

Original Article

The Mediating Role of Rumination in Structural Model of Anorexia Nervosa

Sara Kashani Vahid¹, Alireza Mohammadi Arya^{1,2*}, Khadijeh Abolmaali Alhosseini¹

¹Department of Psychology, North Tehran Branch, Islamic Azad University, Tehran, Iran
²Department of Preschool, university of social welfare and Rehabilitation Sciences, Tehran, Iran.

Received: 16 August 2023; Revised: 3 Sep 2023; Accepted: 20 Sep 2023

Abstract

Background and Aim: Anorexia nervosa (AN) is a critical psychological disorder characterized by life-threatening distress, significant weight loss, and distorted body image. This study aimed to explore the mediating role of rumination in the relationship between behavioral inhibition/approach systems (BIS/BAS), metacognitive beliefs (MCB), attachment styles (AS), and AN.

Materials and Methods: Conducted as modeling research, this study focused on Tehran's student population, employing a multi-stage cluster sampling method. The research involved 215 girl students who completed assessments included the Eating Disorder Diagnostic Scale, Ruminative Responses Scale, sensitivity to reinforcement scale, metacognitive beliefs-30, and attachment styles. Data analysis employed the partial least squares method in SPSS and Smart-PLS software.

Results: The results indicate that the revised model of the structural relationship among sensitivity to reinforcement, metacognitive beliefs, attachment styles, and AN, with the mediation of rumination, exhibits appropriate fitness characteristics.

Conclusion: The confirmed mediation of rumination in the complex interplay of BIS/BAS, MCB, AS, and AN reveal a crucial cognitive pathway, deepening our understanding of the disorder's etiology. This underscores the potential efficacy of interventions targeting rumination, prompting a paradigm shift in therapeutic strategies. Recognizing rumination as a central mediator allows for a focused approach, addressing the multifaceted aspects of AN and opening avenues for more effective interventions to support individuals grappling with the disorder.

Keywords: Behavioral inhibition, Approach systems, Metacognitive beliefs, Rumination, Anorexia nervosa, Attachment styles

***Corresponding Author:** Alireza Mohammadi Arya, Department of Preschool, university of social welfare and Rehabilitation Sciences, Tehran, Iran. Email: Mohammadiarya@yahoo.com.
ORCID: 0000-0001-1987-0079

Please cite this article as: Kashani Vahid S, Mohammadi Arya A, Abolmaali Alhosseini K. The Mediating Role of Rumination in Structural Model of Anorexia Nervosa. *Int. J. Appl. Behav. Sci.* 2023;10(3):39-48.

Introduction

Pica, rumination, avoidant/restrictive food intake disorder, anorexia nervosa (AN), bulimia nervosa (BN), and binge-eating disorder (BED) are all feeding and eating disorders; AN is a severe mental disorder characterized by an intense fear of gaining weight, significant weight loss, and distorted body image (1-6). According to studies, more than half of the population engages in harmful weight-control practices such as improper meal preparation, food substitution (powder or a specific drink), and excessive smoking. Furthermore, up to 20% of the population reported more intense weight-loss measures, such as self-imposed vomiting, fasting, diet pills, laxatives, and diuretics. AN is most common during puberty (adolescence), and it primarily affects girl teens and young women (7). The origin of this condition appears to incorporate a number of social, biological, and developmental factors, the clinical features of which have been well-confirmed from both physical and psychological perspectives (8-10). One of the diagnostic aspects of AN is the inability to maintain the lowest normal body weight, an unabashed dread of weight increase, and significant impairment in body image or size perception, which is the most serious consequence of mortality if the condition progresses (11). Epidemiological research (12) in Western nations show that the prevalence of anorexia, bulimia nervosa, and binge eating disorder is 6, 1, and 17.1 percent, respectively. Eating disorders affect 10.8% of Hong Kong residents and 17% of Chinese citizens (13). In 3100 samples, an epidemiological investigation of eating disorders found 9% AN, 23.3% BN, and 63.6% subclinical eating disorders (14). In other research, the incidence of AN and BN in Tehran high school girls was found to be 9% and 2.3%, respectively (15); while the prevalence of AN in Arak city female and male athletes was reported to be 8.89% and 87.3%, respectively (16).

Experts and clinical researchers have been interested

in analyzing cognitive patterns and thoughts in emotional disorders and their function in the persistence of these diseases in recent years; rumination is one of these patterns. Rumination (17) is a group of repeating ideas that inhibit adaptive problem-solving and contribute to an increase in negative thoughts (18); they enter awareness automatically and deflect attention from the symptoms. Disturbing ideas, pictures, and impulses contribute to confusion when they are vital to a person and are related with negative automatic thinking, according to Beck (18).

Another crucial element is metacognition, a multidimensional notion that incorporates information, patterns, and techniques for controlling, evaluating, or monitoring cognitive function (19-21). Experts frequently separate two types of metacognitions: metacognitive beliefs and metacognitive monitoring. Metacognitive belief is information regarding people's self-awareness and learning techniques. Executive processes such as attention, control, planning, and recognizing faults in performance are examples of metacognitive monitoring. Positive views about worry (22), cognitive self-efficacy, cognitive self-awareness, negative beliefs about uncontrollability and danger, and beliefs about the need to manage thoughts (23) are all components of metacognition. For example, suppressing thoughts about weight and food is a typical metacognitive assumption among persons with AN. Some patients feel that worrying is vital to prevent loss of control and weight increase, while others believe that worrying excessively about weight makes them appear foolish (24); Furthermore, metacognitive beliefs contribute to the persistence of anxiety and harmful behaviors such as frequent weighing and mental concern with the amount of food consumed (25-29). Ruminative thinking is an obsessive thought that includes undesired, intense, and tiresome ideas or themes that interfere with other psychological processes. It is a common feature of several emotional illnesses, including MDD, GAD, OCD, BDD, and AN (30-34).

The cognitive and affective behaviors of the personality's neuropsychological systems should also be addressed while explaining AN. One of the most important personality models is Jeffrey Gray's reinforcement sensitivity hypothesis (35). Gray's model comprises behavioral approach (BAS), behavioral inhibition (BIS), and fight-flight-freeze systems (FFFS) in the most recent iteration. The BAS is still in charge of reacting to all positive stimuli. The BAS and FFFS, on the other hand, are considerably different (36) and connected to stress (37). Furthermore, the FFFS reacts to all irritating stimuli (conditional and unconditioned) as well as penalties associated with the stimulus and is associated with fear (38-41). The highest level of activity in these systems is related with various people's emotional experiences. They are, for example, agitated and unable to address the situation successfully (42). As a result, we infer that BAS and BIS are related to AN.

One of the essential aspects in the occurrence of AN is the parent's responsiveness to the kid's demands throughout childhood, which results in attachment styles in the child; attachment styles may also be said to be connected with AN. Attachment types (43-45) have also been shown to be connected to other variables in our model (figure 1). Secure attachment, insecure-avoidant attachment, and insecure-anxious or ambivalent attachment are the three basic attachment styles (46). The attachment theory refers to the nature of the child's interaction with his primary caregiver and the significance of this relationship in shaping a person's personality and worldview. During the recurrence of events relevant to the child's attachment profile, he forms a mental representation, or "internal functional models" of himself and others, according to this hypothesis (47). If the attachment system is enabled after these models are established, these models will also be activated and direct the person's behavior. The differences in people's attachment behaviors or attachment styles are thought to reflect differences in their underlying functional models (48). Given the significance of AN disease and its impact on mental health, the current study sought to investigate the structural link of sensitivity to reinforcement, metacognitive beliefs, and attachment types with AN

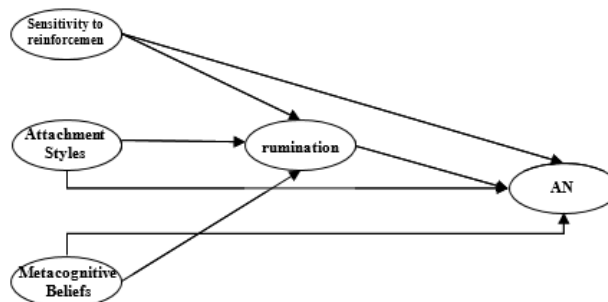


Figure 1. The proposed model of AN.

via rumination mediation. We seek the of this question that "is there a relationship between reinforcement sensitivity, metacognitive beliefs, and attachment styles with AN with the mediation of rumination?"

Methods

This research is a correlational descriptive study of the type of modeling research. The statistical population of the present study includes the students in Tehran. The research sample was a multi-stage cluster sampling from Tehran's north, south, west, east, and center. As a rule of thumb, the suggested sample size for studies that use structural equations using partial least squares (PLS) is 100 people (49); In this research, the sample size was determined in G*Power software. Based on this, the initial sample size for structural equations with a predicted effect size of 0.1, a power of 0.95, one hidden variable, six indicator variables, and a confidence interval level of 0.01, the sample size was 204 people as the minimum sample size. The participants included 215 girl students who completed the following questionnaires on the Google-docs platform.

Materials

Eating Disorder Diagnostic Scale

The eating disorder diagnostic scale (EDDS) was developed by Esties et al. (50). This scale consists of three subscales to measure the symptoms of AN, BN and BED. It is designed and provides diagnosis for these disorders at both clinical and non-clinical levels. This scale has strong criterion, predictive and convergent validity, and also the reliability of EDDS is acceptable based on test-retest method and internal

consistency (50). In this study, Cronbach's alpha coefficient of AN subscale was 0.89.

Adult Attachment Scale

The adult Attachment Scale (AAS) is an 18-item self-report measure developed by Collins and Read (51) to identify three attachment styles: secure, avoidant, and anxious/ambivalent. In Iran, Besharat(52) obtained Cronbach's alpha coefficients of three secure, avoidant, and anxious/ambivalent styles in this test in a sample of 300 students of Tehran University, respectively, 0.85, 0.84, and 0.85. The retest validity in four weeks for the subscales was 0.87, 0.83, and 0.84, respectively, which is good validity for this test.

Reinforcement Sensitivity Theory

The Reinforcement Sensitivity Theory (r-RST) is a 30-item scale that Jackson (53) developed in 2009. This questionnaire includes five subscales of a BIS, BAS, fight, flight, and freeze. For each subscale of r-RST, six items are considered. By exploratory and confirmatory factor analysis (CFA), Jackson measures these subscales; the results also indicated good internal reliability and construct validity. The r-RST (45) standardized(54). The Cronbach's alpha ranged from 0.72 to 0.88 for subscale; The test-retest coefficient of 0.64 to 0.78 was reported for the test components. Exploratory and confirmatory factor analysis (EFA) supported the 5-factor structure of the questionnaire. In this research, two subscales of BAS and BIS were used.

Ruminative Responses Scale

The Ruminative Responses Scale (RRS) is a 22-item scale developed by Treynor et al.,(55). It has 22 items specified to evaluate ruminative response in three subscales. Each item is scored on a four-point Likert scale from zero "not at all" to three "always." The RRS has the validity of Cronbach's alpha method of 0.90. In Iran, Bagherinezhad et al. (56) reports psychometric properties of this scale; The correlations between the RSS with the BDI was 0.79;the Cronbach's alpha of the RRS was 0.88.

Metacognitive Beliefs Questionnaire-30

Metacognitive Beliefs Questionnaire-30 is a brief version Metacognitive Beliefs Questionnaire (MCBQ). Wells (23, 57) developed the long form of MCBQ in 1997; the MCBQ-30(57) measures people's beliefs about their thoughts with a 30-item

self-report scale. The MCBQ has five subscales: 1-positive beliefs, 2-uncontrollable and dangerous beliefs, 3-cognitive self-efficacy, 4-negative beliefs, and 5-self-awareness. In Iran, ShirinzadehDastgiri(58) reports the Persian form of MCBQ's internal consistency coefficient using Cronbach's alpha coefficient for the whole scale was 0.91 and for its subscales from 0.71 to 0.87 and the test-retest reliability of the MCBQ in four weeks for scale reported 0.73 and for its subscales in the range of 0.59 to 0.83.

The PLS method was used in SPSS and Smart-PLS software for data analysis.

Results

The number of participants in the present study was 215; The average age was 14.01, with a standard

Table 1:Fit indicators of measurement model and structural model.

Fit indices	SRMR	d-ULS	d-G	NFI	RMS Theta
Suggested value	<0.10	>0.05	>0.05	>0.80	<0.12
Estimated value of the assumed model	0.08	0.49	0.11	0.18	0.21
Estimated value of modified model	0.09	0.38	0.09	0.92	0.03

deviation of 0.83. Table-1 illustrates the fit indices.

Because it was found that the assumed model did not have a good fit, the model was modified. Then the measurement model, such as the model's reliability (internal consistency) and validity (discriminant validity), have been concerned. To check the reliability of the constructs, Fornell & Larcker (59) suggest three criteria, which include the first, the reliability of each item; the second, the composite reliability (CR) of each of the constructs, and the third, the extracted average variance (AVE). Regarding the reliability of each item, a factor load of 0.70 or more for each item in the CFA indicates a good structure, and the items should not have a significant factor load on other structures (60). Dillon-Goldstein coefficient

(pc) was used to check the CR of each structure. In Table 2, the factor loadings, CR, and AVE of each of the constructs are presented. In this table, the sub-variables with a factor load of less than 0.30 were excluded from the analysis. Therefore, the subscales of the constructs of anorexia nervosa and personal innovation did not have a significant load on other constructs.

and AAS (r=0.41). The correlation between all variables ranged from 0.000 to 0.41, and the sensitivity to reinforcement, MCB, and AAS did not associate with each other at the 0.05 level. The correlation between other research variables is significant at 0.01 level.

PLS structural model and research hypotheses are possible by examining path coefficients and R² values.

Table 2: Descriptive, validity and reliability of indices of the model.

Indicators	Mean	SD	Skewness	Kurtosis	α	AVE	CR	f ²	Q ²
SR	-	-	-	-	0.75	0.56	0.72	0.19	-
BIS	17.74	7.71	-1.24	-0.10	-	-	-	-	-
BAS	17.02	7.49	-1.21	0.11	-	-	-	-	-
Rumination	51.31	11.19	-1.15	0.06	1.00	1.00	1.00	0.15	0.15
MCB	-	-	-	-	0.90	0.50	0.73	0.20	-
P-B	12.59	7.19	-1.29	0.01	-	-	-	-	-
N-B	12.66	7.08	1.29	0.00	-	-	-	-	-
iC-B	6.36	3.48	-1.17	0.08	-	-	-	-	-
AAS	-	-	-	-	0.77	0.50	0.81	0.17	-
Avoidant	21.38	8.72	-1.26	-0.12	-	-	-	-	-
AnAmb	20.57	8.30	-1.18	0.06	-	-	-	-	-
AN	2.76	1.34	-1.20	0.14	1.00	1.00	1.00	-	0.27

SR: sensitivity to reinforcement; BIS: behavioral inhibition system; MCB: metacognitive belief; P-B: positive metacognitive belief; N-B: negative metacognitive belief; iC-B: in control belief; AAS: adult attachment styles; AnAmb: anxious ambivalence; AN: anorexia nervosa

Therefore, the values in Table 2 indicate the sufficient reliability of the structures. Srite(60), to determine the discriminant validity of constructs, recommends that the mean square of the extracted variance of a construct should be greater than the correlation of that construct with other constructs. Discriminant validity indicates that the correlation of that structure with its indicators is higher than its correlation with other structures. Table 3 presents the results related to this criterion, which indicate the appropriate validity of the constructs.

Also, the bootstrap method estimates the T-values to determine the significance of the path coefficients. Path coefficients determine the contribution of each predictor variable in explaining the variance of the criterion variable, and R² values indicate the explained variance of the criterion variable by the predictor variables.

Figure 2 illustrates the revised model for predicting anorexia nervosa. The numbers on the paths are standardized parameters. According to Figure 3, the direct effect of all predictor variables is significant at the 0.05 level. Among the variables in the model, the

Table 3: Correlation matrix and mean square root of extracted variance of variables.

Variable	1	2	3	4	5
1. AAS	0.753				
2. Anorexia	0.411	1.000			
3. MCB	0.074	0.214	0.569		
4. Rumination	0.126	0.317	0.190	1.000	
5. SR	0.096	0.327	0.004	0.200	0.763

Table 3 demonstrates that the highest correlation among the variables is the relationship between AN

Table 4: Estimation of the standardized coefficients of the direct, indirect and the whole model.

Indicator	direct effect	indirect effect	total effect	P Value
AAS	0.351	0.036	0.387	0.05
MCB	0.151	0.070	0.221	0.05
SR	0.254	0.074	0.328	0.05
Rumination	0.193	-	0.193	0.05

BIS (0.97) has the most direct effect on AN. Since the present study aimed to investigate the mediating role of rumination among the variables of SR, AAS, and MCB, Table 4 indicates the coefficients of direct, indirect, total, explained variance and significance

anorexia nervosa and are significant at the 0.01 level. The indirect effect of sensitivity to reinforcement (0.04), metacognitive beliefs (0.04), and attachment styles (0.02) on anorexia nervosa is significant at the 0.05 level, which indicates the mediating role of

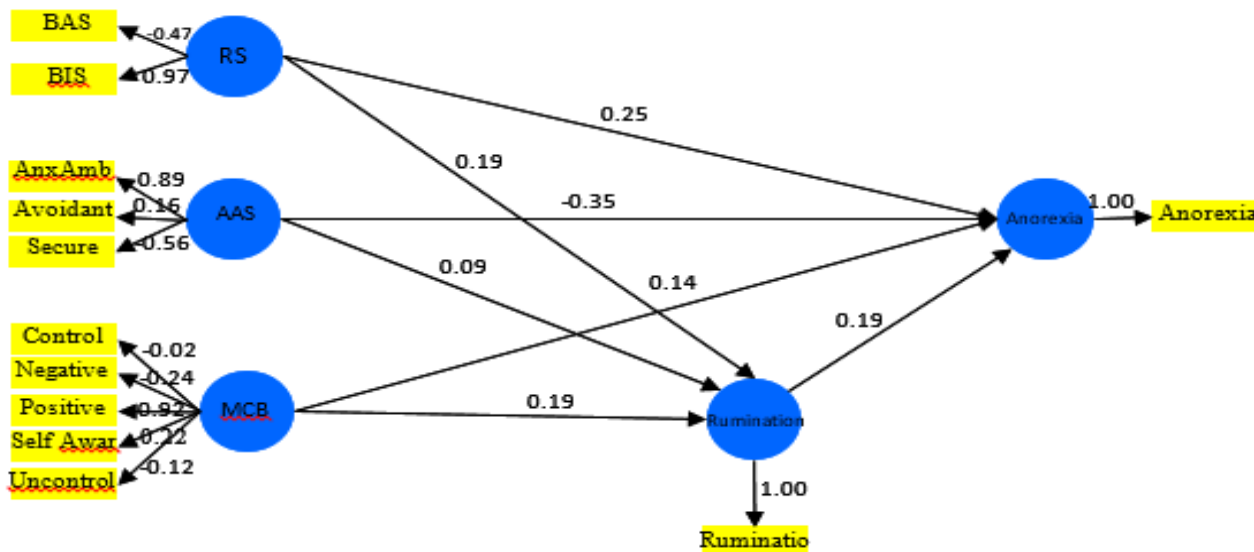


Figure 2. Proposed tested model of AN.

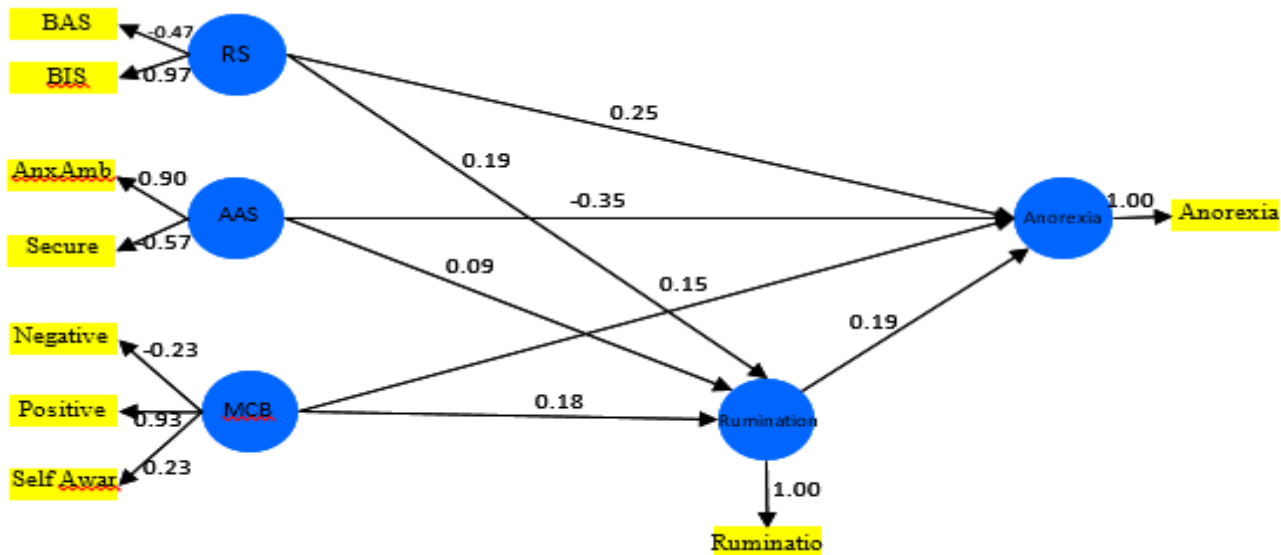


Figure 3. Modified model of anorexia nervosa.

level between the research variables. As we can see in Table 4, all four variables of sensitivity to reinforcement (0.33), metacognitive beliefs (0.22), attachment styles (0.39), and rumination (0.19) have a significant direct effect on

rumination.

Discussion

The present study aimed to determine the mediating

role of rumination in the structural relationship between sensitivity to reinforcement, metacognitive beliefs, and parenting styles with anorexia nervosa. The results showed that this model has an acceptable fit. In this regard, the structural model data analysis showed that positive metacognitive beliefs are positively related to anorexia nervosa. This finding is consistent with the research of Griffiths et al. (22) and inconsistent with the research findings of McDermott and Rashford (27). In explaining this finding, it can be said that people with anorexia nervosa believe that worry can protect a person from losing control and gaining weight (24).

This study also showed a moderate and significant association between ambivalent/anxious and secure attachment styles with AN. However, our results are inconsistent regarding whether avoidant type of attachment are associated with AN. In a review of research, Tasca and Balfour (43) concluded that anxious/ambivalence attachment style is associated with higher level of eating disorder symptoms and is a factor that increases the risk of eating disorders beyond diagnosis. Several studies using clinical and subclinical samples have explored the mechanisms by which attachment styles may lead to increased symptoms of the AN. Tasca and his colleagues (44) found that emotional hyperactivation mediates the relationship between attachment anxiety and eating disorder symptoms.

The analysis of the model disclosed that metacognitive thought control has a positive relationship with AN. This finding is consistent with the studies of McDermott and Rushford (27), Olstad et al. (28), Davenport et al. (26), and Zeinodini et al. (29). In explaining this finding, it can be said that people try to control their thoughts to avoid the negative consequences of their thoughts. These people try not to think about their appearance, weight, and eating or suppress these thoughts. On the other hand, The Self-Regulatory Executive Function (S-REF) model hypothesizes that some maladaptive coping strategies, including redundant negative thoughts (wishful thinking, worry, rumination), perpetuate mental distress. These dysfunctional and maladaptive forms of coping are termed "cognitive attention syndrome" (CAS) (17). The CAS is a repetitive thinking style that can manifest as

ineffective coping strategies and behaviors such as suppression of thoughts, avoidance, or distraction. This syndrome has consequences that lead to the continuation of negative emotions and the strengthening of negative thoughts. Usually, cognitive-attentional syndrome causes the feeling of threat to persist in people; In other words, the same feeling of threat causes AN to last.

They are activated and maintained by metacognitive beliefs (i.e., the information individuals have about their cognition and coping). CAS is problematic because it leaves a negative cognitive-emotional condition in consciousness that is not automatically resolved, and self-belief about mind control is not modified. Given the association between rumination and AN and the association between metacognitive beliefs and AN and maladaptive eating behavior (17), the rumination suggests a mediator role for BAS/BIS, MCB, and AS in the structural model of AN.

Conclusion

In conclusion, this study delved into the intricate relationships between sensitivity to reinforcement, metacognitive beliefs, parenting styles, and anorexia nervosa (AN), aiming to identify the mediating role of rumination. The analysis revealed that the proposed model exhibited an acceptable fit. Notably, positive metacognitive beliefs demonstrated a positive association with AN, aligning with Griffiths et al.'s research but contradicting McDermott and Rashford's findings. This incongruity may stem from individuals with AN perceiving worry as a protective mechanism against loss of control and weight gain.

Further insights emerged regarding attachment styles, indicating a moderate and significant link between ambivalent/anxious and secure attachments with AN. However, the association between avoidant attachment and AN displayed inconsistency, contrasting findings from Tasca and Balfour. Examining attachment anxiety, Tasca and colleagues proposed that emotional hyperactivation mediated the relationship between attachment anxiety and eating disorder symptoms, adding depth to our understanding of these connections.

Analyzing metacognitive thought control, the study uncovered a positive relationship with AN, consistent

with multiple studies. This aligns with the Self-Regulatory Executive Function (S-REF) model, which posits that maladaptive coping strategies, including cognitive attention syndrome (CAS), perpetuate mental distress in AN. CAS, characterized by repetitive and ineffective thinking styles, serves as a mediator, activating and sustaining negative cognitive-emotional conditions. Rumination, with its links to BAS/BIS, metacognitive beliefs, and attachment styles, emerges as a central mediator in the structural model of AN. This study contributes valuable insights to our understanding of the nuanced interplay of psychological factors in the manifestation and perpetuation of AN, suggesting potential avenues for targeted interventions and treatment strategies.

Acknowledgment

None.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

1. ApA. Diagnostic and Statistical Manual of Mental Disorders. 5-TR ed. Washington DC: American psychiatric Association; 2022.
2. Crone C, Fochtmann LJ, Attia E, Boland R, Escobar J, Fornari V, et al. The American Psychiatric Association Practice Guideline for the Treatment of Patients With Eating Disorders. *American Journal of Psychiatry*. 2023;180(2):167-71.
3. Barakat S, McLean SA, Bryant E, Le A, Marks P, Aouad P, et al. Risk factors for eating disorders: findings from a rapid review. *J Eat Disord*. 2023;11(1):8.
4. Azari S, Abdolmanafi A, Zeinodini Z, Poursharifi H. Comparison of health-related quality of life between obese women with binge eating disorder and obese women without binge eating disorder. *Int J Behav Sci*. 2017;3(3):47-51.
5. Sajadi F, Khabir L, Aflakseir A. The prevalence, intensity of DSM-V feeding and eating disorders and its sub-thresholds among women. *Int J Behav Sci*. 2016;3(1):25-30.
6. Gorgas DL. Eating disorders. *Emerg Med Clin*. 2024;42(1):163-79.
7. Calzo JP, Austin SB, Micali N. Sexual orientation disparities in eating disorder symptoms among adolescent boys and girls in the UK. *Eur Child Adolesc Psychiatry*. 2018;27(11):1483-90.
8. Herpertz-Dahlmann B. Adolescent eating disorders: update on definitions, symptomatology, epidemiology, and comorbidity. *Child Adolesc Psychiatr Clin N Am*. 2015;24(1):177-96.
9. Au ES, Cosh SM. Social media and eating disorder recovery: An exploration of Instagram recovery community users and their reasons for engagement. *Eat Behav*. 2022;46:101651.
10. Springmann M-L, Svaldi J, Kiegelmann M. A qualitative study of gendered psychosocial processes in eating disorder development. *Int J Eat Disord*. 2022;55(7):947-55.
11. Sadock BJ, Sadock VA, Ruiz P. Kaplan & Sadock's synopsis of psychiatry: behavioral sciences/clinical psychiatry 11 ed. Philadelphia: Wolters Kluwer; 2015.
12. Silén Y, Keski-Rahkonen A. Worldwide prevalence of DSM-5 eating disorders among young people. *Curr Opin Psychiatry*. 2022;35(6):362-71.
13. Feng T, Abebe DS. Eating behaviour disorders among adolescents in a middle school in Dongfanghong, China. *J Eat Disord*. 2017;5:47.
14. Shayeghian Z, Aguilar-Vafaie ME, RasoolzadehTabatabaie K. Core maladaptive schemas and parental bonding among female adolescent with normal weight, overweight and anorexia symptoms. *Pajoohandeh*. 2011;16(1):30-8.
15. Safarzade S, Mahmoody Khorandi Z. Survey on Eating Disorders (Mental Anorexia, Bulimia) among 13-18-Year-Old Adolescents of Gonabad City in 2014. *RUMS_JOURNAL*. 2015;14(5):393-404.
16. Farzaneh Dehkordi SS, Jamilian A. The Prevalence of Body Dysmorphic Disorder and Eating Disorder among Body-building and Fitness Athletes in Aarak. *Journal of Clinical Sport Neuropsychology*. 2022;2(2):0-.
17. Palmieri S, Mansueto G, Scaini S, Caselli G, Sapuppo W, Spada MM, et al. Repetitive Negative Thinking and Eating Disorders: A Meta-Analysis of the Role of Worry and Rumination. *J Clin Med*. 2021;10(11):2448.
18. Vesal M, Godarzi MA. Examining the predicting suicidal thoughts model based on stressful life events and depressive mediated rumination. *JTBSP*. 2016;10(38):57-66.
19. Entezari S, Taher M, Aghaei H. The Comparison of the Effectiveness of Cognitive Behavioral Therapy and Metacognitive Therapy on Depression, Suicide Ideation, and Masochistic Aggression in Individuals with Subclinical Symptoms of Body Dysmorphic Disorder. *childmh*. 2021;7(4):1-18.
20. Alavizadeh SM, Sobhi Gharamaleki N, Mami S, Mohammadzadeh J, Ahmadi V. The comparison impact of Metacognitive Therapy-Based Group Intervention and Group Acceptance-Based Behavioral Therapy on Psychophysiological Signs of Professional Soccer Players in the U-19 League in Tehran. *Zahedan J Res Med Sci*. 2020;22(2):e92514.
21. Alavizadeh SM, Sobhi Gharamaleki N, Mami S, Mohammadzadeh J, Ahmadi V. The comparison of group Metacognitive Therapy and group Acceptance Based Behavioral Therapy on Competitive Anxiety of Soccer Athletes in Tehran. *IJMBS*. 2021;1(1).
22. Griffiths S, Mond JM, Murray SB, Touyz S. Positive beliefs about anorexia nervosa and muscle dysmorphia are associated with eating disorder symptomatology. *Aust N Z J Psychiatry*. 2015;49(9):812-20.

23. Wells A. *Metacognitive therapy for anxiety and depression*. New York: Guilford Press; 2009.
24. Woolrich RA, Cooper MJ, Turner HM. Metacognition in patients with anorexia nervosa, dieting and non-dieting women: a preliminary study. *Eur Eat Disord Rev*. 2008;16(1):11-20.
25. Cooper MJ, Grocutt E, Deepak K, Bailey E. Metacognition in anorexia nervosa, dieting and non-dieting controls: a preliminary investigation. *Br J Clin Psychol*. 2007;46(Pt 1):113-7.
26. Davenport E, Rushford N, Soon S, McDermott C. Dysfunctional metacognition and drive for thinness in typical and atypical anorexia nervosa. *J Eat Disord*. 2015;3:24.
27. McDermott CJ, Rushford N. Dysfunctional metacognitions in anorexia nervosa. *Eat Weight Disord*. 2011;16(1):e49-55.
28. Olstad S, Solem S, Hjemdal O, Hagen R. Metacognition in eating disorders: comparison of women with eating disorders, self-reported history of eating disorders or psychiatric problems, and healthy controls. *Eat Behav*. 2015;16:17-22.
29. Zeinodini Z, Sedighi S, Baghertork Rahimi M, Noorbakhsh S, Rajezi Esfahani S. Dysfunctional Metacognitive Beliefs in Body Dysmorphic Disorder. *Glob J Health Sci*. 2015;8(3):10-6.
30. Zhang R, Kranz GS, Zou W, Deng Y, Huang X, Lin K, et al. Rumination network dysfunction in major depression: A brain connectome study. *Prog Neuropsychopharmacol Biol Psychiatry*. 2020;98:109819.
31. Clayton M, Renna ME, Klemanski DH, Kerns C, McLaughlin KA, Mennin DS. The Impact of Emotion Regulation on the Relationship Between Momentary Negative Affect and End-of-Day Worry and Rumination. *Cognit Ther Res*. 2023;47(1):94-108.
32. Raines AM, Vidaurri DN, Portero AK, Schmidt NB. Associations between rumination and obsessive-compulsive symptom dimensions. *Pers Individ Differ*. 2017;113:63-7.
33. Dehghan Sarvolia N, Dehghani A. Role of Early Maladaptive Schemas and Attachment Styles in the Prediction of Thoughtful Rumination in Individuals with Body Dysmorphic Disorder. *JRH*. 2019;9(7):568-74.
34. Fresnics AA, Wang SB, Borders A. The unique associations between self-compassion and eating disorder psychopathology and the mediating role of rumination. *Psychiatry Res*. 2019;274:91-7.
35. Gray JA, McNaughton N. *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. Oxford: Oxford University Press; 2000.
36. Zhao J, Harris M, Vigo R. Anxiety and moral judgment: The shared deontological tendency of the behavioral inhibition system and the unique utilitarian tendency of trait anxiety. *Pers Individ Differ*. 2016;95:29-33.
37. Krupić D, Gračanin A, Corr PJ. The evolution of the Behavioural Approach System (BAS): Cooperative and competitive resource acquisition strategies. *Personality and Individual Differences*. 2016;94:223-7.
38. Claes L, Nederkoorn C, Vandereycken W, Guerrieri R, Vertommen H. Impulsiveness and lack of inhibitory control in eating disorders. *Eat Behav*. 2006;7(3):196-203.
39. Harnett PH, Loxton NJ, Jackson CJ. Revised reinforcement sensitivity theory: Implications for psychopathology and psychological health. *Pers Individ Differ*. 2013;54:432-7.
40. Morton RD, White MJ. Revised reinforcement sensitivity theory: The impact of FFFS and stress on driving. *Pers Individ Differ*. 2013;54(1):57-63.
41. Jappe LM, Frank GKW, Shott ME, Rollin MDH, Pryor T, Hagman JO, et al. Heightened sensitivity to reward and punishment in anorexia nervosa. *Int J of Eat Disord*. 2011;44(4):317-24.
42. Cutrona CE, Russell DW. Autonomy promotion, responsiveness, and emotion regulation promote effective social support in times of stress. *Curr Opin Psychol*. 2017;13:126-30.
43. Tasca GA, Balfour L. Attachment and eating disorders: A review of current research. *Int J Eat Disord*. 2014;47(7):710-7.
44. Tasca GA, Szadkowski L, Illing V, Trinneer A, Grenon R, Demidenko N, et al. Adult attachment, depression, and eating disorder symptoms: The mediating role of affect regulation strategies. *Pers Individ Differ*. 2009;47(6):662-7.
45. Tasca GA. Attachment and eating disorders: a research update. *Curr Opin Psychol*. 2019;25:59-64.
46. Bowlby J. Attachment and loss: Retrospect and prospect. *Am J Orthopsychiatry*. 1982;52:664-78.
47. Vander Zanden JW. *Human development*, 5th ed. New York, NY, England: Mcgraw-Hill Book Company; 1993. xvii, 705-xvii, p.
48. Şenormancı Ö, Konkan R, Güçlü O, Şenormancı G. Two Cases of Excessive Internet Use with Comorbid Family Relationship Problems. *Noro Psikiyatrs Ars*. 2014;51(3):280-2.
49. Soper DS. A-priori Sample Size Calculator for Structural Equation Models 2020 [Available from: <https://www.danielsoper.com/statcalc>].
50. Stice E, Fisher M, Martinez E. Eating disorder diagnostic scale: additional evidence of reliability and validity. *Psychol Assess*. 2004;16(1):60-71.
51. Collins NL. Revised adult attachment scale. *Behav Ther*. 1996.
52. Besharat MA. Adult Attachment Inventory: Questionnaire, Instruction and Scoring Key (Persian Version). *Journal of Developmental Psychology: Iranian Psychologist*. 2013;9(35):317-20.
53. Jackson CJ. Jackson-5 scales of revised Reinforcement Sensitivity Theory (r-RST) and their application to dysfunctional real world outcomes. *J Res Pers*. 2009;43(4):556-69.
54. Hasani J, Salehi S, Rasoli Azad M. Psychometric Properties of Jackson's Five Factor Questionnaire: Scales of revised Reinforcement Sensitivity Theory (r-RST). *rph*. 2012;6(3):60-73.
55. Treynor W, Gonzalez R, Nolen-Hoeksema S. Rumination reconsidered: A psychometric analysis. *Cogn Ther Res*. 2003;27:247-59.
56. Bagherinezhad M, Salehi Fadardi J, Tabatabayi SM. The relationship between rumination and depression in a sample of Iranian student. *Res Clin Psychol Couns*. 2010;011(1).
57. Cartwright-Hatton S, Wells A. Beliefs about Worry and Intrusions: The Meta-Cognitions Questionnaire and its Correlates. *J Anx Disord*. 1997;11(3):279-96.
58. Shirinzadeh Dastgiri S, Goudarzi M, Rahimi C, Naziri G. Study of Factor Structure, Validity and Reliability of Metacognition Questionnaire-30. *Journal of Psychology*. 2012;12(4):445-61.
59. Fornell C, Larcker DF. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *J Mark Res*. 1981;18(1):39-50.

60. Srite M, editor The Influence of National Culture on the Acceptance and Use of Information Technologies: An Empirical Study 1999.

© Sara Kashani Vahid, Alireza Mohammadi Aria, Khadijeh Abolmaali Alhosseini, et al. Originally published in the International Journal of Applied Behavioral Sciences (<https://journals.sbm.ac.ir/ijabs/index>), 2021. This article is an open-access article under the terms of Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>); the license permits unlimited use, distribution, and reproduction in any medium, provided the original work is properly cited in the International Journal of Applied Behavioral Sciences. The complete bibliographic information, a link to the original publication on <https://journals.sbm.ac.ir/ijabs/index>, as well as this copyright and license information must be included.