Attachment and thought problems in an adolescent inpatient sample: The mediational role of theory of mind

Jessica R. Hart[a], Amanda Venta[a],*, Carla Sharp[b]

[a]Department of Psychology and Philosophy, Sam Houston State University, Campus Box 2447, Huntsville, TX 77341-2447, USA
[b]Department of Psychology, University of Houston, 4811 Calhoun Rd., Room 373, Houston, TX 77204, USA

Abstract

Background: Previous research has documented increased incidence of insecure attachment and theory of mind (ToM) deficits in individuals experiencing psychotic disorders. ToM has been theorized as a possible mediator of the relation between attachment and psychosis (Korver-Nieberg et al., 2014). The current study sought to extend this area of research to adolescents for the first time by examining adolescent-parent attachment and ToM in inpatient adolescents.
Methods: Participants were 362 inpatient adolescents and their parents; participants completed the Child Attachment Interview, Movie for the Assessment of Social Cognition, Youth Self Report, and Child Behavior Checklist.
Results: Bivariate correlations indicated that attachment coherence (a marker of security) was significantly and positively correlated with ToM abilities, and that low attachment coherence and poor ToM performance were each associated with increased youth- and parent-reported thought problems. Mediational models indicated that ToM mediated the relation between insecure attachment and thought problems according to both parent- and self-report.
Conclusions: The results of the current study provide support for a model in which impairments in ToM contribute to the frequently documented association between insecure attachment and emerging psychotic symptoms. Theoretical and clinical implications of these results are discussed, including the potential support for ToM-based interventions for early psychotic symptoms.
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1. Introduction

Psychosis involves hallucinations, delusions, disorganized thinking, disorganized behavior, and negative symptoms [1]. Despite being the defining characteristics of schizophrenia spectrum disorders, psychotic symptoms can also be present in a number of other disorders, including bipolar, depressive, personality, dissociative, and neurocognitive disorders [1]. A number of theories have been posited regarding the etiology of such symptoms, with theories of a genetic/biological basis featured most prominently in recent decades due to advances in this area of research [2,3]. While the role of genetics and biological factors cannot be understated, some researchers have suggested that psychosocial factors may also be influential in furthering our understanding of the pathway leading to the onset of psychosis [2,4,5]. More specifically, psychosocial factors may serve as the "stress" of the diathesis-stress model, from which a biological vulnerability for psychotic-type symptoms is activated, precipitating development of the disorder [6]. The broad aim of this study was to examine an important psychosocial factor (adolescent-parent attachment) and its relation to theory of mind (ToM), in the context of youth psychotic symptoms.

Attachment theory is often included in theoretical models of how psychotic symptoms are developed and maintained [2,4,5,7–10]. Numerous studies have investigated this relation, with consistent evidence suggesting a link between insecure attachment and psychosis. Over the past decade, four groups of researchers have conducted reviews of the existing attachment-psychosis literature [5,7–9]. All four reviews noted the overrepresentation of insecure attachment found in individuals experiencing psychosis. Gumley and colleagues [9] reviewed 21 studies consisting of over 1400 participants. Insecure attachment was found to have small to modest associations with increased psychiatric symptoms, including both positive

and negative psychotic symptoms, as well as affective symptoms. Results also indicated that insecure attachment was moderately related to an increase in interpersonal problems, as well as poorer engagement in and compliance with services. Korver-Nieberg and colleagues' [5] review of 29 studies evidenced similar associations between insecure attachment and psychotic symptoms, as well as with factors influencing outcomes and recovery. Similarly, Debbané and colleagues [8] noted the association between secure attachment and help-seeking behaviors, as well as more favorable prognosis. Thus, a large literature base in adults shows an association between insecure attachment and psychosis, suggesting insecure attachment may play a role in the development and maintenance of psychotic symptoms. Secure attachment, in contrast, may serve as a protective factor against the development of psychosis when an underlying vulnerability exists.

Of particular relevance in this discussion, both in terms of the relation between insecure attachment and psychosis and of possible mechanisms, is the influence of ToM abilities. ToM, sometimes referred to as "mentalizing" or "metacognition," is a social-cognitive ability involving the recognition that people act on the basis of internal mental states (i.e., thoughts and beliefs), as well as the attribution of such mental states to one's own behaviors and others' behaviors [11,12]. It should be noted that although some researchers have separated the specific capacities referenced by these terms [13–15], the terms all refer broadly to the awareness and attribution of mental states and have largely been used interchangeably in the literature. The relation between attachment and ToM has been well documented [8,16–19], and attachment theory is uniquely poised to explain the observed ToM impairments in individuals experiencing psychotic symptoms. From early attachments to caregivers, children construct internal representations of both the self and others in relationships [2,4,5]. The quality of this attachment influences a child's ability to understand and make inferences regarding others' mental states and emotions, and thus impacts his or her ToM abilities [2]. Indeed, Fonagy and Target [16] proposed that ToM capacities are developed within the context of secure attachments with caregivers. Thus, individuals who experience insecure attachments to caregivers during infancy and childhood are more likely to exhibit impaired ToM abilities later in life.

Given the observed relation between insecure attachment and psychotic symptoms, as well as the theorized development of ToM within the context of secure attachment relationships, it follows logically that ToM deficits would frequently occur in individuals experiencing psychotic disorders. In fact, individuals diagnosed with schizophrenia have been found to have significant impairments in ToM abilities [1,12,19–22]. A meta-analysis conducted by Sprong and colleagues [21], consisting of 29 studies and over 1500 participants, found a large overall effect size of $d = -1.255$ ($p < 0.0001$) for the relation between impaired ToM abilities and schizophrenia. The authors concluded that, "on average the theory of mind performance of participants with schizophrenia is more than one standard deviation below that of healthy controls" (p. 10). Interestingly, a slightly smaller but still significant effect ($d = -0.692$, $p < 0.01$) was found for patients currently in remission, indicating ToM deficits persist even when other symptoms of psychosis remit. In their critical reviews, both Harrington and colleagues [12] and Brüne [20] found evidence suggesting that this impairment occurs independent of the overall cognitive deficits found in schizophrenia, and that it is a trait-based, rather than state-based, deficit. As additional evidence supporting the latter, Sprong and colleagues [21] summarized findings of studies indicating that individuals with increased genetic risk of developing schizophrenia also demonstrate impairments in ToM tasks. Thus, it appears that deficits in ToM abilities are present prior to the onset of a psychotic disorder, and remain present during periods of remission.

Some researchers have further investigated specific types of ToM deficits, separating hypo-mentalizing (underattribution of mental states) from hyper-mentalizing (overattribution of mental states). For example, Crespi and Badcock [23] hypothesized a spectrum of social-cognitive abilities, in which autism spectrum disorder represents extreme hypo-mentalizing, and psychotic disorders represent extreme hyper-mentalizing. Hyper-mentalizing, in particular, has been linked to symptoms of paranoia [24,25]. However, others have argued that the relation between ToM and psychosis is more complex. For instance, Langdon and Brock [26] described several research findings indicating that individuals with psychosis evidence hypo-mentalizing in some circumstances and hyper-mentalizing in others. These authors posited an alternative conceptualization, in which impaired ToM performance in these individuals is due to both hypo- and hyper-mentalizing errors. Furthermore, a recent review by Green, Horan, and Lee [27] described a complex neural activation pattern of individuals with schizophrenia during ToM tasks that suggests distortions in ToM with regard to both hyper- and hypo-mentalizing. Specifically, in the neuroimaging studies reviewed, participants evidenced decreased activation in some areas of the brain associated with mentalizing, but increased activation in other mentalizing areas. While neuroimaging data regarding the complex relation between hypo-/hyper-mentalizing and schizophrenia has only recently emerged, there is a well-documented and long-standing link between impaired ToM overall—that is incorrect ToM judgments, irrespective of error type—and psychotic symptoms [12,20,21].

In regards to a possible mechanism for the relation between insecure attachment and psychosis, two groups of researchers have suggested related hypotheses. Rajkumar [2] posited the "attachment-developmental-cognitive" (ADC) hypothesis, which connects early childhood experiences and attachment relationships with schizophrenia's onset and outcome. Specifically, this hypothesis suggests that, "disturbances in childhood attachment, including neglect and abuse, lead to deficits in neural representation of the self and others, impaired 'theory of mind' skill, and sensitization of the mesolimbic

dopamine pathway, which is relevant to positive symptom formation" (p. 278). Thus, insecure attachment is postulated to increase the risk of developing schizophrenia, as well as affect the prognosis and course of the disease. The ADC hypothesis provides a possible explanation for how psychosocial factors such as attachment security may interact with genetic predispositions and prenatal insults already known to increase risk of psychotic symptoms. As a second hypothesis of the mechanism connecting insecure attachment with psychotic symptoms, Korver-Nieberg and colleagues [5] discussed the mediational role of mentalizing (i.e., ToM) between attachment and psychosis. They noted that secure attachments early in life foster development of ToM skills, and that experiencing negative interpersonal events may disrupt the development of these abilities. This theory is consistent with Fonagy and Target's [16] proposed development of ToM capacities within the context of secure attachments. While Rajkumar's [2] ADC hypothesis and Korver-Nieberg and colleague's [5] hypothesis have some distinctions, both suggest that ToM acts as a mediator or link between insecure attachment and psychosis. Such theoretical models are supported by the existing literature, but additional studies of this relationship are needed.

Despite the prevalence of studies investigating the association between insecure attachment and psychosis in adult samples, very few studies have extended such research into the adolescent population. While some research has included older adolescents (i.e., aged 16 and 17 years) in otherwise adult samples, only one study has focused on an exclusively adolescent sample. Korver-Nieberg and colleagues [17] compared 32 adolescents who had experienced a psychotic episode with 78 control adolescents. Contrary to expectations, the groups did not differ significantly on a perspective-taking task designed to assess ToM, in which they were instructed to move objects into slots, taking into account the perspective of another person. The researchers offered several suggestions for this result, including the possibility that the psychosis had not progressed enough in these adolescents to impair ToM abilities, or that the task measured cognitive rather than affective ToM abilities. However, the patient group did report significantly higher levels of attachment anxiety compared to the control group. Anxious attachment was found to be associated with paranoid thoughts, and avoidant attachment was found to be associated with persecutory ideas. This study had several limitations, most notably the small sample size and limited assessment of ToM, but it took an important step in extending the adult literature to adolescents.

The observed gap in the literature is understandable given the low base rate of psychotic disorders before early adulthood, and thus the difficulty in obtaining a large enough sample of adolescents with whom to conduct such a study. However, research investigating the relation between attachment and psychosis in adolescents has important clinical implications, as earlier identification of adolescents experiencing prodromal psychotic symptoms would allow for earlier interventions, and ToM-based prevention and intervention efforts may be warranted. The current study sought to extend existing research by investigating security of attachment in an adolescent sample currently experiencing emerging psychotic symptoms. Furthermore, ToM capacities were investigated in order to assess their possible role as a mediator between attachment security and psychotic symptoms, as posited by Korver-Nieberg and colleagues [5]. It should be noted that although adolescents experiencing active psychosis were excluded from the study due to inability to complete the assessments, the Thought Problems subscale of the Child Behavior Checklist [28]—used as the outcome variable in this study— has demonstrated diagnostic utility in screening for youth at risk of developing psychosis [29]. Assessing psychotic symptoms continuously in this manner, rather than focusing on specific disorder subgroups, addresses the National Institute of Mental Health's Research Domain Criterion (RDoC) initiative of identifying cross-cutting factors in psychopathology in an inpatient adolescent sample with heterogeneous emotional and behavioral disorders.

Consistent with the existing literature on attachment, ToM, and psychosis, we expected that adolescents reporting greater security of attachment would exhibit greater ToM abilities. Conversely, we expected less secure attachments and reduced ToM abilities to be associated with increased endorsement of thought problems by both the youths and their parents. Finally, we hypothesized that ToM performance would mediate the relation between attachment security and thought problems.

2. Methods

2.1. Participants

This study was approved by the appropriate institutional review board. Experimenters approached 648 consecutive admissions to an adolescent inpatient unit at a private-pay psychiatric hospital for consent on the day of admission. If parents or guardians granted consent, the adolescents were approached for assent. Of those approached, 47 did not grant parent consent or adolescent assent, 5 were discharged prior to completion of the assessments, 3 began assessments and then revoked consent, and 72 were excluded from the study. To meet inclusion criteria, participants had to be between 12 and 17 years of age and be fluent in the English language. Adolescents were excluded ($n = 72$) if they or their parents were non-English speaking, if there were custodial barriers to consent, or if clinicians noted intellectual disability or active psychosis upon admission. The sample was thereby reduced to 521 adolescents.

Additional exclusions were made from each of the data analyses due to missing data on the Child Attachment Interview [30], Movie for the Assessment of Social Cognition [31], Youth Self-Report [28], or Child Behavior Checklist [28]. Analyses for the two mediational models were based on $n = 361$ and $n = 352$, depending upon the outcome measure used (YSR and CBCL, respectively). The 361 adolescents included in this study did not differ from the larger sample of 521 adolescents on the basis of age (t (519) = 0.50, p =

0.617), gender (χ (1) = 0.00, p = 0.995), YSR thought problems (t (507) = −0.09, p = 0.929), or CBCL thought problems (t (496) = 0.072, p = 0.788).

Of the 361 participants included in this study, 61.20% (n = 221) were female. Participants ranged in age from 12 to 17, with a mean age of 15.33 years (SD = 1.46). Based upon parent report, the racial breakdown of the sample was as follows: 78.90% Caucasian, 3.60% Asian, 2.20% Black or African-American, 0.30% American Indian or Alaskan Native, 5.80% multi-racial or other, and 9.10% did not respond. Some parents did not complete the study protocol, accounting for the slightly smaller sample using CBCL as the outcome measure (n = 352); this group did not differ significantly from the larger sample of 361 in any of these descriptive statistics. This unit hosts a heterogeneous group of patients with severe mental illness. At the time of admission, the most common diagnoses in the sample were mood disorders (84.76%), anxiety disorders (46.32%), substance-related disorders (22.99%), ADHD (13.57%), eating disorders (8.59%), and emerging personality disorders (8.59%). Comorbid diagnoses were common. See Table 1 for the full list of diagnoses at time of admission.

2.2. Measures

2.2.1. Attachment security

The Child Attachment Interview (CAI) [30] is a semi-structured interview that assesses attachment styles in youth

Table 1
Diagnoses at time of admission (N = 361).

Disorders	n	%
Mood disorders	306	84.76
With psychotic features[a]	8	2.22
Anxiety disorders	160	46.32
Substance-related disorders	83	22.99
Attention-deficit/hyperactivity disorder	49	13.57
Eating disorders	31	8.59
Personality disorders[b]	31	8.59
Disruptive, impulse-control, and conduct disorders	22	6.09
Personality disorder traits	21	5.82
Obsessive-compulsive disorder	17	4.71
Post-traumatic stress disorder	11	3.05
Psychotic disorders	5	1.39
Autism spectrum disorders	5	1.39
Adjustment disorders and reactive attachment disorder	5	1.39
Learning disorders	5	1.39
Somatic symptom disorders	3	0.83
Other neurodevelopmental disorders	2	0.55
Elimination disorders	2	0.55
Dissociative disorders	1	0.28
No diagnosis	5	1.39

Data in this table consists of diagnoses made by hospital clinicians at time of admission. Comorbidity was common.

[a] The category of mood disorders is inclusive of mood disorders with psychotic features.

[b] The category of personality disorders includes those participants diagnosed with an "emerging" personality disorder, those given a rule-out diagnosis of a personality disorder, and those diagnosed with the full disorder. Participants who were diagnosed with personality disorder features only, rather than a full personality disorder, were included in a separate category.

and adolescents. Examinees are asked to reflect on elements of their attachment relationships with primary caregivers, including the child's valuing of this relationship and the responsiveness of the attachment figure. In particular, questions on the CAI focus on those situations in which the examinee may call on the caregiver for care, understanding, and support, such as during times of conflict, separation, or illness. The psychometric properties of the CAI have been evaluated in the initial publication with a sample of children [32] as well as in a construct validity study with inpatient adolescents [33]. Administration and coding of the CAI requires completion of a three-day training as well as attainment of 85% agreement with the measure's authors on specific training cases. In the current study, all CAI's were administered, transcribed, and coded by trained research assistants or doctoral students. In this study, interrater reliability for the CAI Coherence scale was computed based on approximately 50 randomly selected interviews, based on two independent coders who had completed the reliability training with the measure's authors. The average Intraclass Correlation (ICC) for the Coherence scale was adequate with a value of 0.70 and a 95% confidence interval from 0.47 to 0.83 (F (48, 48) = 3.34, p < 0.001).

CAI interviews are rated on the basis of emotional openness, balance of positive and negative reference to attachment figures, use of examples, preoccupied anger, idealization, dismissal, resolution of conflicts, and overall coherence. These subscales are then used to inform a dichotomous classification of secure or insecure. The current study elected to use a continuous measure of attachment security, namely, the Coherence subscale, rather than the dichotomous overall score. The rating of the Coherence subscale is based on the examinee's demonstration of openness, consistency, and cooperation with the interview as a whole, and has been previously found to be a general indicator of attachment security [33].

2.2.2. Theory of mind

The Movie for the Assessment of Social Cognition (MASC) [31] is a computerized measure for the assessment of ToM or mentalizing abilities. Examinees are instructed to watch a 15-minute film in which four characters get together for a dinner party. The film portrays major themes of friendship and dating matters, and each character experiences situations which elicit a variety of emotions, including embarrassment, disgust, affection, anger, jealousy, gratefulness, ambition, and fear. The relationships between the characters range from strangers to friends, and thus represent a variety of social reference systems and intimacy levels on which mental state inferences will be made. At 45 points during the movie, the film is stopped, and the examinee is asked questions regarding the characters' mental states (i.e., thoughts, feelings, and intentions). The examinee is provided with four response options, representing no mentalizing, undermentalizing, hypermentalizing, and accurate mentalizing. The MASC yields subscale scores for each of four mentalizing options, as well as a total score for

which higher scores indicate more accurate mentalizing abilities. For the current study's assessment of ToM abilities, the MASC total score was utilized. In our sample, Cronbach's alpha for the 45 items was 0.55.

2.2.3. Thought problems

The Youth Self Report (YSR) [28] and the Child Behavior Checklist (CBCL) [28] are commonly used measures of psychopathology in youth aged 12 to 17, consisting of self-report and parent-report forms, respectively. Each measure consists of 112 problem items scored on a 3-point scale (0 = not true, 1 = somewhat or sometimes true, or 2 = very or often true). Eight symptom subscales are calculated based on the child or parent's responses to items, as well as a Total Problems score. The current study utilized the Thought Problems subscales of the YSR and the CBCL to assess a cross-cutting, rather than disorder-specific, symptom of psychosis. The Thought Problems subscales measure symptoms and behaviors relevant to psychosis, including hallucinations and strange thoughts and behaviors. Previous psychometric evaluations have been conducted by the authors of these measures, and have demonstrated adequate validity and reliability [28]. For the Thought Problems subscales in particular, the manual reports Cronbach's alphas of 0.78 for both the YSR and CBCL [28].

2.3. Procedures

All assessments were administered individually in private lab space on the unit by doctoral psychology students and trained clinical research assistants. The assessments were conducted within one week of admission. The average length of stay on the adolescent unit in this sample was 34.15 days (SD = 12.64, Min = 0, Max = 85). These assessments were administered as part of a larger study involving additional measures [34].

3. Results

3.1. Preliminary analyses

Preliminary analyses using bivariate correlations and independent samples t-tests were conducted in order to identify possible confounds. Age at admission was significantly correlated with attachment security ($r = 0.20$, $p < 0.001$), theory of mind (ToM; $r = 0.29$, $p < 0.001$), and parent-reported thought problems ($r = -0.14$, $p = 0.010$), but not with youth-reported thought problems ($r = -0.09$, $p = 0.09$). Attachment security and youth-reported thought problems did not differ significantly on the basis of gender (t (359) = 0.71, $p = 0.479$; and t (359) = 1.33, $p = 0.183$, respectively). However, there were significant group differences on the basis of gender for ToM (t (359) = 1.97, $p = 0.049$) and parent-reported thought problems (t (347) = 2.89, $p = 0.004$). For both of these measures, females scored higher than males, indicating more correct ToM judgments but also more thought

Table 2
Descriptive statistics and correlations between measures.

| Measure | N | M | SD | Correlations | | | |
				1	2	3	4
1. CAI Coherence	361	4.16	1.84	1.00			
2. MASC Total	361	32.09	4.94	0.18**	1.00		
3. YSR Thought Problems	361	64.34	9.48	−0.15**	−0.14**	1.00	
4. CBCL Thought Problems	349	69.44	7.32	−0.09	−0.14*	0.35**	1.00

CAI refers to the Child Attachment Interview. MASC refers to the Movie for the Assessment of Social Cognition. YSR refers to the Youth Self-Report. CBCL refers to the Child Behavior Checklist.
* $p < 0.05$.
** $p < 0.01$.

problems. Therefore, it was necessary to control for both age and gender in all subsequent analyses.

Next, we conducted bivariate correlations between measures in order to evaluate differences in thought problems and theory of mind based on attachment. As seen in Table 2, participants exhibiting greater security in attachment (as measured via the CAI Coherence rating) performed significantly better on the MASC ToM task ($r = 0.18$, $p = 0.001$). Lower attachment coherence was correlated with higher thought problems on youth-report ($r = -0.15$, $p = 0.004$) but not parent-report ($r = -0.09$, $p = 0.084$) measures. Poorer ToM performance was correlated with higher thought problems on both youth-report ($r = -0.14$, $p = 0.007$) and parent-report ($r = -0.14$, $p = 0.012$) measures. Finally, youth-reported thought problems were significantly correlated with parent-reported thought problems ($r = 0.35$, $p < 0.001$).

3.2. Mediation analyses

Hayes' [35] PROCESS Procedure for SPSS was used to assess whether ToM (MASC total score) mediated the relation between adolescents' attachment security (CAI Coherence score) and youth-reported thought problems (YSR Thought Problems T-score). This test was used instead of a traditional Sobel test because it provides a bootstrap test of the indirect effect (confidence interval) and permits the use of a binary outcome [36]. In this study, 1000 bootstrap samples were used to create 95% bias-corrected and accelerated bootstrap confidence intervals of the indirect effect. Mediational models are presented in Figs. 1 and 2.

For the first mediational model, attachment coherence served as the independent variable, ToM served as the mediator, and youth-reported thought-problems served as the dependent variable ($N = 361$). There were significant direct effects of attachment on ToM ($B = 0.32$, $SE = 0.14$, $t = 2.38$, $p = 0.018$), ToM on thought problems ($B = -0.23$, $SE = 0.11$, $t = -2.20$, $p = 0.028$), and attachment on thought problems ($B = -0.65$, $SE = 0.27$, $t = -2.38$, $p = 0.018$). The test of the indirect effect indicated that ToM mediated the relation between adolescents' attachment and youth-reported
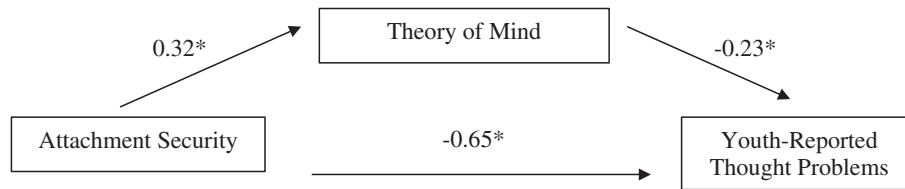
Fig. 1. Mediational model exploring the effect of attachment on youth-reported thought problems through the proposed mediator of theory of mind. *Note*: Values are unstandardized path coefficients. Attachment security = Coherence subscale score from the Child Attachment Interview; theory of mind = total score from the Movie for the Assessment of Social Cognition; youth-reported thought problems = Thought Problems subscale score of Youth Self Report. * $p < 0.05$.

thought problems, with the mean of the indirect effect across all bootstrap samples estimated at -0.08 and a resulting confidence interval that did not include 0 ($CI = -0.216$ to -0.004) [36]. Using the equation ab / (ab + c′), 12.77% of the total effect of attachment on thought problems was explained by this indirect effect.

The same procedure was used to confirm these findings utilizing parent-reported thought problems (CBCL Thought Problems T-score) as the dependent variable ($N = 352$). Similar to the youth-report model, there was a significant direct effect of attachment on ToM ($B = 0.30$, $SE = 0.14$, $t = 2.16$, $p = 0.032$) and a significant direct effect of ToM on thought problems ($B = -0.18$, $SE = 0.08$, $t = -2.22$, $p = 0.027$). However, in this model, the direct effect of attachment on thought problems was not significant ($B = -0.29$, $SE = 0.21$, $t = -1.34$, $p = 0.180$). This model provides additional support for the youth-report findings, again showing that ToM mediated the relation between adolescents' attachment and thought problems, with the mean of the indirect effect across all bootstrap samples estimated at -0.05 and a confidence interval that did not include 0 ($CI = -0.150$ to -0.003) [36]. Using the equation ab / (ab + c′), 15.70% of the total effect of attachment on thought problems was explained by this indirect effect.

4. Discussion

The broad purpose of the current study was to examine whether attachment security related to emerging psychotic symptoms via theory of mind (ToM) in a clinical sample of adolescents. An extensive body of literature has documented the relation between insecure attachment and psychotic

disorders [5,7,9]. Significant ToM deficits have also been consistently observed in this population, and appear to be present both prior to the onset of psychosis, as well as during periods of remission [12,20,21]. Thus, ToM appears to be a trait-based, rather than state-based, deficit associated with psychosis. The theorized mediational role of ToM between attachment and thought problems [2,5] was one of the main foci of the current paper, which extended this area of research to an adolescent sample. While some studies have included older adolescents in primarily adult samples, only one known study [17] has focused on an exclusively adolescent sample. This appears to be a major gap in the available literature; as such research could have important clinical implications, most notably the earlier identification of, and intervention with, adolescents experiencing prodromal symptoms of psychosis.

Consistent with expectations, the results of bivariate correlations indicated that attachment security was significantly and positively correlated with ToM capacities. Thus, adolescents in our sample who exhibited more secure attachments performed better on ToM tasks. This result is consistent with Fonagy and Target's [16] model for the development of ToM capacities, in which secure attachments with caregivers early in life foster development of ToM skills. The results of bivariate correlations also showed that low attachment coherence and poorer ToM performance were each associated with increased thought problems, particularly youth-reported thought problems. These observed relations are consistent with the numerous prior studies using adult samples [5,7,9,12,20,21], and provide support for a parallel model in adolescents.

The results of mediational models assessed in this study suggested that for both youth- and parent-reported thought problems, ToM was found to mediate the relation between insecure attachment and thought problems. It should be noted
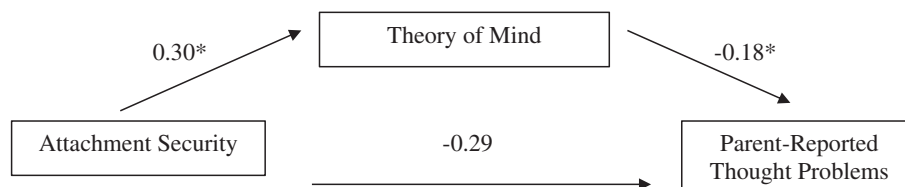

Fig. 2. Mediational model exploring the effect of attachment on parent-reported thought problems through the proposed mediator of theory of mind. *Note*: Values are unstandardized path coefficients. Attachment security = Coherence subscale score from the Child Attachment Interview; theory of mind = total score from the Movie for the Assessment of Social Cognition; parent-reported thought problems = Thought Problems subscale score of Child Behavior Checklist. * $p < 0.05$.

that the indirect effects in both mediational models were small. However, this significant mediation is noteworthy in that it provides support for a model in which impairments in ToM contribute to the observed relation between insecure attachment styles and early psychotic symptoms. Thus, our findings provide the first empirical evidence in support of Korver-Nieberg and colleagues' [5] theory that individuals who form insecure attachments with caregivers early in life develop deficits in accurate ToM, and that these impairments contribute to the experience of psychotic symptoms. This hypothesis is consistent with those of other researchers, who have posited, "mentalization impairments arising in the context of aberrant caregiving relationships may interact with dysregulation of the stress-response system and of mesolimbic dopamine to heighten the risk for psychosis in genetically vulnerable people" (p. 18) [37]. Findings are also consistent with Rajkumar's [2] ADC hypothesis, in which disturbances in early attachment relationships are theorized to lead to impairments in ToM (as well as other effects), and thereby contribute to formation of positive psychotic symptoms. It should also be noted that Debbané and colleagues [8] recently suggested an alternative theoretical model in which embodied mentalizing serves as a moderator of vulnerability to psychosis. While this model was not tested in the current study, future research could examine the relative fit of ToM as a moderator rather than a mediator.

The results of the current study also have a number of clinical implications. Most significant is the theoretical support for ToM- or mentalization-based therapeutic interventions for early psychotic symptoms. Although ToM-based interventions were not the focus of the current study, the mediational role of ToM found in the current study suggests that such interventions may be helpful for individuals experiencing emerging psychotic symptoms. This is certainly an important area for future research. Mentalization-based treatment (MBT) has been developed to address ToM deficits associated with a number of disorders, and has been found successful in the treatment of Borderline Personality Disorder (BPD) [38,39]. In MBT, the primary focus of therapy is on mentalizing (i.e., ToM) skills. Core interventions with BPD patients include the therapist's demonstration of empathy with the client's feelings, exploration and occasional challenging of the client's subjective state, identification of affect, and mentalization of the client-therapist relationship [39]. Mentalization-based psychodynamic psychotherapy has also been developed for the treatment of psychosis [40]. According to Brent [40], a case formulation utilizing this therapy conceptualizes the impairments in ToM within the context of both biological vulnerability and early attachment-related events. Brent and colleagues [37] also noted that while MBT shares commonalities with more established therapies for psychotic disorders, including cognitive-behavioral therapy and meta-cognitive psychotherapy, it adds the potentially beneficial focus on ToM and social-cognitive skills. At this time, research on the clinical efficacy of MBT for psychosis appears limited to case studies [37,40].

Similarly, several metacognition-based interventions for psychosis are early in development and clinical testing, including Metacognitive Interpersonal Therapy (MIT) [41] and Metacognitive Reflective and Insight Therapy (MERIT) [42]. In their rationale for metacognition-based interventions, Lysaker and Dimaggio [43] wrote, "Disability in schizophrenia may result when persons face the challenges of their illness, the social adversity associated with their illness, and the regular stresses of daily life without an integrated understanding of their own thoughts, feelings, longings, and intentions and those of others" (p. 3). It has been suggested that treatment should thus involve a focus on increasing understanding of mental states [43,44]. As with MBT for psychosis, additional research on the clinical efficacy of these interventions is needed beyond the initial case studies, though impaired metacognition has been implicated in numerous disorders [e.g., 45,46] and, particularly relevant to the current study, linked to attachment disturbance [46].

More broadly, a number of social-cognitive interventions for schizophrenia have been developed which show promise. Tan, Lee, and Lee [47] reviewed 61 studies investigating effectiveness of such interventions, which in addition to ToM, focus on processing of emotions, biases and styles of attributions, and social perception. Following their review, these authors concluded that social-cognitive interventions can have positive effects on both the specific social-cognitive domain targeted, and more broadly across skills in these domains. The results of the current study provide support for use of ToM-based interventions as well as broader social-cognitive interventions. However, additional research is needed, particularly on adolescent samples, as all of the participant groups in the studies reviewed by Tan and colleagues [47] were composed of adults. Given the potential impact of earlier intervention with adolescents experiencing prodromal psychotic symptoms, it would be beneficial to study the efficacy and effectiveness of MBT and other social-cognitive interventions with both adolescent and adult samples.

The results of the current study also support the utility of assessing attachment relationships and ToM in the context of emerging psychosis. While the emergence of a psychotic disorder is unlikely without an underlying genetic or biological vulnerability, until reliable markers for such vulnerabilities are discovered, these constructs may be beneficial for earlier detection and treatment of at-risk individuals. Furthermore, the inclusion of attachment and ToM measures in evaluations is likely to be informative for clinicians planning treatments for patients already experiencing psychotic symptoms.

4.1. Limitations and strengths

There are some important limitations to this study that must be acknowledged. First, participants experiencing active psychosis were excluded from this study, which raises questions regarding the generalizability of the results to such populations. However, as noted previously, the Thought Problems subscale of the CBCL has demonstrated diagnostic

utility in screening for youth at risk of developing psychosis [29]. By utilizing the Thought Problems subscales of the CBCL and YSR, the current study was able to assess emerging psychotic symptoms as a dimensional cross-cutting factor in a sample of adolescents with heterogeneous emotional and behavioral disorders. Regardless of its utility in the current study, an important direction for future research is the investigation of this mediational model in samples of actively psychotic patients, and with measures designed to directly assess symptoms of psychosis. Another limitation of this study was the relatively homogeneous sample in terms of ethnic background and SES. The sample was primarily Caucasian (79.00%), and as inpatients at a private-pay psychiatric hospital, included few participants from lower SES levels. It will be important to assess the utility of this model in more heterogeneous samples. Third, the current study did not include assessment of neurocognitive abilities (e.g., memory, attention, processing speed, intelligence, etc.). This is a significant limitation given prior research indicating associations between ToM (i.e., metacognition) deficits and neurocognition deficits in individuals experiencing psychosis [13,48–50]. Future research should include control for neurocognitive abilities in order to reassess this model without influence of such abilities. One final limitation to the current study is the use of cross-sectional data collection. While the relations between attachment, ToM, and emerging psychotic symptoms are *theoretically* causal in nature, this interpretation is just an assumption without longitudinal data to support it. At this time, additional research, particularly prospective work, is needed to understand the directionality of these relations. It is recommended that the proposed mediational models be assessed in the future using longitudinal research designs in order to validate the causal hypotheses of Korver-Nieberg and colleagues [5] and Rajkumar [2].

Notwithstanding these limitations, the current study had several strengths. First, the variables were assessed using multiple methods, including self-report, parent-report, interview, and an experimental task. Second, by assessing emerging psychotic symptoms continuously, rather than focusing on specific disorder subgroups, the current study contributed to the National Institute of Mental Health's RDoC initiative of identifying cross-cutting psychopathological factors. The current study also utilized a broader measurement of ToM than has been used in previous studies. For example, in the only other study of attachment and psychotic symptoms using an exclusively adolescent sample [17], a cognitive perspective-taking task was used to assess ToM. The Movie for the Assessment of Social Cognition, used in the current study, allowed for assessment of affective perspective taking, and thus provided a better measurement of the ToM abilities found to be impaired with psychosis. One final strength of the current study was the use of an adolescent sample. With only one previous study of these factors using adolescents [17], this area of the literature is relatively unexplored. The current study took an important step towards furthering our understanding of the relations between attachment, ToM, and emerging psychosis, and how these relations may be applied to clinical populations.

4.2. Conclusions

The current study investigated relations between attachment, ToM, and emerging psychotic symptoms in an inpatient adolescent sample. The possible mediational role of ToM between attachment and thought problems was a major focus, as previously theorized [2,5]. Consistent with expectations, the results of mediational models indicated that for both youth- and parent-reported thought problems, ToM was found to mediate the relation between insecure attachment and thought problems. The results provide support for a model in which insecure attachments early in life lead to impaired development of accurate ToM, which contributes to the experience of psychotic symptoms in vulnerable individuals. In regards to clinical implications, results of the current study support the use of ToM-based interventions for early psychotic symptoms. Routine assessment of attachment security and ToM may also be useful as psychosocial markers for those at risk of developing psychosis.

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