loading had the subscale Worry from The COVID-19 Phobia Scale (Dilbaz et al., 2020) followed by Psychological factors from another COVID-19 Phobia Scale (Arpaci et al., 2020) both encompassing such aspects of coronaphobia as fear and anxiety caused by potential virus infection, or just by listening and thinking about coronavirus, then Social factors from the same scale and Fear of Social interaction from The COVID-19 Anxiety Scale (Chandu et al., 2020). However, all scales have relatively high loadings, so it cannot be concluded that the extracted component is limited to one aspect of coronaphobia, particularly considering that some scales assess multiple aspects simultaneously. These results indicate that the differentiation of coronaphobia aspects is not clear, at least not at the measurement level. Thus, we should better label coronaphobia as a syndrome that captures various cognitive, emotional, physiological, behavioral, and socio-economic aspects. Previous research have also suggested that different aspects of fear (disease anxiety and COVID-related fear about income) are central in the network of pandemic anxiety, coronaphobia, and other factors (Vargová et al., 2023), indicating the complexity and interconnectedness of various symptoms and aspects of coronaphobia. However, it is worth noting that previous research, which explored the factor structure of four COVID-19 fear measures, resulted in four latent factors, including both fear symptoms and fear related to

various consequences (Mertens et al., 2021). Therefore, although a distinction could be made based on fear themes, it seems that it could not be made based on a wider range of symptoms surrounding coronaphobia.

The second aim of this study was to explore a wide range of correlates of coronaphobia. First, predictors of coronaphobia were explored in domains of demographic characteristics, knowledge about the coronavirus, personality traits, and political orientation. Results showed that the main predictor of coronaphobia was GAD. Considering the correlational design of our study, we could conclude that individuals with a tendency towards developing GAD posed a major risk for developing coronaphobia, as well as that individuals with coronaphobia could suffer from GAD. Although GAD was not explored in the context of other potential predictors in previous research, our findings are in line with previous studies in which GAD showed a high association with coronaphobia (e.g., Lee et al., 2020). Additionally, previous research also found that coronaphobia was more related to general anxiety, indicating its eligibility in being dysfunctional and clinically significant (Vargová et al., 2023).

Considering that the dominant predictor of coronaphobia was GAD, we should take into account the similarity between these two constructs. Based on the variables included in this research, profile similarity between them ranges from high to moderate, but results do not support that they are the same construct. The main distinction between them is in their relationships with corona-specific outcomes, which is stronger for coronaphobia. Similarly with the distinction between broad and narrow personality traits, empirical evidence confirmed that narrow traits better predict complex, real-world criteria (e.g., Paunonen & Nicol, 2021).

Considering that GAD showed a high correlation with neuroticism (r = .56, p < .001), including both of them in the model resulted in a non-significant effect of neuroticism, despite a significant correlation between neuroticism and coronaphobia. In the final model, among the basic personality traits, only openness showed a small and negative effect on coronaphobia. It could be assumed that intellectual curiosity and information-seeking captured in openness (e.g., Goldberg, 1999) reduce fear and worry about the infection and

consequences of coronavirus. Since the fear of coronavirus is mostly due to unknown circumstances of infection and the course of the disease, it could be assumed that individuals who are more open to experience invest more resources in information gathering, as well as in coping with crisis, which repeals the coronaphobia.

Regarding demographic characteristics, the only significant predictor of coronaphobia is age, in a positive direction. Previous research showed mixed results regarding the relations with age (e.g., Silva et al., 2020; Lippold et al., 2020). However, our results indicated that older people manifest higher levels of coronaphobia. This finding is in line with some prior research (e.g. Jain & Jha, 2020; Niño et al., 2020) suggesting that due to their vulnerable immune system, older people face higher risk of being infected as well as the susceptibility to severe forms of the disease, which consequently results in increased levels of fear.

Previous studies showed mixed results regarding the effects of gender (e.g., Cao et al., 2020; Silva et al., 2020) and positive effect of education (Lippold et al., 2020), but in our study, they do not show significant effects in the final model. Gender only showed a significant correlation, with women having higher levels of coronaphobia, although this effect was rather small. Similarly, knowledge about the coronavirus as well as political orientation were not significant correlates of coronaphobia. Considering that data were collected in 2021, it could be assumed that more information regarding coronavirus was known and available, which was also indicated in high performance on the Knowledge about coronavirus test. Thus, while knowledge about coronavirus appeared to be an important factor at the onset of the pandemic, in the current stage, other characteristics are more associated with coronaphobia. Results regarding the non-significant role of political orientation in the explanation of coronaphobia are in line with Lippold et al.'s (2020) conclusion that political orientation is not a stable predictor of fear of coronavirus, but rather personality traits.

There are several limitations of this study. First, the sample was convenient which limited the generalizability of the conclusions. Second, this study was limited by its exclusive use of online survey methodology. Third, due to a large set of measures, it is possible that participants got tired, which could induce response biases. Although participants had the option to fill out the measures on two occassions and not all at once, we did not have attention-check items. Finally, given the cross-sectional and convenient sample, the causal ordering of the variables could not be determined.

Despite these limitations, this study provides valuable insights into coronaphobia phenomenon. The results indicated that coronaphobia is rather a syndrome and that its specific dimensions could not be easily distinguished, at least based on existing measures. Furthermore, the main correlate of coronaphobia is in the domain of psychopathological disorder (GAD), followed by rigid cognitive style (openness) and older age. Based on our findings, it is evident that certain groups of people may be more vulnerable, and it is important for healthcare and mental health professionals to adjust their practices accordingly. Therefore, interventions should be prioritized and tailored to meet the specific needs of individuals. Healthcare professionals should pay particular attention to individuals with GAD and similar disorders to provide adequate support in coping with corona-related thoughts, emotions, psychosomatic issues and consequences. This is especially important due to pre-existing vulnerabilities and increased risk of adverse effects on mental health of these individuals caused by prolonged stress exposure during the pandemic. In addition, our results highlight the importance of adopting an age-specific approach. Older individuals are more prone to coronaphobia and they may require a different counseling approach compared to younger ones. Practitioners should focus on providing targeted support to this age group, which may involve engaging in clear and reassuring discussions about their specific risk factors and safety measures. Encouraging individuals to stay informed through reliable sources and maintaining a balanced perspective can also contribute to reducing excessive fears. Future studies should examine

coronaphobia and its influence on mental health over time by using a large and representative sample.

Following the Open Science practices

The authors of this paper are dedicated to following the core principles of open science. We believe that adopting such practices is highly beneficial since it promotes a transparent, collaborative, and accessible research enviroment. Moreover, open science practices enhance the visiability, reproducibility, and verifiability of the produced scientific findings and can also have the positive impact on the general trust in science. In line with this, we deposited all used coronaphobia instruments in this research, including all relevant information, original items and items adapted to Serbian, a codebook, all utilized data and syntaxes, as well as the supplementary materials. All of the aforementioned can be found at the Open Science Framework (OSF) at the following link: https://osf.io/rnmqh/.

Ethical approval

The study was approved by the Ethical Committee for the Psychological Research of the Department of Psychology, Faculty of Philosophy, University of Novi Sad (code 202103300011_f4Tx).

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data, material, and syntax are available at https://osf.io/rnmqh/.

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Supplement

Table A

Loadings of coronaphobia scales on the first component

Scale or subscale	Loading
Worry (COVID-19 Phobia Scale; Dilbaz et al., 2020)	.90
Psychological factors (COVID-19 Phobia Scale; Arpaci et al., 2020)	.87
Fear of social interaction (COVID-19 Anxiety Scale; Chandu et al., 2020)	.86
Social factors (COVID-19 Phobia Scale; Arpaci et al., 2020)	.85
Contamination (COVID Stress scales; Taylor et al., 2020)	.84
Anxiety of COVID-19 (COVID-19 Anxiety Scale; Silva et al., 2020)	.83
Fear of the Coronavirus (Fear of the Coronavirus Questionnaire; Mertens et al., 2020)	.83
Fear (COVID-19 Pandemic Anxiety Scale; Kumar et al., 2020)	.82
Unsafety (Coronavirus Disease Concern Scale; Dadfar & Lester, 2020)	.81
Non-somatic symptoms (Coronavirus Pandemic Anxiety Scale; Bernando et al., 2020)	.81

Emotional fear reaction (Fear of COVID-19 Scale; Tzur Bitan et al., 2020)	.80
Precaution (COVID-19 Phobia Scale; Dilbaz et al., 2020)	.79
Illness anxiety (The COVID-19 Anxiety Scale; Chandu et al., 2020)	.78
Danger (COVID Stress scales; Taylor et al., 2020)	.77
Fear of social isolation (Coronavirus Disease Concern Scale; Dadfar & Lester, 2020)	.77
Fear of death (Coronavirus Disease Concern Scale; Dadfar & Lester, 2020)	.77
Xenophobia (COVID Stress scales; Taylor et al., 2020)	.76
Obsession with COVID-19 (The Obsession with COVID-19 Scale; Lee, 2020)	.74
Compulsive checking and reassurance seeking (COVID Stress scales; Taylor et al., 2020)	.73
Somatic concerns (COVID-19 Pandemic Anxiety Scale; Kumar et al., 2020)	.72
Somatic symptoms (Coronavirus Pandemic Anxiety Scale; Bernando et al., 2020)	.72
Psycho-somatic factors (COVID-19 Phobia Scale; Arpaci et al., 2020)	.71

Avoidance (COVID-19 Phobia Scale; Dilbaz et al., 2020)	.70
Anxiety of COVID (Anxiety of COVID Scale; Evren et al., 2020)	.66
Symptomatic expression of fear (Fear of COVID-19 Scale; Tzur Bitan et al., 2020)	.66
Socio-economic consequences (COVID Stress scales; Taylor et al., 2020)	.65
Economic factors (COVID-19 Phobia Scale; Arpaci et al., 2020)	.63
Mood (COVID-19 Phobia Scale; Dilbaz et al., 2020)	.57