Attachment and psychosis

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Theory of Mind and attachment styles in people with psychotic disorders, their siblings, and controls

Karin Pos, Agna A Bartels-Velthuis, Claudia JP Simons, Nikie Korver-Nieberg, Carin J Meijer, Lieuwe de Haan, For GROUP

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Abstract

Objective
Impaired Theory of Mind (ToM) and insecure attachment styles have been found in persons with schizophrenia as well as in their healthy siblings. Insecure attachment is proposed to underlie impaired ToM. Insight in the association between attachment style and ToM is clinically relevant as it enhances our understanding and clinical approach to social dysfunction in schizophrenia. Therefore the aim of this study was to investigate the association between insecure attachment styles and ToM in schizophrenia patients, their siblings and healthy controls.

Methods
In 111 patients with a diagnosis in the schizophrenia-spectrum, 106 non-affected siblings and 63 controls completed the Psychosis Attachment Measure, the Conflicting Beliefs and Emotions, a subsection of the Wechsler Adult Intelligence Scale, the Community Assessment of Psychic Experiences and the Childhood Trauma Questionnaire-Short Form. Severity of symptoms was assessed with the Positive and Negative Syndrome Scale.

Results
Results: (1) avoidant attachment was significantly associated with affective (first order and second order) as well as cognitive (second order) ToM, all suggesting a u-shaped association indicating worse ToM performance at medium scores on avoidant attachment compared to lower scores on avoidant attachment, and better ToM performance at higher scores on avoidant attachment; (2) anxious attachment in patients was significantly negatively associated with cognitive ToM (second order) indicating worse ToM in higher scoring patients.

Conclusion
Medium levels of avoidant attachment and high(er) levels of anxious attachment may compromise ToM in patients. Higher levels of avoidant attachment may be associated with better ToM functioning. These findings bear clinical relevance, as activation of (insecure) attachment-mechanisms may affect interpersonal relations, as well as therapeutic working alliance. However, given multiple comparisons and trend findings the results should be interpreted cautiously. Further clarification is needed on the possible protective effect of avoidant attachment on ToM deficits.
Introduction

Patients with psychotic disorders often have impairments in Theory of Mind (ToM) (Corcoran et al., 1995; Fett et al., 2011; Sprong et al., 2007). ToM encompasses the understanding and inference of mental states (beliefs, thoughts and intentions) of self and others. It is conceptually related to mentalization, which concerns the development of the self, and more affectively and interpersonally complex understandings of oneself and others (Choi-Kain and Gunderson, 2008). ToM can be divided into several components: affective ToM, cognitive ToM, first order skills (inferring the thoughts/emotions of another person) and second order skills (inferring what one person -other than the self- thinks about another person’s thoughts/emotions) (Shamay-Tsoory et al., 2007). ToM impairment is associated with paranoid ideation, functional outcome, help-seeking behaviour and therapeutic alliance (Davis et al., 2011; Garety et al., 2001; Lysaker et al., 2013; Lysaker et al., 2005). Concerning high-risk samples, findings are inconclusive. Impairments in ToM have been found in (ultra) high-risk samples and in persons with a genetic high risk for psychosis (relatives of patients), suggesting a (partly) trait dependency (de Achával et al., 2010; Janssen et al., 2003; Yu et al., 2008). However, others found no evidence for worse ToM performance in relatives (Kelemen et al., 2004). Additionally, ToM impairments were found to worsen during acute phases in schizophrenia, suggesting that ToM deficits may also be (partly) state dependent (Pousa et al., 2008).

Fonagy and Target (1997) proposed that ToM skills are more likely to develop within secure attachment bonds. Attachment theory provides a developmental framework of interpersonal experiences that plays a role in regulating cognition, affect and (interpersonal) behaviour and is associated with resilience, interpersonal functioning, and psychological symptoms (Bentall et al., 2007; Berry et al., 2008; Rutten et al., 2013). Attachment bonds and ToM skills start to develop in childhood, and Meins and colleagues (1998) found evidence for an association between attachment and ToM in a longitudinal study in which securely attached children had superior ToM compared to insecurely attached children. Finally, childhood trauma (indicative for insecure attachment) is associated with poorer ToM in adults (Lysaker et al., 2011; Nazarov et al., 2014). These studies indicate that (childhood) attachment and ToM may be related.

For insecure adult attachment, which guides interpersonal functioning and social life in adults, a distinction is often made between anxious and avoidant attachment styles (Berry et al., 2008). Individuals with high levels of anxious attachment need approval from others, are likely to experience separation anxiety, and engage in an interpersonal style generally marked by fixing attention on distressing stimuli. Individuals with high levels of avoidant attachment tend to feel uncomfortable with closeness to others, value their autonomy and divert attention from distressing stimuli and attachment-related thoughts and feelings (Berry et al., 2008; Fraley et al., 1998).

Anxious and especially avoidant adult attachment are more prevalent in people with psychotic disorders (Gumley et al., 2013; Mickelson et al., 1997), and are associated with poorer engagement with healthcare services, lower therapeutic alliance and non-compliance and social dysfunction (Gumley et al., 2013). Also, as insecure attachment style is associated
with poorer recovery (Drayton et al., 1998) investigating to what extent ToM is associated with insecure adult attachment is of interest as it may shed light on the cognitive structure underlying social dysfunction (Fonagy and Luyten, 2009). Impaired ToM may be improved with use of cognitive training (Kurtz and Richardson, 2012) and may possibly down-regulate initial hyper-activating or deactivating/sealing over strategies, associated with insecure attachment in the context of recovery.

To investigate ToM/mentalization and attachment styles in schizophrenia, Macbeth and colleagues (2011) assessed 34 patients with a first-episode psychosis. Attachment was differentially associated with mentalization: poorer mentalizing skills were associated with avoidant attachment but not with anxious attachment. However, findings from this study are inconclusive with respect to anxious attachment due to small sample size. In another study among 32 patients with early-onset psychosis, no association was found between perspective taking - a key component of cognitive ToM- and attachment, likely as a result of assessing cognitive rather than affective ToM skills (Korver-Nieberg et al., 2013). As attachment style encompasses affect regulation, affective ToM may be more strongly associated with attachment than cognitive ToM. Studying cognitive and affective ToM, as well as first order skills (‘first order belief’ for cognitive ToM and ‘first order emotion’ for affective ToM) and second order skills (‘second order belief’ and ‘second order emotion’), may clarify specific ToM impairment in psychotic disorders and its relationship with attachment styles (Korver-Nieberg et al., 2013; Shamay-Tsoory et al., 2007). The aim of this study was to explore attachment and ToM in patients, siblings and healthy controls to look whether this association differed between these three groups that vary in genetic vulnerability and confounding illness-related factors. As gender, intelligence, symptom severity and a history of traumatization are associated with ToM and attachment, these variables were included as covariates (Ibanez et al., 2013; Meijer et al., 2012; Nazarov et al., 2014). We hypothesized that (a) patients would report higher levels of insecure attachment and (b) experience poorer ToM skills than siblings and controls and that (c) ToM would be associated with attachment style, with most pronounced associations between attachment and affective ToM.

Methods

Subjects

The present study was an add-on study of the Genetic Risk and Outcome of Psychosis (GROUP) research project, a naturalistic, longitudinal cohort study, and included samples recruited by the Amsterdam site. Inclusion criteria at baseline for patients and their siblings were the following: (a) age range of 16 to 50 years (extremes included); (b) a diagnosis of non-affective psychotic disorder according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria (APA, 2000); (c) good command of the Dutch language; and (d) able and willing to give written informed consent. Similar criteria applied to siblings, except that non-affective psychotic disorder was an exclusion criterion. Exclusion criteria for healthy controls were a lifetime psychotic disorder in the subject or in first degree
family (2012). For this study, 111 patients, 106 siblings and 63 controls were included. Of the 111 patients, 59 had paranoid- and 20 schizo-affective schizophrenia, 10 a psychotic disorder NOS, 8 residual-, 4 undifferentiated-, 3 disorganized-, and 2 schizophreniform schizophrenia; 2 had a brief psychotic disorder, 2 a drug induced psychotic disorder and 1 had a delusional disorder.

**Instruments**

**Attachment**

Attachment was assessed with the ‘Psychosis Attachment Measure’ (PAM; (Berry et al., 2006); Dutch translation (Korver-Nieberg et al., Submitted)), which is developed to assess adult attachment style in psychosis. The Dutch PAM is a 15-item questionnaire referring to thoughts, feelings and behaviours, rated on a 4-point answer scale ranging from 0 'not at all' to 3 'very much'. Seven items reflect avoidant attachment and 8 reflect anxious attachment. Average item scores were calculated for attachment anxiety and avoidance, with higher scores reflecting higher levels of insecure attachment.

**Theory of mind**

To assess cognitive and affective ToM, a shortened version of the Conflicting Beliefs and Emotions (CBE) (Shaw et al., 2004; Swart et al., 2009) was administered. This task consists of four vignettes, each concerning a short story involving a social situation featuring two actors. Each story is followed by four questions testing the subjects’ understanding of first order and second order belief as well as emotional states of the actors in the story. Two control questions are included to test recall of the story and the making of inferences. Each correct response is assigned 2 points, a partially correct response 1 point, and wrong answers receive no points. Average scores of first order belief (FOB) (range 0-4), first order emotion (FOE) (range 0-8), second order belief (SOB) (range 0-4), second order emotion (SOE) (range 0-4), and control questions (range 0-8) were calculated.

**Intelligence**

To estimate IQ, the following four subtests of the Wechsler adult intelligence scale were employed (Wechsler, 2000): Arithmetic, Digit Symbol-coding, Information and Block Design (Blyler et al., 2000).

**Symptoms**

The Positive and Negative Syndrome Scale (PANSS), was administered to assess severity of positive and negative symptoms in patients and is one of the most widely used interviews to assess the symptoms of schizophrenia (Peralta and Cuestab, 1994).

The Community Assessment of Psychic Experiences (CAPE) was administered to assess subclinical positive and negative symptoms in siblings and controls. Studies using the CAPE in general population samples have shown good psychometric properties in terms of reliability and validity (Konings et al., 2006).
Trauma
The Childhood Trauma Questionnaire-Short Form (CTQ-SF) was administered to measure childhood trauma, and total score was used (Daalder and Bogaerts, 2011).

Data analyses
Due to the nature of the data, linear mixed models (LMM) were conducted with use of IBM SPSS 20. As patients and siblings were part of the same family, their ToM and IQ scores may not be considered independent. A random effect for ‘family’ was therefore included in the models. This random effect represented unobserved heterogeneity between families, and therefore explicitly modelled the intra-familial correlations (Heck et al., 2010). Fit of the models was assessed by means of change in log-likelihood. To facilitate interpretation of the beta’s in LMM, the IQ-scores were centred on the total group mean. As the precise association between attachment and ToM is not yet clear, polynomials (i.e. the squared scores on avoidant and anxious attachment) were included in the LMM-model and model fit was determined. To minimize multicollinearity, centred scores were used for the attachment and squared attachment variables.

LMM were conducted as follows:
In the first model group differences in attachment were assessed; status (control, sibling, patient) was entered as independent variable and insecure attachment as dependent variable. Status was treated as a fixed factor.
In the second model group differences in ToM were assessed; status was entered as independent variable and ToM as dependent variable.
In the final model, analyses were performed per status group to explore the association between ToM (dependent variable; repeated for all ToM factors) and scores on attachment

Table 1. Descriptive statistics concerning demographics and illness related variables.

<table>
<thead>
<tr>
<th></th>
<th>Patients</th>
<th>Siblings</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>92</td>
<td>47</td>
<td>43</td>
</tr>
<tr>
<td>female</td>
<td>19</td>
<td>59</td>
<td>20</td>
</tr>
<tr>
<td>Age</td>
<td>31.1 (SD = 7.57)</td>
<td>30.81 (SD = 7.98)</td>
<td>30.65 (SD = 10.6)</td>
</tr>
<tr>
<td>IQ estimate</td>
<td>101.74 (SD = 15.98) *</td>
<td>110.87 (SD = 15.85)</td>
<td>113.57 (SD = 17.52)</td>
</tr>
<tr>
<td>PANSS positive scale</td>
<td>1.52 (SD = 0.64)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PANSS negative scale</td>
<td>1.73 (SD = 0.78)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CAPE positive scale</td>
<td>-</td>
<td>0.115 (SD = 0.134)#+</td>
<td>0.095 (SD = 0.11)^</td>
</tr>
<tr>
<td>CAPE negative scale</td>
<td>-</td>
<td>0.48 (SD = 0.408)#^</td>
<td>0.336 (SD = 0.297)#^</td>
</tr>
<tr>
<td>CTQ-SF Trauma total</td>
<td>1.61 (SD = 0.5) ^</td>
<td>1.37 (SD = 0.39)#^</td>
<td>1.33 (SD = 0.3) #</td>
</tr>
<tr>
<td>Illness duration</td>
<td>7.7 Yrs (SD = 5.33)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Significant association at p <0.05 with: ^ anxious attachment; # avoidant attachment;
+ Trend for an association with anxious attachment
* Significant difference at p <0.05 compared to controls and siblings
Factor scores are used for the Panss and CAPE subscales
Results

We refer to table 1 for demographics and to table 2 for a summary of results concerning model 1 and 2.

First model: between-group differences in insecure attachment

Patients scored significantly higher on anxious attachment than siblings (β=0.29, p=0.000) and significantly higher than controls (β=0.41, p=0.000). The difference between siblings and controls reached trend level significance (β=0.12, p=0.078).

Patients scored significantly higher on avoidant attachment compared to siblings (β=0.32, p=0.000) and compared to controls (β=0.43, p=0.000). The difference between siblings and controls reached trend level significance (β=0.11, p=0.097).

Second model: between-group differences in Theory of Mind

Control questions. Patients scored significantly lower on the control questions than siblings (β=-0.48, p=0.000) and controls (β=-0.53, p=0.000). The difference between siblings and controls was not significant. This indicated that patients had a poorer understanding of the stories than their siblings and controls. To adjust for these differences, the scores on the control questions were factored in the final LMM model besides IQ, gender, trauma,

Table 2. Descriptive statistics and parameter information.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Patients Mean (SD)</th>
<th>Siblings Mean (SD)</th>
<th>Controls Mean (SD)</th>
<th>Patients vs siblings β (95% CI) p-value</th>
<th>Patients vs controls β (95% CI) p-value</th>
<th>Siblings vs controls β (95% CI) p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious attachment</td>
<td>0.72 (0.57)</td>
<td>0.43 (0.35)</td>
<td>0.31 (0.31)</td>
<td>0.29 (0.17 - 0.42) p &lt;.0001</td>
<td>0.41 (0.27 - 0.54) p &lt;.0001</td>
<td>0.12 (-0.02 - 0.25) p =.101</td>
</tr>
<tr>
<td>Avoidant attachment</td>
<td>1.16 (0.56)</td>
<td>0.85 (0.51)</td>
<td>0.74 (0.39)</td>
<td>0.32 (0.18 - 0.46) p &lt;.0001</td>
<td>0.43 (0.27 - 0.58) p &lt;.0001</td>
<td>0.11 (-0.05 - 0.26) p =.180</td>
</tr>
<tr>
<td>First order belief</td>
<td>3.74 (0.61)</td>
<td>3.95 (0.21)</td>
<td>3.92 (0.33)</td>
<td>-0.21 (-0.34 + 0.09) p &lt;.0001</td>
<td>-0.18 (-0.32 + 0.05) p =.008</td>
<td>0.03 (0.1 - 0.17) p =.642</td>
</tr>
<tr>
<td>Second order belief</td>
<td>3.26 (0.94)</td>
<td>3.79 (0.45)</td>
<td>3.86 (0.35)</td>
<td>-0.53 (-0.73 + 0.33) p &lt;.0001</td>
<td>-0.60 (-0.80 + 0.38) p &lt;.0001</td>
<td>-0.06 (-0.28 - 0.1) p =.546</td>
</tr>
<tr>
<td>First order emotion</td>
<td>6.31 (1.78)</td>
<td>6.99 (1.46)</td>
<td>7.19 (1.39)</td>
<td>-0.68 (-1.12 + 0.25) p &lt;.0002</td>
<td>-0.88 (-1.37 + 0.4) p &lt;.0001</td>
<td>-0.20 (-0.69 - 0.29) p =.426</td>
</tr>
<tr>
<td>Second order emotion</td>
<td>2.96 (1.14)</td>
<td>3.61 (0.73)</td>
<td>3.70 (0.59)</td>
<td>-0.65 (-0.90 + 0.39) p &lt;.0001</td>
<td>-0.73 (-1.00 + 0.46) p &lt;.0001</td>
<td>-0.09 (-0.36 - 0.19) p =.545</td>
</tr>
<tr>
<td>Control Questions</td>
<td>7.31 (1.0)</td>
<td>7.78 (0.48)</td>
<td>7.84 (0.52)</td>
<td>-0.48 (-0.69 + 0.27) p &lt;.0001</td>
<td>-0.53 (-0.76 + 0.31) p &lt;.0001</td>
<td>-0.06 (0.29 - 0.17) p =.617</td>
</tr>
</tbody>
</table>
(CTQ-SF) and (subclinical) symptoms; for patients: PANSS positive and negative subscales, and for siblings and controls: CAPE positive and negative subscales.

**First order belief.** Patients scored significantly lower on FOB than siblings ($\beta=-0.21$, $p=0.000$), and controls ($\beta=-0.18$, $p=0.008$). Differences between siblings and controls were not significant.

**First order emotion.** Patients scored significantly lower on FOE than siblings ($\beta=-0.68$, $p=0.002$); and controls ($\beta=-0.88$, $p=0.000$). Differences between siblings and controls were not significant.

**Second order belief.** Patients scored significantly lower on SOB than siblings ($\beta=-0.53$, $p=0.000$); and controls ($\beta=-0.60$, $p=0.000$). Differences between siblings and controls were not significant.

**Second order emotion.** Patients scored significantly lower on SOE than siblings ($\beta=-0.65$, $p=0.000$); and controls ($\beta=-0.73$, $p=0.000$). Differences between siblings and controls were not significant.

**Final model: Within-group analysis of insecure attachment and Theory of Mind**

We refer to table 3 for a summary of results concerning the final model.

**Within-group analyses of insecure attachment and first order belief.** Further analysis revealed that avoidant attachment was trend-like associated with FOB in patients ($\beta=0.223$; $p=0.086$). Anxious attachment was not associated with FOB in patients. Both anxious and avoidant attachment were not associated with FOB in siblings or controls.

**Within-group analyses of insecure attachment and first order emotion.** Analysis revealed that a linear association between avoidant attachment and FOE was not significant in patients. Adding the polynomial led to a significant improvement in model fit, after which a significant quadratic association between avoidant attachment and FOE was found ($\beta=1.1$; $p=0.004$). This indicated a u-shaped association (see graph 1). There was no association between anxious attachment and FOE in patients. Neither anxious attachment nor avoidant attachment was associated with FOE in siblings or controls.

**Within-group analyses of insecure attachment and second order belief.** Anxious attachment was significantly linearly associated with SOB in patients ($\beta=-0.45$; $p=0.015$); patients with higher anxious attachment tended to have more problems with SOB compared with lower scoring patients.

Avoidant attachment was significantly linearly associated with SOB in patients ($\beta=0.40$; $p=0.047$), indicating overall better performance on SOB for patients when avoidant attachment was higher. Adding the polynomial led to a non-significant improvement in model fit. However, a quadratic association seemed to fit the data as well, and the association between SOB and avoidant attachment was trend-like quadratic ($\beta=0.37$; $p=0.070$); suggesting a u-shaped association with a positive slope.
Table 3. Within-group associations between insecure attachment and Theory of Mind.

<table>
<thead>
<tr>
<th></th>
<th>First order belief</th>
<th>First order emotion</th>
<th>Second order belief</th>
<th>Second order emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linear $\beta$; p-value</td>
<td>Linear $\beta$; p-value</td>
<td>Quadratic $\beta$; p-value</td>
<td>Linear $\beta$; p-value</td>
</tr>
<tr>
<td></td>
<td>(95% CI)</td>
<td>(95% CI)</td>
<td>(95% CI)</td>
<td>(95% CI)</td>
</tr>
<tr>
<td>Patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxious</td>
<td>0.136; p =0.294</td>
<td>-0.234; p =0.476</td>
<td>-0.45; p =0.015</td>
<td>-0.13; p =0.531</td>
</tr>
<tr>
<td>95% CI</td>
<td>(-0.39 – 0.12)</td>
<td>(-0.88 - 0.41)</td>
<td>(-0.80 - -0.09)</td>
<td>(-0.53 – 0.28)</td>
</tr>
<tr>
<td>Avoidant</td>
<td>0.223; p =0.086</td>
<td>-0.376; p =0.254</td>
<td>1.1; p =0.004</td>
<td>0.43; p =0.047</td>
</tr>
<tr>
<td>95% CI</td>
<td>(-0.03 - 0.48)</td>
<td>(-1.27 - 1.02)</td>
<td>(0.36 - 1.79)</td>
<td>(-0.04 - 0.76)</td>
</tr>
<tr>
<td>Change of model fit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidant</td>
<td></td>
<td></td>
<td>df$^{\text{change}}$ = 11-10= 1; $\chi_1^2$ = 383.6 - 254.0 = 3.4 &lt; 3.84</td>
<td>df$^{\text{change}}$ = 11-10= 1; $\chi_1^2$ = 257.4 - 279.0 = 4.9 &gt; 3.84</td>
</tr>
<tr>
<td>Siblings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxious</td>
<td>- 0.015; p =0.836</td>
<td>-0.29 p =0.527</td>
<td>-0.119; p =0.425</td>
<td>-0.11; p =0.622</td>
</tr>
<tr>
<td>95% CI</td>
<td>(CE: -0.15 - 0.12)</td>
<td>(-1.2 - 0.62)</td>
<td>(-0.41 - 0.18)</td>
<td>(-0.57 - 0.34)</td>
</tr>
<tr>
<td>Avoidant</td>
<td>-0.017; p =0.733</td>
<td>-0.112; p =0.731</td>
<td>-0.027; p =0.798</td>
<td>-0.002; p =0.989</td>
</tr>
<tr>
<td>95% CI</td>
<td>(-0.12 - 0.08)</td>
<td>(-0.75 - 0.53)</td>
<td>(-0.23 - 0.18)</td>
<td>(-0.33 - 0.32)</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxious</td>
<td>0.022; p =0.892</td>
<td>0.288; p =0.676</td>
<td>-0.118; p =0.442</td>
<td>0.006; p =0.982</td>
</tr>
<tr>
<td>95% CI</td>
<td>(-0.31 - 0.35)</td>
<td>(-1.08 - 1.66)</td>
<td>(-0.42 - 0.19)</td>
<td>(-0.50 - 0.52)</td>
</tr>
<tr>
<td>Avoidant</td>
<td>-0.062; p =0.663</td>
<td>-0.38; p =0.519</td>
<td>-0.232; p =0.081</td>
<td>-0.198; p =0.367</td>
</tr>
<tr>
<td>95% CI</td>
<td>(-0.35 - 0.22)</td>
<td>(-1.55 - 0.79)</td>
<td>(-0.50 - 0.03)</td>
<td>(-0.63 - 0.24)</td>
</tr>
</tbody>
</table>

*Bold text indicates a significant association*
Patients scored significantly lower on SOE than siblings (β = -0.65, p = 0.000); and controls (β = -0.73, p = 0.000). Differences between siblings and controls were not significant.

**Final model:** Within-group analysis of insecure attachment and Theory of Mind

We refer to table 3 for a summary of results concerning the final model.

### TABLE 3

**Within-group analyses of insecure attachment and first order belief**

Further analysis revealed that avoidant attachment was trend-like associated with FOB in patients (β = 0.223; p = 0.086). Anxious attachment was not associated with FOB in patients. Both anxious and avoidant attachment were not associated with FOB in siblings or controls.

**Within-group analyses of insecure attachment and first order emotion**

Analysis revealed that a linear association between avoidant attachment and FOE was not significant in patients. Adding the polynomial led to a significant improvement in model fit, after which a significant quadratic association between avoidant attachment and FOE was found (β = 1.1; p = 0.004). This indicated a u-shaped association (see graph 1). There was no association between anxious attachment and FOE in patients. Neither anxious attachment nor avoidant attachment was associated with FOE in siblings or in controls.

**Within-group analyses of insecure attachment and second order belief**

Anxious attachment was significantly linearly associated with SOB in patients (β = -0.45; p = 0.015); patients with higher anxious attachment tended to have more problems with SOB compared with lower scoring patients.

Avoidant attachment was significantly linearly associated with SOB in patients (β = 0.40; p = 0.047), indicating overall better performance on SOB for patients when avoidant attachment was higher. Adding the polynomial led to a non-significant improvement in model fit. However, a quadratic association seemed to fit the data as well, and the association between SOB and avoidant attachment was trend-like quadratic (β = 0.37; p = 0.070); suggesting a u-shaped association with a positive slope.

Avoidant attachment was trend-like associated with SOB in controls (-0.232; p = 0.081), suggesting worse SOB as scores on avoidant attachment rise. Anxious attachment was not associated with SOB in controls. Neither anxious attachment nor avoidant attachment was associated with SOB in siblings.

**Within-group analyses of insecure attachment and second order emotion**

A quadratic association between avoidant attachment and SOE was significant in patients (β = 0.51; p = 0.028). This indicated a u-shaped association. Anxious attachment was not associated with SOE. Neither anxious attachment nor avoidant attachment was associated with SOE in siblings or controls.

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**Graph 1. Association between first order emotion and avoidant attachment**

Significant u-shaped association for patients as measured with Mixed Models; lower- and higher scores on avoidant attachment indicate better ToM first order emotion compared to medium scores on avoidant attachment.

**Graph 2. Association between second order belief and avoidant attachment**

Significant u-shaped association for patients as measured with Mixed Models; lower- and higher scores on avoidant attachment indicate better ToM second order belief compared to medium scores on avoidant attachment.
Avoidant attachment was trend-like associated with SOB in controls (-0.232; \( p = 0.081 \)), suggesting worse SOB as scores on avoidant attachment rise. Anxious attachment was not associated with SOB in controls. Neither anxious attachment nor avoidant attachment was associated with SOB in siblings.

**Within-group analyses of insecure attachment and second order emotion.** A quadratic association between avoidant attachment and SOE was significant in patients (\( \beta = 0.51; \ p = 0.028 \)). This indicated a u-shaped association. Anxious attachment was not associated with SOE. Neither anxious attachment nor avoidant attachment was associated with SOE in siblings or controls.

**Discussion**

In line with our hypotheses and earlier research findings we found that (a) patients scored higher on avoidant and anxious attachment than their siblings and controls; and (b) patients performed worse on cognitive and affective ToM than their siblings and controls (Corcoran et al., 1995; Fett et al., 2011; Korver-Nieberg et al., 2013; MacBeth et al., 2011; Sprong et al., 2007). Differences in attachment between siblings and controls were non-significant. We also found no evidence for worse ToM in siblings compared to controls.
Association between attachment and Theory of Mind

Regarding the association between ToM and attachment (after controlling for severity of symptoms, trauma, IQ and gender), we found that (a) significant associations between ToM and attachment occurred more in affective than in cognitive ToM, (b) that these associations mostly occur in the patient group, (c) that most relations are non-linear. Taken together, we found some evidence that insecure attachment style moderates ToM and that being diagnosed with psychotic disorder uniquely contributes to this association.

One explanation for the heterogeneity in these associations is that insecure attachment differentially moderates ToM. Fonagy and Luyten (2009) argue that higher anxious attachment is associated with a lowered threshold for the activation of defensive/insecure coping mechanisms (activation of insecure attachment related behaviour) and simultaneously for ToM/mentalization deactivation; persons with higher scores on anxious attachment may be easier overwhelmed by social information and emotionally demanding tasks, which is congruent with our finding that higher anxious attachment is indeed (strongly) associated with worse second order belief in patients. Fonagy and Luyten (2009) further propose that avoidant attachment strategies may be associated with a more stable or persistent (e.g. less reactive to emotionally demanding tasks) functioning ToM. This is in accordance with our finding that better affective ToM performance was related with higher levels of avoidant attachment in patients.

No association between attachment and ToM in siblings was found.

In contrast to patients, controls with higher levels of avoidant attachment tend to perform worse on second order belief (n.s.) when avoidant attachment scores rise. A possible, although speculative, explanation is that the moderating effect of avoidant attachment is level-dependent (i.e. suggesting a threshold value of avoidant attachment after which positive moderating takes effect). As scores on avoidant attachment were notably higher for patients, the positive effect of avoidant attachment on ToM may come to the fore in this group, as is found in the right hand extreme of the u-shaped association. Medium or borderline scores on avoidant attachment, compared to a zero score on this scale, may represent a mixture of secure and insecure attachment styles and in effect an inadequate/incomplete avoidant coping/defensive mechanism (e.g. not being able to completely ignore attachment related information). Medium scores on avoidant attachment, compared to either low or high scores may then be related to diminished ToM as the inadequate attachment coping/defensive mechanism falls short. However, we would like to point out that results for controls should be interpreted cautiously, especially with regard to the finding of non-significant relationships in siblings.

The abovementioned findings seem in contrast with the findings of Macbeth and colleagues’ (2011), they found that dysfunction in mentalization was associated with avoidant attachment. It is likely that the operationalization of mentalization in the latter study (as a more complex social skill) may account for these differential findings. As stated, Korver-Nieberg et al. (2013), were unable to find associations between ToM and attachment, probably due to a) relatively low sample size and b) assessing cognitive rather than affective ToM. Our results indeed suggest that associations between ToM and attachment occurred more
in affective ToM. Also, the proposed differential moderation of ToM by attachment may further complicate analyses; future research should further explore non-linear associations between these constructs, and other possible confounders/covariates.

Also, future research may clarify how psychotic symptoms, and especially paranoid ideation as possible expression of inadequate mentalization, may result from the interplay between rooted dysfunctional schemes that inherently operate within insecure attachment styles and impaired cognitive skills, such as afflicted ToM (MacBeth et al., 2011; Sprong et al., 2007). Also, further clarification is needed on the possible protective effect of avoidant attachment on ToM deficits, especially in relation to more complex interpersonal situations.

Summarising, the results from this study support the idea that insecure attachment style is associated with ToM function in patients. This association is clinically relevant, as different interpersonal styles (related to adult attachment) may be related to problems in theory of mind, which can then constitute a possible risk for therapeutic processes and other social interactions (Berry et al., 2007; Slade, 1999).

This study has several limitations. First, scores on first order belief suggest that there was a ceiling effect, possibly explaining the failure to find significant associations. Second, measurement of ToM and attachment were conducted by single methods compromising robustness of results. However, the instrument we used to measure attachment is well-validated and appeared to be reliable in earlier studies (Korver-Nieberg et al., Submitted). Third, given multiple comparisons and trend findings the results should be interpreted cautiously. Finally, due to the cross-sectional design of the study, conclusions about causality between attachment and ToM cannot be drawn.

References


25. Korver-Nieberg N, Meijer CJ, Koeter MWJ and de Haan L (Submitted) *Comparison of Adult Attachment Style in Samples of Psychotic Patients, their Siblings and Healthy Controls*.


