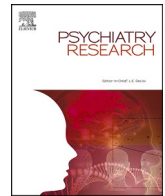




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Optimism, mindfulness, and resilience as potential protective factors for the mental health consequences of fear of the coronavirus

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ABSTRACT

The COVID-19 pandemic has a substantial impact on mental health. Prior reports have shown that depression, anxiety, and stress have increased throughout the pandemic. Nonetheless, not everyone is affected by these negative consequences and some people may be relatively unaffected. In this online study in a predominantly Dutch and Belgian sample ($N = 546$), we investigated whether positive personality traits such as optimism, mindfulness, and resilience may protect against the negative mental health consequences (i.e., fear of the coronavirus, depression, stress, and anxiety) of the COVID-19 pandemic. We found that fear of COVID-19 was related to higher depression, stress, and anxiety. However, for participants scoring high on mindfulness, optimism, and resilience, this relationship was weakened. In addition to these findings, we present the results of network analyses to explore the network structure between these constructs. These results help to identify possible ways through which psychological well-being can be promoted during the COVID-19 pandemic.

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic is one of the largest pandemics since the end of World War 2. As a result of this pandemic, at least 120 million people worldwide have been infected with the virus and more than 2.7 million have died (World Health Organization, 2020). Furthermore, millions of people are affected by governmental corollaries to COVID-19, such as travel restrictions and lockdowns. Unsurprisingly, many psychologists have cautioned about the mental health consequences of this pandemic, such as increased rates of depression, post-traumatic stress symptoms, anxiety disorders, and even suicide (Brooks et al., 2020; Holmes et al., 2020; Mazza et al., 2020).

One risk factor for the mental health consequences of COVID-19 may be increased fear and worries (Mertens et al., 2020; Taylor et al., 2020). Several studies have reported that specific fears and worries due to COVID-19 are related to increased self-reported depression, anxiety, and stress (Bitan et al., 2020). Fears that people report relating to COVID-19 relate to heterogeneous topics such as fear for their own health, fear of infecting others, fear of mass panic, fears of prolonged lockdowns and restrictions, and worries about supplies shortages (Mertens et al., 2020).

Nonetheless, not everyone experiences such increased fears and associated mental health consequences to the same extent. Typically, the

majority of people show resilience in the face of adversity (Bonanno, 2004). This may be related to positive personality traits such as optimism, mindfulness, and resilience. Optimism is the tendency to expect positive outcomes in uncertain situations (Scheier et al., 1994). Previous studies suggest that being optimistic is related to a variety of adaptive outcomes, such as improved psychological well-being, physical health, and coping with uncontrollable life events (Carver et al., 2010; Gallagher and Lopez, 2009; Gallagher et al., 2013). Furthermore, mindfulness refers to the ability to bring one's attention to experiences in the present without judgement (Baer et al., 2008). Being aware of one's experiences and accepting negative thoughts and feelings is related to lower psychological distress during stressful life events (Lindsay and Creswell, 2017). Finally, resilience refers to the ability to bounce back or recover from stress (Smith et al., 2008). Individual differences in trait resilience may influence how people react in times of adversity. In particular, being resilient help individuals to cope with stressful experiences and reduces the negative mental health impact of exposure to traumatic life events (Hu et al., 2015). Taken together, optimism, mindfulness, and resilience can be seen as positive personality traits and may protect against the negative mental health consequences of fear of COVID-19.

Indeed, prior studies have found that optimism, mindfulness, and resilience are negatively associated with people experiencing

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depression, anxiety, and stress during the COVID-19 pandemic (Biber et al., 2020; Conversano et al., 2020; Mosheva et al., 2020; Ran et al., 2020; Zhang et al., 2020). However, these studies have typically examined simple correlations and linear relationships. It is less clear whether optimism, mindfulness, and resilience moderate the relationship between fear of COVID-19 and depression, anxiety, and stress. That is, it could be that these positive traits influence depression, anxiety, and stress independently of people experiencing fear due to COVID-19, or it could be that higher optimism, mindfulness, and resilience weaken the effect of fear of COVID-19 on psychological distress. In the current study, we wanted to look into this possible moderating effect of optimism, mindfulness, and resilience on psychological distress due to fear of COVID-19.

To investigate this, we conducted an online study in a sample of predominantly Dutch and Belgian participants. We predicted that optimism, mindfulness, and resilience would be associated with a weakened or even eliminated relation between fear of COVID-19 and depression, anxiety, and stress. Furthermore, to further explore the relationship between the different constructs mentioned here, we conducted network analyses to explore the network structure. We had no particular hypotheses regarding the network analyses. However, these analyses and plots can help uncover potential pathways between the different items and constructs.

2. Methods

2.1. Participants and procedure

Data from the first wave of an ongoing study on fear of the coronavirus was used. Participants were recruited through the Prolific online working platform (<https://www.prolific.co/>; 90% of the sample) and the social networks of involved students (10% of the sample). Because the questionnaires were administered in Dutch, participation was limited to participants who spoke Dutch fluently. As such, participants were mainly located in the Netherlands and Belgium (see Table 1 below). Participants were informed about the purpose of the study prior

Table 1
Demographic information of the participants (Total $N = 546$).

	<i>n</i>	%
Age in years		
18 – 25	234	42.86 %
26 – 50	282	51.65 %
51 – 64	24	4.39 %
65 >	6	1.10 %
Gender		
Male	300	54.94 %
Female	244	44.69 %
Not binary/other	2	0.37 %
Highest education		
No diploma	2	0.37 %
Elementary school	2	0.37 %
High school diploma	177	32.42 %
Bachelor's degree	227	41.57 %
Master's degree	112	20.51 %
Doctorate (PhD or equivalent)	26	4.76 %
Relationship status		
Single	253	46.34 %
Living together	136	24.91 %
Married	95	17.39 %
Divorced	6	1.10 %
Other	56	10.26 %
Country of residence		
Belgium	112	20.51 %
Netherlands	382	69.96 %
Other*	52	9.53 %

Note. *Other countries of residence: Australia, Canada, Czech Republic, Denmark, France, Germany, Ireland, Israel, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States of America.

to participation. In total, 569 individuals provided consent to participate. Participants with incomplete data were excluded from the dataset, resulting in a total sample of 546 participants ($M_{age} = 29.81$, $SD = 10.36$). Table 1 provides a detailed overview of the demographic variables. The research was conducted in accordance with the Declaration of Helsinki and the study was approved by the Ethics Review Board Social and Behavioral Sciences of Tilburg University (Project number: RP196).

2.2. Measures

2.2.1. Fear of the coronavirus

Fear of the coronavirus was assessed using the Fear of the Coronavirus Questionnaire (FCQ; Mertens et al., 2020). The FCQ consists of 8 items, such as: “I am very worried about the coronavirus outbreak”, “I am constantly following all news updates regarding the virus”, and “I am worried that my friends or family will be infected”. Participants were asked to indicate their level of agreement with each statement on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). In the current study, the Cronbach's alpha coefficient for the FCQ was .80, indicating a good internal consistency.

2.2.2. Corona-related distress

Corona-related distress was measured with the COVID-19 Stress Scales (CSS; Taylor et al., 2020), including 6 items on 6 domains: (1) fears about the dangerousness of corona (e.g., fears of inability to keep family safe), (2) fears about the social and economic consequences of corona (e.g., fears that grocery stores will close down), (3) corona-xenophobia (e.g., fears that foreigners are sources of corona), (4) fears about sources of corona-related contamination (e.g., fears of catching the virus by touching something in public places), (5) traumatic stress symptoms related to corona (e.g., unwanted intrusive thoughts or nightmares relating to corona), and (6) corona-related compulsive checking (e.g., seeking reassurance from friends or medical professionals). Participants were asked to rate the extent to which each statement applied to them over the previous week on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). The Cronbach's alpha reliability coefficients of the SSC domains measured in the current study were .89 for dangerousness, .88 for socio-economic consequences, .90 for xenophobia, .90 for contamination, .89 for compulsive checking, and .89 for traumatic stress symptoms.

2.2.3. Optimism

Optimism was measured using the Life Oriented Test-Revised (LOT-R; Scheier et al., 1994), consisting of 3 items on optimism, 3 items on pessimism, and 4 filler items. Filler items were removed from the scoring. After reversing the pessimism items, the total score of the items represented an overall optimism score. Example questions are: “In uncertain times, I usually expect the best” (i.e., optimism) and “If something can go wrong for me, it will” (i.e., pessimism). Participants were asked to indicate their degree of agreement with each of the items on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). The internal consistency for the LOT-R measured in the current study sample was good (Cronbach's alpha = .80).

2.2.4. Mindfulness

Mindfulness was assessed using a short version of the Three Facet Mindfulness Questionnaire (TFMQ-SF; Truijens et al., 2016) consisting of 5 items on each of the 3 facets: (1) acting with awareness (e.g., “I find myself doing things without paying attention”), (2) non-judging (e.g., “I tell myself that I shouldn't be thinking the way I'm thinking”), and (3) non-reacting (e.g., “When I have distressing thoughts or images, I just notice them and let them go”). Participants were asked to indicate their level of agreement with each statement on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). The overall internal consistency of the TFMQ-SF assessed in the current study was good (Cronbach's alpha = .81).

2.2.5. Resilience

Resilience was measured using the Brief Resilience Scale (BRS; Smith et al., 2008), consisting of 6 items with questions such as: “It does not take me long to recover from a stressful event” and “I tend to take a long time to get over set-backs in my life”. Participants were asked to indicate the extent to which each statement described them on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). After reversing the negative items, the total score on the items represents a total score of resilience. The Cronbach’s alpha for the BRS within the current sample was .90, indicating an excellent internal consistency.

2.2.6. Emotional distress

Depression, anxiety, and stress were assessed using the Depression Anxiety Stress Scale (DASS-21; Lovibond and Lovibond, 1995), consisting of 7 items on each domain. Participants were asked to rate the frequency and severity of experiencing negative emotions over the previous week on a 4-point Likert scale (0 = *did not apply to me at all*; 3 = *applied to me very much, or most of the time*). Example questions are: “I could see nothing in the future to be hopeful about” (i.e., depression), “I was close to panic” (i.e., anxiety), and “I found that I was very irritable” (i.e., stress). Following the conventional scoring guidelines for the DASS-21, the total score for each domain was calculated by multiplying the sum score by two. The Cronbach’s alpha reliability coefficients of the DAS domains assessed in the current study were .91 for depression, .82 for anxiety, and .89 for stress.

2.3. Statistical analyses

All statistical analyses were performed in RStudio (Version 1.2.5.033). First, to get an overview of the correlations between all predictors, a correlation matrix was estimated. Secondly, to investigate individual differences in fear of the coronavirus multiple linear regressions were applied. Furthermore, to investigate which personality traits served as protective factors in the association of fear of the coronavirus and emotional distress, moderation models were considered. To interpret the moderating effects, simple slopes analyses were performed using R-package “interactions” (Version 1.1.3).

Finally, to explore and describe the associations between the item scores of the scales, network analyses were performed and visualized using the R-package “qgraph” (Version 1.6.5). To deal with the ordered categorical items scores, the (regularized partial) correlation networks were estimated based on the polychoric correlation matrix (Epskamp and Fried, 2018). In psychological networks, nodes represent psychological variables such as symptoms and mood states, while edges represent the associations between two nodes (items) adjusted for the influence of all other nodes in the network (Epskamp et al., 2018). When using partial correlation networks, the hyperparameter (gamma) controls whether the EBIC fit index should prefer simpler networks (fewer edges; Epskamp and Fried, 2018). It is recommended by Foygel and Drton (2010) to set the gamma at 0.5, to obtain fewer edges and avoiding most spurious edges but probably missing some true edges. For each node (item) in the network, the centrality was estimated in the following ways, *strength* (i.e., sum of the absolute connection weight), *closeness* (i.e., inverse sum of the distance between one node and all other nodes), and *betweenness* (i.e., number of short paths that pass through a node between two other nodes).

3. Results

3.1. Data availability

The data files and data analysis syntax of the results are provided through the Open Science Framework (<https://osf.io/xb865/>).

3.2. Correlation coefficients

Pearson’s correlation coefficients between the sum score of all continuous predictors are provided in Table 2. As shown, all correlation coefficients were significant ($p < .01$).

3.4. Multiple linear regression

Multiple linear regression analyses were conducted to investigate individual differences in fear of the coronavirus. All continuous predictors and control variables were included to predict depression, anxiety, and stress (Table 3). Results of the first regression analysis (Table 3, Model 1) indicated that the model explained 47.6% of the variance and that the model was a significant predictor of depression ($F(15,530) = 32.14$; $p < .001$). Results of the second regression analysis (Table 3, Model 2) illustrated that the model explained 44.9% of the variance and that the model was a significant predictor of anxiety ($F(15,530) = 28.73$; $p < .001$). The third regression analysis (Table 3, Model 3) indicated that the model explained 50.9% of the variance and that the model was a significant predictor of stress ($F(15,530) = 36.67$; $p < .001$).

3.5. Moderation analyses

Moderation analyses were performed to investigate which personality traits (i.e., optimism, mindfulness, and resilience) served as protective factors in the association between fear of the coronavirus and depression, anxiety, or stress. One personality trait moderation was tested at a time, controlling for the other personality traits (Table 4). To administer the problem of multiple testing, the expected proportion of false positives (i.e., False Discovery Rate (FDR); Benjamini and Hochberg, 1995) was controlled for. The p -values were adjusted, using the “FDR” function in RStudio using R package “stats” (Version 4.0.0). For parsimony, we only reported the nine moderation analyses here relating to the FCQ. Analyses with the different subscales of the CSS are reported in the supplementary materials. For the CSS, the main findings were that optimism, mindfulness, and trait resilience moderated the relationship between anxiety and several subscales of the CSS such as dangerousness of corona, socioeconomic consequences, xenophobia, and compulsive checking (for details, see Table 1 supplementary material).

Significant moderations are depicted in Fig. 1. We used simple slopes to test each line in the graph to determine whether there are significant moderating effects for low (1 SD below the mean), mean, or high (1 SD above the mean) values of the positive personality traits. The association between fear of the coronavirus and depression is based on the score on optimism or resilience. For low and mean levels of optimism, there are no significant associations between fear of the coronavirus and depression while for high levels of optimism there is a significant negative association, $t(540) = -2.14$; $p < .05$. Similarly, for low and mean levels of resilience, there are no significant associations between fear of the coronavirus and depression, whereas for high levels of resilience there is a significant negative association, $t(540) = -2.56$; $p < .01$. Furthermore, the relationship between fear of the coronavirus and anxiety is based on the score on mindfulness and resilience. For low and mean levels of mindfulness, there are positive associations between fear of the coronavirus and anxiety, $t(540) = 4.24$; $p < .001$ and $t(540) = 3.02$; $p < .001$, whereas for higher levels of mindfulness there is no significant relationship. Comparable, for low and mean levels of resilience, there are positive associations between fear of the coronavirus and anxiety, $t(540) = 3.64$; $p < .001$ and $t(540) = 3.05$; $p < .001$, while for high levels of resilience there is no significant association. Finally, the relationship between fear of the coronavirus and stress is based on optimism or resilience. For low levels of optimism, there is a positive relationship between fear of the coronavirus and stress, $t(540) = 2.87$; $p < .001$, whereas for mean and high levels of optimism there are no significant relationships. For low and mean levels of resilience, there are significant positive relationships between fear of the coronavirus and stress, $t(540)$

Table 2
Pearson's correlation coefficients.

	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Fear of coronavirus	25.29	5.75	–												
2. Dangerousness of corona	15.49	5.42	.71	–											
3. Socio-economic consequences	8.69	3.79	.27	.44	–										
4. Xenophobia	10.91	4.96	.32	.43	.44	–									
5. Contamination	13.71	5.28	.61	.68	.43	.49	–								
6. Traumatic stress symptoms	9.41	4.04	.46	.55	.46	.38	.51	–							
7. Compulsive checking	11.20	3.86	.46	.49	.42	.36	.45	.58	–						
8. Optimism	19.79	4.10	-.19	-.26	-.16	-.18	-.25	-.27	-.11*	–					
9. Mindfulness	48.94	7.80	-.14*	-.29	-.18	-.19	-.24	-.35	-.21	.57	–				
10. Resilience	19.96	4.93	-.20	-.27	-.17	-.12*	-.22	-.30	-.15	.58	.58	–			
11. Depression	8.65	9.16	.12*	.23	.30	.20	.20	.37	.20	-.54	-.57	-.56	–		
12. Anxiety	5.78	6.94	.21	.33	.23	.29	.30	.50	.37	-.41	-.49	-.47	0.70	–	
13. Stress	11.06	8.95	.19	.31	.26	.21	.26	.47	.25	-.49	-.55	-.60	0.76	0.72	–

Note. All correlations were statistically significant with $p < .001$, except for four correlations* that were significant with $p < .01$.

Table 3
Multiple linear regression analyses predicting depression, anxiety, or stress.

Variable	Depression			Anxiety			Stress		
	β	SE	t	β	SE	t	β	SE	t
Fear of the coronavirus	-.063	.04	-1.64	-.047	.03	-1.55	-.082	.04	-2.22*
Dangerousness of corona	.003	.05	.07	.011	.04	.31	.051	.04	1.20
Socioeconomic consequences	.006	.05	.12	.021	.04	.57	.007	.04	.16
Xenophobia	.048	.04	1.33	.066	.03	2.33*	.020	.03	.59
Contamination	-.043	.04	-1.04	-.015	.03	-.47	-.029	.04	-.75
Traumatic stress symptoms	.204	.05	4.01***	.222	.04	5.59***	.311	.05	6.43***
Compulsive checking	.012	.05	.24	.123	.04	3.19**	-.002	.05	-.05
Optimism	-.226	.05	-4.82***	-.070	.04	-1.92	-.136	.04	-3.06**
Mindfulness	-.152	.03	-5.99***	-.080	.02	-4.07***	-.109	.02	-4.54***
Resilience	-.254	.04	-6.42***	-.164	.03	-5.34***	-.321	.04	-8.57***
Gender	-.780	.29	-2.68**	-.145	.23	-.64	-.265	.28	-.96
Age	.003	.02	.18	-.006	.01	-.46	.007	.01	.49
Education	.169	.17	.97	.157	.14	1.17	.639	.16	3.89***
Relationship status	-.311	.12	-2.62**	-.375	.09	-4.06**	-.035	.11	-.31
Country of residence	-.001	.01	-.32	-.001	.01	-.07	-.003	.01	-.86

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4
Moderating effects of fear of the coronavirus and personality traits predicting depression, anxiety, or stress.

Variable	Depression			Anxiety			Stress		
	β	SE	t	β	SE	t	β	SE	t
Fear of the coronavirus * Optimism	-.015	.006	-2.53*	-.009	.005	-1.82	-.013	.006	-2.26*
Fear of the coronavirus * Mindfulness	-.006	.003	-1.94	-.008	.003	-3.02*	-.005	.003	-1.57
Fear of the coronavirus * Resilience	-.016	.005	-3.14*	-.010	.004	-2.19*	-.014	.005	-2.65*

Note. * $p < .05$.

= 3.17; $p < .001$ and $t(540) = 1.93$; $p < .05$, while for high levels of resilience there is no significant relationship.

3.6. Network analyses

Fig. 2 illustrates the correlational structure of all questionnaire items. Every edge is represented by a correlation between two items larger than .1. Each color represents a different scale (domain). The figure shows that there are two smaller networks within the entire network. One network contains the positive personality traits and emotional distress, whereas the other network includes the fear of the corona questionnaires. Secondly, there are differences in the extent to which items cluster together and thus measure the same underlying latent construct. For example, the items measuring *compulsive checking* do not cluster together with the two main clusters, suggesting that these items measure a different construct. Also, the items measuring the domain *mindfulness awareness* do not cluster together with the other two main clusters, indicating that these items are measuring different

constructs. Contrarily, the items measuring *socioeconomic consequences* and *xenophobia* cluster together, indicating that these constructs are closely related to each other. Also, the items measuring *depression* and *stress* cluster together, suggesting that these constructs are highly associated. Finally, some items are located at the sides of the network model, indicating that these items measure unique constructs. Examples are items of the *mindfulness non-judging* and *mindfulness non-reacting* domain, items 2 and 3 of the *fear of the coronavirus* scale, and items 31 and 32 of the *CSS compulsive checking* domain.

Fig. 3 shows the regularized partial correlation network of the *fear of the coronavirus*, *optimism*, *resilience*, *mindfulness*, and *depression*, *anxiety*, and *stress* items. The different psychological constructs are represented by different colors. Each edge represents the relation between two items adjusted for the influence of all other items. Similar to the network correlation (Fig. 2), Fig. 3 shows that the different domains of the DASS scale cluster together, suggesting that these domains are highly related. Also, it illustrates that *mindfulness non-reacting* is clustered within the items of *resilience* and *optimism*, meaning that these constructs are closely

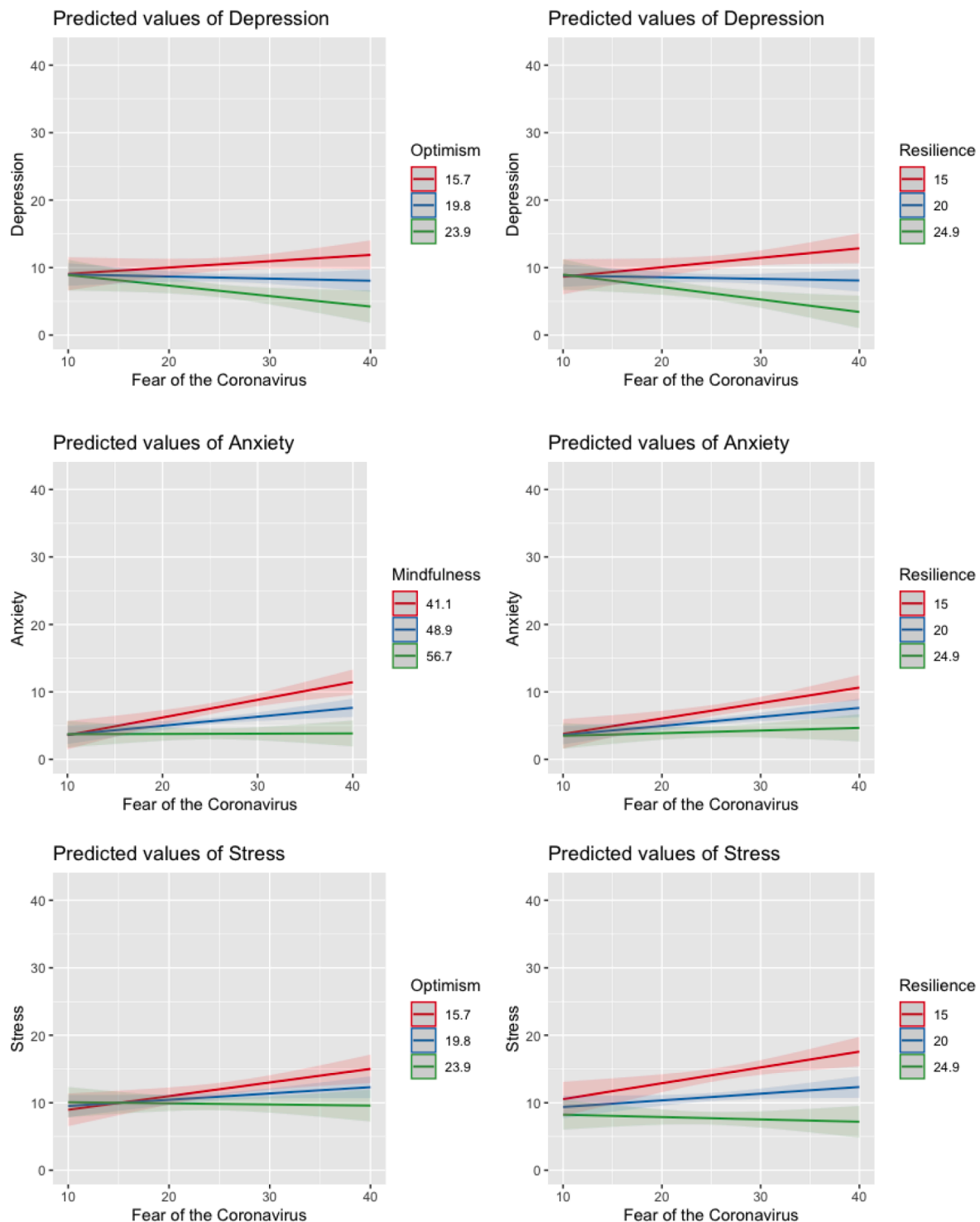


Fig. 1. Significant moderating effects predicting emotional distress.

related. Finally, it reveals negative edges between *depression* and *resilience* and *depression* and *mindfulness non-judging*, meaning that these items are negatively associated with each other.

The top 5 items according to the centrality measures (i.e., *strength*, *closeness*, and *betweenness*) of the partial correlation network are presented in Table 5. The results indicate that DASS item 17 (“I felt I was pretty worthless”) had the largest average connection weight with other items (*strength*) and that DASS item 20 (“I felt scared without any good reason”) showed the lowest average distance to other nodes (*closeness*) and is most often located in the shortest path through a node between

other nodes (*betweenness*). This is also shown in Fig. 3, in which DASS item 17 is located in the middle of the network. Secondly, it reveals that DASS item 3 (“I couldn’t seem to experience any positive feelings at all”), DASS item 12 (“I found it difficult to relax”), and DASS item 13 (“I felt sad and depressed”) play a central role in the network.

4. Discussion

In an online study, we investigate the relationship between fear of COVID-19, positive personality traits (i.e., optimism, mindfulness, and

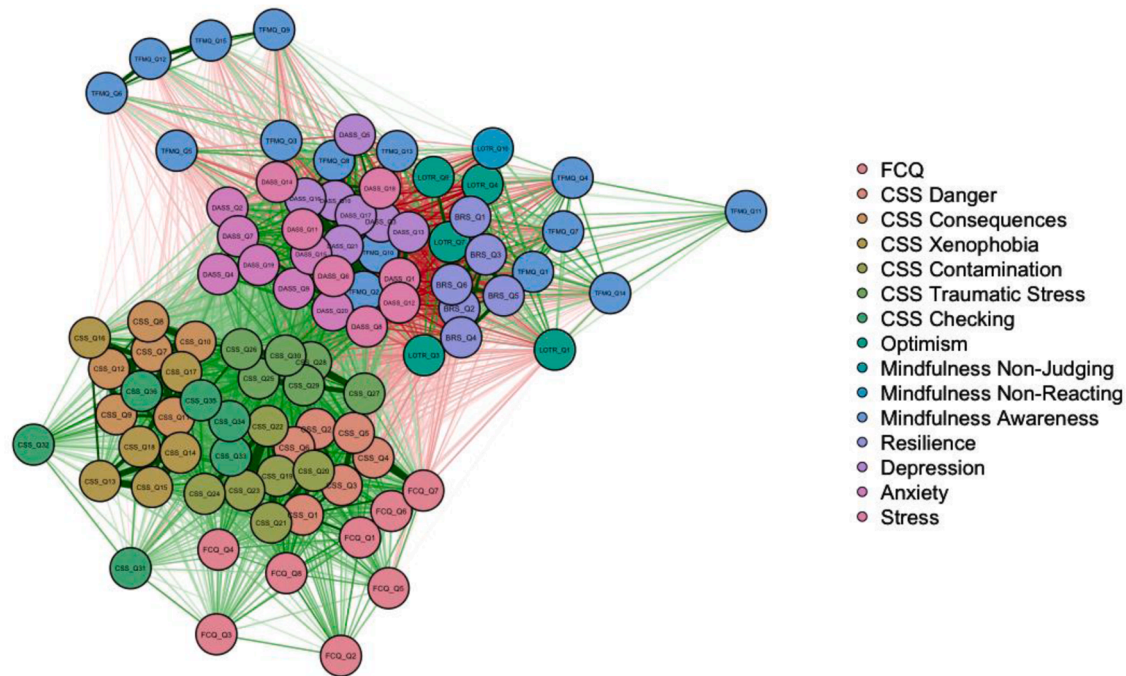


Fig. 2. Network correlation structure of all scales.

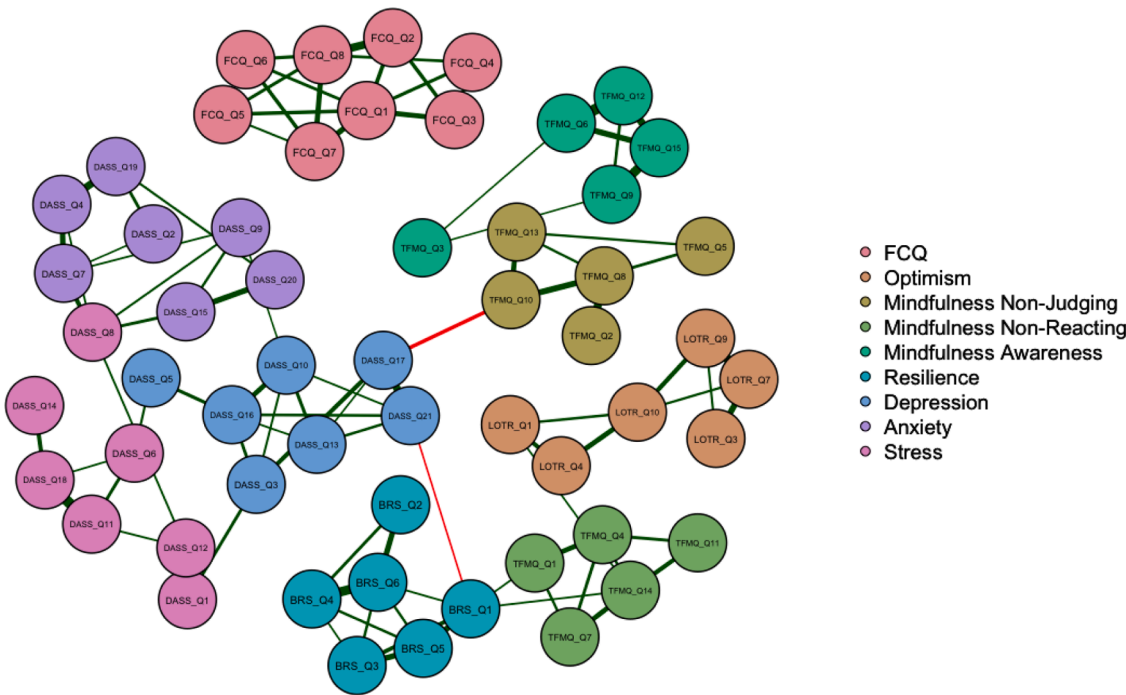


Fig. 3. Regularized partial correlation structure of fear of the coronavirus, personality traits, and emotional distress.

Table 5
The top 5 items on strength, closeness, and betweenness, based on the regularized partial correlation network.

	Strength	Closeness	Betweenness
1	DASS_Q17	DASS_Q20	DASS_Q20
2	DASS_Q3	DASS_Q17	FCQ_Q7
3	DASS_Q12	DASS_Q3	FCQ_Q1
4	DASS_Q13	DASS_Q12	TFMQ_Q8
5	DASS_Q20	DASS_Q13	DASS_Q8

resilience), and mental health symptoms (i.e., depression, anxiety, and stress). The findings illustrate that being optimistic, mindful, and resilient was negatively related to experiencing depressive, anxiety, and stress symptoms. Conversely, having traumatic stress symptoms related to corona (e.g., unwanted intrusive thoughts or nightmares) was associated with increased depression, anxiety, and stress. Additionally, corona-related compulsive checking (e.g., seeking reassurance from friends or medical professionals) was related to anxiety. Regarding the potential fear-buffering effects of positive personality traits (i.e., optimism, mindfulness, or resilience), it can be concluded that being

optimistic, mindful, and resilient may serve as protective factors for the negative mental health symptoms associated with fear of COVID-19. That is, we found that optimism, mindfulness, and resilience significantly moderated the relationship between fear of COVID-19 and depression, anxiety, and stress. Our findings are in line with previous studies investigating the effects of optimism, mindfulness, or resilience on coping with aversive life events. Indeed, previous research found that optimism is associated with better health-related outcomes and coping with negative life events (Carver et al., 2010). Similarly, mindfulness has been found to buffer against the negative impact of unavoidable events on psychological distress (Bergomi et al., 2013; Nyklíček et al., 2015; van Son et al., 2015). Lastly, our findings corroborate previous research indicating that resilience has a buffering effect on the negative mental health consequences of stressful events (Sheerin et al., 2018).

These results suggest that not everyone is equally sensitive to suffering from the negative mental health consequences of the COVID-19 pandemic. This is also encouraging, because future studies could look into whether boosting positive traits such as optimism, mindfulness, and resilience can help reduce the mental health impact of COVID-19. Previous studies have shown that interventions aimed at increasing positive constructs such as optimism, mindfulness, and resilience are associated with improved mental and physical health (Bolier et al., 2013; Steptoe et al., 2009). These interventions are readily available and relatively easy to provide online without requiring in-person contact (Mitchell et al., 2010; Mrazek et al., 2019), which is particularly important during the pandemic. Indeed, positive findings of a mindfulness based intervention in the context of COVID-19 have already been published (Matiz et al., 2020). Based on current knowledge, existing positive psychology interventions (e.g., cultivating optimism, experiencing gratitude, increasing positive affect) could be provided in clinical practice to patients and possibly even in the general population to reduce COVID-19 related distress.

From a network perspective, we found that depressive symptoms play a central role in the association of fear of COVID-19, emotional distress, and positive personality traits. Experiencing depressive symptoms and worrying about COVID-19 were highly related to anxiety and stress, whereas being optimistic, mindful, and resilient was negatively related to experiencing depressive symptoms. A possible interpretation might be that people suffering from less depressive symptoms due to the COVID-19 prevention measures may be more optimistic, mindful, and resilient, and therefore, may experience less COVID-19 related fear. However, because of the cross-sectional nature of this design, it is complicated to disentangle the causal pathways between the different constructs. Future studies should further examine the exact causal relationships, ideally using longitudinal or experimental designs.

In addition to the cross-sectional design, several other limitations of this study can be highlighted. First, the data for this study were collected in a predominantly Dutch and Belgian sample in the summer of 2020. At this time, there were relatively few cases and hospital admission in the Netherlands and Belgium, which limits the generalizability of our findings to different stages of the pandemic and of course to other countries. Second, the sample was not collected as a representative sample. For instance, more than 65% of our sample had a bachelor, master, or doctorate degree, which is not representative of the general population of the Netherlands and Belgium. As such, generalization of our findings to a broader population should be done carefully. Finally, it can be noted that the analyses reported here focused mostly on the FCQ and CSS as measures of COVID-19 related fear. In a previous study we found that these questionnaires fail to capture fears of socio-economic consequences of the COVID-19 pandemic (Mertens et al., 2020). Whether our results can be extended to this different type of COVID-19 related fear remains to be further investigated.

Taken together, we found in this study that mindfulness, optimism, and resilience moderated the negative impact of fear of COVID-19 on depression, anxiety, and stress. These findings suggest that these characteristics may potentially be protecting against mental health

consequences of COVID-19 related fear. If so, this would suggest possible avenues for the design of treatment or even prevention options of emotional distress resulting from fear of COVID-19.

CRediT authorship contribution statement

Lisa M.W. Vos: Conceptualization, Formal analysis, Investigation, Data curation, Writing - original draft, Visualization. **Mirela Habibović:** Conceptualization, Resources, Writing - review & editing, Supervision, Funding acquisition. **Ivan Nyklíček:** Conceptualization, Resources, Writing - review & editing, Supervision, Funding acquisition. **Tom Smeets:** Conceptualization, Resources, Writing - review & editing, Supervision, Funding acquisition. **Gaëtan Mertens:** Conceptualization, Methodology, Resources, Data curation, Writing - original draft, Writing - review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors declared no conflicts of interest regarding this work.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.psychres.2021.113927](https://doi.org/10.1016/j.psychres.2021.113927).

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