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ORIGINAL ARTICLE

Attachment, rumination, and disordered eating among adolescent girls: The moderating role of stress

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Abstract

Purpose Disordered eating behaviors are prevalent and problematic in adolescent girls. Given that disordered eating has been linked to attachment insecurity and emotion dysregulation, the current study used an emotion regulation model of attachment theory to investigate pathways to disordered eating among adolescent girls. While past research has examined attachment and eating, an emotion regulation perspective is rarely used. Additionally, limited studies have investigated specific types of eating or mediators or moderators. To address these research gaps, this study examined whether rumination mediates the relationship between attachment anxiety and avoidance and three types of disordered eating and whether stress moderates this mediation.

Methods 100 adolescent girls ($M_{age} = 14.35$ years, $SD = 2.29$) completed online surveys including the Relationship Structures Questionnaire, Dutch Eating Behaviour Questionnaire, Rumination Questionnaire, and Perceived Stress Scale.

Results The interaction between stress and attachment anxiety on rumination was significant ($b = .09$, $SE = .04$, $p < .05$), and stress and attachment anxiety predicted emotional eating through rumination ($b = .50$, $SE = .15$, $p < .05$). Rumination also predicted external eating ($b = .32$, $SE = .11$, $p < .05$). The mediation was not significant for restrained eating. Attachment avoidance did not significantly predict eating behaviors.

Conclusion The emotion regulation model of attachment theory provides a suitable framework for studying disordered eating in adolescent girls. Future research may continue the use of this framework to examine related topics. Clinicians treating girls experiencing disordered eating may use interventions to promote healthy emotion regulation strategies.

Level of evidence Level V: cross-sectional descriptive study.

Keywords Attachment · Eating · Rumination · Stress · Adolescence

Introduction

Obesity is an increasingly prevalent problem that is associated with negative physical and mental health comorbidities [1]. Disordered eating behaviors are associated with obesity, and they are especially common in adolescent girls. In a large sample study, 57% of girls reported engaging in unhealthy weight control behaviors and 12% in extreme behaviors (e.g. taking diet pills, laxatives, or diuretics, or vomiting) [2]. Longitudinal research has shown that these behaviors remain constant throughout adolescence and early adulthood [3] and are associated with negative physical and psychological outcomes, like obesity and depression, in both clinical [4] and non-clinical populations [5, 6]. Researchers have conceptualized disordered eating behaviors into three major types: *restrained, emotional, and external* eating. Restrained eating refers to an intentional restriction of calories to avoid weight gain. Emotional eating is used to describe a type of disinhibited eating in response to internal cues such as sadness and anger. Another type of disinhibited eating is external eating, which refers to eating in response to environmental cues such as food or people [7]. Although emotional and external eating often co-occur, they are considered to be two independent constructs [8].

Attachment theory has been utilized as a framework for studying many different types of psychopathology, including disordered eating [9]. Attachment theory [10] proposes that individuals develop attachment styles with regard to their caregivers early in life. These attachment styles will

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influence individuals' emotion regulation capability and subsequently, their psychological adjustment [11]. Individual differences in attachment styles can be captured with a two-dimensional model underlined by attachment anxiety and attachment avoidance. Attachment anxiety is defined by individuals' tendency to feel worried about the availability and approval of attachment figures. Attachment avoidance is defined by individuals' tendency to feel uncomfortable with closeness and have a sense of mistrust in close relationships. Many studies have shown relationships between attachment styles and disordered eating in adolescents. In a review of studies investigating children and adolescents, Jewell et al. [9] found a correlation between higher attachment insecurity and more eating pathology in 14 out of 15 studies. This connection was found across various types of disordered eating behaviors, including restrained, emotional, and external eating. While most of the research demonstrated this link using categorical measures of attachment (i.e., secure versus insecure), some of the research measured attachment using the two-dimensional model (i.e., levels of anxiety and avoidance). These studies suggest that relationships between attachment anxiety and eating pathology seem to be stronger in adolescents than between attachment avoidance and eating pathology [12–14].

Shaver and Mikulincer [15] used attachment theory to describe how individuals regulate emotions. According to their model, individuals high on anxiety tend to be hypervigilant towards distress, ruminate on negative thoughts and emotions, and display passivity rather than action. Individuals high on avoidance are likely to deactivate distress and suppress emotions related to it. This suggests that one of the factors that mediates the relationship between attachment insecurity and disordered eating in adolescents may be emotion dysregulation [16]. Establishing healthy emotion regulation strategies is a key developmental task of adolescence [17]. Although some studies have investigated the mediating role of maladaptive emotion regulation in general in the relationship between attachment insecurity and disordered eating in adolescents [16], few studies have examined specific styles of emotion regulation. One specific type of maladaptive emotion regulation is rumination or the process of repeatedly and passively focusing on one's distress [18]. Compared to other emotion regulation strategies, rumination has been most strongly linked to psychopathology [19]. While rumination has been extensively studied in the depression literature, it has been less examined in the field of eating pathology, especially in adolescent populations. Adolescent girls, in particular, are at risk for rumination as compared to their male peers, beginning in early adolescence [20].

Some research has linked rumination to eating pathology in adolescents [21, 22]. However, there are only two studies that have investigated rumination as a mediator in the relationship between attachment insecurity and eating pathology in adolescents. Hilt et al. [23] found that rumination mediated the relationship between peer alienation, which is indicative of insecure attachment and eating pathology in adolescent girls. Van Durme and colleagues [24] found that rumination mediated the relationship between attachment anxiety and symptoms of bulimia in adolescents. Interestingly, emotional control, not rumination, mediated the relationship between attachment avoidance and symptoms of bulimia.

As pointed out by Shaver and Mikulincer's model [15], stressors activate the attachment system and relevant coping behaviors. It is particularly important to consider stress when studying adolescents given that they are more likely to experience stress than any other age group [25]. Additionally, girls are particularly vulnerable to stress compared to boys [26, 27]. Stress, including perceived and objective, has been regularly suggested as a potential contributor to disordered eating, including restrained, emotional, and external, in adolescents [28]. Importantly, these findings seem stronger among girls than boys [29, 30]. In accordance with the diathesis-stress model [31], attachment insecurity may interact with stress to contribute to increased rumination. More rumination could in turn lead to more disordered eating behaviors. Indeed, research has shown that adolescents who are insecurely attached cope with stress in unhealthier ways than those who are securely attached [32]. Studies have also shown that adolescents who experience more stress also ruminate more [33]. Adolescents who are insecurely attached may not have healthy coping strategies to deal with stressors, and thus may use unhealthy strategies such as rumination. This rumination may, in turn, lead to more disordered eating practices. Despite the evidence suggesting that stress may play a role in relationships between attachment insecurity, rumination, and eating pathology in adolescents, no research has examined all of these factors together.

Current study

Disordered eating behaviors during adolescence are associated with detrimental physical and psychological outcomes including obesity and depression [4–6]. According to the emotion regulation model of attachment theory [15], eating pathology may result from insecurely attached individuals' use of unhealthy emotion regulation strategies such as rumination in the face of stress. Although multiple researchers hypothesize that emotion regulation difficulties may play a role in the relationship between insecure attachment and disordered eating [16, 34], few studies have investigated rumination as a mediator in this relationship. Additionally, while much research has implicated stress in the etiology of disordered eating [28], few studies have examined the interactive role of stress and attachment insecurity in predicting

eating pathology. Finally, few studies have focused directly on adolescent girls, which is a population that is particularly vulnerable to disordered eating [1]. Given these gaps in the literature, the current study examined relationships between attachment, rumination, stress, and eating behaviors in adolescent girls.

It is hypothesized that higher attachment anxiety, higher attachment avoidance, and higher stress will be related to more restrained, emotional, and external eating. We propose that rumination will mediate the relationship between anxious attachment, avoidant attachment, and disordered eating, such that adolescent girls who are more anxious or avoidant will ruminate more and in turn engage in more disordered eating (see Fig. 1, simple mediation model). These processes may occur in line with Shaver and Mikulincer's model [15] as follows: an individual who is anxiously attached may worry excessively about others' approval of their body (hyperactivate distress), and thus ruminate about their body and eating habits. This could lead to disordered eating behaviors. Avoidant girls may also ruminate about their body and eating habits because they want to appear healthy and perfect to others (minimize distress), and thus may also engage in disordered eating behaviors. Additionally, we hypothesize that stress will interact with attachment anxiety and avoidance in the prediction of rumination and, in turn, their disordered eating (restrained, emotional, external). Specifically, high stress will be particularly detrimental to individuals with high attachment anxiety or avoidance in predicting higher levels of rumination and in turn, their restrained, emotional, and external eating (see Fig. 1, moderated mediation model).

Method

Procedures

Mother-daughter dyads were recruited from a Midwestern metropolitan area, USA. Participation in the study was restricted to mothers who (a) had an adolescent daughter between the ages of 11 and 18 and (b) typically conversed in English with their daughter. Flyers advertised a study for mothers and daughters about how relationships, health, and weight are related, and included the researchers' contact information. The flyers were posted on webpages (e.g., Facebook, Craigslist) and at local community centers (e.g., colleges and schools). Mother-daughter dyads interested in the study would contact the researchers to schedule a laboratory visit that took place at the investigator's department. During the laboratory visit, mother-daughter dyads were first informed about the nature and purposes of this study. Both adolescents and their mothers were then asked to provide written informed consents/assents before their participations. Following that, adolescents and their mothers were assigned to separate rooms to complete a computer-administered survey. Both members also completed two video-recorded interactions, but the observational data were not reported in the current study (see Hart and Chow [35]). Each

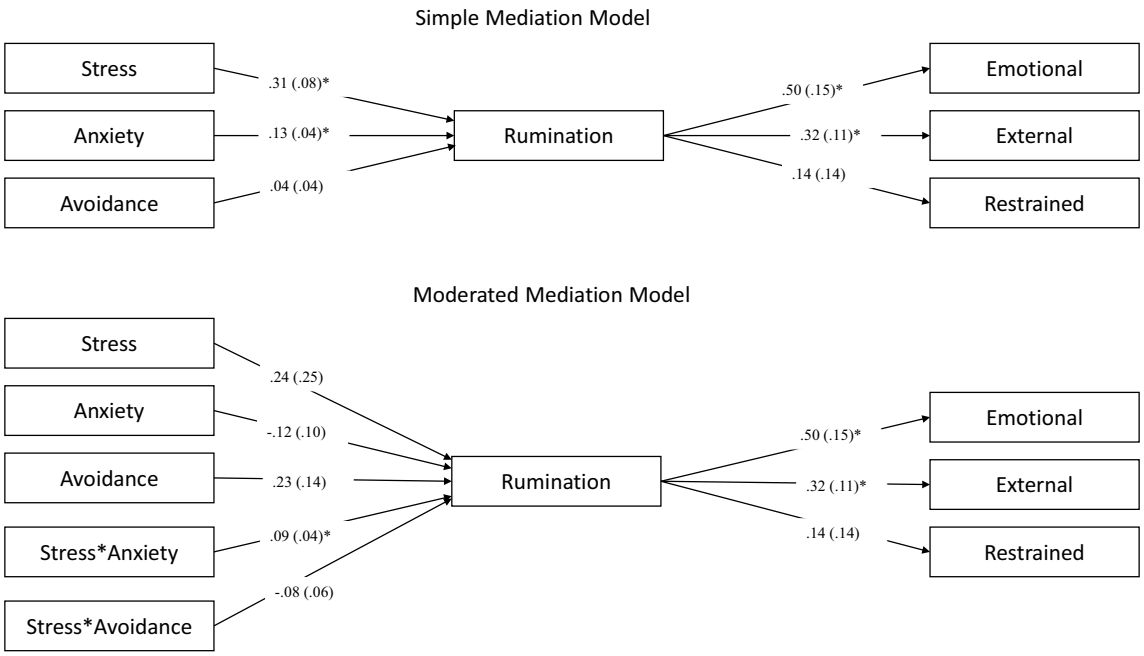

Fig. 1 Simple and moderated mediation models. Note. Although not shown, adolescent age and BMI percentile were included as covariates. All predictor variables were allowed to covary. Also, residuals of eating behaviors were allowed to covary. $*p < 0.05$

mother-daughter dyad received a $40 grocery gift card for their participation.

Participants

The current sample included 100 adolescent girls (M_{age} = 14.21 years, SD = 2.73) About 48% of the adolescents were Caucasian, followed by African American (30%), Mixed race/Other (15%), Asian (4%), Hispanic (2%), and Middle Eastern (1%). A majority of the adolescents came from middle-class families, with 79% of the mothers reporting household income of $35,000 or above and 90% of the mothers having at least some college education. With regard to marital status, 60% of the mothers reported that they were married, 14% were single, 17% were divorced, and 9% were either widowed or other relationship status. Adolescent daughters' body mass index (BMI; kg/m^2) were computed based on their self-reported weight and height (M = 23.2, SD = 6.59). To adjust for the adolescents' age, their BMI scores were converted into percentiles. For this study, adolescents' mean BMI percentile was 64.53 (SD = 27.45).

Measures

Attachment style Adolescent girls' attachment style was measured using the Relationship Structures Questionnaire (ECR-RS) [36]. This scale measures general attachment style within close relationships from two dimensions: attachment anxiety (6 items) and avoidance (3 items). An example item of attachment anxiety was "I often worry that others don't really care for me." An example item of attachment avoidance was "I don't feel comfortable opening up to others." Participants rated their agreement with each statement on a 7-item Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Higher scores on each scale reflected a higher level of attachment anxiety or avoidance, respectively. For this study, the reliability of the anxious attachment scale was α = 0.89 and the reliability of the avoidant attachment scale was α = 0.78.

Eating behaviors Adolescent girls' eating behaviors were measured by a 33-item questionnaire, Dutch Eating Behaviour Questionnaire (DEBQ) [7]. Specifically, three constructs were captured: restrained eating (10 items; e.g. "do you deliberately eat less to in order not to become heavier?"), emotional eating (13 items; e.g. "do you have a desire to eat when you are emotionally upset?"), and external eating (10 items; e.g. "if food tastes good to you, do you eat more than usual?"). Each question was answered on a Likert Scale of 1 (*never)* to 5 *(very often).* Higher average composite scores from each subscale indicated more engagement in these eating behaviors. The internal reliability for each subscale was good within this sample (restrained eating, α = 0.92; emotional eating, α = 0.94; external eating, α = 0.86).

Perceived stress The Perceived Stress Scale [37] was used to measure the perception of stress. This brief 4-item scale assesses the individual's feelings of stress over the past month (e.g. "In the last month, how often have you felt confident about your ability to handle your personal problems?"). Participants reported the frequency with which they have experienced feelings of stress on a 5-point Likert Scale ranging from 0 *(never)* and 4 (*very often*). A composite score was created by adding together the scores from each item. Higher scores indicated higher levels of perceived stress during the past month. For this study, the reliability of the scale was acceptable (α = 0.68).

Rumination Adolescent girls' tendency to ruminate was measured with Rumination Questionnaire [38]. This scale includes 22 items which assess what adolescents think or do when they "feel sad, blue or depressed." Participants rate the frequency of their engagement in rumination in response to negative emotions on a 4-point Likert scale ranging from 1 (*never*) to 4 (*always*). Example items asking participants how often they "think about all your shortcomings, failings, faults, mistakes" or how often they "think about a recent situation, wishing it had gone better." An average score was formed, with higher averages indicating more engagement in ruminative thoughts and behaviors. For this study, the reliability of the scale was good (α = 0.95).

Analysis plan

We first conducted data screening procedures to examine the multivariable normality and missing data mechanisms of the studied variables. Furthermore, descriptive statistics (including correlations) among the studied variables would be computed. In terms of model testing, we began by estimating a *simple mediation* model in which the effects of stress and attachment on eating behaviors (restrained, emotional, and external) are mediated by rumination (see Fig. 1, top model). Following that, a *moderated mediation* model would be estimated by including the interaction effects of stress-attachment avoidance and stress-attachment anxiety on rumination (see Fig. 1, bottom model). The inclusion of these interaction terms would estimate the moderated mediation effects such that the mediation effects of stress on eating behaviors (restrained, emotional, and external) through rumination vary by different levels of attachment avoidance and anxiety (i.e., − 1 SD, mean, + 1 SD). Both the mediation and moderated mediation models would be estimated with *R*'s [39] *lavaan* package [40]. Significance of the mediation and moderated mediation effects would be examined with bootstrapped 95% bias-corrected confidence intervals of 2000 re-samples. Although not displayed in Fig. 1, the

effects of age and BMI percentile on rumination and eating behaviors were controlled for in the analyses.

Results

Preliminary analysis was conducted to examine the multivariate normality and missing data mechanisms of the variables included in the model. Hawkins test revealed that both multivariate normality and missing completely at random (MCAR) assumptions have been met, $p = 0.86$ [41, 42]. Based on these findings, Maximum Likelihood (ML) estimation was used in all analyses to account for a small amount of missingness in the data [60]. Descriptive and bivariate correlations are presented in Table 1.

We began estimating a simple mediation model in which the effects of stress and attachment on eating behaviors (restrained, emotional, and external) were mediated by rumination (see Fig. 1). This model fitted the data well, $\chi^2(9) = 18.96$, $p = 0.09$, CFI = 0.96, TLI = 0.90, RMSEA = 0.09, SRMR = 0.04. Results showed that the experience of higher stress was related to more rumination. Also, adolescents who were higher on attachment anxiety, but not avoidance, engaged in more rumination. Higher rumination, subsequently, was related to more emotional eating and external eating. Rumination was not significantly related to restrained eating. Mediation analyses (see Table 2) showed that the indirect effects of stress and attachment anxiety, but not attachment avoidance, on emotional eating through rumination was significant. Indirect effects also showed that the indirect effects of stress and attachment anxiety, but not attachment avoidance, on external eating through rumination was significant. None of the indirect effects of stress and attachment on restrained eating were significant.

We then estimated a *moderated mediation* model would be estimated by including the interaction effects of stress-attachment avoidance and stress-attachment anxiety on rumination (see Fig. 1). The model fitted the data well, $\chi^2(15) = 18.96$, $p = 0.22$, CFI = 0.98, TLI = 0.95, RMSEA = 0.06, SRMR = 0.05. Results showed that the interaction effect between stress and attachment anxiety on rumination was significant. Simple slopes analysis (see Fig. 2) revealed that the association between stress and rumination was stronger for adolescents with a higher level (1 SD above mean) of attachment anxiety ($b = 0.78$, $SE = 0.30$, $p = 0.01$), compared to those with a lower level (1 SD above mean) of attachment anxiety ($b = 0.41$, $SE = 0.26$, $p = 0.11$). Subsequently, moderated mediation analyses showed that the indirect effects of stress on emotional eating through rumination were significantly moderated by attachment anxiety. Specifically, the association between stress and emotional eating through rumination was stronger for adolescents with a higher level of attachment anxiety ($b_{indirect} = 0.39$, $SE = 0.17$, $p = 0.03$, $CI_{95} = 0.10$ to 0.79), compared to those with a lower level of attachment anxiety ($b_{indirect} = 0.21$, $SE = 0.13$, $p = 0.12$, $CI_{95} = -0.01$ to 0.50). Furthermore, the indirect effects of stress on external eating through rumination were

Table 2 Indirect effects of stress and attachment on eating behaviors through rumination

Predictors	*B*	*SE*	*p*	*LL*	*UL*
	Emotional				
Stress	0.15	0.06	0.01	0.05	0.31
Anxiety	0.07	0.03	0.02	0.02	0.16
Avoidance	0.02	0.02	0.37	−0.02	0.07
	External				
Stress	0.10	0.04	0.01	0.04	0.09
Anxiety	0.04	0.02	0.03	0.01	0.09
Avoidance	0.01	0.02	0.41	−0.01	0.05
	Restrained				
Stress	0.04	04	0.33	−0.03	0.15
Anxiety	0.02	0.02	0.35	−0.01	0.07
Avoidance	0.01	0.01	0.57	−0.00	0.04

B unstandardized indirect effects, *SE* standard errors, *LL* lower limits of confidence intervals, *UP* upper limits of confidence intervals

Table 1 Descriptive statistics

	M	*SD*	1	2	3	4	5	6	7	8	9
1. Age	14.21	2.73	–	− 0.05	0.32*	0.19	0.27*	0.26*	0.23*	0.27*	0.39*
2. BMI%	64.53	27.45		–	0.08	0.09	0.04	0.14	-0.10	-0.22*	0.28*
3. Anxiety	3.79	2.00			–	0.24*	0.56*	0.62*	0.42*	0.25*	0.39*
4. Avoidance	3.97	1.35				–	0.30*	0.29*	0.06	0.00	0.25*
5. Stress	2.65	.85					–	0.60*	0.34*	0.19	0.34*
6. Rumination	2.13	.70						–	0.43*	0.37*	0.31*
7. Emotional	2.05	.86							–	0.63*	0.35*
8. External	2.95	.73								–	0.32*
9. Restrained	2.18	.90									–

*$p < .05$. BMI ($M = 23.2$, $SD = 6.59$); all parameters were estimated with Maximum Likelihood

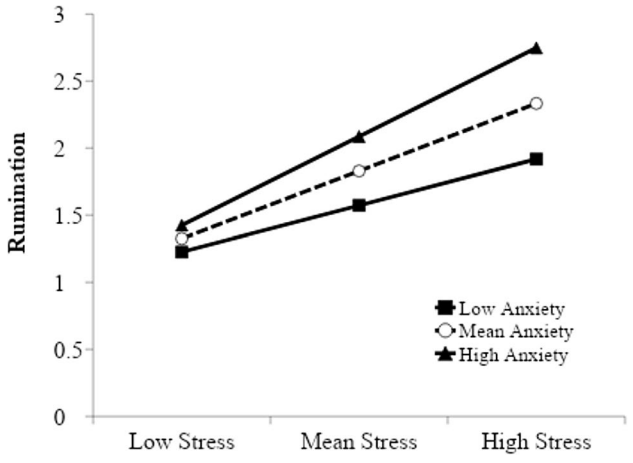

Fig. 2 Interaction between attachment anxiety and stress on rumination. Note. High = 1 SD above mean, Low = 1 SD below mean

significantly moderated by attachment anxiety. Specifically, the association between stress and external eating through rumination was stronger for adolescents with a higher level of attachment anxiety ($b_{indirect} = 0.25$, $SE = 0.12$, $p = 0.03$, $CI_{95} = 0.06$ to 0.53), compared to those with a lower level of attachment anxiety ($b_{indirect} = 0.13$, $SE = 0.09$, $p = 0.13$, $CI_{95} = -0.01$ to 0.33). However, the interaction effect between stress and attachment avoidance on rumination was not significant. Subsequently, the moderating roles of attachment avoidance on the indirect effects of stress on eating behaviors through rumination were not probed.

Discussion

This study contributes to the literature by describing how attachment theory, specifically the emotion regulation model of attachment [15], can serve as a framework for studying disordered eating in adolescents. Furthermore, the results help clarify relationships between attachment anxiety and avoidance, stress, rumination, and eating behavior including emotional, external, and restrained eating. Importantly, the study used a sample of adolescent girls, a population that is particularly vulnerable to high levels of stress, rumination, and disordered eating. While many studies have investigated eating pathology in general in adolescent girls, this is one of the few studies that has looked at emotional, external, and restrained eating specifically and concurrently. Additionally, few studies have used mediation and moderation models with these variables. Finally, although much research in other fields of psychopathology has utilized an attachment perspective, eating research incorporates attachment theory less often. Overall, this study contributes a specific and nuanced picture of eating behaviors in adolescent girls that is guided by an attachment framework. Our findings build upon and strengthen findings from past research and inform directions for future research. Additionally, the results of this study highlight areas of intervention for clinical practice with girls at risk for eating problems.

As hypothesized, results of the simple mediation showed that rumination mediated the relationship between attachment anxiety and stress with emotional and external eating. In other words, adolescent girls who experienced more attachment anxiety or higher stress also engaged in more rumination, which was related to more emotional and external eating. The relationship between attachment anxiety and disinhibited eating can be partially explained by the increased engagement in rumination among individuals with higher attachment anxiety. Rumination appears to be an ineffective and problematic coping mechanism. These findings align with the emotion regulation model of attachment that suggests that anxiously attached individuals use hyperactivating strategies such as rumination to cope with distress [15]. Additionally, these results are consistent with past research suggesting that ruminative cognitions are associated with disordered eating [43].

Results of the moderated mediation showed that stress and attachment anxiety interacted in their indirect relationship with emotional and external eating through rumination. For adolescents high in attachment anxiety, high levels of stress were particularly problematic, associated with higher rumination and, indirectly, more emotional and external eating. These results are supported by the emotion regulation model of attachment and concur with and build upon past research [24, 34, 44]. Taken together, these findings suggest that high attachment anxiety appears to be a risk factor for disinhibited eating. Particularly when stress is high, individuals with attachment anxiety appear likely to experience disinhibited cognitions (in the form of rumination) as well as behaviors (external eating in response to external cues, or emotional eating in response to the experienced distress). This may occur as individuals with anxious attachment attempt to cope with interpersonal distress using unhealthy coping methods like eating [45].

Our results did not show any significant effects for restrained eating in the simple mediation and moderated mediation models. This aligns with past research: in a meta-analysis by Smith et al. [43], relationships between rumination and restrained eating had the smallest magnitude of the association. This may be because our sample was not a clinical sample, and thus did not endorse restraint as much as the other disinhibited (external and emotional) eating.

Additionally, attachment avoidance did not play a significant role in any of the analyses. This is unsurprising, given that other studies have not found effects for dismissiveness or attachment avoidance in relationships between attachment and eating [34], and attachment and rumination [24]. In accordance with Shaver and Mikulincer's model [15], in

contrast to anxiously attached adolescents, avoidant individuals may be more likely to use deactivating strategies, including suppression of their emotions. These individuals may be less likely to experience changes in their eating based on the effects of stress and rumination. Anxious individuals, on the other hand, are prone to hyperactivating their emotions and distress, and are more likely to engage in rumination [15], as supported by the current study.

The results of this study have clear clinical implications. First, given that this research suggests that attachment styles play a role in how individuals cope with distress, clinicians should be attentive to clients' attachment styles and related coping mechanisms and use them to inform treatment. Specific attention should be paid to teens with higher attachment anxiety who experience high levels of stress, as they may be at risk for reliance on rumination and disordered eating as coping mechanisms. Within a cognitive-behavioral framework, clinicians may provide clients with psychoeducation about emotion regulation in general, and skills training on specific healthy emotion regulation strategies like problem-solving. Additionally, they may work with clients on changing the content of or decreasing ruminative thoughts. Clinicians may also provide psychoeducation about these topics to parents and assist them in supporting their teens' implementation of strategies. Further, clinicians should monitor the levels of stress their client's experience and encourage them to use healthy emotion regulation strategies during times of heightened stress. This is particularly important for weight management given that stress alone is a risk factor for disinhibited eating and obesity [46]. Since adolescents with more anxious attachment appear particularly susceptible to disinhibited eating related to stress, they are likely also at risk for increased BMI related to their disordered eating. Both clinicians and parents should monitor changes in eating and weight closely.

Limitations and future directions

This study has several limitations. First, recruitment materials specified that the study was about health, weight, and relationships. This could have resulted in selection bias such that participants were more interested in these topics than the general population. Additionally, all data were collected via self-report measures completed by adolescent girls, so the results could be biased as they are subjective accounts of the girls' experiences. More varied measures, including clinical assessment of symptomatology and other reports, may result in less biased and more accurate, clinically relevant findings. Attachment was measured by asking about close relationships in general. It may also be helpful to assess specific attachment relationships with mothers, fathers, peers and/or romantic partners, as relationship-specific patterns of an attachment may impact eating behavior and tendency to ruminate differently.

Further, the current study assumed that the characteristics measured were rater-stable and trait-like. For example, rumination was measured as trait rumination; state rumination could also be measured, and engagement in disinhibited eating as a result of rumination may be quite situational. Additionally, it may be helpful to investigate the content of ruminative thoughts. Researchers have suggested that ruminative thoughts about eating disorder-related concerns could maintain eating pathology [47, 48]. Finally, the current study used a correlational design, which limits our ability to determine the direction of relationships between the variables studied, and ultimately draw causal conclusions. While the current model is supported theoretically, it is possible that the variables could be related in a different order. More longitudinal research would help clarify the order of variables.

What is already known on this subject?

Past research has identified connections between disordered eating, rumination, stress, and attachment style in various populations. Specifically, higher levels of rumination and stress, as well as attachment insecurity, are related to disordered eating behaviors. Additional research needed to be done on the nature of the relationships between these variables.

What does this study add?

This study contributes to the literature on disordered eating, rumination, stress, and attachment style in a female adolescent population. It is unique in that it used an emotion regulation model of attachment theory to investigate all of these variables together. Additionally, it used mediation and moderation models, thus clarifying the nature of the relationships between these variables. Finally, it examined three specific types of disordered eating (*emotional, external, and restrained*) and attachment insecurity as two dimensions, which few studies have done. Implications include directions for future research and targets for clinical intervention in adolescent girls with eating disorders or subclinical eating problems, especially emotion regulation.

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Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Eastern Michigan University Human Subjects Review Committee.

Consent to participate/consent for publication Informed consent and/or assent was obtained from participants; mother provided consent if the girls were under 18.

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