Investigation of Rumination and Cognitive Flexibility Levels in Patients with Depression

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Abstract

Aim: Depression is characterized by continuous depressed mood, anhedonia, loss of interest, and cognitive, behavioral, and physical symptoms. Many psychological factors such as individuals' cognitive processes, high neuroticism, low self-esteem have been reported to play important roles in the etiology, exacerbation, persistence, and treatment of depressive mood. The aim of this study is to compare the levels of rumination and cognitive flexibility in a healthy adult group without any mental disorders and adult patients followed up with depression.

Methods: In this cross-sectional case-control study, patients with depression (n=76, 34.1±9.32) and healthy controls (HG) (n=74, 34.5±10.5) were compared. The Sociodemographic Information Form, Beck Depression Inventory, Ruminative Thinking Scale, and the Cognitive Flexibility Inventory were performed to all participants.

Results: The study showed that depressive patients had higher ruminative thought levels and lower cognitive flexibility levels than healthy individuals. In addition, it was found that cognitive flexibility and ruminative thought severity can explain 35% of the variability of depressive symptom severity in the patient group. In the healthy group, ruminative thought severity can explain 9 % of the variability of depressive symptom severity.

Conclusions: The results of the study showed that ruminative thought and cognitive flexibility are important factors when predicting and preventing depression during the premorbid period and are useful when making formulation and determining treatment goals during the treatment. Therefore, interventions to improve cognitive flexibility and rumination are important. The clinicians should add interventions to cognitive flexibility and rumination into their treatment approach.

Keywords: *Depression, Rumination, Cognitive Flexibility*

1. Introduction

Depression is characterized by at least 2 weeks of continuous depressed mood, anhedonia, loss of interest, and cognitive, behavioral, and physical symptoms. It has significant societal, economic, and clinical implications because can cause a wide range of problems like sadness, difficulties in interpersonal relationships, occupational performance, and educational performance, impairment in assessing reality, slowing of psychomotor skills and cognitive processes, limitations in thought content, and a decrease in functionality, as well as deterioration of social and family harmony[1-3]. It was ranked that the prevalence of depressive disorders is 3440 cases per 100.000 people (95% Uncertainty interval 4038.1-5112.4), and 13th among the top 25 leading causes of DALYs (Disability Adjusted Life Years) in 2019 according to Global Burden of the Disease Study[4]. Similarly, it was reported that 322 million people worldwide, and 3,260,647 people in Turkey suffer from depression according to the World Health Organization's report on Depression and Other Mental Disorders[4].

Many psychological risk factors which can be called transdiagnostic factors in general, have been identified in the development of depression, such as high neuroticism, low self-esteem, negative repetitive thinking, cognitive reactivity, rumination, automatic thoughts, dysfunctional attitudes, and thought suppression[5,6]. The cognitive model of depression which suggests focusing on the cognitive content of the person's reactions to events and thoughts has significantly increased the understanding of cognitive processes in major depression[7]. According to the cognitive model, the real world is rebuilt and distorted by the depressed person who has negative and distorted thoughts about oneself, the environment, and the future, this model is also known as Beck's cognitive triad[8]. People who have depression perceive themselves and the environment and the future

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with a biased perspective, and usually report repetitive negative thoughts about themselves. There is a mutual interaction between distorted thoughts[9]. It was reported that there is a high relationship between the onset, relapse, and symptom severity of depression and cognitive distortions, negative thoughts about oneself, cognitive rigidity, and immature defense styles[10-12]. These results lead researchers to seek a more comprehensive understanding of depression and focus on cognitive processes and the content of depressive cognition.

Rumination is defined as an attempt to make sense of an upsetting event or to solve a problem. It is very common in the general population. But in substance clinically rumination is conceptualized as repetitive thought on unresolved personal goals and concerns and does not help the progress toward the unattained goal[13]. According to the theory of response styles, it is defined as passive, pervasive, and repetitive thinking patterns about emotional symptoms and the causes and consequences of these symptoms[14]. It can also be defined as the experience of being stuck in the head and focusing on the internal state that causes disengage in positive activities, like learning, and enjoying. Typically, ruminators have more focus on the events and passively and less consider their final reactions[15]. When prolonged, frequent, and extreme, rumination is problematic, contributes to anxiety and depression, reduces motivation, contributes to perseveration of negative affective states, leads to procrastination, and reduces direct contact with the world. Rumination has been related to severe and persistent depression[13,16]. Rumination exacerbates depression and other pathological conditions because it causes increased focus and being attached to negative thoughts and memories while trying to make sense of the distressing events, enhancing the content of fatalistic and pessimistic thinking, reducing problem-solving skills, and reducing adaptation to unstable conditions[17]. Just and Alloy[18] revealed in their longitudinal study of the relationship between depression and rumination that rumination is effective in the onset and exacerbation of depressive symptoms, and that depression is more common in people who think ruminatively. Similarly, Mor and Winquist[19] concluded in their meta-analysis that rumination is consistently and strongly associated with depressive symptoms. In addition, it was stated that patients with ruminative thinking have more severe depressive symptoms[16,18,20].

Cognitive flexibility defines the ability to switch thoughts or to be open to different perspectives[21]. Understanding the options that the individual has, considering difficult life experiences as bearable, and modifying cognitions to adapt to new contexts all are elements of cognitive flexibility[22]. Cognitive rigidity which means one's difficulty in switching ways of responding is the opposite of this. Rigidity refers to a mindset that is "all or nothing" according to cognitive behavioral therapy. When faced with difficult situations, cognitively flexible people are confident in their ability to behave effectively, aware of their options in the face of a situation, evaluate, and integrate various relevant sources of information, and can produce several scenarios during this process. These are important steps in making the right decision[23,24]. Cognitive flexibility has been positively related to psychological well-being, interpersonal competence, life satisfaction, and happiness[25-29], and negatively related to the severity of depressive symptoms[22,30]. Similarly, Deveney and Deldin[31] noticed that patients with depression performed worse than healthy controls in cognitive flexibility tasks in the card matching test when the stimuli were negative, according to the Wisconsin Card Sorting Test. It was stated that cognitive rigidity enhances the acceptance of maladaptive beliefs and causes to persist depression[32]. Moreover, cognitive rigidity which means one's difficulty in switching ways of responding has been related to a worse outcome like enhancement of suicide risk. It has been stated that significant relationship between cognitive rigidity and some transdiagnostic factors like perfectionism, compulsive behaviors, and impulsivity[33].

The study was designed to compare the ruminative thinking style and cognitive flexibility level of patients with depression who applied to a psychiatry outpatient clinic and a healthy control group. We believe that our findings may provide us to improve our understanding of the cognitive forms of depression and reorganize our treatment approach.

2. Materials and methods

2.1. Participants and Study Design

The ethical principles and permissions were obtained from The University Clinical Research Ethics Committee (Date: 20/02/2019, with decision number 87). After providing detailed verbal and written information about the study and obtaining written consent, the participants were recruited into the study. Data was collected with the sociodemographic Data form, the Beck Depression Inventory, the Ruminative Thinking Style Scale, and the Cognitive Flexibility Inventory from all of the participants who volunteered to participate in the study.

The Patient group (PG) enrolled 100 patients diagnosed with Major Depression based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) who applied to the Ankara University Faculty of Medicine Psychiatry outpatient clinic between January 2019 and November 2019, or who were currently being followed. 24 participants were excluded from the study because of refusing to participate, difficulty understanding the scale forms, missing or incorrect marking. 74 healthy subjects who were not diagnosed with any psychiatric disorder and met the study criteria were enrolled in the hospital and outpatient clinic. All of the participants aged between 18 and 65, were literate, not receiving any specialized psychotherapy intervention (cognitive behavioral therapy, etc.), has no history of substance abuse or use of any drugs, and had no additional psychiatric diagnosis based on DSM-V that affects their cognitive process (neurological disease, severe physical illness, history of brain trauma, or ECT treatment in the previous 6 months), to be able to give consent to participate the study, were recruited in the study.

2.2. Measurement Tools

Sociodemographic Data Form

Information on demographic variables such as age, gender, marital and working status, education level, and data on various clinical characteristics such as psychiatric history, smoking or alcohol consumption, substance use, and general medical history was obtained from all participants using the Sociodemographic Data Form which was prepared by the researchers.

The Beck Depression Inventory (BDI)

Beck Depression Inventory was developed to measure the severity of depressive symptoms by Beck et al.[34]. It can be evaluated various symptoms of depression, including sadness, hopelessness, somatic symptoms, vegetative symptoms, self-blame, feeling of guilt, fatigue, and loss of appetite with this scale. The test consists of 21 items and the lowest 0 and the highest 63 points can be rated. The cut-off point was determined as 17 points. The Turkish version of the scale has good reliability and validity properties have been stated, with a Cronbach's alpha of $\alpha = 0.80$[35].

The Ruminative Thought Style Questionnaire (RTSQ)

The scale was developed to assess the general rumination tendency as a thought form, considering ruminative thought as a repetitive, uncontrollable, pervasive, and reversible manner of thinking by Brinker and Dozois (36). It consists of 20 items and is rated every item on a 7-point Likert scale (1 = not at all descriptive of me, 7 = describes me very well). İt was not determined cut-off score. Brinker and Dozois developed the original form of the scale. İt has been reported the scale presents good convergent validity with the

Response Style Questionnaire, the Global Rumination Scale, and the Beck Depression Inventory, adequate test-retest reliability and high internal consistency with a Cronbach's alpha of α = 0.94, and internal consistency coefficient was calculated to be 0.92[36]. Karatepe, Yavuz, and Turkcan conducted a Turkish validity and reliability assessment of the scale, with an internal consistency coefficient of 0.91[37].

The Cognitive Flexibility Inventory (CFI)

The inventory was developed to assess people's capacity to produce alternatives, recognize appropriate options, and think rationally in tough situations by Dennis and Vander Wal[22]. It has a 20-item and two-factor structure. The first factor called the Alternatives subscale provides an assessment of people's ability to comprehend that there are alternatives and find solutions in the face of negative situations. The second factor, called Control subscale measures one's adaptability to challenging situations. The questionnaire was designed on a 5-point Likert scale (1= not at all appropriate and 5=completely appropriate). A high score indicates a high level of cognitive flexibility. The Turkish reliability and validity study was carried out by Gülüm and Dağ[38] The internal consistency value was found 0.91 for the Alternative subscale and 0.84 for the Control subscale. Cronbach's alpha coefficients were found to be .89 for the Alternatives subscale, 0.85 for the Control subscale, and .90 for the Total scale.

2.3. Statistical Analysis

It was evaluated whether the continuous variables had normal distribution by the Shapiro-Wilk test. The descriptive statistics of the data like the mean, standard deviation, maximum-minimum values, distributions, and ratios were determined. Independent sample t-test and Mann-Whitney U test were used for comparisons between two groups of continuous variables. Pearson Chi-Square Test was used for comparisons between categorical variables. Pearson correlation analysis was used to examine the relationships between the variables. Linear regression analysis was applied to calculate the effect of the main variables of the study. Statistical analyzes were performed with SPSS 26.0 (SPSS Inc, Chicago, IL, USA) package program and the level of significance was accepted as p<0.05. p<.01, p<.001.

3. Results

In this cross-sectional case-control study, patients with depression (PG, n=76, 34.1±9.32) and healthy controls (HC, n=74, 34.5±10.5) were compared in terms of ruminative thinking styles and cognitive flexibility levels. There was found no statistically significant difference between the two groups in terms of age, gender, working, and marital status (respectively p = .80, .25., 89, 19) The sociodemographic characteristics of the participants are shown in Table 1.

Table 1

Sociodemographic Characteristics of the Patient and Healthy Control Groups

Characteristic	PG (n:76)	HG (n:74)	Statistical Analysis
Age (years)	34.1±9.32 (18-62)	34.5±10.5 (18-62)	t=.-25, pa=.80
S (Female n, %)	52 (68.4%)	44 (59.5%)	x2=1.31, p=.25
Marital status (married n, %)	54 (71.1%)	45 (60.8%)	x2=1.75, p=.19
Working status (unemployed n, %)	45 (59.2%)	43 (58.1%)	x2=.019 p=.89

Note; a= Independent Sample t-Test, x2= Chi Square

PG and HC were compared in terms of RTSQ score and CFI there was a statistically significant difference between the groups (both p<0.05). The PG has a higher ruminative thinking level and a lower cognitive flexibility level than the HC (Table 2).

Table 2

The Comparison Between the Groups in terms of the Ruminative Thought Style Questionnaire score and Cognitive Flexibility Inventory Score

	PG			HG				
	N	Mean	SD	N	Mean	SD	t	p
RTSQ	76	101.8	17.9	74	88.2	10.9	9.02	.00*
CFI	76	62.7	8.1	74	68.9	9.0	-9.46	.00**
Alternatives	76	44,4	7.3	74	49.5	8.5	-8.18	.00**
Control	76	18.6	4.6	74	19.9	5.1	-3.34	.00**

*Note; * Mann Whitney U; ** Independent Sample t Test*

Pearson correlation analysis was performed to examine the relationship between the participants' depressive symptom severity, cognitive flexibility (control, and alternative subscale) ruminative thinking level, and age. It was found a negative relationship between depressive symptom severity and CFI-Alternatives subscale RTSQ score (both p<0.01), and a positive relationship between depressive symptom severity and CFI-Control subscale (p<0.01) for the patients. There was a positive significant relationship between RTSQ and CFI-Control subscale (p<0.01) and a negative significant relationship between RTSQ and CFI-Alternatives subscale (p<0.01). The results were shown in Table 3

Table 3

Correlation between the Patient Group in terms of Various Sociodemografical and Clinical variables

	1	2	3	4	5	6
1-Age						
2-Dep. Sym. Sev. (BDI)		.14	.07	-.06	.13	-.01
3-RTSQ			-.42**	-.40**	.31**	-22**
4-CFI-total				.08	.53**	-.24**
5-CFI-Control					.43**	.82**
6-CFI Alternatives						

*Note; ** p<0,01, Dep Sym. Sev.: Depressive Symptom Severity measured by Beck Depression Inventory, RTSQ: The Ruminative Thought Style Questionnaire, CFI: The Cognitive Flexibility Inventory, CFI-Control: The Cognitive Flexibility Inventory Control Subscale, CFI-Alternatives: The Cognitive Flexibility Inventory Alternatives Subscale*

Table 4

Correlation between the Control Group in terms of Various Sociodemografical and Clinical variables

	1	2	3	4	5	6
1-Age						
2-Dep. Sym. Sev. (BDI)		.11	.03	.00	-.23*	-.04
3-RTSQ			.28**	.13	.13*	.06
4-CFI-total				.37**	.53**	.07
5-CFI-Control					.40**	.83**
6-CFI Alternatives						

*Note; ** p<0,01, Dep Sym. Sev.: Depressive Symptom Severity measured by Beck Depression Inventory, RTSQ: The Ruminative Thought Style Questionnaire, CFI: The Cognitive Flexibility Inventory, CFI-Control: The Cognitive Flexibility Inventory Control Subscale, CFI-Alternatives: The Cognitive Flexibility Inventory Alternatives Subscale.*

It was found a positive relationship between depressive symptom severity and the CFI-Control subscale RTSQ score (both p<0.01), and a positive relationship between the RTSQ and CFI-Control subscale (p<0.01) for the HC. There was a positive significant relationship between RTSQ and CFI-total and CFI control subscale (both p<0.01) The results were shown in Table 4.

In the study, linear regression analysis examined the variables that predicted the depressive symptom levels of the patient group. ANOVA test was performed to examine whether the regression model was significant. According to the results, the model is statistically significant (F (2,75) = 9.23, p <. 001, R^2 =0.35) and the R2 value indicated that 35% of the variability of depressive symptom severity is explained by the BDI and RTSQ. When the regression model was examined, it was observed that RTSQ had a positive and significant effect on depressive symptom severity (t=6.618, p<0.05, β=0.441), and the level of cognitive flexibility had a negative and significant effect (t =-6.34, p<0.05, β=-0.423). The results were shown in Table 5.

Figure 1

The Effect of Ruminative Thought and Cognitive Flexibility Levels on Depressive Symptom Severity

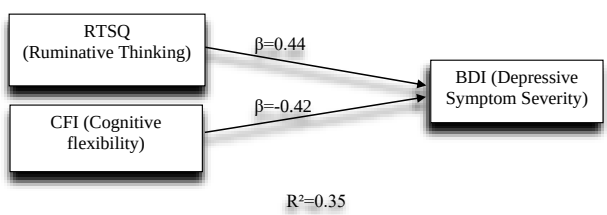

Table 5

Patient Group Linear Regression Analysis Results

	B	SE(B)	B	t	R²	F
CFI	-0.465	0.073	-0.423	-6.34	0.349	39.39
RTSQ	0.224	0.034	0.441	6.62		

NOTE; SE: Standart Error

Similarly, linear regression analysis examined the variables that predicted the depressive symptom levels of the HC. Before the regression analysis, the relationship between the variables was examined and it was observed that there was only a relationship between depressive symptom severity (BDI) and RTSQ score. ANOVA test was performed to examine whether the regression model was significant.

Table 6

Patient Group Linear Regression Analysis Results

	B	SE(B)	B	t	R²	F
Ruminative Thinking	0.043	0.02	0.30	2.68	0.09	0.009

NOTE: SE: Standart Error

According to the results, the model is statistically significant (F (1,73) = 7.2, p<.001, R^2 =.09), and the R2 value indicated that 9% of the variability of depressive symptom severity is explained by the RTSQ. It was observed that RTSQ had a positive and significant effect on depressive symptom severity (t=2.68, p=0, β= 0.30). The results were shown in Table 6.

4. Discussions

Depression is a common disorder that causes severe social, economic, and social consequences in our country and the world and it affects people's lives very seriously. The results of the study show that depressive patients had higher ruminative thought levels and lower cognitive flexibility levels than healthy individuals. There was found a significant and negative relationship between ruminative thought, cognitive flexibility, and depressive symptom severity in the patient group. In the control group, there was a significant negative relationship between only ruminative thought and depressive symptom severity. In addition, it was found that cognitive flexibility and ruminative thought severity can explain 35% of the variability of depressive symptom severity in the patient group. In the healthy group, ruminative thought severity can explain 9 % of the variability of depressive symptom severity. According to the results, it can be said that the cognitive flexibility and ruminative thinking level have had a significant effect on depressive symptom levels in the patient group and the ruminative thought level has a significant effect in the healthy control group. Even if there are not many studies examining the relationship between depressive symptom levels and ruminative thinking in the clinical population the results from the studies are consistent with the present study. It has been shown in two studies conducted in a non-clinical sample that ruminative thought is related to depressive mood[39,40]. It was stated that the level of ruminative thinking contributed to the explanation of depressive symptoms both directly and through negative metacognitive beliefs[40].

The results obtained from the literature review show that healthy individuals with a tendency to ruminative thinking can easily enter a depressive mood, and it increases the severity of the disease in clinical patients diagnosed with depression[41]. There were some explanations for this close relationship between depression and rumination. People who experience depressive moods and are faced with negative life events constantly think about the causes and consequences of the negative events and overthinking causes negative events to remain in the memory constantly and creates negative reactions to the current positive situation. For this reason, individuals under the influence of rumination are more likely to encounter diseases that will turn into emotional disorders such as depression and anxiety. For this reason, ruminators have a high risk for depression and anxiety disorders[42]. Besides, rumination facilitates access to negative cognitions and triggers negative emotional states. Even, for this reason, rumination has been described as an emotional magnifier[13]. The negative thought style is cut down people's problem-solving skills and motivation for problem-solving. It was stated that these situations contribute to the development of depression[14]. Those results lead clinicians to seek advanced treatment for rumination. It was suggested that a lot of therapy approaches like Rumination Focused-Cognitive Behavioral Therapy, Cognitive Bias Modification, Metacognitive Therapy, Mindfulness-Based-Cognitive Behavioral Therapy, cognitive Control Training, and Self Systems Therapy[43].

According to another result of the study, there was a negatively significant relationship between cognitive flexibility levels and depressive symptom levels in the patient group. In other words, the patient who has low cognitive flexibility had higher depressive symptom severity. In the control group, there was no relationship

between cognitive flexibility and the level of depressive symptoms. Similarly in the literature, negative relationships between cognitive flexibility and depressive symptoms were shown in the clinic and non-clinic populations[30,31,44-46]. A similar relationship has also been shown in caregivers of cancer patients[47]. In another study which is used emotional and neutral stimuli; patients with depression spend more time and attention while performing tasks with emotional stimuli have been reported[48]. This may be due to that high cognitive flexibility provides the person's high belief that they can easily solve problems and change their thoughts in a positive way. While cognitive flexibility has been related to individuals producing different perspectives and solutions against current situations, cognitive rigidity has been related to higher vulnerability to tough life events and in the end, the outcome is increased depression risk[46]. With the results and literature review, thinking about the causes and consequences of events deeply, having difficulties in producing alternative solutions, and not being able to control own negative thoughts may cause enlargement of depressive symptom severity and duration for the patient with depression can be said. In the non-clinical population, those excuses cause a negative mood. As a result of our research and the knowledge from previous research, if cognitive rigidity is one of the causes of depression, treatment of this symptom may be prevented the occurrence of major depression can be said.

Therefore, interventions related to cognitive rigidity are important in the approach to patients with depression. Being able to produce alternative solutions without being stuck on the problems and developing their problem-solving skills should be among the treatment goals. Various studies were shown Cognitive Behavioral Therapy is useful for the remediation of cognitive flexibility[49,50], though, Oishi et al.[51] suggested that stress management training on the internet can enhance cognitive flexibility levels. Greenberg et al[52] stated that mindfulness practice is beneficial for reducing cognitive rigidity. But the opposite of those results Johnco et al.[53] said that CBT couldn't provide significant improvement in cognitive flexibility. However, we think that whatever the final result, the clinicians had to use effective technics to improve cognitive rigidity.

The limitations of the study are including the cross-sectional design which reduces the researchers' interpretation of causality, and it provided self-report data from participants which causes them may not to be honest about their ideas, behaviors, and attitudes when filling out the measurement tools. In addition, the drug treatments currently used by the patients were overlooked. This is an important limitation. Additionally, the data cannot be generalized because of made only in a certain period and group and included only a small number of patients with depression. But, it can be said that the patient and control groups are similar in terms of gender, employment status, marital status, and age. Besides, to exclude factors that may affect the test results it has been taken as a condition that they should not have additional medical, neurological, or psychiatric diagnoses and have no individualized psychotherapeutic interventions in the past and present for the participants. These are advantages for our study, considering the effects of the factors on the tests.

In the literature, it was reported that depressive symptoms are related to executive functions, cognitive rigidity, and ruminative thinking[14,22]. Recent studies about rumination have been marked the studies' results may change because of study population features, experiment design, various impairments of cognitive functions, intellectual ability, executive functions, problem-solving abilities, and coping strategies[54,55]. It was not adjusted to these factors in the study and unfortunately, it is a limitation, but Davis and Nolen-Hoeksema[56] stated that there is a direct relationship between ruminative thought and cognitive flexibility and depressive symptoms severity in both patients and non-clinic populations.

5. Conclusions

Depression is a common disorder that causes severe social, economic, and social consequences in our country and the world and it affects people's lives very seriously. The results of the study showed that ruminative thought and cognitive flexibility are important factors for the formulation of patient problems, and for determining treatment goals during the treatment. Therefore, interventions to improve cognitive flexibility and rumination are important. Clinicians should combine interventions to cognitive flexibility and rumination into their treatment approach. These interventions would provide to increase the effectiveness of therapies, make shorter the therapy and treatment duration, and reduce the risk of relapse. We hope that this study and future studies which are carefully designed, large-sample, prospective studies will determine the various transdiagnostic factors in depression and other mental disorders to develop targeted prevention and treatment programs.

Statement of ethics

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by The Ankara University Clinical Research Ethics Committee (Date: 20/02/2019, with decision number 87).

Conflict of interest statement

Author declare that they have no financial conflict of interest with regard to the content of this report.

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