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Examining the Relationship Between Coronavirus Anxiety and Cognitive Failures

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ABSTRACT

Objective: Throughout the coronavirus disease 2019 pandemic, it is critical to look at the impact of high levels of worry and stress on people's cognitive health. This study examines the relationship between anxiety, despair, and perception of threat as coronavirus disease 2019 distress and cognitive failures.

Methods: The sample of the study consisted of 818 people aged between 18 and 81 years. Structural equation modeling was carried out to reveal the existing relationships. In addition, demographic variables that predict cognitive failures during the coronavirus disease 2019 pandemic period are expressed in the simple linear regression analysis. Finally, an independent samples *t*-test was applied according to gender for anxiety, despair, perception of threat, cognitive failures, perception, attention, forgetting, and motor functioning.

Results: The results obtained from the structural equation modeling show that the coronavirus disease 2019 distress latent variables (anxiety, despair, and perception of threat) predict perception, attention, forgetting, and motor functioning during the pandemic period. It was found that cognitive failures were predicted by age, gender, educational status, media exposure, having a chronic disease, and compliance with hygiene rules.

Conclusion: In cognitive failures total score, perception, forgetting, attention, and motor functioning men exhibit more cognitive failures than women during the pandemic period. Women have higher anxiety and perception of threat scores than men.

Keywords: COVID-19, anxiety, cognitive failures, attention, perception, forgetting

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INTRODUCTION

The self-isolation measures implemented to retard the spread of the coronavirus disease 2019 (COVID-19) may negatively affect the mental health of the population. A novel COVID-19 outbreak was discovered in Wuhan, Hubei Province, China, in December 2019. Then COVID-19 spread quickly to the neighboring countries, causing a public health disaster that drew international attention. A global epidemic has been declared by the World Health Organization.[1] On March 13, 2020, the first COVID-19 case in Turkey was announced. For this reason, the Turkish Government implemented measures such as home quarantine and social isolation, social distance, continuing education online, and working remotely.

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The COVID-19 pandemic has had psychological effects on both healthcare workers and the general population in many countries.[2-10] Evidence of psychological impact of COVID-19 on healthcare workers and the general public indicates that psychological interventions be developed to protect the mental health of the vulnerable groups during and after the pandemic.[11]

Since the 19th century, there have been reports of an upsurge in respiratory tract pandemics and neuropsychiatric disorders.[12] Coronavirus disease 2019 has been linked to cognitive deficiencies, including attention, executive function, and memory, according to new research. Anxiety, depression, exhaustion, sleep disturbance, and, to a lesser extent, posttraumatic stress are all common psychiatric symptoms in COVID-19 survivors.[13] As a result, it is assumed that people diagnosed with COVID-19 have problems with their cognitive status. Further, our cognitive frames of reference are undoubtedly shifted by a sudden change in routines, worries for oneself and loved ones, and economic concerns related to the pandemic. The cognitive dimension has certainly received less attention than psychological distress in studies conducted during the pandemic period. Furthermore, higher predispositions to cognitive failures in everyday life can result from cognitive discomfort following a period of stress exposure.[14,15]

In this study, first, the definition of cognitive failure will be given, and then a review about COVID-19 distress and anxiety will be presented. In so doing, we will illustrate how anxiety, despair, and perception of threat affect cognitive failures during pandemic period.

Definitions of Cognitive Failures

Broadbent et al[14] used the term "cognitive failures" to describe small errors that disturb the normally smooth flow of intended action (physical or mental). Cognitive failures are a symptom of a larger problem with recurrent breakdowns in cognitive control.[15] Studies have suggested that a predisposition to cognitive failures increases susceptibility to minor mental health symptoms after exposure to stress and in situations of anxiety.[14,16] Negative mood states exacerbate cognitive failures in daily life,[17] while individuals with good control capacity were more likely to have cognitive failures when faced with distracting environmental factors, while those with poor objective control experienced failures regardless of context.[18]

Considering that quarantine/isolation has a negative influence on mental health[19] and that prolonged discomfort might cause perceived memory and concentration deficiencies.[3]

Coronavirus Disease 2019 Distress and Anxiety

Quarantine and isolation are uncomfortable situations that have significant psychological consequences such as posttraumatic stress disorder symptoms, bewilderment, and hostility.[20] Evidence of psychological impact of COVID-19 on healthcare workers and the general public indicates that psychological interventions be developed to protect the mental health of the vulnerable groups during and after the pandemic.[11]

Quarantine/isolation has a negative impact on mental health, and prolonged stress has been linked to memory and concentration deficits.[19,21] Additionally, it is stated that during an epidemic, people are more likely to have psychological issues like stress, despair, and anxiety.[22] Some patients diagnosed with COVID-19 present with anosmia, cognitive and attention deficits (i.e., brain fog), new-onset anxiety, depression, psychosis, seizures, and even suicidal behavior.[23,24] According to Woo and his colleagues,[24] 78% of patients showed persistent mild cognitive deficits and performed worse for mild cognitive impairment compared to 10 healthy controls of the same age. It has been determined that short-term memory, attention, and concentration are particularly affected by COVID-19. These results suggest that persistent subclinical cognitive impairments may be a common complication after recovery from COVID-19 in young adults.[24]

Psychosocial responses to infectious disease epidemics can readily deteriorate into psychological discomfort, such as high-level and protracted worry, panic, and sadness, as with menstrual rumination.[25,26] In the study conducted in China by Qui et al.[8] psychological distress was investigated during the pandemic process. The results of the study demonstrated that women, young and older adults, those with higher levels of education, and migrant workers showed significantly higher levels of psychological distress.[8] According to the findings of a study conducted in Turkey, women with psychiatric diseases, living in cities, and with chronic diseases are among the populations most affected psychologically by the COVID-19 pandemic.[10] According to another study, the psychological impacts of quarantine during the current COVID-19 outbreak were similar to those identified in prior studies of the psychological effects of quarantine during previous outbreaks (severe acute respiratory syndrome, H1N1, Ebola, Middle East respiratory syndrome, and equine flu).[7] There has been a substantial shift in daily patterns in terms of waking and sleeping times, Internet usage, and reading hours. Long-term confinement, existential anxiety caused by the fear of infection, frustration, boredom, lack of contact with significant people, and limitations on personal space at home all contribute to the development of a threat perception marked by the attribution of negative meanings to initially neutral stimuli.[27,28] Lastly, according to Asmundson and Taylor,[29] many people experienced anxiety in their daily lives during the epidemic.

The Present Empirical Study: Cognitive Failures Related to Coronavirus Disease 2019 Distress

Traumatic occurrences can make people feel unsafe, remind them of their mortality, and harm their mental health. Questions about the pandemic that have no definite answers, such as when it will end and treatment methods, constant exposure to a flow of information about the pandemic and its effects, decreased social relations because of the pandemic, and recommendations/prohibitions such as staying at home as much as possible, all have the potential to negatively impact people's mental health.[30] People are seeking protection from the hazards of contagion as the number of new cases grows, coupled with ineffectual and anxiety-inducing information. The prevention of infectious diseases has its origins in human phylogenetic history. Infectious disorders appear to have had a significant evolutionary role in human development, leading to the concept of a behavioral immune system.[31] Humans have developed a complex of proactive, emotional, and cognitive reactions that influence behavior, such as avoiding persons who appear to be diseased or at danger of infection, in addition to the physiological immune system. Indeed, the best defense against the disease is to adopt acceptable behaviors based on the current knowledge and apply them with prudence and caution in daily life. On the one hand, fear of contagion and *germ panic*[32] play a role in people's ability to protect themselves; on the other hand, this fear can lead to dysfunctional processes, maladaptive lifestyle choices, and psychological side effects, all of which can wreak havoc on people's sense of well-being during outbreaks.[32]

The impact of COVID-19 quarantine and vulnerability factors on subjective cognitive functioning and mental health during the final phase of lockdown in Italy was investigated.[34] Lockdown has been shown to have a negative impact on subjective cognitive functioning as well as mental health disorders. That is, when cognitive complaints were restricted, they were largely felt in daily tasks involving attention, temporal orientation, and executive processes; no alterations in language skills were noted. In the memory region, on the other hand, there was a counterintuitive effect, with respondents reporting less memory errors than before the lockdown.[33,34]

First and foremost, our aim was to investigate whether the COVID-19 distress affects cognitive status. Our main hypothesis is that anxiety, perception of threat, and despair from COVID-19 may have a detrimental effect on subjective cognitive functioning. Additionally, another goal was to identify subjective cognitive functioning in this unique context, as well as demographic factors associated with COVID-19 distress. Indeed, our goal was to pave the way for the implementation of certain interventions and to demonstrate in this sample that the COVID-19 pandemic caused psychological and cognitive complaints in the society. Our findings, we believe, can help government decision-makers and healthcare experts design a worldwide and long-term response to the pandemic's cognitive and mental health concerns.

According to the considerations mentioned above, the following hypotheses were proposed for investigation:

1. Coronavirus disease 2019-induced anxiety, despair, and perception of threat predict cognitive errors during the pandemic period.
2. Anxiety, despair, and perception of threat scores will differ between male and female participants.
3. Cognitive failures diverge by gender.
4. Some demographic variables predict self-reported cognitive failures during COVID-19 pandemic.

METHODS

Study Design and Participants

The current study was conducted under the approval of Bolu Abant Izzet Baysal University Humanities & Social Sciences Research Ethics Committee (dated March 29, 2021 and numbered 2021/124). The data of the research were collected between April 8, 2021, and June 11, 2021, through online forms with a convenient sampling method. A snowball sampling strategy was employed to gather a representative national sample of the Turkish population, which has been affected differentially by the pandemic. Participants were urged to distribute and invite new responses among their contacts in addition to making their input. The participation was completely on a voluntary basis and without compensation. Before their participation, written informed consent was obtained from all subjects. The questionnaire took about 20 minutes to complete and was anonymous, ensuring data confidentiality. The data of this study were collected during the curfew imposed by the state and the 17-day official lockdown period in Turkey.

Measures

Demographic Information Form: In addition to the scales used in the study, information on age, gender, educational status, relationship status, and with whom they lived during the pandemic process were obtained from the participants. In addition, it was asked whether people in the risk group live in their homes, and they were asked about the details of their children, whether they work or not, and the way they work during the pandemic period. The participants were asked whether they had a chronic disease, whether they had been diagnosed with COVID-19, and whether a relative had COVID-19. Participants' desire to be vaccinated against COVID-19 was questioned. In addition, the level of exposure to news about COVID-19, the use of masks, and the level of compliance with mask–social distance–hygiene rules were examined.

The Cognitive Failures Questionnaire: In the current study, The Cognitive Failures Questionnaire (CFQ) was applied to evaluate the cognitive status during the pandemic process. The scale was first developed by Broadbent et al.[14] The Turkish validity and reliability study of the scale was carried out by Ekici et al.[35] The aim of the CFQ is to measure self-reported failures in perception, memory, and motor function.[14] Cognitive Failures Questionnaire is a self-report questionnaire measuring failures of perception, memory, and motor function. It consists of 25 items and the subjects answer the items on a 5-order scale (ranging from "never" to "always"). The 5 response choices are: (0) never, (1) very rarely, (2) occasionally, (3) quite often, and (4) very often. An example question is "Do you fail to listen to people's names when you are meeting them?" Scores for the CFQ can range from 0 to 100. A high score indicates an increased tendency to cognitive failure. The findings of the studies indicate that the CFQ is a valid and reliable instrument.[14,36-38]

Coronavirus Disease 2019 Distress Scale: In the current study, the COVID-19 Distress Scale was used to measure the anxiety, perception of threat, and despair levels of the participants regarding COVID-19. The scale has a 3-factor structure and consists of 14 items.[39] Eigenvalues and scree plot graph explain 50.88% of the variance. The Cronbach's alpha coefficient of the total scale was found to be 0.87. The scores obtained from the scale were positively correlated with depression, anxiety, stress, OCD symptoms, obsessive beliefs, especially exaggerated threat perception, and health anxiety and negatively correlated with positive affect and resilience. These findings indicated that the component and divergent validity of the scale was at the desired level. The predictive validity of the COVID-19 Distress Scale was examined by hierarchical regression analyses; it was observed that the scores obtained from the scale significantly predicted the general anxiety level and health anxiety even when the effect of other mental health measures was controlled. Analyses evaluating internal consistency and test-retest reliability revealed that the scale had satisfactory reliability values.[39]

Statistical Analysis

Descriptive analyses were performed for all outcome measures, skewness and kurtosis values were examined for normality analysis. Correlations analyses were computed to explore the relationship between variables (See in https://osf.io/qdmhe/quickfiles). Regression analysis was performed between the total score of Cognitive Failures Questionnaire and demographic variables. In addition, the structural equation model was applied. There were both male (n= 314) and female (n= 494) participants in the present study. The ages of the participants ranged from 18 to 81. It was found that the mean age of the participants was 33.14 and the standard deviation was 11.74. Detailed information about the sample structure of the study and descriptive statistics can be found at https://osf.io/qdmhe/quickfiles.

RESULTS

Results of Regression Analysis: Regression analysis was applied to determine whether the demographic variables of the current study predicted self-reported cognitive failures. Regression analysis results are presented in Table 1.

It was found that cognitive failures were predicted by age (β=0.17, *P*=.01), gender (β=0.22, *P*=.01), educational status (β=0.07, *P*=.05), media exposure (β=-0.14, *P*=.01), having a chronic disease (β=0.07, *P* < .05), and compliance with hygiene rules (β=0.12, *P* < .05). The overall model fit was R^2=0.12.

Results of Structural Equation Modeling

Structural Equation Modeling: The SEM shown in Figure 1 was applied. It was seen that the model had good fit values. According to the SEM, this model consists of 1 latent variable COVID-19 distress (3 observed variables) and 4 dependent variables. On the basis of SEM analysis for this model, COVID-19 distress predicts perception (β=–0.85, *P*=.001), forgetting (β=–0.92, *P*=.001), attention (β=–0.73, *P*=.001), and motor functioning (β=–0.68, *P*=.001). It was seen that the model showed good fit values (χ^2 (17, n=808)=46.216, *P*=.00, χ^2/df=4.20, Root Mean Square Error of Approximation (RMSEA) = 0.063, Goodness of Fit Index (GFI)=0.99, Adjusted Goodness of Fit Index (AGFI)=0.96, Comparative Fit Index (CFI)=0.99, Normed Fit Index (NFI)=0.98).

Results of Independent Samples t-Test: To evaluate the gender differences, bootstrapping procedure with 2000 samples with replacement from the full sample to construct bias-corrected 95% CIs was conducted by Statistical Package for Social Sciences software Version 22. The results of the analysis are summarized in Table 2.

Table 1. Results of Regression Analysis

Model		*B*	SE *B*	*β*	*t*
1	Constant	54.70	5.48		9.99
	Age	0.21	0.05	0.17**	4.66
	Gender	6.55	1.04	0.22**	6.30
	Education status	0.97	0.47	0.07*	2.05
	Media exposure	–2.52	0.61	–0.14**	–4.10
	Having chronic disease	2.98	1.40	0.07*	2.13
	Compliance with hygiene rules	3.41	0.97	0.12**	3.53

F = 18.864, R^2=0.12, *P < .05, **P < .01.
SE, standard error.

Table 2. Results of Independent Samples *t*-Test

	Women		Men			
Variables	*M*	SD	*M*	SD	*t*(806)	*P*
CFQ total	83.57	14.55	90.05	13.94	–6.28	.00
Perception	26.92	5.28	28.66	4.95	–4.68	.00
Forgetting	26.90	5.15	29.22	5.01	–6.31	.00
Attention	11.63	3.21	12.58	3.18	–4.09	.00
Motor functioning	14.87	2.71	16.12	2.39	–6.65	.00
Anxiety	22.96	6.91	21.00	7.00	3.90	.00
Perception of threat	7.55	2.61	7.54	2.92	0.01	.99
Despair	9.46	3.44	8.04	3.56	5.67	.00

CFQ, Cognitive Failures Questionnaire; SD, standard deviation.

Cognitive Failures Questionnaire total of men (*M*=90.05, SD=13.94) was higher than that of women (*M*=83.57, SD=14.55), *t*(806)=–6.28, *P*=.00. Men (*M*=28.66, SD=4.95) showed higher scores than women (*M*=26.92, SD=5.28) in perception, *t*(806)=–4.68, *P*=.00. In forgetting subscale, men (*M*=29.22, SD=5.01) indicated higher scores than women (*M*=26.90, SD=5.15), *t*(806)=–6.31, *P*=.00. In attention, men (*M*=12.58, SD=3.18) exhibited higher scores than women (*M*=11.63, SD=3.21), *t*(806)=–4.09, *P*=.00. Lastly, in motor functioning, men (*M*=16.11, SD=2.39) showed higher scores than women (*M*=14.87, SD=2.71), *t*(806)=–6.65, *P*=.00. Overall, it has been found that men exhibit more cognitive failures than women during the pandemic period.

In the subscale of COVID-19 Distress Scale, anxiety, women (*M*=22.96, SD=6.91) had higher score than men (*M*=21.00, SD=7.00), *t*(806)=3.90, *P*=.00. Also in despair, women (*M*=9.46, SD=3.44) showed higher scores than men (*M*=8.04, SD=3.56), *t*(806)=5.67, *P*=.00. Overall, it has been found that women have higher levels of anxiety and despair during the pandemic process.

DISCUSSION

The current study suggested that individuals' subjective cognitive failures are influenced by the anxiety, despair, and perception of threat induced by the COVID-19 epidemic. Exposure to this unusual stressful circumstance, according to available information from throughout the world, increases the prevalence of mental health issues like sadness and anxiety. The findings of this study support the data that individuals' mental health deteriorated during the pandemic. The findings of the study allowed for the identification of many vulnerability variables linked to a higher risk of cognitive impairment and mental health disorders in people who had spent a long period living in pandemic conditions. In light of the results of the current study, our hypotheses were partially met.

Subjective Cognitive Functioning

In this study, the effect of distress (anxiety, despair, and perception of threat) caused by the COVID-19 pandemic on people's perceived cognitive functions was examined. Studies indicate that exposure to stressful situations such as a pandemic increases the prevalence of mental health disorders such as depression and anxiety. The results of this research show that people's COVID-19 distress affects cognitive status. In the study, it was determined that the participants had moderate levels of anxiety, despair, and perception of threat. Men exhibited worse scores than women in total cognitive failures, perception, attention, and motor functioning, whereas women showed higher levels of anxiety and despair.

Regression analysis was performed to determine the demographic variables that significantly predicted cognitive status during the pandemic process. Age, gender, education level, exposure to media, having a chronic disease, and following hygiene rules were found to significantly predict cognitive failures. The current study demonstrated positive relationship between cognitive failures and compliance with hygiene rules.Although cognitive errors did not play a unique role in the regression model, Thoma et al. (2021)[40] reported a negative relationship between cognitive errors and preventive behaviors.

Subjective cognitive failures and the relationship between resilience, coping style, depression, anger, and anxiety were investigated by Santangelo et al.[11] It is estimated that 30% of participants reported cognitive failures at least occasionally during quarantine /self-isolation, with some reporting very frequent cognitive failures. Furthermore, resilience was claimed to mediate the relationship between depressive and anger symptoms, as well as cognitive failures.[11]

The structural equation modeling analyses were conducted to identify related cognitive failures with COVID-19 distress. The model showed that the latent variables of COVID-19 distress were obtained from anxiety, despair, and perception of threat dimensions predicted by individuals' perception, forgetting, attention, and motor functioning.

When the independent samples *t*-test was conducted according to the genders, it was found that men were worse than women in total cognitive functioning, perception, attention, forgetting, and motor functioning. However, this finding differs from Fiorenzato et al[34] because this study suggested that being female was identified as a relevant risk factor for experiencing problems with cognitive status.

Coronavirus Disease 2019 Distress and Anxiety

According to independent sample *t*-test results, women have higher scores on anxiety and hopelessness subdimensions than men in COVID-19 Distress Scale. Fiorenzato et al[34] found that being female is a relevant risk factor in predicting anxiety disorders during lockdown. As our results highlight and confirmed by other European studies, in COVID-19 pandemic, women have been portrayed as more vulnerable to anxiety disorders than men.[4,7,34]

Overall, our study showed that perceived anxiety, despair, and perception of threat during the pandemic period had a detrimental effect on subjective cognitive functioning in the general population. Specifically, it was found that self-reported cognitive failures related to COVID-19 was predicted as meaning by age, gender, educational status, media exposure, having chronic disease, compliance with hygiene rules.

It is known that women and the elderly are adversely affected during the pandemic.[34,41] In their thematic analysis study, Ogueji et al[42] stated that the coping strategies of the participants during the COVID-19 period and being busy with work/working emerged as one of the positive coping.[42] It is thought that people with a high level of education may continue to work and have social life at some point and may protect themselves against the negative effects of the pandemic. Lower educational level, fewer people in the house, and more exits per week were associated with more cognitive failures. As a result, a higher educational level and a more active social lifestyle are proxies for cognitive reserve in relation to cognitively and socially stimulating lifestyles.[11] Also, people with high levels of cognitive reserve were more likely to develop self-perceived cognitive failures than those with low levels of cognitive reserve. Higher frequency of cognitive failures was linked to lower levels of resilience, as well as more severe depressive symptoms and anger.[43] Exposure to news about COVID-19 was associated with self-reported cognitive failures, as found in the study of Fiorenzato et al.[34] Another study of middle-aged and elderly participants examined cognition with COVID-19 anxiety, and it was found that women were more anxious than men and, in association with this, exhibited more memory errors and slower processing speed.[44] In contrast to our findings, COVID-19 state anxiety is associated with everyday cognition and processing speed in women but not in men. The need for sex-specific understanding of the pandemic's behavioral and cognitive effects in mid-to-late life is emphasized by consistency across subjective and objective measures.

It is suggested that the restriction of the lives of people with chronic diseases during the pandemic period is more than people without a chronic disease and is related to cognitive status. In the study of Pue et al.[41] 8% of the elderly participants reported a decrease in their cognitive functions compared to the pre-COVID-19 period. After researchers analyzed potential vulnerability and protective factors, they discovered that reported changes in well-being, activity level, sleep quality, and cognitive functioning were notably associated with depression.[41] The results of this study suggest that older people become more vulnerable to depression as their social networks and contacts decrease during COVID-19. High levels of compliance with hygiene rules were found to be associated with self-reported cognitive failures. This situation made the authors think that it may be harmful to comply with the rules of hygiene excessively and that, at some point, it may cause the person to enter the obsession and compulsion cycle as in obsessive compulsive disorder. It is suggested that adequate hygiene practices can be protective against COVID-19 and are important in protecting people's cognitive and psychological health.

Incidentally, in their international study (N = 49,968 in 67 countries), Van Bavel et al[45] investigated self-reported factors and public policy interventions associated with behaviors such as spatial distance and stricter hygiene in the early phase of the COVID-19 pandemic (April-May 2020). Participants who reported stronger identification with their nation consistently reported greater involvement in public health behaviors and support for public health policies. The participants' stronger identification with their nation is assumed to be a possible confounding variable in the current study.

This is the first known study to show that COVID-19-induced anxiety, despair, and perception of threat together can have a serious impact on subjective cognitive failures in this unique context. Given that restrictions may be re-imposed during the COVID-19 pandemic in this context, knowing the associated cognitive and psychological impacts is crucial to provide effective and supportive psychological interventions and social support particularly to vulnerable populations. In this sense, the current study adds to the body of knowledge. In addition, considering the cognitive problems associated with anxiety, despair, and perception of threat, it is thought that the neurological and psychological conditions of these people should be examined in more detail. It is also necessary for the ministry of health and governments to plan the necessary interventions.

In conclusion, we believe that more study is needed to determine the long-term effects of an epidemic on subjective cognition and mental health conditions, as well as to provide guidelines for COVID-19 media consumption to reduce the psychological burden.

Ethics Committee Approval: Ethical committee approval was received from the Bolu Abant Izzet Baysal University Humanities & Social Sciences Research Ethics Committee, (Date: March 29, 2021, Approval No: 2021/124).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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