

Original Article

The Relationship between Cognitive Flexibility and Social Anxiety with Perceived Anxiety Control in People with Eating Disorder Symptoms: The Mediating Role of Cognitive Emotion Regulation

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Abstract

Background and Aim: Eating disorder is one public health problem with increasing prevalence in recent decades. Therefore, the present study aimed to investigate the mediating role of cognitive emotion regulation in the relationship between cognitive flexibility and social anxiety and perceived anxiety control in people with eating disorder symptoms.

Materials and Methods: The method of the present research was descriptive-structural equations. The statistical population included all people referred to health and counseling centers in Tehran, among whom 384 people with eating disorders were selected through purposive sampling based on a semi-structured clinical interview (based on DSM5 criteria). The tools used in the research included questionnaires on social anxiety, cognitive flexibility, perceived anxiety control, and cognitive emotion regulation. Pearson correlation method, structural modeling, and partial least square algorithm (PLS) were used for data analysis.

Results: The results indicated the fitness of the research model. The findings showed that cognitive flexibility has a direct effect on social anxiety and perceived anxiety control ($p < 0.001$). Also, cognitive flexibility indirectly affected social anxiety and perceived anxiety control through cognitive emotion regulation ($p < 0.001$).

Conclusion: According to the findings of the present study, cognitive flexibility and cognitive emotion regulation play a key role in predicting social anxiety and the perception of anxiety control, and in counseling and psychotherapy centers, there is a need to pay more attention to these variables in people with symptoms of eating disorder.

Keywords: Cognitive flexibility, Cognitive regulation, Social anxiety, Perception of anxiety control

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Introduction

Eating disorders are among serious mental health disorders(1). Although eating disorders have psychological roots, they can lead to many problems in the field of health and medicine because it is not adaptable to a healthy lifestyle (2). Eating disorders are psychological disorders characterized by concerns about body shape, eating, and weight, and in adults, they are divided into four categories: anorexia, bulimia, gluttony, and unspecified eating disorders (3). The results of studies suggest that people with eating disorders usually have a lower perception of anxiety control in daily life (4). The structure of anxiety control perception indicates thoughts or behaviors related to anxiety control. Low control of unfortunate events causes the foundation of anxiety disorders. Also, the findings show a significant relationship between perceived anxiety control and mental anxiety and the symptoms and severity of specific anxiety disorders (5). In a study, Maggi and Vork found (6) that exercise will improve cognitive flexibility, which is associated with reducing anxiety symptoms. Also, people with eating disorders have higher social anxiety (7). Sweating, hot flashes, and increased heart rate are among the signs of social anxiety if you feel humiliated. Social anxiety is the feeling of fear and anxiety of being humiliated and is defined by the fear of being in such a situation(8).

People with social anxiety in new situations tend to interpret them in a threatening way because they have negative assumptions and have experienced various negative consequences, such as increased anxiety and physical symptoms in social situations (9). In their study, Jin et al. (10) showed that there is a significant relationship between symptoms of social anxiety disorder, appearance anxiety, and symptoms of eating disorders among Chinese university students.

Another component that is related to anxiety is cognitive emotion regulation (11). The results indicate the key role of positive and negative cognitive emotion regulation strategies in predicting eating disorders (12). Cognitive emotion regulation refers to all the cognitive styles that each person uses to increase, decrease, or maintain their emotions. For unpleasant emotional experiences to be resolved and

for other experiences and behaviors to be processed, a person must allow physiological and psychological processes to accompany the emotional experience (13). People who are used to using negative emotions usually lack the necessary skills to manage and regulate their emotional experiences (14), and those who avoid all negative or unwanted emotions and manage their emotions effectively, even when they are intense, usually show more adaptability in dealing with problems and these people suffer less harm (15). Also, the findings of some studies indicate the role of people's cognitive flexibility in explaining anxiety(16). Cognitive flexibility has a direct and meaningful effect in predicting preferences and expectations related to the future and can explain the sense of power in a positive and meaningful way (17). Cognitive flexibility is an important aspect of executive function, defined as the ability to effectively adapt to changing tasks. Considering the permanent environmental changes, this structure can play a key role in survival (18). Due to the needs felt in the field of creating mental health in people with eating disorders, there is a gap in basic research in this field by which examining the antecedents of social anxiety and the perception of anxiety control, to some extent, identify the problems related to people suffering from eating disorders. In this regard, based on the cases mentioned above, no study has been done to explain the relationship between cognitive flexibility and social anxiety with perceived anxiety control with the mediating role of cognitive emotion regulation. Therefore, conducting this research can lead to implicit achievements for counseling and psychology centers in the country. So, the present aimed to investigate the mediating role of cognitive emotion regulation in the relationship between cognitive flexibility and social anxiety and perceived anxiety control in people with eating disorder symptoms.

Methods

The method of this research was descriptive-correlation and structural equation modeling. The statistical population included people referred to the Health and Treatment and Counseling Centers of Tehran 2021. Through the purposeful sampling method, 384 people with symptoms of eating disorder (based on a semi-structured clinical interview based on criteria DSM5)

were selected as samples. The inclusion criteria of the research included the age range of 20 to 60 years (to match the subjects), people referring to counseling centers and suffering from eating disorder symptoms (based on a semi-structured clinical interview based on DSM5 criteria), not having psychiatric and neurological disorders (with semi-structured clinical interview), absence of acute and chronic physical illness (based on self-report form), and informed consent to participate in the research, and the exclusion criterion was lack of consent to participate in the study.

Materials

Social Anxiety Questionnaire: The degree of social anxiety was measured through the Social Anxiety Scale (SPIN). The social anxiety scale is a 17-item scale developed by Conner et al., and it measures three subscales of fear, avoidance, and physiological discomfort. The minimum and maximum scores are 0 - 68. The validity of the factor analysis of this questionnaire was 0.85, and the reliability using the test-retest method with an interval of 14 days was reported as 0.78(19). Hassanv and Amozadeh (20) obtained the factor analysis validity of this questionnaire at 0.69, and the reliability of this tool using Cronbach's alpha coefficient was 0.82. In the present study, the reliability was 0.80, calculated using Cronbach's alpha coefficient.

Anxiety Control Perception Questionnaire: This questionnaire measures people's perception of controlling emotional reactions and external threats. This questionnaire consists of 30 items, which have three subscales of emotion control, threat control, and stress control, and the subject will answer it on a 5-point Likert scale. The minimum is 30, and the maximum is 150. The internal consistency and test-retest validity of this questionnaire is suitable. Cronbach's alpha coefficient of 0.87 to 0.89 was reported for the questionnaire, and the validity of the retest test after one month was reported as $R=0.82$ (21). In Iran, Aghaz Harris has reported a reliability of 0.62 and its validity through Cronbach's alpha (22). In the present study, the reliability of the questionnaire was obtained through Cronbach's alpha method of 0.80.

Cognitive Flexibility Questionnaire:The Cognitive Flexibility Questionnaire (CFI) was developed by Dennis and Vanderwaal, which consists of 20 questions and measures three aspects of cognitive flexibility, including the perception of controllability, the perception of justification of behavior, and the ability to create multiple alternative solutions to difficult situations. The highest and lowest scores obtained by the person in this questionnaire are 140 and 20, respectively. The convergent validity of the cognitive flexibility questionnaire with the resilience questionnaire was equal to 0.67, and its concurrent validity with the Beck depression questionnaire was equal to -0.50. Also, the reliability of the questionnaire was obtained by Cronbach's alpha method for the whole tool at 0.81 (23). In Iran, Soltani et al. (24) reported the convergent validity of the resilience scale as 0.67 and the reliability coefficient using the retest method with an interval of 20 days as 0.71. In the present study, the reliability of the questionnaire was obtained through Cronbach's alpha method of 0.76.

Cognitive emotion regulation Questionnaire:The Cognitive Emotion Regulation Questionnaire (ERQ) developed by Gross and John has 10 items and two subscales of expressive suppression and cognitive reappraisal based on a 7-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree' (7). The minimum and maximum scores are 10 and 70, respectively. Its construct validity was 0.85 with confirmatory factor analysis; Cronbach's alpha coefficient was 0.79 for cognitive appraisal and 0.73 for cognitive suppression, and the three-month retest reliability for both subcomponents was 0.69 (25). The reliability of this tool for the Iranian sample was 0.76 for cognitive reappraisal and 0.72 for expressive suppression using Cronbach's alpha method. The result of divergent and convergent validity of this scale with state-trait anxiety was -0.24 for the cognitive reappraisal subscale and 0.28 for suppression (26). In the present study, the reliability coefficient for the entire questionnaire was calculated to be 0.77 using Cronbach's alpha.

Results

Demographic findings showed that 241 (63%) of the research samples were male and 143 (37%) were

female, 129 people (33%) were 20 to 30 years old, 103 people (26%) were 31 to 40 years old, 132 people (31%) were 41 to 50 years old, and 20 people (10%) were over 50 years old.

Of the level of education, 124 people (32%) had a diploma or sub-diploma, 126 people (32%) had a graduate degree, 97 people (27%) had a bachelor's degree, and 37 people (9%) had a master's degree or higher. The marital status, 156 people (41%) were single, and 228 people (59%) were married.

Also, descriptive information, including mean, standard deviation, minimum, maximum, skewness, and skewness of research variables, including social anxiety, perception of anxiety control, cognitive flexibility, and cognitive emotion regulation, are presented in Table 1 (skewness and skewness indicate the normality of the data).

In Table 1, Pearson's correlation coefficients show that there is a significant relationship between endogenous, mediating, and exogenous variables; the relationship between social anxiety and perception of pain control, cognitive flexibility, and cognitive regulation was negative and meaningful emotion; the relationship between perception of control and cognitive flexibility and cognitive regulation is positive and significant, and the relationship between cognitive flexibility and cognitive emotion regulation was positive and significant (Table1).

Measurement model

Three criteria were used to evaluate external models: reliability, convergent and divergent validity. In the reliability section, it is necessary to check the reliability at the level of the representative and current variables. The reliability of the indicator was assessed by measuring factor loading components with good convergent validity, as the extracted average variance level was higher than 0.50 in all cases. The Fornell and

Larcker method was also used to assess convergent validity, and it was found that each factor was most related to its construct (Table 2).

Therefore, the null hypothesis is rejected, and the research hypotheses are confirmed. The follow-up test is before evaluating the proposed model, and the assumptions of using structural equations were evaluated. The normality of the data is presented in (Table 1) and the assumption of linearity is shown in (Table 2). The tolerance index and the variance inflation factor (VIF) were used to check the linearity of the variables (27).

As the results in Table 3 show, the condition of non-collinearity was met. To evaluate the internal model of the path coefficients and check their significance, an auto-weighting procedure was also used. These coefficients, together with T-values, significance level, and confidence interval for direct and indirect effects, are presented in Table 3 The next criterion for evaluating the internal model is the effect size (f^2), which indicates the change in the value (R^2) after removing a certain exogenous latent variable from the model.

The results shown in Table 3 indicate that the direct effect of cognitive flexibility on cognitive emotion regulation is 0.620, cognitive flexibility on the perception of pain control is equal to 0.749, cognitive flexibility on social anxiety is equal to -0.803, the cognitive emotion regulation on the perception of pain control is equal to 0.768, and the cognitive emotion regulation on social anxiety is equal to 0.835. Also, the results show that the indirect effect of the cognitive flexibility variable on the perception of pain control through cognitive emotion regulation is equal to 0.218, and the indirect effect of cognitive flexibility on social anxiety through cognitive emotion regulation is equal to 0.103. Based on the estimation of the T statistic, all relationships were significant at the level ($P < 0.001$).

Table 1. Descriptive indices and Pearson correlation coefficients related to research variables

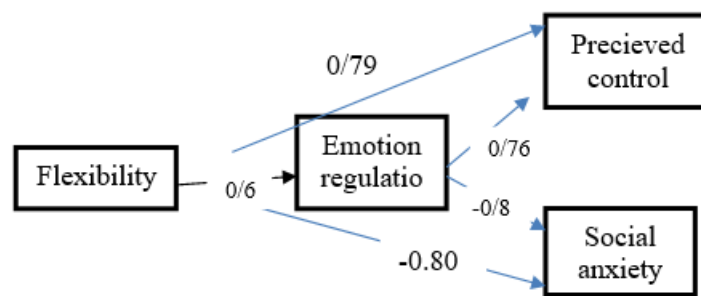
Variable	M	SD	Min	Max	Skewness	kurtosis	1	2	3	4
1.Social anxiety	39.72	7.41	10	48	0.16	0.84	-			
2.Precieved anxiety control	71.60	12.52	43	91	0.21	1.79	-0.79	-		
3.felxibility	82.15	14.39	39	112	-0.39	-1.13	-0.48	0.64	-	
4.Emotion regulation	41.22	9.09	17	59	0.13	0.49	-0.63	0.82	0.78	-

Table 2. Reliability and validity indices of the external model

Variable	Chronbakh Alpha	Composite reliability	AVE
Social anxiety	0.85	0.90	0.76
Precieved anxiety control	0.87	0.90	0.63
felxibility	0.95	0.96	0.88
Emotion regulation	0.89	0.92	0.77

Table 3. Colinearity indexes, direct and indirect effects and the effect size of the internal model of the research

Direct effect	VIF	B	T	P	f^2
Emotion regulation>flexibility	1.64	0.62	7.18	0.001	0.34
Precieved anxiety control>felxibility	2.23	0.79	11.49	0.001	0.13
Social anxiety>flexibility	2.41	0.80	10.29	0.001	0.83
Precieved anxiety control>emotion control	1.84	0.76	9.74	0.001	0.27
Social anxiety>emotion regulation	1.46	0.83	14.52	0.001	0.12
Indirect effect					
Flexibility>emotion regulation>precived control	0.21	4.97	0.001		
Flexibility>emotion regulation>social anxiety	0.10	3.72	0.001		

**Figure 1.** The fitted causal model of the mediating role of cognitive emotion regulation in the relationship between cognitive flexibility with social anxiety and perceived anxiety control

Discussion

The present study was conducted to mediate the role of cognitive emotion regulation in the relationship between cognitive flexibility and social anxiety and perceived anxiety control in people with eating disorder symptoms. The findings showed that cognitive flexibility affects perceived anxiety control and social anxiety both directly and indirectly through cognitive emotion regulation. The first finding of the research showed that cognitive flexibility has a positive and significant effect on the perception of anxiety control. This finding is consistent with the results of Akgol *et al.*(28) and Wang *et al.* (29). In explaining this finding, we can state that cognitive flexibility will cause perceived anxiety control in people with eating disorders. Cognitive flexibility determines the type of people's reaction to new experiences, and generally, the lives of flexible people are rich in experience. Because they like new

experiences and want more experience, not only do they not avoid facing internal and external experiences, but sometimes they even seek new experiences, and this acceptance of experience can reduce the degree and intensity of unpleasant events and improve people's perceived anxiety control by reducing anxiety(30).

The other finding of the research was the significant effect of cognitive flexibility on social anxiety. This finding is consistent with the results of Vand and Shafiabadi (31) and Jain *et al.* (32). Also, in explaining this finding, we can state that in social anxiety, a person focuses on the judgment of others about himself and his performance and distances himself from his emotions; as a result, he shows more flexibility problems. In the meantime, cognitive flexibility helps people increase their contact with the present, cope with challenges, and reduce their social anxiety by focusing on their performance and emotions and accepting and managing their behavior correctly (27).

Another finding of the research indicated the significant

effect of cognitive emotion regulation on the perception of anxiety control. This finding is consistent with the results of Wang *et al.* (33) and Zhao *et al.* (34). It has a positive effect on stressful situations. Anxious patients suffer from negative and intense emotional reactions due to disruption in the analysis of threat-related information, which often manifests themselves as unpleasant and intense emotional actions against perceived threats (35). By maintaining emotions in the face of stressful situations, people can have a more objective understanding of the level of threat, and by using positive emotion regulation strategies, they can have more control over their actions in the face of social performance events and reduce their anxiety (36). Also, the results showed that cognitive emotion regulation has a significant effect on social anxiety. This finding is consistent with the results of Garke *et al.* (37) and Mukherji *et al.* (38). In explaining this finding, we can state that the cognitive skills of emotional regulation play a key role in assessing social situations. So, those who have serious deficiencies in these skills interpret situations inappropriately, which is the basis for social anxiety. In contrast, those who use and apply the cognitive skills of emotional regulation in different situations will usually experience lower social anxiety (39).

Another finding indicated the indirect effect of cognitive flexibility on perceived anxiety control through cognitive emotion regulation. This finding was consistent with the results of Motlo and Solehi (40) and Akgol *et al.* (28). In explaining this finding, we can state that cognitive flexibility leads to the perception of high anxiety control through improving cognitive emotion regulations. Cognitive flexibility is a process whereby a person's ability to cope with emotional, social, and physical challenges increases. People who change their cognitive cues to adapt to environmental stimuli can use positive and appropriate emotion regulation strategies (7), and this leads to higher perceived anxiety control in these people.

The last finding of the research showed that cognitive flexibility has an indirect and significant effect on social anxiety through cognitive emotion regulation. This finding is in line with the results of Garcia (7) and Wang *et al.* (41). To explain this finding, we can say

that cognitive flexibility improves social anxiety by enhancing the cognitive regulation of people's emotions. People with high psychological flexibility are more likely to behave in ways consistent with their values, accept and experience their experiences without trying to control or eliminate them and use adaptive emotion regulation strategies. They are aware of their problems and give appropriate emotional responses to demands and environmental conditions (42). As a result, adaptive strategies are often associated with an increase in positive emotional psychological adjustment and a decrease in social anxiety (43).

Conducting this research was accompanied by limitations, such as focusing on people with eating disorders in Tehran, which limits the generalization of the findings. Other limitations include the sampling method available and the correlational research method, where it was not possible to identify the cause. Therefore, it is suggested that future research should address the existing limitations and examine other influencing variables on perceived anxiety control and social anxiety so that it can be adapted in the form of clinical interventions by developing a comprehensive educational program and improving positive behaviors in people with eating disorders.

Conclusion

In general, the research results showed that cognitive flexibility has a direct and significant effect on social anxiety and perceived anxiety control, and cognitive emotion regulation has an indirect and significant impact on social anxiety and perceived anxiety control. Considering the meaningful effect of cognitive flexibility and cognitive emotion regulation on social anxiety and perceived anxiety control of people with eating disorders, and also by teaching these variables and holding workshops in this area, people with eating disorders can be helped to adapt to this psychological disorder.

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Ethical Approval

This study is based on a research project approved by the Ethics Committees of Semnan University of Medical Sciences and Health Services (ID: IR.SEMUMS.REC.1402.319) at 11.3.2024. All procedures performed in this study were in accordance with the ethical standards of the institutional or national research committee and were consistent with the 1964 Helsinki Declaration and its later amendments or comparable.

Conflict of Interest

The authors declare no conflict of interest.

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