



Association between Metacognitive Beliefs and COVID-19 phobia in a community population: a cross-sectional study

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Accepted: 5 June 2022

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Abstract

This study aims to investigate the relationship between metacognitive beliefs and COVID-19 phobia. The sample included 514 Turkish adults, 295 of whom are women (57,4%), and 219 are men (42,6%). Their ages ranged between 18 and 70 years ($M=32.96$, $SD=10.79$). COVID-19 Phobia Scale (C19P-S) and Metacognitions Questionnaire-30 (MCQ-30) were administered. Our analysis showed that women reported significantly higher COVID-19 phobia. The participants with chronic illnesses showed significantly higher COVID-19 phobia and MCQ-30 scores. It was found that C19P-S total score positively correlated with negative beliefs about worry concerning uncontrollability of thoughts, the need to control thoughts, cognitive self-consciousness, positive beliefs, cognitive confidence, and MCQ-30 total score respectively ($r=.47$, $p<.001$; $r=.33$, $p<.001$; $r=.30$, $p<.001$; $r=.29$, $p<.001$; $r=.12$, $p<.001$; $r=.44$, $p<.001$). Then, hierarchical multiple regression was conducted, and the relationships were tested via structural equation modeling. To sum up, it can be concluded that negative beliefs about worry concerning the uncontrollability of thoughts contribute to COVID-19 phobia. However, explained variance was small suggesting that there are additional factors involved. These results provided preliminary findings relating to the association between metacognitive beliefs and coronavirus phobia symptoms. Further longitudinal research is necessary to determine the causal direction of these findings.

Keywords COVID-19 · Coronavirus phobia · Metacognition · Metacognitive beliefs

Coronavirus disease 2019 (COVID-19) is a serious life-threatening illness that emerged in late 2019. Nowadays, it is the most common infectious disease which is associated with the immune system. Since its emergence, 194.608.040 cases of COVID-19 and 4.170.155 deaths have been reported worldwide as of 27 July 2021 (World Health Organization, 2021). The government of Turkey reported the first case on 11 March 2020, and now the number of cases and deaths have reached 5.514.373 and 50.450, respectively (Republic of Turkey Ministry of Health, 2021).

A pandemic may cause fear in not only those directly influenced by the infection but also in those who have a risk of infection and mortality (Shalev & Shapiro, 2020). According to recent studies conducted in various regions of the world, participants reported that they are highly anxious due to the ongoing coronavirus (Balkhi et al., 2020; Ahorsu et al., 2020; Lee, 2020; Biçer et al., 2020). Some of the psychological effects of COVID-19 are listed as anxiety, depression, and traumatic stress (Zandifar & Badrfam, 2020).

Specific phobia is defined as a persistent and excessive fear or anxiety of an object or a situation in DSM-V (American Psychiatric Association, 2013). Animal, natural-environment, blood-injection-injury, situational, and others are listed as sources of specific phobia (APA, 2013). Based on the DSM-V, Arpacı et al., (2020) suggested that major man-made catastrophes or natural disasters, such as the COVID-19 pandemic, can be environmental triggers of phobic conditions. Accordingly, persistent and excessive fear of COVID-19, in other words “corona phobia”, can be classified as a specific phobia (Arpacı et al., 2020). It

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has been emphasized that coronavirus affects people economically, politically, socially, and psychologically. The combination of psychological, psychosomatic, economic, and social symptoms has been suggested as the indicators of corona phobia. In the study of Amin (2020), the findings showed that healthcare professionals who have less physical and social contact with others have various psychological symptoms related to corona-phobia.

Whereas many studies showed that fear of COVID-19 or excessive anxiety is observed among people, individual reactions to COVID-19 vary. In some studies, some participants had been reported having had high levels of fear, anxiety, and phobic reaction related to COVID-19 (Memiş Doğan & Düzel, 2020; Arpacı et al., 2021). In this context, researching the factors that affect corona phobia levels can help field experts comprehend this issue better.

According to Wells (2009), metacognitive beliefs have a prominent underlying role in pathology and especially negative metacognitive beliefs are considered to be the foremost factors. Previous studies have been shown that worry, anxiety, and emotional symptoms were predicted by negative metacognitive beliefs (Salguero et al., 2019; Nordahl & Wells, 2017).

Metacognition refers to any knowledge and cognitive process, and metacognitive experiences include any conscious cognitive and affective experiences (Flavell, 1979). In this context, metacognition is related to the knowledge, awareness, and appraisal of one's cognitive system and it can be defined as "cognition applied to cognition" (Wells, 1995, 2007). According to the Self-Regulatory Executive Function (S-REF) model which has been recommended by Wells & Mathews (1996), emotional disorders are about a way of thinking, and activation of the cognitive attentional syndrome (CAS). Self-focused attention, excessive mentation such as worry and rumination, threat controlling, and dysfunctional coping strategies are included in CAS (Wells, 2009).

The metacognitive model suggests that maladaptive metacognitive beliefs have an influential role in the development and maintain anxiety and related disorders (Wells & Mathews, 1996). As an example, the beliefs about the uncontrollability of the worrying result in the persistence of the worry, and the person does not disturb or attempt the control of this process (Nordahl & Wells, 2017). Two broad types of metacognitive beliefs activating the CAS had been indicated. One of them is positive metacognitive beliefs focusing on positive sides and benefits of negative thoughts such as "Worrying helps me to get things sorted out in my mind". On the other hand, negative metacognitive beliefs are about uncontrollability and the danger of repetitive negative thinking such as "My worrying is dangerous for me". Metacognitive beliefs also include beliefs concerning the

need to control thoughts such as "I should be in control of my thoughts all of the time". Besides this example, beliefs about the need to control thoughts contain the assumptions regarding catastrophic results if the individuals cannot be successful to control their thoughts (Wells, 2009).

Along these lines, we aim to investigate the relationship between metacognitive beliefs and COVID-19 phobia. While there is an increasing number of findings suggesting that the metacognitive model may be effective in generalized anxiety disorder and depression (Papageorgiou & Wells, 2000; Wells & King, 2006; Wells et al., 2010), to our knowledge, the current study is the first to investigate the relationships between metacognitive beliefs and COVID-19 phobia. Some examples of the negative beliefs about worry concerning uncontrollability of thoughts (MCQ-30-NEG) are: "My worrying is dangerous for me.", "I could make myself sick with worrying.", "My worrying could make me go mad.". Based on the metacognitive model and previous studies, we hypothesized that MCQ-30-NEG is associated with the symptoms of COVID-19 phobia. Besides, we examined the metacognitive beliefs and COVID-19 phobia across demographic variables of the participants such as age, chronic illness, sex, educational level, working status, profession, romantic relationship, psychiatric illness in the family background in this study.

Method

Participants

The study sample consisted of adults living in various regions of Turkey. The sample included 514 Turkish adults, of whom 295 are women (57.4%), and 219 are men (42.6%). Their ages ranged between 18 and 70 years with a mean age of 32.96 ($SD=10.79$). Sixty-five (12.6%) participants reported chronic disease, whilst 449 (87.4%) participants did not report a chronic disease. It has been reported that thirty-two participants have asthma, seventeen participants have heart disease, and twelve participants have diabetes. Four participants did not provide additional information about their chronic diseases. When we examine the age interval of the sample, we saw that 223 participants (43.4%) are within the age range of 18–29. Additionally, 276 (53.7%) participants hold bachelor's degrees, and 128 (24.9%) hold master's degrees and above. Our sample consists of 210 (40.9%) teachers, 103 (20%) students, 64 (12.5%) health-care professionals, 137 (26.7%) members of other professions. When we examine the working status of participants during the pandemic, 200 of whom (38.9%) reported not working, 134 (26.1%) reported working at home, 180 (35%) reported working at the workplace. 299 (58.2%) participants

reported a romantic relationship and 444 (86.4%) participants reported no existence of psychiatric illness in their family background, see Table 1.

Procedure

Üsküdar University Ethics Committee and the Republic of Turkey Ministry of Health Scientific Research Platform approved this study. The process and procedures of this study were carried out based on the Declaration of Helsinki. Participants were informed about the research, ethical considerations, and criteria for inclusion in research. Sample participants were required to meet three criteria for inclusion: Being in the 18–70 age range, having neither alcohol nor substance abuse, not being diagnosed with COVID-19, and a psychiatric illness. Those who did not meet the

criteria for inclusion and did not approve participation were not included in the study. Participants were recruited through social media accounts. Survey data were collected via Google Forms from July 11 to July 20, 2020. They were fully informed about their rights, confidentiality, and anonymity. People who did not read the information sheet presented on the first page and did not consent to participate could not access the survey. Additionally, any financial compensation was not used to get the involvement in this study.

Measures

Instruments used in the study consisted of an Informed Consent Form, a Demographic Information Form, and two

Table 1 COVID-19 Phobia and MCQ-30 Scores across Demographic Variables

Variable	C19P-S			MCQ-30			C19P-S		MCQ-30		C19P-S		MCQ-30	
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>F</i>	<i>t</i>	<i>t</i>	<i>p</i>	<i>p</i>			
Sex								3.93	1.23	<0.001	0.21			
Women	295	49.75	13.45	70.83	12.86									
Men	219	45.08	13.11	69.37	13.87									
Chronic illness								-3.28	-2.45	0.001	0.01			
Yes	65	52.86	14.21	73.98	11.90									
No	449	47.02	13.24	69.66	13.42									
Age Interval						0.52	0.39			0.72	0.81			
Between 18–29	223	47.69	13.42	70.52	13.56									
Between 30–39	159	48.66	13.16	70.41	12.10									
Between 40–49	92	47.43	14.86	68.70	13.81									
Between 50–59	28	45.07	11.35	70.89	14.78									
Between 60–70	12	46.00	13.83	71.75	17.39									
Educational level						1.76	0.93			0.13	0.44			
Primary school	8	51.87	17.76	75.00	16.49									
High school	83	48.65	15.19	68.32	14.78									
Associate degree	19	52.89	12.87	73.21	11.14									
Bachelor’s degree	276	48.00	13.08	70.34	12.81									
Master’s degree and above	128	45.66	12.84	70.40	13.46									
Profession						2.16	0.62			0.09	0.59			
Teacher	210	48.98	13.47	69.85	13.24									
Student	103	47.98	12.94	70.68	13.66									
Healthcare Professionals	64	44.14	13.27	68.62	12.89									
Others	137	47.43	13.86	71.15	13.39									
Working						2.61	5.42			0.07	0.005			
Not working	200	48.58	14.17	71.04	13.72									
Working from home	134	49.01	12.28	72.35	11.30									
Working in workplace	180	45.93	13.46	67.70	13.89									
Romantic Relationship								0.77	0.47	0.44	0.63			
Yes	299	48.15	13.79	70.44	12.60									
No	215	47.22	13.09	69.88	14.25									
Psychiatric illness in the family background								0.03	1.11	0.97	0.26			
Yes	70	47.81	14.61	71.85	14.01									
No	444	47.75	13.32	69.95	13.19									
Total	514	47.76	13.49	70.21	13.31									

Note: C19P-S: COVID-19 Phobia Scale. MCQ-30: Metacognitions Questionnaire-30

self-report inventories as follows: COVID-19 Phobia Scale (C19P-S) and Metacognitions Questionnaire-30 (MCQ-30).

Demographic information form

The demographic information form was created by researchers included some queries regarding participants' age, sex, education level, current residency, romantic relationship status, working status, the presence of chronic disease, and the presence of psychiatric diagnosis in their family background.

COVID-19 phobia scale

COVID-19 Phobia Scale (C19P-S) is developed by Arpacı et al., (2020) to assess levels of corona phobia as insistent and extreme fear of COVID-19 across four subscales: (1) psychological factors (e.g., "The fear of coming down with coronavirus makes me very anxious"), (2) psycho-somatic factors (e.g., "I experience serious stomachaches out of the fear of coronavirus"), (3) economic factors (e.g., "The possibility of a food supply shortage due to the coronavirus pandemic causes me anxiety"), (4) social factors (e.g., "After the coronavirus pandemic, I actively avoid people I see sneezing"). This scale consists of 20 items; and a self-report measure. Items in the scale are scored on a 5-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree". Higher scores shown by subjects mean a greater phobia related to COVID-19. Cronbach's α coefficient of the scale was 0.92 (Arpacı et al., 2020). Cronbach's α in the present study was 0.93 for the total C19P-S score, see Table 2.

Metacognitions Questionnaire-30

Metacognitions Questionnaire 30 (MCQ-30) is developed by Wells & Cartwright-Hatton (2004) and is adapted to Turkish by Tosun & Irak (2008). This scale contains 5 subscales which are named as positive metacognitive beliefs about worry (MCQ-30-POS), negative metacognitive beliefs concerning uncontrollability and danger (MCQ-30-NEG), cognitive confidence (MCQ-30-CC), beliefs concerning the need for control (MCQ-30-NC), cognitive self-consciousness (MCQ-30-CSC) assesses metacognitive beliefs. Metacognitive beliefs are scored on a 4-point Likert scale ranging from 1 (do not agree) to 4 (agree very much). Higher scores shown indicate higher levels of maladaptive metacognitive beliefs. The MCQ-30 helps us to assess metacognition to explore and conceptualize psychopathological processes (Wells & Cartwright-Hatton, 2004). The Turkish version of the MCQ-30 (Tosun & Irak, 2008) was used in our study. Tosun & Irak (2008) found that Cronbach's α of

the total scale was 0.86. Cronbach's α in the present study was 0.88 for the total MCQ-30, see Table 2.

Data Analysis

Before the analyses, we checked the data for missing values, univariate and multivariate outliers. The outliers and missing values were not observed and the data were normally distributed (Tabachnick & Fidell, 2013). Independent-samples *t*-test and ANOVA analyses were performed to investigate the variation of the coronavirus phobia scale scores and metacognitive beliefs scores based on participants' demographic variables with SPSS (version25). Cohen's *d* and *F* effect sizes were calculated. To examine the relationships between C19P-S and MCQ-30, Pearson's correlation coefficients, and hierarchical multiple regression were computed. Then, to test the relationships between them, structural equation modeling (SEM) was used in AMOS (version 24). The model was designed according to metacognitive theory and previous research, using the maximum likelihood method. Based on recommendations, measures of model fit values proposed were used, consisting of good fit index (GFI > 0.90), Tucker Lewis Index (TLI > 0.90) root mean squared error of approximation (RMSEA < 0.08), standardized root mean square residual (SRMR < 0.08), and comparative fit index (CFI > 0.90) (Hu & Bentler, 1999; Schweizer, 2010; Kline, 2015).

Results

Group comparisons and correlational analyses

Descriptive statistics were used to assess demographic variables. We conducted an independent samples *t*-test and one-way analysis of variance (ANOVA) to ascertain whether coronavirus phobia scores and metacognitive beliefs scores differ based on participants' sex, age, chronic illness, educational level, profession, working status, having a romantic relationship, the existence of psychiatric illness in their family background. The result of the independent *t*-test analysis showed that women ($t(512) = 3.93, p < .001$, Cohen's $d = 0.35$), and the participants with chronic illness ($t(512) = 3.28, p = .001$, Cohen's $d = 0.42$) showed significantly higher COVID-19 phobia. The participants with chronic illness showed significantly higher MCQ-30 scores ($t(512) = 2.45, p < .05$, Cohen's $d = 0.34$). Additionally, using Scheffe's posthoc analysis, we found that individuals working from home showed significantly higher MCQ-30 scores than others ($F(2,511) = 5.42, p = .005$, Cohen's $F = 0.17$), see Table 1.

Table 2 Means, Standard Deviations and Bivariate Correlations

Variable	M	SD	α	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Age	32.96	10.70	-	-											
2. Cpsy	17.83	5.23	0.86	-0.09*	-										
3. Csom	8.92	3.20	0.82	0.08	0.66**	-									
4. Csoc	13.02	4.34	0.85	-0.05	0.82**	0.65**	-								
5. Cceo	7.98	2.72	0.73	0.02	0.57**	0.60**	0.56**	-							
6. MCQ-30 (POS)	13.11	3.80	0.80	0.10*	0.27**	0.26**	0.24**	0.22**	-						
7. MCQ-30 (NEG)	13.53	4.12	0.81	-0.07	0.46**	0.38**	0.45**	0.29**	0.33**	-					
8. MCQ-30 (CC)	12.61	4.44	0.87	0.02	0.14**	0.15**	0.09*	0.04	0.15**	0.34**	-				
9. MCQ-30 (NC)	14.21	3.76	0.74	0.00	0.32**	0.25**	0.27**	0.29**	0.38**	0.44**	0.25**	-			
10. MCQ-30 (CSC)	16.73	3.21	0.67	-0.11**	0.34**	0.20**	0.25**	0.20**	0.39**	0.46**	0.17**	0.53**	-		
11. C19P-S total	47.76	13.49	0.93	-0.02	0.92**	0.83**	0.91**	0.74**	0.29**	0.47**	0.12**	0.33**	0.30**	-	
12. MCQ-30 total	70.21	13.31	0.88	-0.01	0.44**	0.37**	0.37**	0.30**	0.64**	0.75**	0.60**	0.74**	0.70**	0.44**	-

* $p < .05$. ** $p < .01$

Note: Age = Age in years; Cpsy = psychological subscale of C19P-S; Csom = somatic subscale of C19P-S; Cceo = economic subscale of C19P-S; MCQ-30 (POS) = Metacognitions Questionnaire-30 (Positive); MCQ-30 (NEG) = Metacognitions Questionnaire-30 (Negative); MCQ-30 (CC) = Metacognitions Questionnaire-30 (Cognitive Confidence); MCQ-30 (NC) = Metacognitions Questionnaire-30 (Need for Control); MCQ-30 (CSC) = Metacognitions Questionnaire-30 (Cognitive Self-Consciousness); α = Cronbach's α ; $n = 514$

To examine the relationship between C19P-S and MCQ-30, Pearson's correlation coefficients were computed. The results of the correlation analysis are shown in Table 2. In particular, it was found that C19P-S total score positively correlated with negative beliefs about worry concerning uncontrollability of thoughts (MCQ-30-NEG), need to control thoughts (MCQ-30-NC), cognitive self-consciousness (MCQ-30-CSC), positive beliefs (MCQ-30-POS), cognitive confidence (MCQ-30-CC), and MCQ-30 total score respectively ($r = .47, p < .001$; $r = .33, p < .001$; $r = .30, p < .001$; $r = .29, p < .001$; $r = .12, p < .001$; $r = .44, p < .001$).

Hierarchical multiple regression

The hierarchical multiple regression was used to investigate the contributions of five types of metacognitive beliefs on COVID-19 phobia controlled for age, sex, and chronic illness (Table 3). To identify any multicollinearity, we examined the variance inflation factor (VIF), and correlation coefficients between independent variables. The VIF values ranged from 1.019 to 1.646, and the correlation coefficients between independent variables ranged from -0.11 to 0.53 . Thus, the assumption of no multicollinearity was respected (Neter et al., 1996; Berry & Feldman, 1985). To overall model significantly explained 28.1% of variance in COVID-19 phobia ($F(8,505) = 24.66, p < .001, R^2_{adjusted} = 0.27$), 4.7% in the first block with control variables ($F(3,510) = 8.390, p < .001, R^2_{adjusted} = 0.041$). When metacognitive beliefs were added as a second block, R square change was found to be 0.234. Within the final model, sex ($\beta = 0.11, p = .004$), chronic illness ($\beta = 0.08, p = .032$), MCQ-30-POS ($\beta = 0.13, p = .003$), MCQ-30-NC ($\beta = 0.15, p = .002$), MCQ-30-NEG ($\beta = 0.34, p < .001$) were the salient predictors of COVID-19 phobia, see Table 3.

Structural equation modeling

We tested the associations between positive beliefs about worry (MCQ-30-POS), negative beliefs about worry concerning uncontrollability of thoughts (MCQ-30-NEG), the need to control thoughts (MCQ-30-NC), chronic illness, sex, and COVID-19 Phobia using SEM, see Fig. 1. The maximum likelihood estimation procedure (ML) was used in our analysis. MCQ-30-POS, MCQ-30-NEG, and MCQ-30-NC were exogenous latent variables. Chronic illness and sex were exogenous observed variables. The COVID-19 Phobia (C19P-S) was an endogenous latent variable consisting of four observed variables. To achieve that, confirmatory factor analysis was performed to C19P-S, and we obtained a chi-square fit value of $\chi^2 = 330.918, \chi^2/df$ value of 3.27 for the model fit. The goodness of fitness values RMSEA = 0.06, SRMR = 0.05, AGFI = 0.90, NFI = 0.89,

Table 3 Hierarchical Multiple Regression Analysis of Metacognitive Beliefs for COVID-19 Phobia (N = 514)

	Model-1					Model-2						
	C19PS B	S.E.	β	(%95 CI)	t	p	C19PS B	S.E.	β	(%95 CI)	t	p
(Constant)	2.342	0.102		(2.142, 2.542)	23.002	<0.001**	0.968	0.176		(0.622, 1.314)	5.496	<0.001**
Age	-0.003	0.003	-0.052	(-0.009, 0.002)	-1.170	0.242	-0.002	0.003	-0.028	(-0.007, 0.003)	-0.695	0.487
Sex	0.208	0.059	0.153	(0.092, 0.325)	3.503	0.001*	0.157	0.054	0.115	(0.051, 0.263)	2.903	0.004*
Chronic illness	0.274	0.090	0.135	(0.096, 0.452)	3.030	0.003*	0.172	0.080	0.085	(0.015, 0.330)	2.150	0.032*
MCQ-30-CC							-0.060	0.037	-0.066	(-0.133, 0.012)	-1.632	0.103
MCQ-30-POS							0.138	0.046	0.130	(0.048, 0.229)	3.002	0.003*
MCQ-30-CSC							0.013	0.061	0.010	(-0.107, 0.133)	0.213	0.831
MCQ-30-NC							0.161	0.052	0.150	(0.059, 0.264)	3.102	0.002*
MCQ-30-NEG							0.342	0.047	0.348	(0.250, 0.435)	7.287	<0.001**
R	0.217						0.530					
R ²	0.047						0.281					
Adjusted R ²	0.041						0.270					
ΔR^2	0.047						0.234					

Note. Sex reference category = Male. ΔR^2 = change in R². C19PS = COVID-19 Phobia Scale; MCQ-30-POS = Metacognitions Questionnaire-30-Positive beliefs; MCQ-30-NEG = Metacognitions Questionnaire-30-Negative beliefs; MCQ-30-CC = Metacognitions Questionnaire-30-Cognitive Confidence; MCQ-30-NC = Metacognitions Questionnaire-30-Need for Control; MCQ-30-CSC = Metacognitions Questionnaire-30-Cognitive Self Consciousness; n = 514. *p < .05; **p < .001

IFI=0.92, GFI=0.92, CFI=0.92, TLI=0.91. After this process, the scores for each of the four subscales of the C19P-S were treated as observed variables of the COVID-19 phobia via the facet-representative parcel method. The goodness of model fit was tested, the model showed the following fit indices: we obtained a chi-square fit value of $\chi^2 = 772.302$, χ^2/df value of 3.13 for the model fit. The goodness of fitness values RMSEA=0.06, SRMR=0.06, AGFI=0.86, NFI=0.84, IFI=0.88, GFI=0.89, CFI=0.88, TLI=0.87. Based on the modification suggestions, the covariances were drawn between error terms of 4 items which yielded an improved model. In the final model, we obtained a chi-square fit value of $\chi^2 = 701.163$, χ^2/df value of 2.89 for the model fit. The goodness of model fit values RMSEA=0.06, SRMR=0.06, AGFI=0.88, NFI=0.86, IFI=0.90, GFI=0.90, CFI=0.90, TLI=0.89. These values suggest an adequate fit level. All the standardized regression weights in the model were significant at the $p < .001$ level except pathways of MCQ-30-NC ($\beta = 0.164$, $p = .008$), MCQ-30-POS ($\beta = 0.021$, $p = .715$) and chronic illness ($\beta = 0.065$, $p = .101$) to COVID-19 phobia. The standardized regression weight of the pathway from the MCQ-30-NEG to COVID-19 phobia was found to be $\beta = 0.448$, $p < .001$. The standardized regression weight of the pathway from sex to COVID-19 phobia was found to be $\beta = 0.132$, $p < .001$. (Fig. 1).

Discussion

Firstly, the COVID-19 phobia scores and MCQ-30 scores were examined within demographics. When we examined the COVID-19 phobia across demographics, it was found that women showed significantly higher COVID-19 phobia. Similarly, Arpacı et al., (2021) reported that women scored higher than men on the C19P-S. Ay et al., (2021) found that women have more psychological distress related to COVID-19 than men. Recent studies about the psychological effects of pandemics showed that females have a high risk of fear, anxiety, depression, and psychological distress (Wang et al., 2020; Haktanır et al., 2020; Mora-Magaña et al., 2020; Rahman et al., 2020; Evren et al., 2020).

In our study, the participants having chronic illness showed significantly higher COVID-19 phobia. Similarly, Bitan et al., (2020) found that chronic illness is positively associated with fear of COVID-19. Because the COVID-19 is a life-threatening illness related to the immune system, in our opinion, this result may be expected. People with chronic conditions confront various threats and challenges (de Ridder & Schreurs, 2001). On the other hand, Arpacı et al., (2021) found that COVID-19 phobia scores had not differed based on chronic illnesses, and a previous study that investigated the fear of COVID-19 reported that fear of

COVID-19 had not differed in people with chronic illnesses (Haktanır et al. 2020). One of the probable explanations of the different results in the literature can be characteristics of study samples. Some characteristics of the participants, such as different psychological characteristics, levels of chronic disease, levels of resilience, living in different regions that provide health insurance, and socio-economic advantages, might have caused the different findings.

Our analyses also revealed that the level of COVID-19 phobia did not differ based on age interval, educational level, profession, working or not working, having a romantic relationship, the existence of psychiatric illness in their family background. Some studies showed that the C19P-S total score was higher in the people who stayed at home than those who continued to work (Toprak-Celenay et al. 2020). And also, it did not differ based on marital status (Arpacı et al. 2021). Haktanır et al. (2020) concluded that fear of coronavirus score did not differ based on age interval and educational level whereas it differed based on socioeconomic levels.

When we examined the MCQ-30 scores within demographics, participants with chronic illnesses and participants working from home scored significantly higher MCQ-30. Previous studies pointed out that the subjects with chronic diseases (e.g. cancer, diabetes, chronic pain, HIV) showed stronger negative metacognitive beliefs (Mutlu et al., 2018; Purewal & Fisher, 2018; Ziadni et al., 2018; Strodl et al., 2015). Consistently, these previous studies revealed that anxiety and depression levels are associated with metacognitive beliefs in patients with chronic disease. In our study, subjects working from home scored higher MCQ-30 than others. Working from home may have caused changes in working hours and it may have been difficult to adapt to the new work environment during the pandemic period. These changes may affect the subjects' metacognitive beliefs. Although employed people had higher levels of anxiety than unemployed ones during the pandemic in a study (Verma & Mishra, 2020), a research which is related to the relationship between working status such as working from home or working at the workplace and metacognitive beliefs in pandemic was not found in the literature.

Secondly, when the relationships between COVID-19 phobia and metacognitive beliefs were examined, most of the research variables were found to be related to each other in the correlational analysis. In spite of the significant correlations between COVID-19 phobia and all subscales of MCQ-30 in correlation analysis, the hierarchical multiple regression showed that MCQ-30-POS ($\beta = 0.13$, $p = .003$), MCQ-30-NC ($\beta = 0.15$, $p = .002$), MCQ-30-NEG ($\beta = 0.34$, $p < .001$) were the salient predictors of COVID-19 phobia after controlling the demographics. It was observed that the standardized coefficients of pathways from MCQ-30-POS

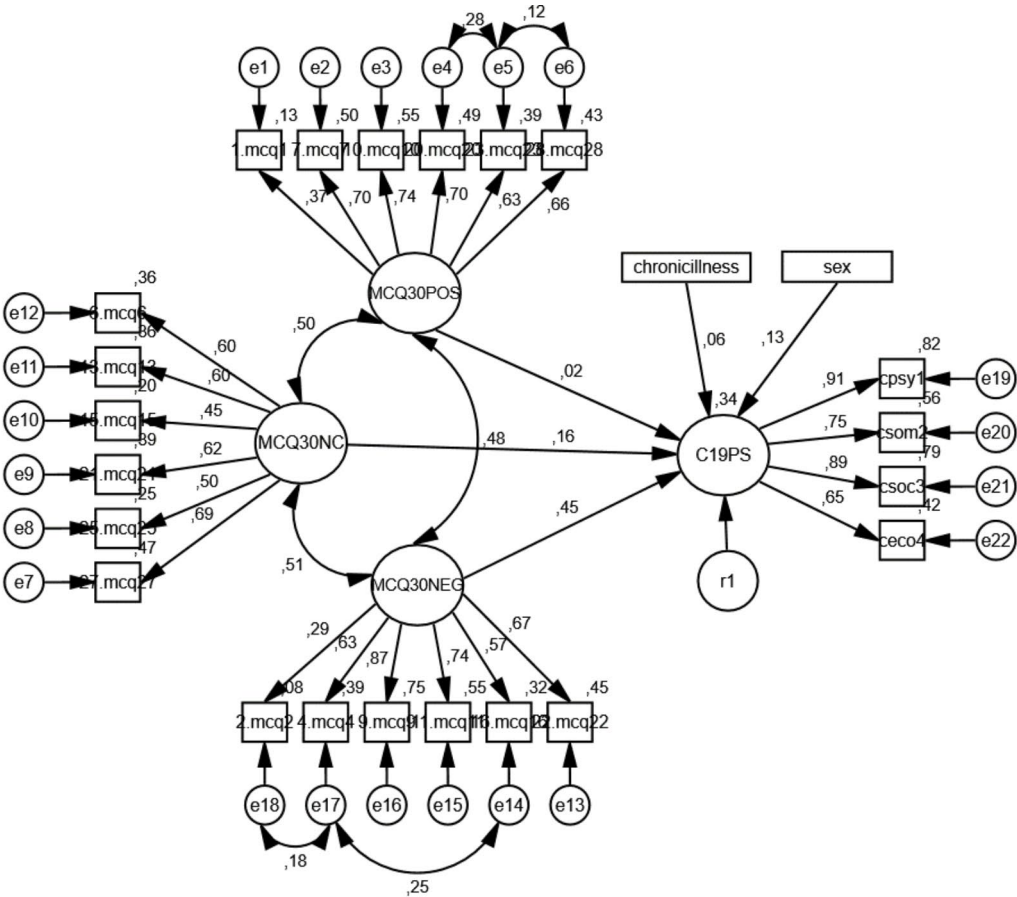


Fig. 1 Standardized Estimates and The Structural Equation Model Testing the Relationship Between Positive Beliefs About Worry (MCQ-30-POS), Negative Beliefs About Worry Concerning Uncontrollability of Thoughts (MCQ-30-NEG), Need to Control Thoughts (MCQ-30-NC), chronic illness, sex and the COVID-19 Phobia (C19P-S). (Note. C19PS: COVID-19 Phobia Scale. MCQ30POS: Metacognitions Questionnaire-30-Positive beliefs. MCQ30NC: Metacognitions Questionnaire-30-Need for Control. MCQ30NEG: Metacognitions Questionnaire-30-Negative beliefs)

and MCQ-30-NC to COVID-19 phobia were small. Then, we tested the effect of MCQ-30-POS, MCQ-30-NC, and MCQ-NEG on COVID-19 phobia in SEM. The SEM helped us about more reliable findings whether positive beliefs (e.g. Worrying helps me to get things sorted out in my mind.), the beliefs about the need to control thoughts (e.g. Not being able to control my thoughts is a sign of weakness.), the negative metacognitive beliefs (e.g. My worrying is dangerous for me.), chronic illness and sex effect on coronavirus phobia or not.

According to the results, the total explained variance is lower than our expectation in the regression analysis and the structural equation model, and it is difficult to imply a causal relationship due to the nature of the study design. It was found that the pathway from the MCQ-30-NEG to COVID-19 phobia is statistically significant, whereas the contribution of MCQ-30-POS and MCQ-30-NC to COVID-19 phobia is not sufficient. The structural equation modeling confirmed that only MCQ-30-NEG was significantly

positively associated with COVID-19 phobia. Similarly, Spada et. al., (2008a) found that whereas negative beliefs about worry concerning uncontrollability and danger was the strongest predictor for both anxiety and depression scores; cognitive confidence, beliefs about the need to control thoughts, and cognitive self-consciousness predicted depression but not anxiety. In the metacognitive theory, it has been stated that whereas negative metacognitive beliefs may have direct effects on the psychological disorders, other metacognitive beliefs such as positive metacognitive beliefs may have indirect effects on them by increasing negative metacognitive beliefs (Wells, 2009). On the other hand, rumination, repetitive thinking, and resilience were not assessed in this study. The previous studies noted that rumination and repetitive thinking predict anxiety and mood disorders. And also, rumination plays a prominent role in maintaining anxiety (Wong & Moulds, 2009; Nolen-Hoeksema, 2000). Additionally, Lindinger-Sternart et al., (2021) stated that the resilience level affected the level of

coronavirus phobia. Investigating relationships between these factors and study variables might be helpful to comprehend the smaller coefficients between MCQ-30-POS, MCQ-30-NC, and coronavirus phobia.

The finding can be evaluated that our hypothesis concerning negative metacognitive beliefs and COVID-19 phobia was confirmed. So, it can be stated that as negative metacognitive beliefs increase, COVID-19 phobia increases. Even though no studies are examining the relationship between metacognitive beliefs and coronavirus phobia in the literature yet, our results are in line with the previous studies that have found associations between negative metacognitive beliefs and psychological disorders. Consistently, such studies have noted that there are positive and significant correlations between negative metacognitive beliefs and some psychological disorders such as obsessive-compulsive symptoms, emotional dysregulation, pathological worry, perceived stress, anxiety, depression, displaced aggression (e.g. Wells & Papageorgiou 1998; Salguero et al., 2019; Spada et al., 2008b; Sariçam, 2015; Ryum et al., 2017; Salguero et al., 2020; Kannis-Dyman et al., 2019). Besides, Salguero et al., (2019) reported that metacognitive beliefs have a specific contribution to worry and emotional symptoms in generalized anxiety disorder. In many studies like that, anxiety was predicted by negative metacognitive beliefs (e.g. Fisher & Noble 2017; Nordahl & Wells, 2017; Kannis-Dymand et al., 2020; Dragan & Dragan, 2014; Anderson et al., 2019; Clauss et al., 2020).

In conclusion, because of the cross-sectional design and correlational nature of the current study, it is difficult to imply the causal relationship between metacognitive beliefs and coronavirus phobia. Nevertheless, according to our findings, it can be concluded that negative metacognitive beliefs were found to be positively associated with COVID-19 phobia, and it may be helpful to take into consideration its contribution to coronavirus phobia. Our findings should be interpreted in an account of some limitations. First of all, our sample was not drawn from diagnosed patients, it consists of the general population. In this study, sample participants were required to meet three criteria for inclusion: being in the 18–70 age range, having neither alcohol nor substance abuse, not being diagnosed with COVID-19, and a psychiatric illness. Detailed investigation about the history of psychiatric illness, type of job, and depressive mood would be useful to future studies. In our opinion, it would be useful to carry out future studies on diagnosed patients as well as the general population. Another limitation is that the most of participants aged from 18 to 39, smaller part of them aged around 70. In addition, unfortunately, we were not able to find more research examining corona phobia and demographic variables in the literature to compare our findings. Therefore, we suggest that future relevant research

should take into account coronavirus phobia and various demographic variables. Besides, this study has been implemented using self-report measures. Although participation is entirely voluntary, it should be considered that sometimes self-report measurements might be influenced by social bias. It can also be suggested that, together with metacognitive beliefs, future studies involving repetitive negative thinking, rumination, and resilience would provide enlightenment about coronavirus phobia. This study is hoped to lead to future studies about them.

Funding We received no financial support for this investigation, authorship, and/or publication of this study.

Data Availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

DisclosureStatement There are no financial or non-financial competing interests to report.

Ethical approval All procedures performed in studies involving human participants were following the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all participants included in the study.

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