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Fear of COVID-19, stress and depression: A meta-analytic test of the mediating role of anxiety

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Abstract

Objectives: The COVID-19 pandemic has negatively affected the lives of millions of individuals physiologically, behaviorally, socially, and/or psychologically. Moreover, there is now much empirical evidence that mental health problems have increased during the pandemic period and these problems have various consequences. The changes in the mood states of individuals due to the pandemic underpins the rationale of the present study. The aim of the study was to identify the cross-sectional associations between fear of COVID-19, stress, anxiety, and depression by using two stage-meta-analytic structural equation modeling (TS-MASEM).

Design: This is a meta-analytic structural equation modelling study.

Method: A systematic literature review initially identified 4840 studies. As a result of applying inclusion and exclusion criteria, 25 studies comprising 28 samples (reporting 120 effect sizes) were eligible for inclusion in the current TS-MASEM ($N = 16,452$).

Results: The results showed significant associations between fear of COVID-19, stress, anxiety, and depression. Additionally, the mediation role of anxiety in the association between depression and fear of COVID-19 and stress was explored.

Introduction

The coronavirus pandemic (SARS-CoV-2) as a global health problem has affected the whole world in terms of economic, political, social, and psychological aspects (Wang et al., 2020). Apart from high mortality, the COVID-19 pandemic has caused psychological problems among individuals (Liu et al., 2020). Every individual may encounter challenging processes in life. Individuals may respond to those processes in different ways (physiological, emotional, and behavioral). Generally, those responses are considered normal and terminated by adjustment (Townsend & Morgan, 2018). Psychopathology may occur in cases where adjustment is not achieved (Bach et al., 2020; Keeley et al., 2016). Currently, depression is the most commonly diagnosed psychiatric disorder in the world (Downs et al., 2017; Leung et al., 2021).

Individuals may encounter unpredictable and challenging situations in life. The new coronavirus pandemic is a reality that humanity has to face and fight. In face of this reality, it could be stated that there are intense cognitive evaluations behind the reactions of individuals.

These cognitive structures may have roles in both the development of fear of COVID-19 and depression, anxiety, and stress.

Theoretical framework

The model employed in the present study was based on the empirical study performed by Rodríguez-Hidalgo et al. (2020). In this section, the conceptual variables are presented comprising fear of COVID-19, depression, anxiety, and stress in the model. The conceptual model that guides the present study is then discussed.

Depression

Depression is characterized by an unwillingness to carry out daily routines, intense sadness, loss of interest, guilt, loss of motivation, and problems related to sleep and appetite (American Psychiatric Association, 2013; World Health Organization, 1993). According to the World Health Organization (2017), more than 300 million individuals suffer from depression worldwide. Currently, it is estimated that the number of individuals suffering from depression may be higher than 350 million (Aryani & Kurniawan, 2020). It is well known that depression may reduce life quality (Erbay et al., 2021; Luseno et al., 2021), academic achievement (Schrack et al., 2021; Spence et al., 2020), and job performance (Parent-Lamarche et al., 2020). Moreover, depression may be considered a predisposing factor in both substance addictions (Howe et al., 2021) and behavioral addictions (Çıkrıkçı, 2019; Young & Rogers, 1998). The studies focusing on the etiology of depression have shown various determinants. Given the nature of depression, it has been observed that dysfunctional processes in the cognitive system may be associated with depression (Beck et al., 1983; Ma et al., 2021; Odacı & Çıkrıkçı, 2021). Biological, psychological, and social factors that are considered potential predisposing factors (Slavich & Irwin, 2014) may have effects on cognitive evaluations. Cognitions that cause reactions to events may lead to not only depression but also anxiety and stress (Beck, 1995).

The possible association between the COVID-19 pandemic and depression

It has been shown that unpredictable situations and uncertainty may adversely affect mental health. The findings of many studies show that the pandemic had specific effects on mental health (Pfefferbaum & North, 2020), well-being (Lades et al., 2020), behavior change (Barber & Kim, 2021; Çıkrıkçı, 2020), and education policy (Coker, 2021). Furthermore, the association between the COVID-19 pandemic and depression has been examined (Mazza et al., 2020; Rehman et al., 2021). Ettman et al. (2020) reported the prevalence of mild and greater depressive symptoms to be 24.7% before the COVID-19 pandemic among US adults. On the other hand, this prevalence was estimated to be 52.5% during the COVID-19 pandemic. Hyland et al. (2020) reported the prevalence of depression among the general population in Ireland to be 22.8%. In their meta-analytic study, Salari et al. (2020) determined the prevalence of depression to be 33.7% among general populations during the COVID-19 pandemic. It may be concluded that there has been an increase in depressive symptoms during the pandemic period.

Fear of COVID-19

Fear is a primitive feeling against a real or perceived threat. Because fear is developed depending on threatening factors, the experienced fear is related to the current time (Bakioğlu et al., 2020; Garcia, 2017). Pandemics have been threatening stimuli for individuals and fear has been reported in previous pandemics (Reynold et al., 2008; Bukhari et al., 2016). Fear of COVID-19 has gained the attention of many researchers. Globally, fear of COVID-19 and associated factors continue to be explored. These studies have been based on the effects of fear on cognitive evaluations (Dozois et al., 2019). When fear is extensive, it may lead individuals to behave in dysfunctional ways. Additionally, these dysfunctional processes may result in the

development of general distress and irrational beliefs (Han et al., 2021). It has also been demonstrated that fear of sickness and being infected may result in depression, anxiety, and stress for some individuals (Hall et al, 2008). Huang and Zhao (2020) reported moderate to severe symptoms of depression, anxiety, and stress during the early period of the COVID-19 pandemic.

Stress

Stress is considered an inevitable phenomenon and has been defined as a mental state that occurs when individuals encounter physical or psychological difficulties (Hung, 2011). Lazarus and Folkman (1984) defined stress as a reaction to situations that threaten individuals' mental and physical structures. According to Lazarus (1993), stress is a result of excessive demands that create discomfort in physiological, social, and spiritual structures among individuals.

Individuals who attempt to adapt to new situations throughout their lives can be successful or unsuccessful in this adaptation process. When adaptation became difficult or unsuccessful, the processes that cause deterioration or fatigue in the individual's body and mental state have been conceptualized as stress. However, it has been asserted that the existence of a situation related to stress, which can occur as a result of the interaction of the social environment and the individual, is related to individual perceptions and evaluations (Lazarus & Folkman, 1984). Stress, which is considered as a psychologically-based expectation that causes worry in the face of change or requires adaptation, may occur as a result of the interaction between individuals and their environment or the experiences (O'Connor et al., 2021).

Anxiety

Anxiety is a combination of unpleasant emotions and cognitions. These emotions and cognitions are mostly future-oriented (Barlow, 2002). Physiological and behavioral components as well as cognitive/subjective components are included in the terminology of anxiety. The negative mood state of anxiety, the feeling of worrying about possible future threats and dangers, being busy with oneself, not being able to predict the future threat, and not being able to control it are handled at the cognitive/subjective level. At the physiological level, anxiety is often characterized by tension and chronic hyperarousal. At this level, individuals make a risk assessment to be ready to deal with danger in case they encounter it. At the behavioral level, anxiety causes a tendency to avoid situations where individuals may encounter danger (Butcher et al., 2017). In its simplest conceptualization, anxiety is a natural reaction of the body to future threats or dangers. Therefore, anxiety has critical importance in sustaining life. However, there is a specific threshold value for each individual. Anxiety above this value begins to harm the individual and can contribute to the etiology of some psychological problems (Jacobson & Newman, 2017).

The associations among fear of COVID-19, stress, anxiety, and depression

Emotional, cognitive, and psychometric models support the empirical associations reported between fear, anxiety, and depression (Dobson, 1985; Izard, 1977). Fear can be a predictor of future emotions, while anxiety can be an important determinant of depression. Reactions to past or recent life events may present strong findings in the explanation of depression by anxiety (Dobson, 1985). In other words, reactions to life events can be shaped by anxiety. Pandemics can also be included in these life events.

It is well known that specific psychosocial stressors such as pandemics can threaten human life. The COVID-19 pandemic has been characterized by disruption of routines, leave from family members and friends, restriction of daily needs, economic losses, social isolation, and school closures (Taylor, 2019). During the pandemic, the psychological consequences have been felt at many levels (individual, family, regional, national, and international). Fear of

getting sick and dying, feeling despair, and being affected by stereotypes are potential consequences (Hall et al., 2008; Koh et al., 2005; Pakpour & Griffiths, 2020).

The COVID-19 pandemic has caused individuals to experience fear of the virus (Ahorsu et al., 2020). This situation in itself has been an important stressor for individuals (Şimşir et al., 2022). The stress experienced by individuals with a fear of COVID-19 may trigger anxiety among individuals. Coelho et al. (2020) evaluated the COVID-19 pandemic as a situation that contained different types of fear (fear of death, fear of the virus, etc.) and has been considered a predisposing factor for anxiety. Moreover, fear related to COVID-19 can also affect the anxiety that accompanies unpredictable and uncontrollable situations. Anxiety can be of an adaptive nature when faced with potential threats. However, the inability of the individuals to manage their anxiety in the face of a real threat may negatively affect those (Mertens et al., 2020). It is also known that anxiety has affected individuals significantly during the pandemic. For example, a recent study reported that isolation and quarantine experience increased anxiety levels among individuals (Brooks et al., 2020). Rodrigues-Rey et al. (2020) reported that anxiety was a significant predictor of depressive symptoms during the pandemic period among the non-clinical population. In the extant literature, the comorbidity of depression and anxiety disorders is prominent among clinical samples (Krueger & Finger, 2001). Anxiety disorders and depression are also common in society, and anxiety often accompanies depression. In addition, depressive episodes have been reported among patients with anxiety disorders (Kessler et al., 1996).

Anxiety can be considered a causal risk factor in the development of depressive symptoms due to its cognitive structure (Bittner et al., 2004; Kraemer et al., 1997). Similarly, Garber and Weersing (2010) argued that the negative complications of anxiety (e.g., familial effects, physiological factors, neurobiological factors, worry, rumination, emotion regulation, coping, etc.) may predispose depressive symptoms. These complications can lead to emotional dysfunction and depression. In fact, this situation may arise from the reactions of individuals to their own experiences. According to the metacognitive model of depression, ruminative thinking is considered to be the basic cognitive feature of depressive disorders (Papageorgiou & Wells, 2003; Wells, 2011). Garber and Weersing (2010) posited rumination as a factor that may occur after anxiety and cause depression.

In the tripartite model, Clark and Watson (1991) postulated that depression and anxiety share a common negative affective component. On the other hand, they emphasized that anxiety and depression can also be distinguished by two constructs (i.e., positive affect and physiologically hyperarousal). While low-level positive affect and high-level negative affect are common among depressed individuals, individuals with anxiety show high levels of physiological hyperarousal with high levels of negative affect. Clark and Watson (1991) used this view to argue that anxiety may be a predisposing factor for depression. In other words, although depression and anxiety differ from each other in terms of some structures, anxiety can be a determinant of depression. Consistent with this view, the unidirectional model posits that anxiety would be the prodrome of depression (Andover et al., 2011; Schleider et al., 2014; Wittchen et al., 2003). Consequently, anxiety, which becomes evident with the fear of COVID-19 and the cognitive and behavioral dimensions brought by stress, may affect depressive symptoms.

Conceptual framework

Considering the possible mediating effect of anxiety, the present study examined the extent to which fear of COVID-19 and stress is associated with depression. This mediation model was developed by conducting an extensive literature review on depression. The proposed model was rationalized by adopting the metacognitive model (Wells, 2011) and the tripartite model (Clark and Watson, 1991) of depression.

There have been studies on the etiology of depression (Chen et al., 2022; Durisko et al., 2015; Saveanu & Nemeroff, 2012) which is the most common mental health disorder in the general population (Lim et al., 2018). Efforts have been made in line with this during the pandemic (Hajek et al., 2022; Liu, Yu et al., 2022). According to the cognitive approach, a dysfunctional belief system may be effective in the development of depression (Beck, 1995). Additionally, it has been considered that the fear, stress, and anxiety in the face of challenging life events may also affect the development of depressive symptoms (Beck et al., 1983).

Theoretical associations in the model presented here were previously empirically tested by Rodríguez-Hidalgo et al. (2020). Rodríguez-Hidalgo et al. (2020) examined the associations between fear of COVID-19, depression, anxiety, and stress with structural equation modelling (SEM). In this model, fear of COVID-19 and stress were evaluated as independent variables, depression as a dependent variable, and anxiety as a mediating variable. In the present study, the theoretical model confirmed by Rodríguez-Hidalgo et al. (2020) was retested with two stage meta-analytic structural equation modelling (TS-MASEM). By means of meta-analytic structural equation modelling (MASEM), findings from many studies are used to test the theoretical model that explains the associations among variables (Becker, 1992). MASEM provides confidence intervals and parameter estimates in addition to the general fitness of a model. Therefore, MASEM offers stronger findings by combining meta-analysis and SEM (Jak, 2015).

To the best of the present authors' knowledge (and based on an extensive literature review), a quantitative synthesis of the studies examining the associations between fear of COVID-19, depression, anxiety, and stress has not yet been conducted by means of MASEM. Therefore, the primary purpose of the present study was to clarify the associations between fear of COVID-19, depression, anxiety, and stress by synthesizing the existing data using MASEM. Additionally, modelling how diverse structures combine to predict depression was carried out by using TS-MASEM. As seen in Figure 1, the model was defined on the associations between four variables. In the present study, the associations among these variables were examined by attempting to answer the following three research questions:

- To what extent is fear of COVID-19 and stress associated with depression?
- To what extent is fear of COVID-19 and stress associated with anxiety?
- To what extend does anxiety mediate the association between fear of COVID-19 and stress with depression?
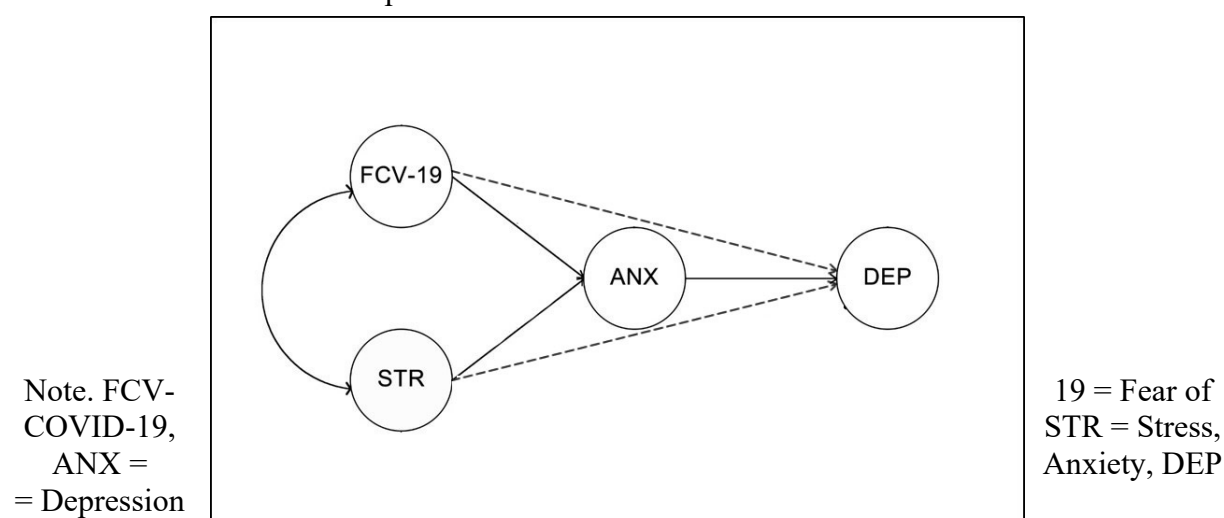

Note. FCV-COVID-19, ANX = = Depression   19 = Fear of STR = Stress, Anxiety, DEP

Figure 1. Conceptual Framework

Method

Research design

The present paper investigated the structural pathways between fear of COVID-19, depression, anxiety, and stress. The effects of fear of COVID-19 and stress as exogenous variables on depression via anxiety were explored by means of MASEM. MASEM is based on combining meta-analytic techniques in structural equation modelling (Cheung, 2015; Cook et al., 1992). The review was conducted utilizing PRISMA guidelines (Moher et al., 2009).

Selection of studies

A literature search was carried out utilizing five databases (*Educational Resource Information Center [ERIC], ProQuest Dissertations and Theses, PubMed, Scopus,* and *Web of Science*). In addition to these databases, *Google Scholar* was also used. The second author limited the searching process depending on keywords in the research title. The search was completed on 25 April 2021. A literature search with regard to the fear of COVID-19 was undertaken. The following terms were used: ("fear") AND ("COVID" OR "COVID-19" OR "coronavirus" OR "SARS-CoV-2" OR "SARS coronavirus"). As a result of searching, it was determined that there was no thesis or dissertation. After the literature search, 4840 studies were initially identified.

Inclusion and exclusion criteria

Studies identified in the initial literature review had to meet to some criteria to be included in the MASEM. To be included in the analysis, the published study had to: (*i*) have statistical information regarding the associations between fear of COVID-19, depression, anxiety, and stress, (*ii*) report the associations between fear of COVID-19 with at least two other variables, and (*iii*) be published in the English language. The exclusion criteria were studies: (*i*) not reporting correlational coefficients for correlation matrix, (*ii*) not reporting correlational coefficients, (*iii*) being qualitative, (*iv*) not published in a peer-reviewed journal. Following this process, a total of 25 different studies met the inclusion criteria comprising 28 different samples. The PRISMA diagram for the present MASEM is shown in Figure 2.
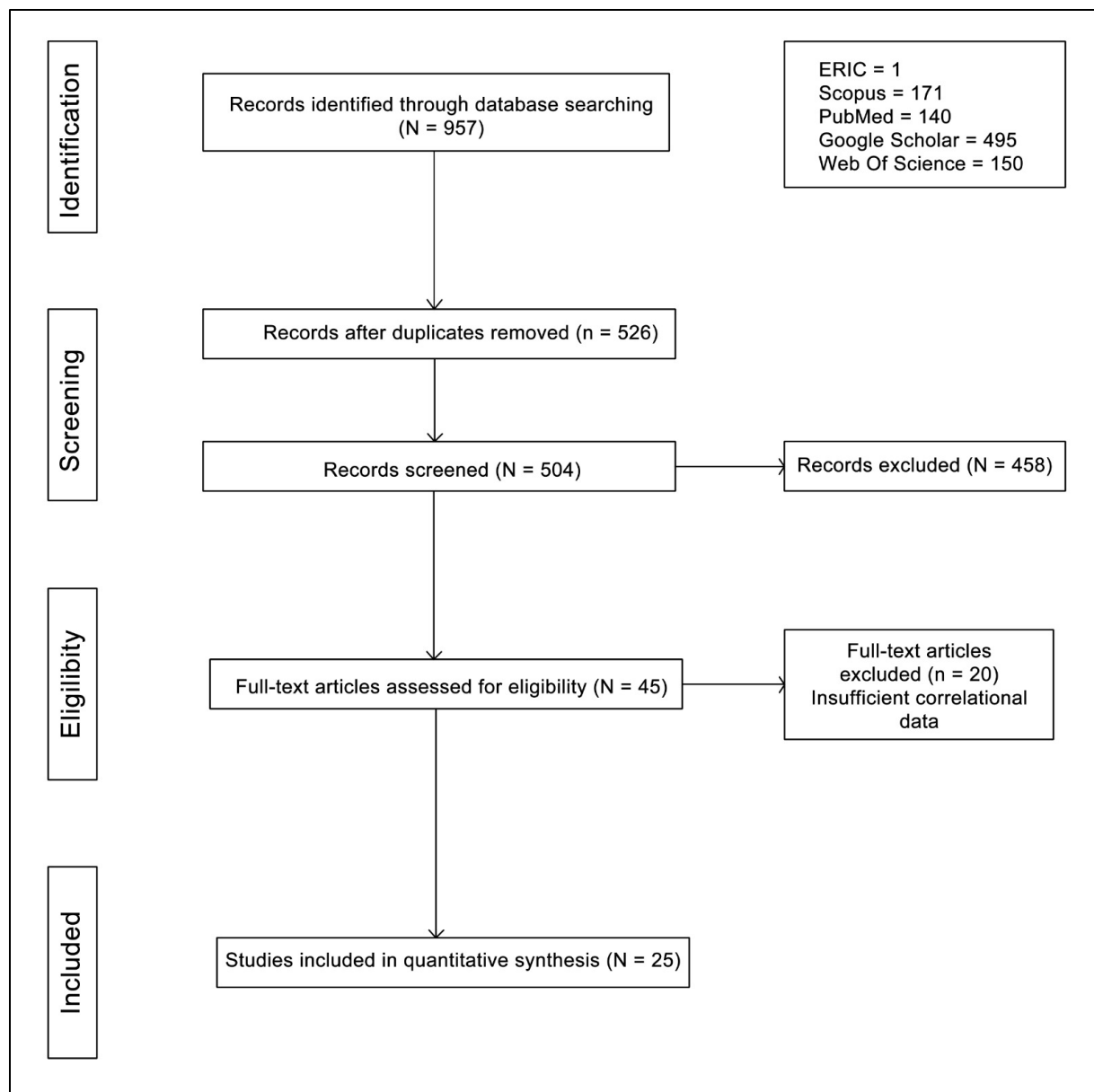
Figure 2. The PRISMA diagram.

Study coding

The study coding process was completed based on extracting the following information from each study: sample size, sample type, mean age, country in which the study was carried out, percentage of female participants, the measure assessing fear of COVID-19, and the measures for assessing depression, anxiety, and stress.

Two stage meta-analytic structural equation modelling

The meta-analytic structural equation modelling (MASEM) was performed in two phases and the two stage meta-analytic structural equation modelling (TS-MASEM) was conducted with metaSEM packages for R. To estimate the true population value of the correlation coefficient (Jak, 2015), Stage 1 was employed. Stage 1 involved testing two models. The first model

assumed that all correlation coefficients are equally distributed between studies, while the second model assumed that the correlation coefficients are freely obtained. Stage 1 compared these two models and presented findings regarding the homogeneity or heterogeneity of the correlation matrix. In Stage 1, the homogeneity or heterogeneity status of the correlation matrix of the studies ($k = 28$) was analyzed and the estimated pooled correlation matrix was assessed.

Using the fixed-effect model, averaged-sample-weighted correlation coefficients between fear of COVID-19, depression, anxiety, and stress were calculated with 95% confidence intervals. Cochran's Q and the I^2 statistics were applied for heterogeneity. The significant Q-value *and* I^2 statistics exceeding 25% were accepted as indicators of heterogeneity (Higgins et al., 2003). Testing the significance of heterogeneity is a prerequisite for Stage 2. In line the results from Stage 1 analysis, it is then decided whether to initiate the Stage 2. Because the analysis carried out produced significant findings that ensured heterogeneity, Stage 2 was employed. In Stage 2, the mediation role of anxiety in the association between fear of COVID-19 and stress and depression was examined by testing four different theoretical models. To assess model fit, chi-square (χ^2), the comparative fit index (CFI), Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) were calculated. For CFI and TLI, a .95 and higher value indicates an excellent fit to the model. As for RMSEA and SRMR, a .05 and lower value is expected for sufficient fit (Kline, 2016). Apart from these fit indices, the χ^2 statistic was calculated to evaluate the goodness of fit for four models. In other words, the χ^2 statistic was operated as a measure of relative fit to determine which model would be more suitable.

Measures

In most of the studies, the Fear of COVID-19 Scale (FCV-19S) has been used to assess fear of COVID-19. The FCV-19S had a single factor and comprises seven items (e.g., *"It makes me uncomfortable to think about COVID-19"*). The items are responded to on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The FCV-19S has sufficient evidence for reliability and validity. The internal consistency coefficient was .82 in the original validation study (Ahorsu et al., 2020). There was one study that used a different instrument to assess fear of COVID-19 (i.e., the COVID-19 Fear Inventory; Han et al., 2021). The 13-item of COVID-19 Fear Inventory was developed based on Ebola Fear Inventory (Blakey et al., 2015) and Swine Flu Anxiety Items (Wheaton et al., 2012). The 21-item Depression, Anxiety and Stress Scale (DASS-21) was the instrument most used to assess depression, anxiety, and stress (Lovibond & Lovibond, 1995). Other instruments used were the Hospital Anxiety and Depression Scale (HADS, Zigmond & Snaith, 1983), Perinatal Anxiety Screening Scale (PASS, Pereira et al., 2019), 24-item Perinatal Depression Screening Scale (PDSS-24, Pereira et al. 2013), seven-item Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006), nine-item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001), 15-Item Geriatric Depression Scale (GDS-15, Yesavage & Sheikh, 1986), Geriatric Anxiety Inventory-Short Form (GAI-SF, Byrne & Pachana, 2011), COVID-19 Anxiety Scale (CDAS, Alipour et al., 2020), Perceived Stress Scale (PSS, Cohen et al., 1994), Anxiety Subscale of the Symptom Checklist-90 Revised (SCL-90-ANX, Derogatis & Unger, 2010), and Depression Subscale of the Symptom Checklist-90 Revised (SCL-90R-DEP, Derogatis & Unger, 2010).

Results

Stage 1 analysis

In Stage 1, the homogeneity or heterogeneity status of the correlation matrix of the studies ($k = 28$) were analyzed and the estimated pooled correlation matrix was assessed. Table 1 shows the number of studies and the sample sizes. The total number of participants in the 28 samples of

the 25 studies was 16,452. The mean age of the participants was 31.73 years ($SD = 11.16$). The percentage of female participants was 70.76% (SD = 20.37). Most of the participants were European (48.86%), Asian (24.92%), and American (23.26%).

Table 1. Study characteristics

Study	Sample					Measure			
	N	Sample Type	Mean Age	Female	Nationality	Fear of COVID-19	Depression	Anxiety	Stress
Ahmed & Atia (2020), Sample 1	132	Nurses	24.6	78.03%	Egypt	FCV-19S	DASS-21	DASS-21	DASS-21
Ahmed & Atia (2020), Sample 2	268	Community	23.3	74.62%	Egypt	FCV-19S	DASS-21	DASS-21	DASS-21
Ahorsu et al. (2020), sample 1	290	Pregnant women	29.24	100%	Iran	FCV-19S	HADS	HADS	NR
Ahorsu et al. (2020), sample 2	290	Community	33.6	0%	Iran	FCV-19S	HADS	HADS	NR
Alnazly et al. (2021)	362	Health-care workers	NR	55.61%	Spain	FCV-19S	DASS-21	DASS-21	DASS-21
Bakioglu et al. (2020)	960	Community	29.74	69.1%	Turkey	FCV-19S	DASS-21	DASS-21	DASS-21
Barros et al. (2021), women	204	Pregnant women	30.12	100%	Brazil	FCV-19S	**PDSS-24**	**PASS**	NR
Bitan et al. (2020)	639	Community	NR	84.50%	Israel	FCV-19S	DASS-21	DASS-21	DASS-21
Caycho-Rodríguez e al. (2020), sample 1	1291	Community	38.47	79.24%	Argentina	FCV-19S	PHQ-9	GAD-7	NR
Caycho-Rodríguez e al. (2020), sample 2	1291	Community	38.47	79.24%	Argentina	FCV-19S	PHQ-9	GAD-7	NR
de Medeiros et al. (2021)	302	Community	31.07	74.83%	Brazil	FCV-19S	DASS-21	DASS-21	DASS-21
Han et al. (2021)	413	Community	69.09	65.37%	Singapore	COVID-19 FI	GDS-15	GAI-SF	NR
Hill et al. (2021)	100	Cancer patients	55.03	100%	USA	FCV-19S	DASS-21	DASS-21	DASS-21

Study	N	Sample	Age	Female %	Country	Fear	Depression	Anxiety	Stress
Hwang et al. (2021)	186	Community	29.19	44.08%	Korean	FCV-19S	HADS	HADS	NR
Kassim et al. (2020)	434	Community	26	75.11%	Indonesia	FCV-19S	DASS-21	DASS-21	DASS-21
Kassim et al. (2021)	255	Community	NR	65.49%	Malaysia	FCV-19S	DASS-21	DASS-21	DASS-21
Kausar et al. (2021)	500	Community	NR	59%	Pakistan	FCV-19S	DASS-21	DASS-21	DASS-21
Koçak et al. (2021)	3287	Community	31.78	56.67%	Turkey	FCV-19S	DASS-21	DASS-21	DASS-21
Mahamid and Bdier (2020)	280	Psychosocial service providers	NR	70%	Palestine	FCV-19S	DASS-21	DASS-21	DASS-21
Masjoudi et al. (2021)	215	Pregnant women	27.84	100%	Iran	FCV-19S	NR	CAS	PSS
Pang et al. (2020)	228	Community	26	71.05%	Malaysia	FCV-19S	DASS-21	DASS-21	DASS-21
Rodríguez-Hidalgo et al. (2020)	640	Community	21.69	72.03%	Ecuador	FCV-19S	DASS-21	DASS-21	DASS-21
Rossi et al. (2020)	1200	Community	39.59	81.91%	Italy	FCV-19S	SCL-90R – DEP	SCL-90R – ANX	NR
Satıcı et al. (2020)	1304	Community	29.47	70.32%	Turkey	FCV-19S	DASS-21	DASS-21	DASS-21
Servidio et al. (2021)	454	Community	21.09	91.85%	Italy	FCV-19S	DASS-21	DASS-21	DASS-21
Suhail et al. (2021)	163	Community	26.64	56.44%	India	FCV-19S	CES-D	GAD-7	NR
Yalçın et al. (2021)	506	Community	21.69	78.65%	Turkey	FCV-19S	DASS-21	DASS-21	DASS-21
Yıldırım et al. (2021)	255	Community	32.96	87.84%	Saudi Arabia	FCV-19S	DASS-21	DASS-21	DASS-21

Note. **FCV-19S** = The Fear of COVID-19 Scale; **COVID-19 FI** = COVID-19 Fear Inventory; **DASS-21** = 21-item Depression, Anxiety and Stress Scale; **HADS** = Hospital Anxiety and Depression Scale; **PASS** = Perinatal Anxiety Screening Scale; **PDSS-24 =** 24-item Perinatal Depression Screening Scale; **GAD-7** = Seven-item Generalized Anxiety Disorder Scale; **PHQ-9** = Nine-item Health Questionnaire; **GDS-15** = 15-item Geriatric Depression Scale; **GAI-SF** = Geriatric Anxiety Inventory-Short Form; **CAS** = COVID-19 Anxiety Scale; **PSS** = Cohen et al. (1994) Perceived Stress Scale; **SCL-90-ANX** = Anxiety Subscale of the Symptom Checklist-90 Revised; **SCL-90R-DEP** = Depression Subscale of the Symptom Checklist-90 Revised.

In Stage 1 analysis, firstly, the homogeneity of the correlation matrix was examined with the fixed-effects method. The model's fit indices were as follows: ($\chi^2_{(df = 114)}$ = 3314, $p<.001$, the comparable fit index (CFI) = .874, the root mean squares of approximation (RMSEA) and its 95% confidence interval (CI) = 0.218 (0.212, 0.225), the standardized root mean square residual (SRMR) = 0.122, and Tucker–Lewis index (TLI) = 0.868. These indices were interpreted as an indicator of a bad fit. According to these results, the assumption of homogeneity of correlation matrices was not acceptable. Because the studies pooled may vary from different perspectives, the random-effect model is generally proposed.

Table 2 shows the pooled correlation matrices and related standard errors. The summary of the results of the random-effect analysis was determined with Q statistics. Significant Q statistics ($Q_{(114)}$ = 1985.42, $p<.001$) demonstrated the significant heterogeneity of the correlation matrices. Because Q statistics with 114 degrees of freedom exceeded the critical value of χ^2 distribution ($\chi^2_{(114)}$ = 166.40) the null hypothesis of homogeneity of correlation matrices was refuted in the random-effect model. The I^2 values of the six correlation coefficients ranged from .87 to .95. Results from Stage 1 analysis showed that heterogeneity of the correlation coefficients was significant. It was concluded that the assumptions for Stage 2 were met.

Table 2. Numbers of studies and sample sizes used in Stage 1 analysis

	Fear	Stress	Anxiety	Depression
Fear of COVID-19		10,670	16,452	16,237
Stress	18		8,704	9,689
Anxiety	28	15		14,271
Depression	27	14	24	

Note. Values in the lower and the upper triangles represent the number of studies and the sample sizes, respectively.

Stage 2 analysis

In Stage 2, four theoretical models were tested. The first model (Model A) was related to the full mediation role of anxiety. In Model A, fear of COVID-19 and stress had direct paths to anxiety, and anxiety had a direct path to depression. In the second model (Model B), the direct path from stress to depression was added into the model. In the third model (Model C), the direct path from fear of COVID-19 to depression was added into the model. The degrees of freedom of Model A, B, and C was 2. Due to the fact that the fourth model (Model D) included the directs effects of exogenous variables on the endogenous variable, the degrees of freedom was 0 for Model D. In other words, Model D was a saturated model.

Table 3. Pooled correlation matrix and their associated standard errors with the random-effects model in Stage 1 analysis.
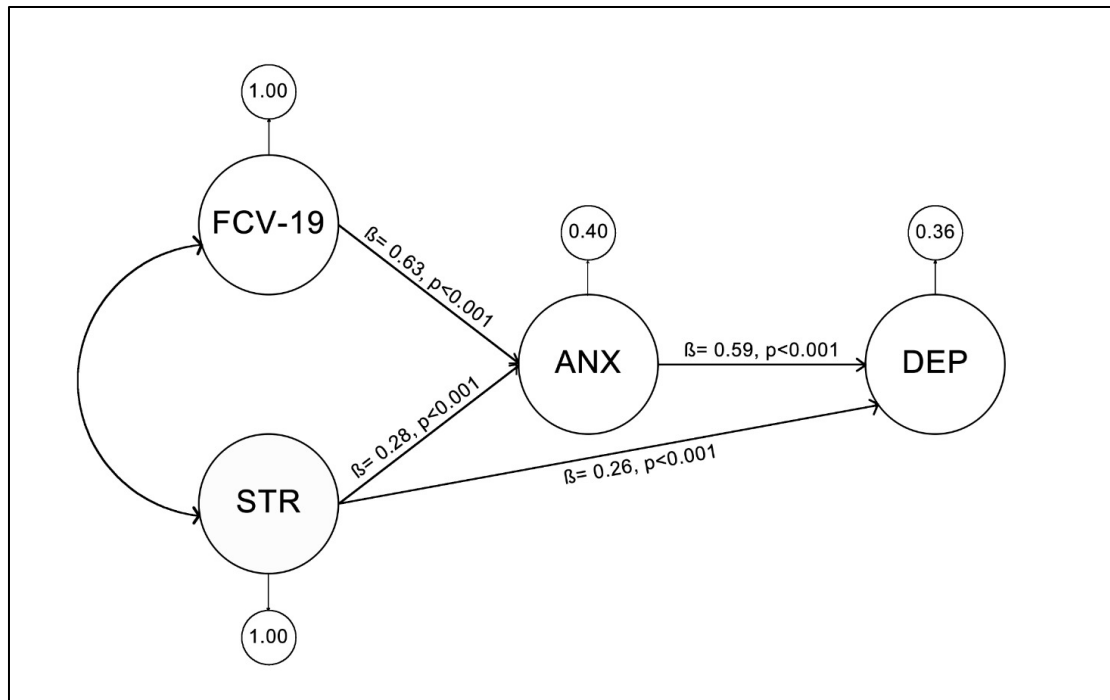
	Fear	Stress	Anxiety	Depression
Fear of COVID-19		0.034	0.029	0.031
Stress	0.446 [0.379, 0.512]		0.031	0.028

	Anxiety			
Anxiety	0.473	0.727		0.028
	[0.416, 0.529]	[0.666, 0.787]		
Depression	0.341	0.733	0.69	
	[0.280, 0.401]	[0.678, 0.789]	[0.635, 0.744]	

Note. Values in the lower and the upper triangles represent the estimated correlation coefficients and their standard errors, respectively. All the correlation coefficients are statistically significant at $\alpha = .001$.

In Model A, it was assumed that there were direct paths from fear of COVID-19 and stress, as exogenous variables, to anxiety. Additionally, the direct path from anxiety to depression was assumed. Although Model A had sufficient fit indices ($\chi^2_{(df = 2)} = 21.006$, $p < .001$; $RMSEA = 0.024$ 95% CI [0.015, 0.034], $SRMR = 0.058$, $TLI = 0.973$, $CFI = 0.991$, $AIC = 17.006$, $BIC = 1.59$), OpenMx status1 value was found to be 6. While performing analysis for Model B, the direct path from stress to depression was added. This path significantly improved the model fit ($\Delta\chi^2_{(1)} = 7.537$, p = 0.006). Additionally, Model B had sufficient fit indices ($\chi^2_{(df = 1)} = 13.469$, $p < .001$; $RMSEA = 0.027$ 95% CI [0.015, 0.041], $SRMR = 0.044$, $TLI = 0.964$, $CFI = 0.994$, $AIC = 11.469$, $BIC = 3.76$). However, the OpenMx status1 value for Model B was also found to be 6.

In Model C, the direct path from stress to depression was excluded from the model, and the direct path from fear of COVID-19 to depression was added into the model. The path from fear of COVID-19 to depression significantly improved the model ($\Delta\chi^2_{(1)} = 6.658$, $p = 0.009$). Moreover, Model C presented sufficient fit indices ($\chi^2_{(df = 1)} = 14.348$, $p < .001$; $RMSEA = 0.028$ 95% CI [0.016, 0.042], $SRMR = 0.047$, $TLI = 0.961$, $CFI = 0.993$, $AIC = 12.348$, $BIC = 4.64$). The OpenMx status1 value for Model C was equal to 0. This result showed good optimization and reliable results. All paths in Model C were significant ($p<.001$). Fear of COVID-19 ($\beta = 0.63$, $p < .001$; 95% CI [0.557, 0.696]) and stress ($\beta = 0.28$, $p<.001$; 95% CI [0.202, 0.362]) were significant predictors of anxiety. Additionally, the direct effect of anxiety on depression was significant ($\beta = 0.59$, $p<.001$; 95% CI [0.448, 0.759]). In Model C, the direct effect of fear of COVID-19 on depression was significant ($\beta = 0.26$, $p<.001$; 95% CI [0.071, 0.418]). The indirect effect of fear of COVID-19 on depression via anxiety was also significant ($ab = 0.368$, 95% CI [0.264, 0.511]) (Figure 3).

Note.FCV-19 = Fear of COVID-19, STR = Stress, ANX = Anxiety, DEP = Depression

Figure 3. Meta-analytic structural equation model

Consequently, the saturated model (Model D) was tested. The direct effects on the endogenous variable were assessed in Model D. However, Model D did not provide a sufficient fit to the data. When comparing the models, it was concluded that Model C was the most suitable model. The predictive roles of exogenous variables (fear of COVID-19 and stress) on anxiety and depression were explored. Furthermore, fear of COVID-19 and stress accounted for 60% of the total variance of anxiety. Additionally, Model C accounted for 64% of the total variance of depression.

Table 4. Test statistics on the models in Stage 2 analysis.

Statistics	Model A	Model B	Model C	Model D
Chi-square of the target model	21.006	13.469	14.348	0
df of the target model	2	1	1	0
p-value of target model	<.001	<.001	<.001	NA
RMSEA	0.024	0.027	0.028	0
(95% CI of RMSEA)	0.015, 0.034	0.015, 0.041	0.016, 0.042	0, 0
SRMR	0.058	0.044	0.047	0
TLI	0.973	0.964	0.961	0
CFI	0.991	0.994	0.993	1.000

AIC	17.006	11.469	12.348	0
BIC	1.59	3.76	4.64	0

Note. RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; TLI = Tucker–Lewis Index; CFI = Comparative Fit Indices; AIC = Akaike information criterion; BIC = Bayesian information criterion; NA = not available.

Table 5. Parameter estimates and their 95% likelihood-based confidence intervals in Stage 2 analysis on Model C with all direct effects.

Parameters	Parameter Estimates	Lower 95% confidence limit	Upper 95% confidence limit
Paths on anxiety			
Fear of COVID-19	0.63	0.557	0.696
Stress	0.28	0.202	0.362
Paths on depression			
Stress	0.26	0.071	0.418
Anxiety	0.59	0.448	0.759

Discussion

Decreases in positive emotions, thoughts, and behaviors are considered decisive factors in depressive symptoms. As thoughts and moods become dysfunctional, the tendency to withdraw from daily activities increases, which can lead to deepening depression. The present review provided two key contributions to the understanding of depression in the COVID-19 pandemic. First, the associations between fear of COVID-19, depression, anxiety, and stress were investigated utilizing data from 28 cross-sectional samples (from 25 studies) comprising 16,452 participants. Second, models explaining depression were tested, and the direct and indirect effects on depression were determined by TS-MASEM. Additionally, four structural models were compared to determine which model(s) would be more appropriate to explain depression.

Results from Stage 1 analysis (Table 3) showed that depression was associated with fear of COVID-19, anxiety, and stress at a medium level (Cohen, 1992). The comorbidity of depression and anxiety and the strong association between depression and anxiety have been reported among all age groups in previous research (e.g., Braam et al., 2014; Osborn et al., 2017). Anxiety symptoms have been associated with neurotic traits (Watson & Clark, 1984). Wetherell et al. (2001) argued that anxiety is more stable than depression and therefore anxiety may be more likely to cause depression. In previous studies, the results in relation to the association between depression and anxiety were based on cross-sectional studies (Elbay et al., 2020; Odacı & Çıkrıkçı, 2021; Uliaszek et al., 2010). As these results were two-paired, the results of longitudinal studies to determine cause and effect are more functional. Lovibond (1998) examined the long-term effects of depression, anxiety, and stress, and determined the causal effect of anxiety on depression. Anxiety can cause depressive symptoms due to the cognitive content it contains. Similarly, stress has been found to be related to depression.

The maladaptive effects of stress in the reinforcement process may lead to depressive symptoms. The preference for passive coping, which is considered a maladaptive strategy, can play a role in the development of depression. In compliance with behavioral conceptualizations of depression, depressive symptoms appear when positive reinforcement for healthy behaviors decreases (Carvalho & Hopko, 2011; Lewinsohn, 1974). Passive strategies for internal and external stressors that affect the reinforcement process may lead to the development of depressive symptoms and make them more persistent (Watkins & Moulds, 2007).

Results from TS-MASEM showed that anxiety had a mediating role in the associations between fear of COVID-19 and stress with depression. The mediating role of anxiety in the association between fear of COVID-19 and stress with depression was first examined in a cross-sectional study conducted by Rodríguez-Hidalgo et al. (2020). The results of the present study were consistent with their study. The most important difference in the present study was that the direct effect of stress on depression was also significant. Moreover, the present study demonstrated that fear of COVID-19 and stress via anxiety appear to have a contributory role in depression. The results of the present TS-MASEM showed that an increase in fear of COVID-19 and stress may lead to an increase in anxiety, and that increase in anxiety, as a mediating variable, may lead to an increase in depression.

There were several models and theoretical conceptual frameworks which might be effective in explaining the results from the structural model in the present study. According to the cognitive perspective, depression would appear secondary to a cognitive disorder. There are maladaptive schemas in relation to the self, future, and external world among individuals prone to depression. These maladaptive schemas may cause negative evaluations, thoughts, and attitudes over time. Therefore, perceiving negative aspects across all events and exhibiting dysfunctional attitudes might be possible (Beck & Bredemeier, 2016). From this point of view, it is proposed that fear of COVID-19, stress, and anxiety may affect this negative evaluation process. Cognitive impairments relating to the pandemic may be observed among individuals prone to displaying maladjusted responses by making negative evaluations.

The significant association between fear of COVID-19 and depression has been reported in different studies conducted during the pandemic period (e.g., Alnazly et at., 2021; Bakioğlu et al., 2020; Bendau et al., 2021). The chronic and fluctuating nature of pandemics may lead to an increase in worry and tension (Morganstein et al., 2017). The common consequences of past pandemics such as the H1n1 and Ebola viruses included anxiety, panic, depression, and anger (Acharibasam et al., 2021; Bah et al., 2020; Bults et al., 2015). At the individual level, aggrievement, social stigma, distress, and isolation have been seen in the current pandemic period (Bruns et al., 2020; Çıkrıkçı, 2020; Plagg et al., 2020; Rashid et al., 2021). The virus and coping styles may affect individuals adversely. Despair and loneliness based on isolation might increase depressive symptoms (Başterzi et al., 2021). It is well known that depression and loneliness are significantly associated (Janjani et al., 2017; Mngoma et al., 2021; Padmanabhanunni & Pretorius, 2021; van der Velden et al., 2021). Therefore, it might be concluded that the two paired interactions between despair, loneliness, and depression affected moods.

Cognitions and behaviors concerning living with the pandemic can increase depressive symptoms. In short, fear of COVID-19 caused by the virus may adversely affect mood states. Human minds need to integrate new knowledge and abilities into existing cognitive schemas. This need was assessed in the Stress Response Theory and defined as completion tendency (Horowitz, 1993). Traumatic events are integrated into existing schemas. The COVID-19 pandemic can be considered a traumatic event. Individuals are exposed to events they have not

experienced before and these exposure experiences may affect cognitive structures in the integration process (Başterzi et al., 2021).

The chronicity of fear of COVID-19 and stress can result in a dysfunctional status and cause impairments in cognitive structures. Additionally, this situation may lead to the development of anxiety and depression. In the present review, the covariance from fear of COVID-19 to stress was added into the model. Because of the fact that interpretation style in traumatic events such as the pandemic might affect cognitive processes, this covariance may facilitate the examination of the association between stress and fear systems. It may be that information processing developed as a result of fear of COVID-19 may have a role in the development of stress symptoms.

Anxiety is a natural reaction to many situations and is frequently considered a non-pathological variable. Furthermore, future plans of individuals have been changed due to the COVID-19 pandemic. In addition to this changing process and life events, it may be that both fear of COVID-19 and stress have an effect on anxiety. Bostan et al. (2020) reported the prevalence of moderate and severe anxiety symptoms among Turkish individuals aged 20 years and older as 13%. Malesza and Kaczmarek (2021) reported that the prevalence of anxiety symptoms among Polish adults increased from 50.1% to 58.8% during the pandemic period. Similarly, Tang et al. (2021) reported that the prevalence of anxiety symptoms among quarantined individuals in China was 70.8%. As a consequence of theoretical and empirical outcomes, it is concluded that fear of COVID-19 and stress have effects on the occurrence of anxiety.

Limitations

The findings of the present study should be interpreted in line with the limitations that may guide future studies. In the present study, the tested structural model was limited to four variables. The predisposing role of fear of COVID-19, stress, and anxiety in depression was assessed. It may be possible to make different and comprehensive evaluations by including different variables in the model. While performing the TS-MASEM procedures, studies containing at least three correlation values were preferred in accordance with the correlation matrix. Another limitation was the cross-sectional studies included in the study. Due to the lack of longitudinal data, no causal inference can be made regarding the results from the present study. In other words, this situation limits the etiological evaluations of depression. Conducting longitudinal studies on research variables may partially reduce this limitation.

Conclusion

The results of the present TS-MASEM were consistent with the previous research. Anxiety had a mediating role in the association between depression and fear of COVID-19 and stress. Additionally, the direct effect of stress on depression was significant. Overall, the results enabled the comprehension of the structural paths among study variables.

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