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ORIGINAL ARTICLE

Attachment, mentalizing, and eating disorder symptoms in adolescent psychiatric inpatients and healthy controls: a test of a mediational model

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Abstract

Objective Research has supported a link between insecure attachment and eating disorders (EDs) in adolescents; however, mechanisms accounting for this association remain unclear. Growing evidence suggests impaired mentalizing as a potential mechanism. Yet, little is known about the relationship between mentalizing and ED symptoms or how it relates to the link between attachment and EDs in adolescents. This study examined mentalizing deficits in adolescents with ED symptoms relative to psychiatric and healthy controls and tested a mediational model, wherein mentalizing capacity mediates the relationship between attachment and ED symptoms.

Method Inpatient adolescents with EDs and other pathology ($n = 568$) and healthy controls ($n = 184$) were administered the child attachment interview, the movie for the assessment of social cognition and the diagnostic interview schedule for children to assess attachment, mentalizing and ED symptoms, respectively.

Results Inpatients showed lower attachment security and more hypermentalizing than healthy adolescents. Hypermentalizing explained the association between insecure attachment and ED symptoms.

Conclusions These findings suggest potential utility of targeting mentalizing in prevention and treatment of EDs in adolescents.

Level of evidence Level III, case-control analytic study.

Keywords Eating disorder symptoms · Mentalizing · Attachment · Adolescents · Mediation analysis

Introduction

Eating disorders (EDs), including anorexia and bulimia nervosa (AN and BN), present considerable public health concern due to their detrimental clinical and social impact [1]. EDs are associated with psychiatric and physical problems, high rates of persistence and recurrence, and elevated risk for mortality [2, 3]. Importantly, the highest incidence of EDs, specifically AN and BN, is during adolescence [4]. Therefore, it is crucial to identify factors that contribute to the causation and maintenance of EDs at this developmental stage. In this regard, insecure attachment and mentalizing difficulties represent two aspects of socioemotional development systematically associated with EDs [5–7]. However, few studies have examined both constructs simultaneously in association with ED symptoms among clinical adolescents [8]. This study aims to extend this literature by investigating attachment and mentalizing among inpatient and healthy adolescents, comparing those with and without ED symptoms. We also tested whether the relationship between attachment and ED symptoms is explained by impaired mentalizing. Such knowledge will inform assessment and treatment efforts.

Research has consistently shown that individuals with EDs are more likely to exhibit insecure attachment [6, 7]. Bowlby's [9] Attachment theory posits that children develop

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internal working models (IWMs) about themselves and others based on the quality of early caregiving, which influences later psychosocial functioning. Insensitive, unreliable, or simply poorly matched caregiving contribute to the development of dysfunctional IWMs—representations of the self as unlovable and others as untrustworthy [10]. Additionally, attachment experiences in childhood are related to self-esteem, emotion regulation, and interpersonal functioning in adolescence and adulthood [11]. These three aspects have been identified as related to ED symptoms in explanatory models [12, 13]. Patients with EDs cope with emotions by directing attention away from them—via starvation, bingeing, or extreme exercise [14]. It is noteworthy to consider that adolescence represents a particularly challenging developmental stage, especially in the social environment [15]. For example, insecurely attached children may focus on the importance of physical appearance to gain acceptance by others and, simultaneously, improve their self-esteem [16]. Moreover, with the increasing cognitive capacities of adolescence, youngsters are increasingly able to incorporate the perceptions of other's into their own self-concept. Thus, it is a normative developmental characteristic for adolescents to become more preoccupied with what others think of them [17]. However, as body image becomes more essential for adolescent's self-esteem [18, 19], insecurely attached adolescents may attempt to reduce unpleasant affect associated with a negative self-concept and gain social acceptance by physically modifying their bodies [14, 20].

Despite the link between insecure attachment and EDs [6, 7], little is known about mechanisms explaining this relation [11, 21]. Insecurely attached adolescents with EDs report difficulties in recognizing and interpreting emotional states [8, 20], likely related to a reduced capacity to mentalize. Mentalizing refers to the ability to understand one's own and other's behavior in terms of mental states [22]. Recently, a systematic review concluded that patients with EDs have a poorer understanding of or concern for other's perspectives, poorer perception and interpretation of internal cues (e.g., hunger), and difficulty describing mental states [23], indicating a clear mentalizing failure among these patients. According to Bruch's theory [24], such difficulties are a consequence of consistently poor attunement between the innate needs of the child and the responses of caregivers, which complements Bateman and Fonagy's view [25] that mentalizing capacity is developed in the context of early attachment relationships. To date though, few studies have simultaneously investigated links between attachment, mentalizing and ED symptoms, and further, most of these studies were conducted in clinical samples of young female adults [5]. For instance, patients with EDs, compared to controls without EDs, have been found to be more often insecurely attached, have lower levels of mentalizing and experience more difficulties with their parents [26–28]. Furthermore, Redondo and Luyten [28] found support for the mediating role of impaired attention to internal states in the relation between insecure attachment and ED symptoms. Thus, mentalizing is potentially a key factor in ED etiology [5, 14].

In summary, both theory and empirical studies provide evidence for the hypothesis that, first, insecure attachment and impaired mentalizing are associated with ED symptoms and that the capacity to mentalize partially explains symptoms of ED. However, there exist several gaps in this literature. Most notably, no study has tested these hypotheses among adolescents, despite it being a sensitive period for the development of EDs [8, 20]. Second, while previous studies compared individuals with EDs and healthy controls, it is unclear whether individuals with EDs differ from those with other forms of psychopathology, which are similarly characterized by insecure attachment and impaired mentalizing [29]. It is essential to understand whether certain patterns of insecure attachment and whether certain mentalizing impairments are specific to EDs rather than an indicator of psychopathology in general [11]. Third, no studies have characterized the specific type of impaired mentalizing found in adolescents with EDs [5]; mentalizing impairments can be characterized by the degree to which mental states are used to understand behavior; therefore, inaccurate mental state attribution can be organized on a spectrum ranging from hypomentalizing (or under mentalizing) to hypermentalizing (or over mentalizing). Hypomentalizing refers to the inability to consider the inner mental states and emotions underlying the actions of self and others. As such, hypomentalizing is characterized by a reliance on concrete, observable events (rather than internal states) when making sense of behavior [14]. Hypermentalizing is characterized by an over-attribution of mental states to other people that often leads to misunderstandings and can impede the development of stable interpersonal relationships [30–32]. Thus far, no studies have provided data as to the specific form of impaired mentalizing seen in individuals with EDs. Understanding the ways in which mentalizing goes awry is informative in guiding treatment as it implies the specific strategies that can be implemented by therapists in order to facilitate accurate mentalizing by their patients [33]. For instance, at times when a patient is hypermentalizing, they may be in a state of over-certainty, high arousal, and mentalizing dominated by affect. Interventions specified during these situations include increasing the focus on more controlled and cognitive mentalizing as well as empathic validation with the patient's subjective experience (versus a focus on the attributions they are making to other's minds). In the case of hypomentalizing, the therapist is instructed to increase the focus on mental states and affect [33]. Finally, given that psychopathology likely exists on a continuous spectrum of severity that may cut across a variety of types of disorder, research on the associations between attachment, mentalizing, and EDs

would benefit from taking a dimensional perspective where eating problems are continuously scored. This is particularly relevant during adolescence when symptom presentation may still be in the subclinical range, yet resulting in similar psychological impairment as those recognized as clinically affected [34, 35]. By clarifying our understanding of risk factors associated with the development of ED symptoms, efforts can be targeted to prevent the development of full-syndrome EDs [36].

To fill these gaps, the present study aims to (1) compare adolescent inpatients with notable ED symptoms to both adolescent patients with no ED symptoms but meeting criteria for other psychiatric disorders and healthy adolescents on quality of attachment and mentalizing, while distinguishing between forms of impaired mentalizing (i.e., hypomentalizing and hypermentalizing) and (2) assess Bateman and Fonagy's [25] model in which mentalizing deficits explain the relation between attachment and ED symptoms in the full sample of inpatient adolescents. To this end, we will use the Movie for the Assessment of Social Cognition (MASC) [37], which is a well-validated ecologically valid measure for assessing mentalizing in adolescent samples [32, 38, 39], which not only provides a score indicating the times an individual makes a correct attribution of mental states, but also classifies the incorrect attributions into either hypermentalizing or hypomentalizing. In line with theory and previous findings, we expected to find significantly lower levels of mentalizing and quality of attachment among the clinical sample (ED group and psychiatric control) compared to healthy controls. Because of limited evidence comparing mentalizing between individuals with ED compared to psychiatric controls, these analyses were exploratory. Based on Bateman and Fonagy's model [25], we also expected a mediating effect of impaired mentalizing in the relationship between attachment and AN and BN symptoms; however, because this is the first study testing specific forms of incorrect mentalizing as mediators, we did not make more specific hypotheses.

Method

Participants

Clinical sample

804 adolescents of ages 12–17 admitted to an adolescent psychiatric unit were invited to participate. Adolescent inpatients were recruited as part of a larger study between October of 2008 and June of 2016. Inclusion criteria for study participation consisted of: (1) being 12–17 years of age, and (2) sufficient fluency in English to complete all research. Exclusion criteria included: (1) diagnosis of schizophrenia or any psychotic disorder, and/or (2) diagnosis of mental retardation resulting in 73 patients excluded with 59 additional patients declining participation. 104 participants did not complete study materials, usually due to unexpected discharge; therefore, a total of 568 participants (63% girls; $M_{age} = 15.36$, $SD_{age} = 1.44$) were included in the final sample. Dropouts (i.e., adolescents who did not complete study measures) did not significantly differ from those who completed all measures on gender ($\chi^2(1) = 0.217$, $p = 0.642$) or ethnicity $\chi^2(5) = 9.226$, $p = 0.100$), but were slightly younger than those who were included ($t(650) = 2.724$, $p = 0.007$).

Of the 499 participants who elected to report their ethnicity, 87.6% were Caucasian, 3.6% Asian, 2.0% African American, and 6.8% multiracial or other. Psychopathology of participants was determined using the Diagnostic Interview Schedule for Children (DISC), a fully structured clinical interview conducted with adolescents that is based on DSM-IV diagnoses. 57.4% were diagnosed with a depressive disorder, 7.4% with bipolar disorder, 8.8% with an eating disorder, 42.8% with an externalizing disorder, and 58.8% with an anxiety disorder. Participants were hospitalized for 35.56 days on average (SD = 13.57), and previous to their admission, had seen an average of 2.90 (SD = 1.79) therapists and 1.88 (SD = 1.27) psychiatrists or other healthcare providers for mental health; and had on average 1.07 (SD = 1.93) acute psychiatric hospital stays and 0.81 (SD = 1.18) extended psychiatric hospital stays.

Healthy controls

Healthy adolescents were recruited through schools and community resources between September of 2013 and October of 2014. Inclusion criteria for study participation consisted of: (1) being 12–17 years of age, and (2) sufficient fluency in English to complete all research. Exclusion criteria included any self-disclosed psychiatric diagnosis or clinically significant symptoms of psychopathology reported on the Brief Problem Monitor–Parent Report [40] or other study interviews [Childhood Interview for Borderline Personality Disorder, CI–BPD; 41]. A total of $N = 223$ adolescents consented for participation in the present study, of which 34 failed to attend their scheduled appointments and 5 did not complete study measures. Therefore, the final sample consisted of 184 participants (123 girls and 52 boys; $M_{age} = 15.41$; $SD_{age} = 1.241$). Of the 131 participants who elected to report their ethnicity, 20.4% were African American, 30.9% Asian, 8.8% Caucasian, and 39.8% Hispanic.

Procedures

All aspects of the study were approved by the appropriate IRB board. Assessment procedures were conducted in person and privately by trained research staff. For the clinical

sample, participants were recruited on the day of admission and asked to provide parental consent and adolescent assent. Assessments were completed within 2 weeks from admission date. Healthy controls completed assessments during a scheduled assessment day in the lab.

Measures

The Child Attachment Interview [CAI; 42] is a semi-structured interview assessing attachment organization via children's mental representations of their attachment figures completed in both the clinical sample and healthy control sample. The interview consists of 19 open-ended questions concerning the adolescent's experiences with primary caregivers with prompts for the adolescent to reflect upon each experience. Interviews were videotaped, transcribed, and then coded by a team of trained coders, who were certified by the developers of the instrument based on achieving a pre-designated level of reliability. While several scales of attachment are coded from the CAI, for the current study, we relied on the overall coherence scale, which integrates other scales, providing an estimate of overall attachment quality and has been used in previous research as a dimensional proxy for attachment security [43]. The CAI was originally designed to be used with children ages 8–13; however, evidence for validity has been demonstrated in adolescent samples, including adequate interrater reliability, concurrent validity, and convergent validity [44]. For the present study, 100 randomly selected interviews (21.98% of the full sample) were coded by an independent rater revealing moderate interrater reliability for the coherence scale ($r = 0.511$, $p < 0.01$).

The Diagnostic Interview Schedule for Children [DISC-IV; 45] was used to assess eating disorder symptoms in the clinical sample. The DISC-IV is a DSM-IV structured clinical interview used to assess for Axis I psychopathology in youth ages 9–17 years. Only the clinical sample completed the DISC. For aim 1, a cutoff of 2 symptoms of anorexia or bulimia was used to determine membership to the disordered eating group, with adolescent patients reporting 1 or fewer symptoms assigned to the psychiatric control group. Given the overall low prevalence of full threshold ED in the current sample, we took a data-based approach in identifying a cutoff for symptoms to create groups. Specifically, we used the modal number of symptoms in the sample (mode = 1 for both AN and BN symptoms), which allowed for an even distribution of participants into the two groups. The low prevalence of EDs in the current sample may be explained by the strict DSM criteria for ED diagnoses, which requires individuals to endorse all listed symptoms. This has the effect of excluding adolescent patients with milder eating psychopathology or subclinical forms of EDs [34–36]. A large proportion of adolescents referred to ED clinics present with subclinical forms of EDs [46, 47], whereas even experiencing a single ED symptom can be harmful as it can lead to various unhealthy weight control measures (e.g., extreme dieting or use of laxatives and diuretics) [18, 48, 49]. For aim 2, the total number of symptoms endorsed for AN and BN were used to estimate severity of disordered eating.

The Movie for the Assessment of Social Cognition [MASC; 37] is a well-validated measure of mentalizing. All participants (i.e., clinical sample and healthy controls) watch a 15 min film about four characters getting together for a dinner party, during which, the film is stopped and multiple choice questions referring to the character's mental states (feelings, thoughts, and intentions) are asked. Each question has one correct answer and three incorrect answers, one for each incorrect mentalizing strategy, resulting in four subscales: correct mentalizing, hypermentalizing, hypomentalizing, and no mentalizing, based on number of responses of each category. The MASC is a reliable instrument that has proven sensitive in detecting subtle mentalizing difficulties in adolescents and in clinical samples [38].

Data analytic strategy

All analyses were conducted in SPSS version 26 [50]. First, preliminary analyses were run to determine means and standard deviations for all main study variables. Next, Pearson correlations, χ^2 tests, and independent sample t tests were run to examine associations between main study variables and demographic characteristics (age, gender, and ethnicity). Demographic characteristics significantly related to dependent variables were included in mediational analyses as covariates. To address the first aim of the study, an ANCOVA was performed to compare groups (healthy controls, psychiatric controls, and adolescents with two or more ED symptoms) on attachment and mentalizing between. Significant ANCOVAs were followed up using Tukey's test to control for multiple comparisons.

Second, mediational analyses were conducted using the PROCESS macro [51] to address the second aim of this study. Mediation analysis is a suitable statistical method to evaluate the extent to which a third intermediate or mediating variable explains the effect of an independent variable on a dependent variable [52]. We tested mentalizing as a mediator in the relation between attachment and ED symptoms (anorexia and bulimia symptoms). This analysis was conducted in the full sample of inpatient adolescents (excluding healthy controls). We examined the indirect effect provided by 5000 bootstrapped samples. Demographic characteristics that were significantly related to ED symptoms were included as covariates.

Results

Descriptive results and bivariate relations between main study variables

Descriptive statistics for and Pearson's correlations between mentalizing and attachment in the full sample are presented in Table 1, which reveals that attachment security was positively (although small in magnitude) related to correct mentalizing and negatively to hypermentalizing and no mentalizing. No significant gender differences were found for attachment and mentalizing. Independent samples *t* tests revealed that females scored significantly higher than males on both AN ($t(473) = 7.749$, $p < 0.001$) and BN ($t(473) = 7.785$, $p < 0.001$). There were small but significant negative correlations between age and all types mentalizing errors, and positive correlations between age and correct mentalizing and attachment security. Thus, age and gender were included as covariates in mediational analyses. Both AN and BN symptoms were negatively correlated with no mentalizing and positively correlated with hypermentalizing; however, these correlations were very small in magnitude.

Group differences

In testing the first aim, analyses comparing groups were performed. The clinical sample was split into psychiatric controls ($N = 440$; 56% girls; M(SD)anorexia symptoms = 0.92(0.92); M(SD)bulimia symptoms = 0.92(0.917)) and eating disorder (2 + symptoms; $N = 128$; 87% girls; M(SD)anorexia symptoms = 2.67(1.08); M(SD)bulimia symptoms = 2.70(1.05)) groups. Demographic information for and group differences between the three groups are presented in Table 2. Healthy controls reported significantly higher attachment security and lower hypermentalizing than both clinical groups. Additionally, the ED group demonstrated significantly less hypomentalizing than healthy controls. No other group differences were significant. In sum, the two psychiatric groups did not significantly differ from each other in the quality of attachment, overall mentalizing ability, or forms of incorrect mentalizing. Taken together, these findings provide only partial support to our

Table 1 Descriptive information for and Pearson's correlations between main study variables and demographic variables

	Mean (SD)	1	2	3	4	5	6	7	
1. Attachment	4.64 (1.91)								
2. Correct mentalizing	32.52 (4.63)	.19**							
3. Hypermentalizing	7.37 (3.45)	−.17**	−.73**						
4. Hypomentalizing	3.33 (2.33)	−.04	−.56**	−.06					
5. No mentalizing	1.78 (1.58)	−.12**	−.51**	.04	.28**				
6. Anorexia symptoms	1.31 (1.20)	.01	−.02	.11*	−.05	−.10*			
7. Bulimia symptoms	1.32 (1.21)	.01	.01	.10*	−.05	−.11*	.99		
8. Age	15.38 (1.39)	.12**	.28**	−.23**	−.164**	−.08*	−.01	.00	
9. Gender (*t*)	63.8% girls	1.97	2.64	−2.75	−0.99	−0.26	9.00**	9.03**	−2.80

Attachment = overall coherence scale from the child attachment interview; mentalizing scales from the Movie for the assessment of social cognition

**$p < .01$; *$p < .05$

Table 2 Group differences in demographic characteristics and main study variables

Variable	Eating disorder ($N = 128$)	Psychiatric controls ($N = 440$)	Healthy controls ($N = 184$)	*F*	*p*	η^2	Significant post hoc comparisons
Age	15.38 (1.47)	15.36 (1.43)	15.41 (1.21)	0.08	.925	.00	
Attachment	4.42 (1.87)	4.46 (1.86)	5.94 (1.76)	23.19	< .001	.07	HC > PC; HC > ED
Correct mentalizing	32.46 (4.91)	32.26 (4.79)	33.11 (4.02)	1.24	.291	.00	
Hypermentalizing	8.02 (3.94)	7.63 (3.51)	6.42 (2.78)	9.87	< .001	.03	HC < PC; HC < ED
Hypomentalizing	2.98 (2.12)	3.28 (2.29)	3.66 (2.50)	3.57	.029	.01	HC > ED
No mentalizing	1.54 (1.41)	1.83 (1.64)	1.80 (1.54)	1.35	.260	.00	

Attachment = overall coherence scale from the child attachment interview; mentalizing scales from the Movie for the assessment of social cognition

first hypothesis, whereby we expected to find significantly lower levels of mentalizing and quality of attachment among the clinical sample (ED group and psychiatric control) compared to healthy controls.

Mediational analysis

Regarding our second aim, we conducted separate mediational analyses in the clinical sample to test whether mentalizing was a mediator in the association between attachment and anorexia nervosa and bulimia nervosa symptoms. The test of the indirect effect provides a bootstrap test with 5000 samples of the indirect effects of attachment (coherence) on eating disorder symptoms (DISC) through the proposed mediator of each individual MASC score (four subscales of mentalizing). A total of eight mediational models were tested; results are presented in Table 3. We first tested these models with anorexia symptoms as the dependent variable. All four models accounted for a significant amount of variance in anorexia symptoms, but only the model mediated by hypermentalizing ($R^2 = 0.13$) demonstrated a significant indirect effect of attachment on ED symptoms. No models indicated a direct effect of attachment on anorexia symptoms. However, as recommended by Hayes [52], a direct effect of X (i.e., attachment) on Y (i.e., ED symptoms) are not required to determine whether M (i.e., mentalizing) mediates the effect of X on Y. The same models were tested with bulimia symptoms as the dependent variable. Again, all models accounted for a significant amount of variance in bulimia symptoms, but only the model with hypermentalizing as a mediator demonstrated a significant indirect effect of attachment on eating disorder symptoms. This test confirmed the mediating effect of hypermentalizing, but did not confirm a direct effect of attachment on bulimia symptoms. Together, these predictors accounted for 13.02% of the variance in bulimia symptoms. These findings support our second hypothesis, whereby we also expected a mediating effect of impaired mentalizing in the association between attachment problems and AN and BN symptoms. While no other mediation effects were supported, we did find that correct mentalizing was negatively related to severity of ED symptoms, and that hypermentalizing and no mentalization were positively related to severity of ED symptoms.

Discussion

Previous research has supported the association between insecure attachment and eating psychopathology in adolescents [8, 20]. Although insecure attachment has been found to be a strong predictor of ED symptoms across adolescence [53, 54], its influence might be exerted by other intermediate mechanisms [6, 21]. In this regard, impaired mentalizing (i.e., difficulties in understanding oneself and others in terms of intentional mental states) has been proposed as one of the main underlying mechanisms explaining the association between insecure attachment and ED symptoms [14]. The present work explored differences in attachment and mentalizing abilities between samples of adolescents with ED symptoms, other psychiatric diagnoses, and healthy controls. Furthermore, we tested, for the first time, whether impaired mentalizing mediated the insecure attachment ED symptom link among inpatient adolescents. In doing this, we used an ecologically valid task (i.e., the MASC [37]), which evaluates implicit mentalizing abilities. Our results revealed differences in attachment and hypermentalizing, specifically, between healthy and clinical groups, but not between the two clinical groups, which partially supports our first hypothesis. We also found that impaired mentalizing mediates the association between insecure attachment and AN and BN symptoms, separately, which is in line with our second hypothesis related to Bateman and Fonagy's model

Table 3 Results of mediational analyses of the effect of attachment on anorexia and bulimia symptoms

Mediator	X→Y		X→M		M→Y		R^2
	β(SE)	CI	β(SE)	CI	β(SE)	CI	
DV: AN							
Correct mentalizing	0.00(.03)	[−.06, .05]	**0.37(.11)**	**[.17,.59]**	−0.01(.01)	[−.04,.01]	**.117**
Hypermentalizing	0.00(.03)	[−.05, .06]	**−0.23(.09)**	**[−.40, −.06]**	**0.05(.01)**	**[.02,.08]**	**.134**
Hypomentalzing	−0.01(.03)	[−.07, .04]	−0.05(.06)	[−.16, .06]	−0.04(.02)	[−.09, .00]	**.120**
No mentalizing	−0.01(.03)	[−.07, .04]	**−0.09(.04)**	**[−.17, −.01]**	−0.02(.03)	[−.09, .04]	**.115**
DV: BN							
Correct mentalizing	−0.01(.03)	[−.06, .05]	**0.37(.12)**	**[.14, .59]**	−0.01(.01)	[−.04, .01]	**.118**
Hypermentalizing	0.00(.03)	[−.05, .05]	**−0.23(.09)**	**[−.40, −.06]**	**0.05(.01)**	**[.02, .08]**	**.135**
Hypomentalzing	−0.01(.03)	[−.07, .04]	−0.05(.06)	[−.16, .06]	−0.04(.02)	[−.09, .00]	**.121**
No mentalizing	−0.01(.03)	[−.07, .04]	**−0.09(.04)**	**[−.17, −.01]**	−0.03(.03)	[−.09, .03]	**.117**

Significant effects in bold

[25]. Specifically, we found that hypermentalizing explained such associations, which represents a novel contribution of the present study.

As expected, both psychiatric groups showed lower attachment coherence and more impaired mentalizing (*hypermentalizing*) than the healthy group. These results mirror prior research showing reduced attachment security among adolescents with psychopathology [55], and also in adolescents with EDs [8, 20]. Importantly, because attachment insecurity and mentalizing impairments might be rooted in poor attunement between the innate needs of the child and the responses of caregivers (e.g., insensitive or unresponsive caregiving in times of need), this finding also aligns with prior evidence showing significant associations between poor parenting and the development of eating psychopathology in children and adolescents [56–58]. For instance, negative perceptions of parent–child relationships [59], low parent–child involvement [60], low parent–child connectedness and poor communication [61], rigid parent–child interactions [62], or low parental warmth and monitoring [63] have all been associated with higher odds of engaging in disordered eating behaviors. Future research may expand on how specific parenting behaviors fit into this model of insecure attachment and disordered eating using prospective design with a greater number of participants. Moreover, clinical adolescents relative to healthy adolescents were characterized by increased hypermentalizing, suggesting that it is important to recognize hypermentalizing as an important marker to distinguish adolescents with severe psychopathology from the normative tendency to be preoccupied with one's reputation, which characterizes this developmental stage as previously mentioned. Our results corroborate prior evidence from patients with AN and BN showing significant impairment in emotion recognition and inferring other's mental states [5, 23, 64]. ED symptoms are conceptualized as regulatory strategies aimed at diminishing unpleasant affect [65]. One surprising finding was that the ED group reported significantly less hypomentalizing than healthy controls, which is contrary to prior evidence showing low to absent mentalizing in patients with EDs [8, 27]. This could be due to ED tendency to hypermentalize; because each MASC item is forced choice, if ED patients made a higher proportion of hypermentalizing errors, they would appear lower on hypomentalizing relative to those with an even distribution of errors. Moreover, it should be noted that this is the first study assessing different types of impaired mentalizing using the MASC in adolescent's inpatients with ED symptoms. As such, different results with respect to previous studies could be due, at least in part, to the use of other measures of mentalizing (e.g., Reflective Functioning Scale).

Concerning the mediational model, our results expand upon previous research indicating that, whereas attachment was not directly associated with ED symptoms, the influence of insecure attachment on eating psychopathology might be explained by insecurely attached adolescent's tendency to interpret other's minds inaccurately by attributing intentions to others that are not supported by facts (*hypermentalize*). As such, our results support that, on the one hand, mentalizing relates to attachment insecurity in adolescents [66, 67] and that, on the other hand, impaired mentalizing is also associated with the development of EDs [8, 27]. Our results can be understood in light of Bateman and Fonagy's model [25]—early attachment problems may disrupt the ability to mentalize, which in turn increases the vulnerability to psychopathology. As previously mentioned, bulimic (e.g., binging and purging) or anorexic (e.g., restrictive eating and hyperactivity) symptoms may be related to failures in interpreting other's emotions and mental states. As such, our findings related to the unique role of hypermentalizing in this model suggest that insecurely attached adolescents might be prone to obsessively interpreting other's minds, although not accurately (hypermentalizing). The resultant ways of relating to others in either overly distanced or demanding ways increases the probability of experiencing real or perceived negative interpersonal relationships [68], which may worsen interpersonal relationships [10, 69]. These difficulties are particularly salient during the transition to adolescence, during which youngsters begin to develop more intimate peer relationships, which are increasingly utilized for comfort and emotional support [55]. Disordered eating may allow for momentary relief/escape from negative emotions while simultaneously perpetuating this maladaptive cycle through negative reinforcement [13]. In other words, because disordered eating (e.g., bingeing) functions to reduce negative affect and discomfort, these behaviors are more likely to be used in the future as coping strategies, despite the fact that the relief they provide is short-lived. This perpetuates a dysfunctional cycle and interferes with the development of more adaptive emotion regulation strategies. Taken together, insecurely attached adolescents may think and behave in a way that fosters AN and BN symptoms via hypermentalizing.

Clinically, a focus on negative mental representations and mentalization in treatment of EDs might be useful to increase the chances of treatment success [27]. Our results suggest the use of Mentalization-Based Therapy (MBT) for adolescent patients with eating problems [14]. Kuipers et al. [70] found that recovery from ED after 1 year of MBT was related to improvement of mentalization and reduction of sensitivity to others. MBT has proven to be an effective treatment for improving mentalizing capacity among samples of inpatients adolescents with BPD—an often comorbid disorder with EDs [71, 72] that is associated with hypermentalizing [32, 73]—thereby, reducing symptoms such as self-harm, depressive symptoms and interpersonal dysfunction [32, 74, 75]. Thus, the current study invites further

investigation into the efficacy of mentalization-based treatments for adolescents with EDs.

Although results are promising, there are some limitations. First, the present study is limited by the small number of individuals meeting full criteria for EDs and, therefore, our results must be viewed with caution and cannot be generalized to the whole of the ED population. Future studies should test our suggested mediational model in different populations, such as non-clinical samples, adults, and participants from diverse locations and ethnic backgrounds. Second, the cross-sectional nature of the study design limits the ability to draw causal conclusions. Future studies should examine our model prospectively. Third, EDs were assessed solely with a structured clinical interview (DISC-IV). It is known that at this age participants tend to report less symptoms or underestimate their eating problems when reporting to an interviewer—possibly due to the shame and denial that are associated with these symptoms [36, 46]. Furthermore, the use of a DSM-based instrument restricted the ability to examine more fine-grained distinctions between aspects of disordered eating (e.g., list some things here that wouldn't necessarily be covered in DSM criteria but still would be relevant for ED). Future studies should include a more varied testing battery, such as self-report, along with a diagnostic interview [36, 76].

Conclusion

In sum, the present findings suggest that adolescent inpatients both with and without ED pathology, relative to healthy adolescents, showed lower levels of attachment security and a tendency to hypermentalize. Furthermore, the influence of insecure attachment on the presence of ED symptoms might be explained by increased hypermentalizing, suggesting that targeting attachment representations and difficulties with mentalization may be beneficial in reducing disordered eating during adolescence.

What is already known on this subject?

Attachment and mentalizing are related to eating disorder symptoms, but also to other psychiatric problems in adolescents. No study has identified the exact nature of mentalizing difficulties in adolescents with psychiatric problems.

What does this study add?

Hypermentalizing (the tendency to misinterpret other's emotions and intentions) mediates the link between insecure attachment and ED symptoms; it represents, therefore, an important target for early intervention.

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Compliance with ethical standards

Conflict of interest The authors of this manuscript declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Bioethics Committee of the University of Houston Institutional Review Board (name/number of the protocol: the use of psychological assessment data for program evaluation and research publication/14238–02).

Informed consent Informed consent was obtained from all individual participants included in the study.

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