



The traumatic impact of the COVID-19 pandemic: the possible role of rumination and uncertainty

Gülay Taşdemir Yiğitoğlu¹ · Gülseren Keskin² · Nesrin Çunkuş Köktaş¹

Accepted: 3 February 2023

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2023

Abstract

The COVID-19 pandemic has caused some traumatic injuries to individuals due to the isolation, loneliness, and uncertainty it has created. Ruminative thoughts and uncertain situations are known to affect trauma. It aimed to evaluate the traumatic effect of the pandemic based on the ruminative thoughts and intolerance of uncertainty in the study. The sample for the descriptive and cross-sectional study consisted of 402 participants. Data were collected by using the questionnaire form, the Post Traumatic Stress Disorder Scale (PTSD), the Ruminative Reactions Scale (RRS), and the Intolerance of Uncertainty Scale (IUS). A positive correlation was discovered between the PTSD mean scores of the study participants and their RRS and IUS scores ($p < .05$). Furthermore, RRS ($\beta = 0.280$) was identified as a variable that primarily affected PTSD ($p < .05$). It was concluded that both ruminative thoughts and intolerance of uncertainty were predictors of post-traumatic stress disorder in the COVID-19 pandemic. Considering the possible effects of the pandemic, it is recommended to reduce the intolerance to uncertainty, to rework the ruminative thought content with appropriate and effective methods, and to create some programs for gaining problem-solving skills.

Keywords COVID-19 · Pandemic · Post-traumatic stress disorder · Rumination · Uncertainty

Introduction

There have been great breakdowns that have affected societies at different times in history. Some crises and epidemics can be thought of as examples of these major breakdowns and transformation points in history (Karakas, 2020). Today, the COVID-19 pandemic, which has an impact in Turkey and all over the world, is a breaking situation that causes serious threats to people's physical, and mental health and lives (Hatun et al., 2020). The isolation, loneliness, and

uncertainty processes that have occurred during the pandemic have caused some traumatic injuries in individuals. Traumatic injuries cause both losses of function and deterioration of mental health (Kwok et al., 2020; Wallace et al., 2020). New experiences and changes in priorities during the COVID-19 pandemic have led to a reconsideration of daily life problems and a focused trauma cognitive evaluation of life (Wallace et al., 2020). The most important impact of post-traumatic vulnerability associated with Post-Traumatic Stress Disorder (PTSD) is rumination, which consists of over-generalized, distorted thoughts and beliefs about the consequences of a traumatic experience (Preston et al., 2021). Taking into consideration the cognitive model of PTSD, it has been reported that rumination is an avoidant coping strategy that has been used to reduce post-traumatic stress (Lee et al., 2021; Skalski et al., 2021), and it has been claimed that rumination often causes to worsening of trauma symptoms (Schumm et al., 2022).

Another psychological vulnerability factor that is considered a potential factor for mental trauma is intolerance of uncertainty. Since daily life includes many uncertain or ambiguous situations, it can be thought that perceiving uncertain situations as threatening causes negative emotions

✉ Gülay Taşdemir Yiğitoğlu
gyigitoglu@pau.edu.tr

Gülseren Keskin
gulseren.keskin@ege.edu.tr

Nesrin Çunkuş Köktaş
ncunkus@pau.edu.tr

¹ Department of Nursing, Faculty of Health Sciences, Pamukkale University, Floor 3, Block C, Kınıklı Campus, 20160 Denizli, Turkey

² Atatürk Vocational School of Health Services, Ege University, İzmir, Turkey

in the person; and she/he often experiences anxiety. There can be uncertainty about preventing the spread of the pandemic, which has caused many deaths; the treatment has not yet been determined about returning to the old life. It is claimed that this uncertainty can increase the anxiety of individuals, create mental distress, and exhibiting maladaptive behaviors (such as alcohol use), and develop intolerance of uncertainty (Bao et al., 2020; Chung & Yeung, 2020; Ogueji et al., 2021, 2022). During COVID-19, it has been determined that when people are faced with psychological distress or uncertainties, they are at risk for maladaptive coping strategies such as alcohol consumption (Ogueji et al., 2021, 2022).

Uncertainty intolerance is defined as an attempt to control cognitive, emotional, and behavioral responses to uncertain situations and the future. Uncertainty can trigger the loss of control by preventing daily routines and interactions, and it can create a traumatic effect on individuals (Bao et al., 2020; Chung & Yeung, 2020; Horesh & Brown, 2020). Individuals who have a high intolerance for uncertainty perceive the possibility of a negative event as unacceptable and threatening. As a result of this, they exhibit avoidance behaviors in response to increased anxiety symptoms over time (Oglesby et al., 2017). A bad experience such as COVID-19 can have negative physical, emotional, and social effects on a person's life. It is thought that PTSD can be affected by ruminative thoughts and intolerance of uncertainty (Hyland et al., 2014).

It is stated in the literature that preliminary evidence suggests that intolerance of uncertainty and ruminative thoughts play an important role in the development of PTSD separately. On the other hand, it is estimated that there are some gaps in the literature. As far as we know, no study has evaluated the effects of intolerance of uncertainty and ruminative thoughts on the development of mental trauma for individuals who are exposed to trauma due to COVID-19. Based on this, it is thought that this study can be important in terms of predicting the measures that can be taken for the mental health of society, preventing the mental problems that can occur in the future, and strengthening individuals spiritually.

Taking all this into account, the study has several purposes. First, the study has been conducted to evaluate individuals' PTSD, ruminative reactions, and intolerance of uncertainty; second, it is aimed to determine post-traumatic stress disorder, ruminative reactions, and intolerance of uncertainty in terms of the sociodemographic characteristics and third, the study has been carried out to evaluate the effect of ruminative thoughts and intolerance of uncertainty on post-traumatic stress disorder.

Methods

Study design and data collection

The research is a descriptive and cross-sectional study. While the descriptive aspect of the study included measures of PTSD, ruminative reactions and intolerance to uncertainty, and various demographic characteristics; it also evaluates traumatic individuals in the COVID-19 pandemic process with its cross-sectional aspect.

The information was gathered between February- March 2022. The study sample consisted of individuals who participated in an online questionnaire via Google Forms. Participants completed the survey via Google Forms, which is a safe online survey platform. It took approximately ten minutes to complete the questionnaires. It was informed that the information would be kept confidential and that the data would only be used in scientific research.

Sample and setting

The research population consisted of individuals aged 18 and over who volunteered to participate in the research. To select samples, the random sampling technique was used. The sample size was calculated using the proportion of people with post-traumatic stress disorder from previous research (Alshehri et al., 2020) and an alpha significance level of 0.05; to achieve 95% statistical power, approximately 246 people would have to be recruited. Of the 450 adults who participated in the study, 15 failed to complete the rating scales, and ten of them were still being treated for serious chronic mental disorders. The study included 402 participants who met the inclusion criteria. There were some inclusion criteria such as being at least 18 years old, being able to read and write in Turkish, and volunteering to participate in the study. On the other hand, there were some exclusion criteria, such as the presence of visual or hearing problems that prevented the filling of the scales, and the presence of a serious chronic mental disorder.

Data collection

Measures

Some instruments such as the Introductory information, Post Traumatic Stress Disorder Scale-Short Form, Ruminative Reactions Scale, and Intolerance of Uncertainty Scale were used to collect the research data.

Introductory information form

The Introductory Information Form consisted of twenty-eight questions and these questions were created in terms of sociodemographic characteristics of individuals, their feelings, and thoughts about the pandemic process.

Post-traumatic stress disorder scale-short form (PTSD)

The scale was developed by LeBeau et al. (2014) Turkish validity and reliability of the scale were conducted by Evren et al. (2016). The scale was one-dimensional and consisted of nine items. The questions were arranged as “How much bothered you by each of the following problems that arose or worsened after an extremely stressful event/experience?”. The scale was scored based on a five-point Likert style (0 = None, 4 = Extremely). The scale was developed to diagnose individuals who may have PTSD in the community, as well as individuals who are likely to meet the criteria for a diagnosis of PTSD in clinical settings. A score between 0 and 36 was taken from the scale. When a high score on the scale was taken it indicated a high level of trauma. The Cronbach’s alpha value of the scale was 0.91 (Evren et al., 2016), and 0.92 in this study.

Ruminative reactions scale (RRS)

RRS, which was developed by Nolen-Hoeksema and Morrow (1991), consisted of 22 questions. The Turkish adaptation of the scale was conducted by Neziroglu (2010). It was a four-point Likert-style scale that evaluated people’s ruminative thinking tendencies toward negative events (1 = never, 4 = always). It includes questions such as “What did I do to deserve this? I think”; “I sit in a corner and think about why I feel this way”. RRS included two sub-dimensions: reflective pondering and brooding. While brooding consisted of 5, 10, 13, 15, and 16 items, reflective pondering consisted of 7, 11, 12, 20, and 21 items. A high score on the scale indicated that people had used ruminative thoughts more as a coping response. The Cronbach alpha internal consistency coefficient of the scale was 0.89 (Neziroglu, 2010), and this rate was 0.95 in this study.

Intolerance of uncertainty Scale- (IUS)

It was developed to measure both the emotional and behavioral reactions of individuals in the case of uncertainty. The first form of the scale was edited by Freeston et al. (1994). It was converted into Turkish by Sarı and Dag (2009). The scale, which consisted of 26 items, was scored by using a five-point Likert type (1 = not describe me at all, 5 = describes me fully). Scale, ‘Uncertainty keeps me from living life to

the fullest.’ contains questions. When high scores were taken in IUS, it indicated that people had a high intolerance for uncertainty. IUS was divided into two sub-dimensions: prospective anxiety and inhibitory anxiety. The minimum score that could be taken on the scale was determined to be 25, and the maximum score was 135. Furthermore, a high score meant a high intolerance for uncertainty. The internal consistency of the Turkish version of the IUS was found to be 0.93 (Sarı & Dag, 2009). In this study, Cronbach’s alpha was 0.95.

Data analysis

The data were analyzed using the Statistical Package for the Social Sciences 24.0 package program. Continuous variables were labeled as mean standard deviation, whereas categorical variables were labeled as numbers and percentages. When parametric test assumptions were met, a t-test and one-way analysis of variance was conducted in independent groups to compare independent group differences. The conformity of the data to the normal distribution was examined using the Shapiro-Wilk test. When parametric test assumptions were not met, the Mann-Whitney U test and Kruskal-Wallis Analysis of Variance were applied to compare independent group differences. Both Spearman Correlation analysis and Hierarchical Regression were conducted to determine the relationships between continuous variables. In all analyses, $p < .05$ was considered statistically significant.

Results

Socio-demographic findings and mean scores of scales

The mean age of the participants in the study was 25.92 ± 9.30 (min = 17, max = 18). It was detected that 72.4% of the individuals were women and 79.6% were single; 43.5% of them were high school graduates. It was detected that 64.2% of the participants did not work, 54.0% had a medium income, and the majority (94.5%) lived with their families. It was determined that 79.4% of the participants were not infected with COVID-19 (Table 1).

The mean score of the participants was given in Table 2. While examining Table 2, the mean PTSD scores of the participants were found to be 11.41 ± 4.17 , the mean RRS scores were 46.91 ± 15.74 , and the mean IUS scores were 83.62 ± 24.30 .

Table 1 Sociodemographic Characteristics of the Participants ($n=402$)

Demographic characteristics	<i>n</i>	%
Gender		
Women	291	72.4
Men	111	27.6
Marital status		
Single	320	79.6
Married	82	20.4
Educational status		
High school	175	43.5
Associate degree	97	24.1
Bachelor and above	130	29.6
Working status		
No	258	64.2
Yes	144	35.8
Income status		
Income less than expenses	145	36.1
Income equals expense	217	54.0
Income is more than an expense	40	9.9
Cohabitation status		
Alone	15	3.7
With family	380	94.5
With friends	7	1.7
Passing COVID-19		
No	319	(79.4)
Yes	83	(20.6)
	min-max	Mean \pm Sd
Age	18–62	25.92 \pm 9.30

Sd: Standard deviation.

Table 2 The Scales Score Averages of the Participants ($n=402$)

Scales	Min-max	Mean \pm Sd
Post-Traumatic Stress Disorder Scale	0–36	11.41 \pm 4.17
Ruminative Reactions Scale	22–87	46.91 \pm 15.74
Intolerance of Uncertainty Scale	26–130	83.62 \pm 24.30

Sd: Standard deviation

Comparison of the mean scores of scales according to socio-demographic characteristics

Considering the gender and marital status of the participants in the study, statistical significance was found in the mean scores of PTSD, RRS, and IUS ($p < .05$). Moreover, the mean PTSD, RRS, and IUS scores of women and singles were found to be high (Table 3).

According to the employment status of the participants, it was stated that there was a statistically significant difference in the mean scores of PTSD ($p < .05$), RRS ($p < .05$), and IUS ($p < .05$); and the mean scores of PTSD, RRS, and IUS were found as high for participants who did not work (Table 3).

According to the income status of the participants, it was reported that there was statistical significance in the mean scores of PTSD ($p < .05$) and RRS ($p < .05$). Furthermore, the

mean scores of PTSD and RRS were high for participants whose income was lower than their expenses (Table 3).

There was a weak negative correlation between the age of the participants and the mean scores of PTSD ($p < .000$, $r = -.195$), RRS ($p < .000$, $r = -.237$), and IUS ($p < .002$, $r = -.151$). In the study, it was stated that the mean score decreased since the age increased (Table 3).

Comparison of the mean scores of scales according to pandemic features

In Table 4, the mean scores of PTSD, RRS, and IUS were examined considering the characteristics of the participants during the pandemic. There were some statistically significant differences in the mean scores of PTSD, RRS, and IUS, in terms of the status of participants who had COVID-19, and some problems in social relations, sleeping, and changes in nutrition ($p < .05$). Moreover, a statistically significant difference was found in the PTSD, RRS and IUS scores of the participants in the study, taking into consideration the loneliness in the pandemic, feeling restricted in their freedom, fear of not seeing their relatives again, and fear of losing their relatives ($p < .05$).

Accordingly, participants who had the problems, which had been mentioned above, had higher PTSD, RRS, and IUS scores.

Correlation between the PTSD, RRS, and IUS scores of the study groups

When the relationship between participants' PTSD, RRS, and IUS mean scores was evaluated, a positive correlation was determined between the mean scores of PTSD and the mean scores of RRS and IUS ($p < .05$). When the PTSD mean scores increased, the RRS and IUS mean scores increased, too. In addition to this, a statistically positive correlation was determined between the mean score of IUS and the mean score of RRS ($p < .05$) (Table 5).

Hierarchical regression analysis of PTSD mean scores with RRS, IUS

A hierarchical multiple regression analysis was conducted to examine which variables (IUS, RRS scores) predicted trauma symptoms as measured by the PTSD scale. PTSD was entered as a dependent variable in the regression analysis. In Step 1, RRS was entered. This model significantly predicted trauma symptoms contributing 51% of the variance, $F=425$ $p=.001$, $R^2=0.514$, $Beta=0.718$. When IUS was added to the model as a second (Model 2), controlling for the ruminative reaction variable, it was seen that it made a significant contribution of 1% to the variance explained

Table 3 The Mean Scores of PTSD, RRS, and IUS According to the Sociodemographic Characteristics of the Individuals ($n=402$)

Demographic characteristics	n (%)	PTSD		RRS		IUS	
		Mean \pm Sd	p	Mean \pm Sd	p	Mean \pm Sd	p
Gender							
Women	291 (72.4)	12.25 \pm 9.40	0.002*	48.22 \pm 15.43	0.007*	85.26 \pm 24.29	0.028*
Men	111 (26.7)	9.22 \pm 8.18		43.50 \pm 16.08		79.30 \pm 23.88	
Marital status							
Single	320 (79.6)	12.37 \pm 9.31	<0.000*	49.27 \pm 15.78	<0.000*	85.68 \pm 23.92	<0.000*
Married	82 (20.4)	7.68 \pm 1.59		37.72 \pm 11.71		75.56 \pm 24.21	
Educational status							
High school	175 (43.5)	12.18 \pm 9.67		41.46 \pm 3.65		85.07 \pm 23.85	
Associate degree	97 (24.1)	12.27 \pm 8.75	0.092	40.45 \pm 3.29	0.079	82.78 \pm 24.27	0.601
Bachelor and above	130 (32.4)	10.09 \pm 5.71		39.50 \pm 3.50		81.72 \pm 25.31	
Working status							
No	258 (64.2)	12.20 \pm 9.10	0.021*	48.96 \pm 15.70	<0.000*	85.18 \pm 23.50	0.084
Yes	144 (35.8)	10.01 \pm 9.15		43.24 \pm 15.18		80.81 \pm 25.51	
Income status							
Income less than expenses	145 (36.1)	13.51 \pm 9.60	<0.000*	40.96 \pm 3.63	0.001*	86.57 \pm 24.86	0.167
Income equals expense	217 (54.0)	10.67 \pm 8.65		39.81 \pm 3.39		82.27 \pm 23.74	
Income more than the expense	40 (9.9)	9.85 \pm 5.22		39.10 \pm 3.20		80.23 \pm 24.74	
Cohabitation status							
Alone	15 (3.7)	13.27 \pm 9.09		40.10 \pm 3.50		86.57 \pm 24.86	0.798
With family	380 (94.5)	11.27 \pm 9.17	0.359	38.95 \pm 5.01	0.176	82.27 \pm 23.74	
With friends	7 (1.7)	15.43 \pm 6.55		39.34 \pm 4.95		80.23 \pm 24.74	
		Mean \pm Sd	r values		r values		r values
Age	25.86 \pm 9.37		-0.195		-0.237		-0.151
			<0.000*		<0.000*		0.002*

Sd: Standard deviation; PTSD: Post-Traumatic Stress Disorder Scale; RRS: Ruminative Reactions Scale; IUS: Intolerance of Uncertainty Scale

* $p < .05$

earlier ($p < .01$) $F = 220.80$, $p < .001$, $R^2 = 0.523$, $Beta = 0.659$ (Table 6).

Discussion

This study was conducted to evaluate the traumatic effect of the pandemic in terms of ruminative thoughts and intolerance of uncertainty. The COVID-19 pandemic, which has affected the whole world and Turkey, has caused some significant changes in many social and individual areas. Together with its negative impact on physical health, the ongoing uncertainty and the changes that were made to protect against the disease affected the mental health of individuals in Turkey as well as around the world. Because the COVID-19 process was a global epidemic, it had rapid transmission, and many people lost their lives associated with COVID-19, and contagion was rapid; it could have traumatic effects (Chung & Yeung, 2020; Horesh & Brown, 2020). Implementations such as quarantine and social distancing may cause people to feel alone, left out, and abandoned (Hoffart et al., 2020), and to develop post-traumatic stress symptoms (Ikizer et al., 2021; Rossi et al., 2021). The conditions of the COVID-19 pandemic have led to a deep

sense of uncertainty regarding people's safety, view of the world, and financial situation, which may be difficult to bear for some individuals in Turkey as well as in the world (Ikizer et al., 2021; Satıcı et al., 2020). Given the uncertainty, it was thought that it might be important to reveal the presence of negative ruminative thoughts about changes as well as their tolerance for uncertainty. This was the first study to assess the importance of rumination and intolerance of uncertainty in the relationship with trauma.

In our study, a relationship was found between PTSD, ruminative thinking, and intolerance of uncertainty. It was clear that the traumatic effect of the pandemic on individuals was associated with more ruminative thoughts and less intolerance of uncertainty, and the traumatic effect increased when ruminative thoughts and intolerance of uncertainty increased. Studies indicated that ruminative thinking and intolerance of uncertainty could be accepted as predictive variables for PTSD (Bravo et al., 2019; Brown et al., 2018; Garcia et al., 2017; Mairean, 2019; Oglesby et al., 2016; Satıcı et al., 2020; Wozniak et al., 2020). In a study conducted in Turkey during the COVID-19 pandemic, it was stated that both ruminative thinking and intolerance of uncertainty increased the PTSD score (Celik et al., 2021). Our research findings support the literature. Individuals

Table 4 The Mean Scores of PTSD, RRS, and IUS According to the Characteristics of the Individuals Regarding the Pandemic ($n = 402$)

Demographic characteristics	n (%)	PTSD		RRS		IUS	
		Mean \pm Sd	p	Mean \pm Sd	p	Mean \pm Sd	p
Passing COVID-19							
No	319 (79.4)	11.03 \pm 9.08	0.002*	46.23 \pm 15.68	<0.000*	83.26 \pm 24.49	<0.000*
Yes	83 (20.6)	12.88 \pm 9.42		49.55 \pm 15.78		84.99 \pm 23.62	
Some problems in social relations							
No	162 (40.3)	9.99 \pm 5.26	0.011*	43.02 \pm 15.42	<0.000*	79.12 \pm 26.32	0.002*
Yes	240 (59.7)	12.37 \pm 5.75		49.54 \pm 15.43		86.65 \pm 22.38	
Changes in sleeping							
No	90 (22.4)	7.60 \pm 5.64	<0.000*	39.21 \pm 13.44	<0.000*	71.91 \pm 24.24	<0.000*
Yes	312 (77.6)	12.51 \pm 9.26		49.13 \pm 15.67		86.99 \pm 23.28	
Change in nutrition							
No	101 (25.1)	7.86 \pm 5.65	<0.000*	40.29 \pm 13.34	<0.000*	73.08 \pm 24.93	<0.000*
Yes	301 (74.9)	12.60 \pm 7.79		49.14 \pm 15.87		87.15 \pm 23.07	
Feeling alone in the pandemic							
No	234 (58.2)	9.92 \pm 5.68	<0.000*	45.10 \pm 16.64	0.005*	79.82 \pm 24.65	<0.000*
Yes	168 (41.8)	13.49 \pm 9.05		49.44 \pm 14.04		88.90 \pm 22.98	
Feeling restricted in freedom							
No	63 (15.7)	8.19 \pm 5.09	0.002*	41.02 \pm 13.37	0.001*	71.25 \pm 23.72	<0.000*
Yes	339 (84.3)	12.01 \pm 8.79		48.01 \pm 15.91		85.91 \pm 23.74	
Fear of not seeing their relatives again							
No	227 (56.5)	9.53 \pm 5.58	<0.000*	43.02 \pm 14.48	<0.000*	77.61 \pm 24.43	<0.000*
Yes	175 (43.5)	13.86 \pm 7.23		51.96 \pm 15.91		91.41 \pm 21.85	
Fear of losing their relatives							
No	73 (18.2)	9.84 \pm 6.26	0.004*	43.60 \pm 16.47	0.006*	79.81 \pm 24.63	0.009*
Yes	329 (81.8)	11.76 \pm 8.12		47.65 \pm 15.50		84.46 \pm 24.18	

Sd: Standard deviation; PTSD: Post-Traumatic Stress Disorder Scale; RRS: Ruminative Reactions Scale; IUS: Intolerance of Uncertainty Scale

* $p < .05$

Table 5 Correlation Analysis Results of the Participants ($n=402$)

Scales	PTSD		RRS		IUS	
	<i>R</i>	<i>P</i>	<i>R</i>	<i>P</i>	<i>R</i>	<i>p</i>
PTSD	1.00	-	-	-	-	-
RRS	0.718	<0.000*	1.00	-	-	-
IUS	0.474	<0.000*	0.534	<0.000*	1.00	-

PTSD: Post-Traumatic Stress Disorder Scale; RRS: Ruminative Reactions Scale; IUS: Intolerance of Uncertainty Scale

* $p < .05$

Table 6 Hierarchical Regression Analysis of the Role of Rumination and Uncertainty Properties in the Trauma Procedure ($n=402$)

Model	<i>R</i>	<i>R</i> ²	ΔR^2	β	<i>Beta</i>	<i>F</i>	<i>p</i>
Model 1 RSS	0.718	0.514	0.515	0.418	0.718	425.497	0.000
Model 2 RSS IUS	0.725	0.523	0.010	0.384	0.659	220.800	0.004
				0.095	0.115		

RRS: Ruminative Reactions Scale; IUS: Intolerance of Uncertainty Scale

* $p < .05$

who do not tolerate uncertainty may be focused on negative feelings about being affected by threats and conditions related to the pandemic, as they include various uncertainties. Based on the continuation of the pandemic process, it can be said that ruminative thoughts increase perceived stress and cause PTSD.

It was observed that the PTSD mean scores of the participants in this study were lower than other studies' scores. In a study that had been conducted abroad during the pandemic period, PTSD scores were found to be 19.87 ± 15.88 (Forte et al., 2020), while they were reported as 14.84 ± 12.34 in Turkey (Yilmaz-Karaman & Yastibas, 2021). Another study that was conducted in China stated that the prevalence of PTSD was quite high (Liang et al., 2020). The reason why this research finding is different from other research findings may be the collection of research data after the pandemic, the development of the vaccine, and the use of different measurement tools and research groups.

In our study, it was determined that participants had high intolerance of uncertainty scores. Some research findings supported the results of this study (Aydin & Ozcan, 2021; Gica et al., 2020; Rettie & Daniels, 2021; Ogueji et al., 2021, 2022). During the pandemic period, it is important to tolerate or accept uncertainty. People who are unable or unwilling to accept uncertainty are more likely to experience mental distress. Those with a high intolerance to uncertainty tend to be anxious because they feel they have limited control over a threatening situation such as a pandemic (Taylor, 2019; Ogueji et al., 2021, 2022).

In this study, it was determined that the ruminative response scores of the participants were higher than the moderate level. It was clear that the results of some literature studies were like the findings of this study (Aydin & Ozcan, 2021; Duttweiler et al., 2021). Together with modernization,

people spend their lives thinking. People, who do not cope with stressful life events, experience feelings of inadequacy. These feelings cause the individual to create negative ruminative thinking (Nolen-Hoeksema & Jackson, 2001). When the study is applied, it can be said that it is an expected result that ruminative thinking is high in individuals during the pandemic period, which is one of the stressful life events, even though it is in the later period of the pandemic.

As the average age of the participants increased, the levels of ruminative thinking and PTSD were lower. In a study, it was reported that younger participants used negative cognitive emotion regulation strategies (rumination) more than older participants (Ricarte et al., 2016). Rumination, which is defined as an uncontrollable and repetitive focus on negative thoughts, was stated as an important factor that supported depression. Some studies had also shown that young adults were more stressed and depressed than other age groups during the pandemic process (Jha et al., 2021). That is why rumination contributed to the development of depression by re-experiencing traumatic memories. Young adults were clinically at risk for trauma during the pandemic (Tong et al., 2021). This situation may have resulted from the development of individuals' perspectives on events during their developmental periods, from a realistic point of view rather than repetitive thoughts. Moreover, it is thought that the trauma effect of some negative events may be greater in young individuals because young individuals have high expectations from life and have fewer life experiences.

In this study, it was observed that female and single participants had higher levels of PTSD, ruminative thinking, and intolerance to uncertainty. According to another study, it was determined that female participants had higher ruminative thinking and trauma levels (Brown et al., 2018). In other studies, women were found to have high levels of

ruminative thinking (Allbaugh et al., 2016) and post-traumatic stress (Hetzel-Riggin & Roby, 2013). As seen in the literature, it was determined that women were more prone to rumination than men (Allbaugh et al., 2016; Brown et al., 2018). Rumination is an important emotion regulation strategy that perceived negative impact. The increase in estradiol, which is one of the estrogen hormones, is associated with more rumination, and it has been supported that gender differences in peripheral estradiol cause women to have more ruminative thoughts than men (Graham et al., 2018). This finding suggests that it explains why there is a higher incidence of traumatic and ruminative thoughts, intolerance of uncertainty, anxiety, and depression among women.

On the other hand, it was claimed that people who evaluated their income as low had high PTSD and ruminative thinking scores. Low-income adults are more likely to experience trauma, or even more than one, which increases the risk of mental health problems. According to a study, it was clear that those people had negative life events that caused some mental problems, especially in psychosocial functions (Fusco et al., 2021). A study by Ogueji et al. (2022) supports our research findings. In their studies, it was emphasized that low-resistance coping mechanisms were used more in the low-income group during the COVID-19 pandemic, and this would negatively affect them psychologically. It is estimated that traumatic events can be more common in people who have low income, and traumatic events cause increased ruminative thinking.

In line with the COVID-19 pandemic, some radical changes, such as changes in daily activities and priorities, had occurred (Wallace et al., 2020). These changes cause people to follow social platforms constantly, they are exposed to stimuli on this subject, and that causes them to have ruminative thoughts, and in addition to this, intolerance of uncertainty, PTSD, depression, and sleep disorders increase (Gao et al., 2020). Considering the literature, it was reported that PTSD, ruminative reaction, and intolerance of uncertainty had been affected by some issues such as fear of losing a beloved one, not being able to see friends, having COVID-19 disease during the pandemic process, washing hands more, having problems in social relations, sleep, and nutrition changes, feeling alone in the pandemic, and feeling restricted in freedom.

Limitations

The study had several limitations. One of them was a cross-sectional study design which suggests that causation cannot be made. The other is the use of a random sampling technique; selection involving only voluntary participants may have caused bias. Moreover, there could be some access problems with the study because it was conducted

electronically. Finally, the results were valid only for the study participants and could not be generalized.

Conclusion

It was concluded that the PTSD levels of participants were low and that the level of ruminative reactions and intolerance of uncertainty was higher. Ruminative thoughts and intolerance of uncertainty were found to influence PTSD, with ruminative responses being the most effective variable over PTSD. Based on the socio-demographic and pandemic-related characteristics of the participants, it was determined that PTSD affected both ruminative reactions and intolerance of uncertainty levels.

This is the first study to evaluate the effects of intolerance of uncertainty and ruminative thoughts on the development of mental trauma in individuals exposed to trauma due to the pandemic. With this study, it was concluded that mental health professionals (such as clinical psychologists, psychiatric nurses, and social workers) working with individuals exposed to trauma should evaluate individuals in terms of their intolerance of uncertainty and ruminative thoughts. Considering the possible effects of the pandemic, mental health professionals can apply interventions such as coping with stress and problem-solving skills to reduce intolerance to uncertainty and improve ruminative thought content with appropriate and effective methods. Moreover, it is thought that it will be the basis for similar studies to be conducted with different sample groups.

Acknowledgements The authors thank all individuals who participated in the research.

Author contribution **Gülay Taşdemir Yiğitoğlu**: Study conception and design, data analysis and interpretation, drafting of the article, critical revision of the article. **Gülseren Keskin**: Study conception and design, drafting of the article, critical revision of the article. **Nesrin Çunkuş Köktaş**: Study conception and design, data collection, data analysis and interpretation, drafting of the article, critical revision of the article.

Funding The authors received no financial support for this article's research, authorship, and/or publication.

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

Declarations

Conflict of interest The authors declare that there is no conflict of interest.

Financial disclosure There are no individuals or organizations that support this study financially.

Ethical considerations The study was carried out by the principles of the Declaration of Helsinki. Ethical approval was obtained from the University's Non-Interventional Research Ethics Committee. Permission was obtained to use the scales in the study. Before data collection, informed consent was obtained from all participants. To ensure understanding, the following statements were added before submission: "Submitting the information form indicated consent to participate" and "Proceed to the survey."

References

- Allbaugh, L. J., Wright, M. O. D., & Folger, S. F. (2016). The role of repetitive thought in determining posttraumatic growth and distress following interpersonal trauma. *Anxiety Stress & Coping, 29*(1), 21–37. <https://doi.org/10.1080/10615806.2015.1015422>
- Alshehri, F. S., Alatawi, Y., Alghamdi, B. S., Alhifany, A. A., & Alharbi, A. (2020). Prevalence of post-traumatic stress disorder during the COVID-19 pandemic in Saudi Arabia. *Saudi Pharmaceutical Journal, 28*(12), 1666–1673. <https://doi.org/10.1016/j.jps.2020.10.013>
- Aydin, A., & Ozcan, B. E. (2021). Levels of intolerance of uncertainty, rumination, and resilience among healthcare workers during the COVID-19 pandemic. *Cukurova Medical Journal, 46*(3), 1191–1200. <https://doi.org/10.17826/cumj.925771>
- Bao, Y., Sun, Y., Meng, S., Shi, J., & Lu, L. (2020). 2019-nCoV epidemic: address mental health care to empower society. *The Lancet, 395*(10224), e37–e38. [https://doi.org/10.1016/S0140-6736\(20\)30309-3](https://doi.org/10.1016/S0140-6736(20)30309-3)
- Bravo, A. J., Kelley, M. L., Mason, R., Ehlke, S. J., Vinci, C., & Redman, J. C. (2019). Rumination as a mediator of the associations between moral injury and mental health problems in combat-wounded veterans. *Traumatology, 26*(1), 52–60. <https://doi.org/10.1037/trm0000198>
- Brown, W. J., Hetzel-Riggin, M. D., Mitchell, M. A., & Bruce, S. E. (2018). Rumination mediates the relationship between negative affect and posttraumatic stress disorder symptoms in female interpersonal trauma survivors. *Journal of Interpersonal Violence, 36*(13–14), 6418–6439. <https://doi.org/10.1177/0886260518818434>
- Celik, D., Alpay, E. H., Celebi, B., & Turkeli, A. (2021). Intolerance of uncertainty, rumination, post-traumatic stress symptoms and aggression during COVID-19: a serial mediation model. *European Journal of Psychotraumatology, 12*(1), 1953790. <https://doi.org/10.1080/20008198.2021.1953790>
- Chung, J. P., & Yeung, W. S. (2020). Staff mental health self-assessment during the COVID-19 outbreak. *East Asian Archives of Psychiatry, 30*(1), 34. <https://doi.org/10.12809/eaap2014>
- Duttweiler, H. R., Sheena, M. K., Burkhouse, K. L., & Feurer, C. (2021). The effects of rumination on internalizing symptoms in the context of the COVID-19 pandemic among mothers and their offspring: a brief report. *Cognition and Emotion, 36*(1), 1–8. <https://doi.org/10.1080/02699931.2022.2027702>
- Evren, C., Dalbudak, E., Aydemir, O., Koroglu, E., Evren, B., Ozen, S., & Coskun, K. S. (2016). Psychometric properties of the turkish PTSD-Short scale in a sample of undergraduate students. *Bulletin of Clinical Psychopharmacology, 26*(3), 294–302. <https://doi.org/10.5455/bcp.20151205113132>
- Forte, G., Favieri, F., Tambelli, R., & Casagrande, M. (2020). COVID-19 pandemic in the italian population: validation of a post-traumatic stress disorder questionnaire and prevalence of PTSD symptomatology. *International Journal of Environmental Research and Public Health, 17*(11), 4151. <https://doi.org/10.3390/ijerph17114151>
- Freeston, M. H., Rhéaume, J., Letarte, H., Dugas, M. J., & Ladouceur, R. (1994). Why do people worry? *Personality and Individual Differences, 17*(6), 791–802. [https://doi.org/10.1016/0191-8869\(94\)90048-5](https://doi.org/10.1016/0191-8869(94)90048-5)
- Fusco, R. A., Yuan, Y., Lee, H., & Newhill, C. E. (2021). Trauma, sleep and mental health problems in low-income young adults. *International Journal of Environmental Research and Public Health, 18*(3), 1145. <https://doi.org/10.3390/ijerph18031145>
- Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Wang, Y., Fu, H., & Dai, J. (2020). Mental health problems and social media exposure during the COVID-19 outbreak. *Plos One, 15*(4), e0231924. <https://doi.org/10.1371/journal.pone.0231924>
- García, F. E., Duque, A., & Cova, F. (2017). The four faces of rumination to stressful events: a psychometric analysis. *Psychological Trauma: Theory Research Practice and Policy, 9*(6), 758. <https://doi.org/10.1037/tra0000289>
- Gica, S., Kavakli, M., Durduran, Y., & Ak, M. (2020). The effect of the COVID-19 pandemic on psychosomatic complaints and investigation of the mediating role of intolerance to uncertainty, biological rhythm changes and perceived COVID-19 threat in this relationship: a web-based community survey. *Psychiatry and Clinical Psychopharmacology, 30*(2), 89–96. <https://doi.org/10.5455PCP20200514033022>
- Graham, B. M., Denson, T. F., Barnett, J., Calderwood, C., & Grisham, J. R. (2018). Sex hormones are associated with rumination and interact with emotion regulation strategy choice to predict negative affect in women following d mood induction. *Frontiers in Psychology, 9*, 937. <https://doi.org/10.3389/fpsyg.2018.00937>
- Hatun, O., Dicle, A. N., & Demirci, I. (2020). Psychological reflections of the coronavirus epidemic and coping with it. *Turkish Studies, 15*(4), 531–554. <https://doi.org/10.7827/TurkishStudies.44364>
- Hetzel-Riggin, M. D., & Roby, R. P. (2013). Trauma type and gender effects on PTSD, general distress, and peritraumatic dissociation. *Journal of Loss and Trauma, 18*(1), 41–53. <https://doi.org/10.1080/015325024.2012.679119>
- Horesh, D., & Brown, A. D. (2020). Traumatic stress in the age of COVID-19: a call to close critical gaps and adapt to new realities. *Psychological Trauma: Theory Research Practice and Policy, 12*(4), 331. <https://doi.org/10.1037/tra0000592>
- Hyland, P., Shevlin, M., Adamson, G., & ve Boduszek, D. (2014). The organization of irrational beliefs in posttraumatic stress symptomatology: testing the predictions of REBT theory using structural equation modeling. *Journal of Clinical Psychology, 70*(1), 48–59. <https://doi.org/10.1002/jclp.22009>
- Jha, I. P., Awasthi, R., Kumar, A., Kumar, V., & Sethi, T. (2021). Learning the mental health impact of COVID-19 in the United States with explainable artificial intelligence: an observational study. *JMIR Mental Health, 8*(4), e25097. <https://doi.org/10.2196/25097>
- Ikizer, G., Karanci, A. N., Gul, E., & Dilekler, I. (2021). Post-traumatic stress, growth, and depreciation during the COVID-19 pandemic: evidence from Turkey. *European Journal of Psychotraumatology, 12*(1), 1872966. <https://doi.org/10.1080/20008198.2021.1872966>
- Karakas, M. (2020). The multidimensional sociology of the COVID-19 pandemic and the issue of the new normal. *Istanbul University Journal of Sociology, 40*(1), 541–573. <https://doi.org/10.26650/SJ.2020.40.1.0048>
- Kwok, K. O., Li, K. K., Chan, H. H. H., Yi, Y. Y., Tang, A., Wei, W. I., & Wong, S. Y. S. (2020). Community responses during the early phase of the COVID-19 epidemic, in Hong Kong. *Emerging Infectious Diseases, 26*(7), 1575–1579. <https://doi.org/10.3201/eid2607.200500>
- LeBeau, R., Mischel, E., Resnick, H., Kilpatrick, D., Friedman, M., & Craske, M. (2014). Dimensional assessment of posttraumatic stress disorder in DSM-5. *Psychiatry Research, 218*, 143–147. <https://doi.org/10.1016/j.psychres.2014.03.032>

- Lee, S. A., Jobe, M. C., & Mathis, A. A. (2021). Mental health characteristics associated with dysfunctional coronavirus anxiety. *Psychological Medicine*, *51*(8), 1403–1404. <https://doi.org/10.1017/S003329172000121X>
- Liang, L., Gao, T., Ren, H., Cao, R., Qin, Z., Hu, Y., Li, C., & Mei, S. (2020). Post-traumatic stress disorder and psychological distress in chinese youths following the COVID-19 emergency. *Journal of Health Psychology*, *25*(9), 1164–1175. <https://doi.org/10.1177/1359105320937057>
- Mäirean, C. (2019). Driving cognitions, rumination, and posttraumatic stress disorder in road traffic accident survivors. *Clinical Psychology and Psychotherapy*, *26*(1), 47–54. <https://doi.org/10.1002/cpp.2329>
- Neziroglu, G. (2010). *Examine the relationships between rumination, experiential avoidance, problem-solving skills, and depressive symptoms* [Master's thesis]. Hacettepe University, Institute of Social Sciences, Department of Psychology.
- Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: the 1989 Loma Prieta Earthquake. *Journal of Personality and Social Psychology*, *61*(1), 115–121. <https://doi.org/10.1037/0022-3514.61.1.115>
- Nolen-Hoeksema, S., & Jackson, B. (2001). Mediators of the gender difference in rumination. *Psychology of Women Quarterly*, *25*(1), 37–47. <https://doi.org/10.1111/1471-6402.00005>
- Oglesby, M. E., Boffa, J. W., Short, N. A., Raines, A. M., & Schmidt, N. B. (2016). Intolerance of uncertainty as a predictor of post-traumatic stress symptoms following a traumatic event. *Journal of Anxiety Disorders*, *41*, 82–87. <https://doi.org/10.1016/j.janxdis.2016.01.005>
- Oglesby, M. E., Gibby, B. A., Mathes, B. M., Short, N. A., & Schmidt, N. B. (2017). Intolerance of uncertainty and post-traumatic stress symptoms: an investigation within a treatment-seeking trauma-exposed sample. *Comprehensive Psychiatry*, *72*, 34–40. <https://doi.org/10.1016/j.comppsy.2016.08.011>
- Ogueji, I. A., Agberotimi, S. F., Adesanya, B. J., & Gidado, T. N. (2021). Mental health and coping strategies during the COVID-19 pandemic: a qualitative study of unemployed and employed people in Nigeria. *Analyses of Social Issues and Public Policy*, *21*(1), 941–959. <https://doi.org/10.1111/asap.12259>
- Ogueji, I. A., Okoloba, M. M., & Demoko Ceccaldi, B. M. (2022). Coping strategies of individuals in the United Kingdom during the COVID-19 pandemic. *Current Psychology*, *41*(11), 7493–7499. <https://doi.org/10.1007/s12144-020-01318-7>
- Ogueji, I. A., Bello, I. B., Adesanya, B. J., Agberotimi, S. F., Gidado, T. N., & Olofe, O. J. (2022). Resilient coping during the COVID-19 pandemic: a cross-sectional study of unemployed and employed people in Nigeria. *IFE Psychologia: An International Journal*, *30*(1), 115–127. https://doi.org/10.10520/ejc-ifepsyc_v30_n1_a11
- Preston, T. J., Gorday, J. Y., Bedford, C. E., Mathes, B. M., & Schmidt, N. B. (2021). A longitudinal investigation of trauma-specific rumination and PTSD symptoms: the moderating role of interpersonal trauma experience. *Journal of Affective Disorders*, *292*, 142–148. <https://doi.org/10.1016/j.jad.2021.05.049>
- Rettie, H., & Daniels, J. (2021). Coping and tolerance of uncertainty: predictors and mediators of mental health during the COVID-19 pandemic. *American Psychologist*, *76*(3), 427–437. <https://doi.org/10.1037/amp0000710>
- Ricarte, J., Ros, L., Serrano, J. P., Martínez-Lorca, M., & Latorre, J. M. (2016). Age differences in rumination and autobiographical retrieval. *Aging & Mental Health*, *20*(10), 1063–1069. <https://doi.org/10.1080/13607863.2015.1060944>
- Rossi, R., Soccì, V., Talevi, D., Niolu, C., Pacitti, F., Di Marco, A., Rossi, A., Siracusano, A., Di Lorenzo, G., & Olf, M. (2021). Trauma-spectrum symptoms among the Italian general population at the time of the COVID-19 outbreak. *European Journal of Psychotraumatology*, *12*(1), 1855888. <https://doi.org/10.1080/2008198.2020.1855888>
- Sarı, S., & Dag, İ. (2009). Turkish adaptation, validity, and reliability of the intolerance of uncertainty scale, the positive beliefs related to the worry scale, and the consequences of the worrying scale. *Anadolu Journal of Psychiatry*, *10*, 261–270.
- Satici, B., Saricali, M., Satici, S. A., & Griffiths, M. D. (2020). Intolerance of uncertainty and mental wellbeing: serial mediation by rumination and fear of COVID-19. *International Journal of Mental Health and Addiction*, 1–12. <https://doi.org/10.1007/s11469-020-00305-0>
- Schumm, H., Krüger-Gottschalk, A., Dyer, A., Pittig, A., Cludius, B., Takano, K., Alpers, G. W., & Ehring, T. (2022). Mechanisms of change in trauma-focused treatment for PTSD: the role of rumination. *Behaviour Research and Therapy*, *148*, 104009. <https://doi.org/10.1016/j.brat.2021.104009>
- Skalski, S., Uram, P., Dobrakowski, P., & Kwiatkowska, A. (2021). The link between ego-resiliency, social support, SARS-CoV-2 anxiety, and trauma effects. Polish adaptation of the coronavirus anxiety scale. *Personality and Individual Differences*, *171*, 110540. <https://doi.org/10.1016/j.paid.2020.110540>
- Taylor, S. (2019). *The psychology of pandemics*. Preparing for the Next Global Outbreak of Infectious Disease. Cambridge Scholars Publishing, Newcastle.
- Tong, H., Hou, W. K., Liang, L., Li, T. W., Liu, H., & Lee, T. (2021). Age-related differences of rumination on the loneliness-depression relationship: evidence from a population-representative cohort. *Innovation in Aging*, *5*(4), igab034. <https://doi.org/10.1093/geroni/igab034>
- Wallace, C. L., Władkowski, S. P., Gibson, A., & White, P. (2020). Grief during the COVID-19 pandemic: considerations for palliative care providers. *Journal of Pain and Symptom Management*, *60*(1), e70–e76. <https://doi.org/10.1016/j.jpainsymman.2020.04.012>
- Wozniak, J. D., Caudle, H. E., Harding, K., Vieselmeyer, J., & Mezulis, A. H. (2020). The effect of trauma proximity and ruminative response styles on posttraumatic stress and posttraumatic growth following a university shooting. *Psychological Trauma Theory Research Practice and Policy*, *12*(3), 227–234. <https://doi.org/10.1037/tra0000505>
- Yılmaz Karaman, I. G., & Yastıbas, C. (2021). The relationship of depression, anxiety, and post-traumatic stress symptoms with sociodemographic and occupational variables in healthcare workers working in the COVID-19 pandemic. *Van Medical Journal*, *28*(2), 249–257. <https://doi.org/10.5505/vtd.2021.55453>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.