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Associations between attachment and psychopathology dimensions in a large sample of patients with psychosis

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ABSTRACT

Attachment theory is a powerful theoretical framework that complements and extents current models psychosis. We tested the hypothesis that attachment anxiety and avoidance are differentially associated with the severity of positive, negative and general psychopathology symptoms in patients with a diagnosis of psychosis. Five hundred patients with DSM-IV or ICD-10 diagnoses of psychotic disorders (schizophrenia, schizoaffective or non-affective psychosis) from independent samples from Netherlands, United Kingdom and Israel completed the Relationship Questionnaire. Psychopathology was assessed with the Positive and Negative Syndromes Scale. We used both categorical and dimensional approach to attachment data, which were analyzed using ANOVA with post-hoc tests, Pearson's correlations and multiple regression analysis. The conservative level of statistical significance was established ($p < 0.001$) to control for multiple testing. After adjustment for possible confounders, attachment anxiety predicted severity of positive symptoms as well as affective symptoms. Both attachment anxiety and avoidance were associated with severity of hallucinations and persecution Contrary to predictions, attachment avoidance was not associated with overall scores for negative symptoms, although there was some evidence of relatively weaker association between avoidance and social and emotional withdrawal.
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1. Introduction

The role of trauma in the development of psychosis is well-established and there is now growing interest in elucidating the mechanisms through which trauma exerts its influence (Read and Bentall, 2012). It has been argued that attachment theory is a powerful theoretical framework that both complements and usefully extents current models of the development and persistence of psychosis (Korver-Nieberg et al., 2014; Gumley et al., 2014a, 2014b). Insecure attachment styles may develop as a result of suboptimal caregiving in earlier life and are associated with later difficulties in regulating affect, poorer interpersonal functioning and negative beliefs about the self and others (Mikulincer and Shaver, 2012). They are hypothesised to increase vulnerability to the development of psychosis and are associated with worse outcomes in terms of symptom severity and course of illness (Korver-Nieberg et al., 2014; Gumley et al., 2014a, 2014b). Conversely, secure attachment, which is associated with a positive self-image, a capacity to manage distress, comfort with autonomy and in forming relationships with others is hypothesised to be an important protective factor in the context of mental disorder (Mikulincer and Shaver, 2012).

There are different methods of assessing and conceptualising attachment styles in adulthood. Bartholomew and Horowitz (1991) describe a four category model of adult attachment and have developed a brief self-report questionnaire to assess an individual's attachment style. As shown in Fig. 1, the four categories of attachment (secure, preoccupied, dismissing and fearful) can also be conceptualised as dimensions, either in cognitive terms as beliefs about self and others, or in affective terms as anxiety and avoidance. The dimensions of attachment anxiety and avoidance have been found to underlie a number of other self-report measures of attachment (Brennan et al., 1998).

As different types of insecure attachment are associated with different methods of regulating distress and self-other beliefs, it is possible that attachment styles may be differentially associated with specific symptom profiles. Preoccupied attachment or higher attachment anxiety is associated with hyper-activating coping strategies (excessive proximity seeking) that results in difficulties in regulating negative affect as well as sensitivity to threat (Mikulincer and Shaver, 2012). Conversely, dismissing or high avoidant attachment is associated with deactivating coping strategies that result in a blocking of conscious emotions, withdrawal from others and

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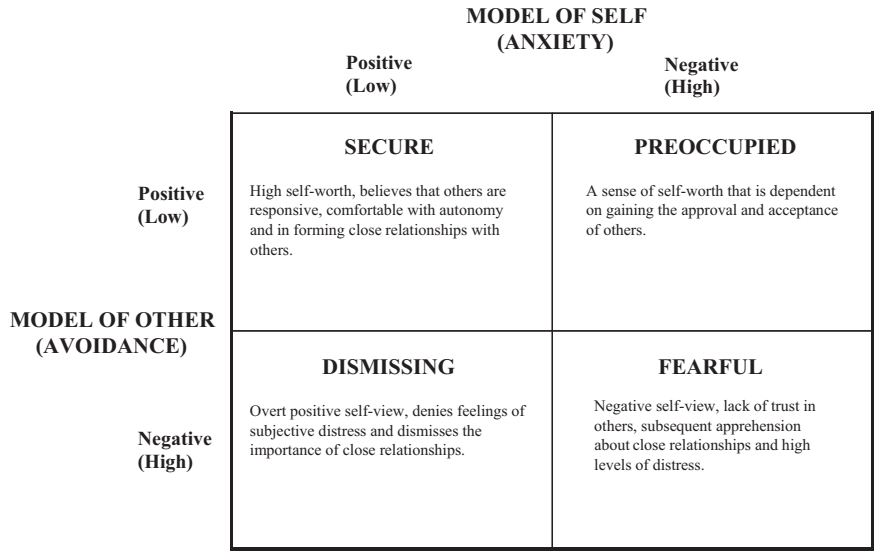

Fig. 1. Bartholomew and Horowitz's (1991) model of adult attachment.

impaired mentalization (Mikulincer and Shaver, 2012). Fearful attachment is associated with both high levels of anxiety and avoidance or 'disorganisation' of the attachment system.

Previous research has generated mixed findings in relation to associations between symptoms profiles and insecure attachment patterns (Berry et al., 2008; Ponizovsky et al., 2007, 2013; Korver-Nieberg et al., 2014, 2013). However, two recent reviews of the psychosis and attachment literature conclude that there is good evidence that dismissing-avoidant attachment is associated with positive symptoms and to a lesser extent negative symptoms (Korver-Nieberg et al., 2014; Gumley et al., 2014a, 2014b). There is also some evidence that preoccupied/anxious attachment is associated with positive and affective symptoms, but not negative symptoms. The role of fearful attachment has been relatively less well researched, but a related concept of disorganised attachment has been implicated as a potential risk factor for the development of psychosis (Harder, 2014).

Although there is a growing consensus of the importance of attachment theory to the understanding of psychosis, there are limitations in the existing literature including small sample sizes, different ways of conceptualising and assessing attachment and cultural differences in attachment patterns. Accordingly, the aims of this study are to explore associations between attachment style and symptoms of psychosis in a large cross-cultural sample of patients who all completed the Bartholomew and Horowitz's (1991) Relationship Questionnaire (RQ) to assess attachment (we refer to Fig. 1 for a description of the attachment prototypes as assessed with the RQ). Consistent with previous research and theoretical formulations (Korver-Nieberg et al., 2014; Gumley et al., 2014a, 2014b; Harder, 2014), we hypothesised that preoccupied attachment (or high attachment anxiety) would be associated with positive and affective symptoms of psychosis, and dismissing attachment (or high avoidant attachment) would increase vulnerability to both negative and positive symptoms.

Further, we hypothesised that fearful attachment would be implicated in positive, affective and negative symptoms, whereas secure attachment would be negatively correlated with positive, affective and negative symptoms. Our primary aim was to investigate associations between attachment and symptom domains. However, in line with a single-symptom approach to understanding psychosis, we specifically investigated associations between attachment and two of the key positive symptoms of psychosis: hallucinations and paranoia. In line with previous studies, we predicted positive associations between all types of insecure attachment and both more severe hallucinations and more severe persecution.

2. Methods

2.1. Participants

In this study we used the data on 500 psychiatric patients who participated in different research projects in the Netherlands, United Kingdom and Israel. The criteria for inclusion of the patients were: 1) diagnosis of schizophrenia, schizoaffective or non-affective psychosis according to ICD-10 or DSM-IV criteria; 2) age 16 or older; 3) medication-stabilised condition; 4) ability to provide the written informed consent; 5) completed attachment (RQ) and psychopathology (PANSS) measures; and 6) a native language (respectively Dutch, English, or Hebrew) proficiency. Patients were excluded, if they had comorbid organic syndromes implicated in the aetiology of psychotic symptoms or impairing their comprehension of study procedures. The Netherlands' subsample ($n=92$) was derived from the ongoing longitudinal multicentre cohort study the 'GROUP (Genetic Risk and Outcome of Psychosis) project' in the Netherlands and (Dutch speaking part of) Belgium (Korver et al., 2012). The United Kingdom's subsample ($n=81$) was collected across community and inpatient psychiatric services in Greater Manchester as part of a previous study validating a new self-report of attachment (Berry et al., 2008). The Israel's subsample ($n=327$) was composed of patients participating in different attachment-in-psychopathology projects that were performed in three inpatient and community settings across Israel (Ponizovsky et al., 2007, 2013; Ponizovsky et al., 2014). Demographic and illness-related information, including gender, age, marital and employment status, diagnosis, age of onset, illness duration and number of inpatient admissions was extracted from the patients' medical records.

2.2. Measures

2.2.1. Psychopathology

The clinical profile and severity of current symptomatology were evaluated using the Positive and Negative Syndromes Scale (PANSS) (Kay et al., 1987). It is a 30-item scale with 7 positive-symptom items, 7 negative-symptom items, and 16 general psychopathology symptom items, including symptoms of anxiety and depression. Each item is scored on the 7-point severity scale, resulting in a range of possible scores from 30 to 210. The positive- and negative-symptom item groups are often reported separately, with a possible range of 7–49. The internal consistency of the PANSS scales in our sample ranged from acceptable to excellent; Cronbach's alphas were 0.94 for the total scale, 0.79 for the positive symptom scale, 0.92 for the negative symptom and 0.88 for the general psychopathology symptom scale.

2.2.2. Attachment

To evaluate attachment styles, all patients completed the Relationship Questionnaire (Bartholomew and Horowitz, 1991), which characterises adult attachment styles through 4 brief statements and asks participants to endorse the statement

that is most self-descriptive. In addition to the categorical forced-choice approach we also applied a dimensional approach, asking participants to indicate how much each description corresponded to their general relationship style. Responses were rated on a 7-point Likert-type scale ranging from 1 ("*Not at all like me*") to 7 ("*Very much like me*"). Completing the forced-choice section first serves to counterbalance and minimise order effects when participants rank the degree to which each prototype characterises them. The validity of this attachment classification has been demonstrated by its empirical relationships to self-concept and interpersonal functioning as well as to psychological wellbeing and social functioning (Bartholomew and Horowitz, 1991).

2.3. Data analyses

Before the three independent samples were pooled, differences between the sites on demographics (age, gender), clinical variables (diagnosis, age at onset, psychiatric admissions, illness duration, PANSS scores) and attachment style (both categorical and continuous RQ scores) were assessed with one-way analyses of variance (ANOVA) combined with Tukey post-hoc tests for continuous variables and Chi-square tests for categorical variables. Taking into account the significant inter-site differences in age and illness duration (data not shown), these variables were added to the regression models as possible confounders.

2.3.1. Categorical attachment analyses

Based on the conservative RQ cut-off score 5 or higher (to avoid mixed or uncertain cases), we split the total sample, allocating patients to one of the four prototypes: 153 patients with secure attachment, 90 patients with fearful-avoidant, 57 patients with preoccupied and 120 patients with dismissing-avoidant patterns. To test the hypothesis that insecure attachment styles are distinctively related to specific symptoms of psychopathology, ANOVAs including post-hoc test were performed with PANSS scores (subscales and items) across the RQ prototypes.

2.3.2. Continuous attachment analyses

In order to assess whether insecure attachment could predict psychopathology in the total sample, continuous attachment dimensions were also calculated. The prototype scales were transformed into the underlying anxiety [(fearful plus preoccupied) minus (secure plus dismissing)] and avoidance [(fearful plus dismissing) minus (secure plus preoccupied)] dimensions resulting in continuous scores. Pearson correlations between the PANSS scores (subscales and items) and the RQ dimensions (anxiety and avoidance) were calculated. Hierarchical multiple regression analyses were performed with the PANSS subscales as outcome variables, and insecure attachment dimensions as predictors, controlling for possible confounders. In Step 1, the confounding variables were entered (age, illness duration, as well as depression in positive and negative subscale analyses) and in Step 2 the attachment (anxiety and avoidance) dimensions were added.

To control for multiple testing, a p-value < 0.001 was considered statistically significant. All analyses were performed with two-tailed hypothesis testing using IBM SPSS 20 (SPSS Inc., Chicago, IL).

3. Results

Table 1 presents the total sample's basic demographic and clinical characteristics. The sample was mostly male, with a mean age of 37.5 ± 11.7 years. Most patients were single and nearly half were unemployed. The vast majority had a diagnosis of schizophrenia, with the typical onset in young adulthood. The mean illness duration was 13.3 ± 10.4 years, and mean number of lifetime psychiatric admissions was 7 (median 5; range 0–69). The severity of psychopathology, as measured by the PANSS mean total and subscale scores, was moderate.

We compared patients with the four attachment prototypes on all the PANSS subscales (positive, negative and general psychopathology) scores and the 30 individual item scores, as well. Table 2 displays statistically significant between-group differences. Compared with securely attached patients, those with any insecure attachment prototype had significantly higher PANSS total and the Positive and General but not Negative subscale scores. Specifically, suspiciousness/persecution was rated higher in patients with any attachment insecurity. Hallucinatory behaviour was rated higher in patients with both fearful- and dismissing-avoidant attachment. The fearful-avoidant attachment prototype was associated with higher excitement and tension scores. Both fearful and preoccupied attachment prototypes were associated with higher scores on the anxiety and depression symptoms. In addition, the preoccupied prototype was related to higher guilt feelings scores. Although the PANSS Negative scale as a whole was not associated with any attachment style, two symptoms: emotional withdrawal and passive social withdrawal were rated higher in patients with the dismissing-avoidant attachment style compared with securely attached patients. However, the differences did not approach our more conservative threshold of statistical significance (data not shown).

Table 1
Basic sociodemographic and clinical characteristics of the total sample ($n=500$).

Characteristic	*N* (%)
Gender	
Male	402 (80.4)
Female	98 (19.6)
Marital status	
Single	297 (59.4)
Married	41(8.2)
Divorced/separated/widowed	70 (14.0)
Unknown	92 (18.4)
Employment status	
Employed	93 (18.6)
Unemployed	234 (46.8)
Unknown	173 (34.6)
Primary diagnosis	
Schizophrenia	426 (85.2)
Schizoaffective disorder	38 (7.6)
Other psychotic disorders	36 (7.2)
	Mean (S.D.)
Age at examination (years)	37.5 (11.7)
Age at onset (years)	24.4 (8.1)
Duration of disorder (years)	13.3 (10.4)
Number of hospitalisations	6.8 (7.8)
PANSS total score	67.9 (23.6)
Positive syndrome	14.8 (6.3)
Negative syndrome	19.1 (7.9)
General psychopathology	34.1 (12.0)

PANSS = the Positive and Negative Syndromes Scale (Kay et al., 1987).

Table 3 presents Pearson's correlations between the PANSS subscales/items and attachment anxiety/avoidance dimensions. While attachment anxiety was significantly correlated with both positive and general psychopathology subscales and PANSS total score, attachment avoidance was only significantly correlated with the positive scale. There were 9 PANSS items that were significantly associated with attachment anxiety: delusions, suspiciousness/persecution, hallucinatory behaviour, anxiety, tension, depression, guilt feelings, somatic concern and preoccupation; while only 3 PANSS items were significantly associated with attachment avoidance: hallucinatory behaviour, suspiciousness/persecution and anxiety.

Tables 4a, b and c displays summaries of three linear regression models with each PANSS symptom dimension as outcome and the RQ attachment dimensions as predictors. In all the models we controlled for age, and illness duration and depression (in the positive and negative symptom models) as these covariates were significantly associated with symptoms in the bivariate analyses. Models predicted a significant proportion of variance in the positive symptoms subscale (Total $R^2=0.10$) and in the general psychopathology subscale ($R^2=0.12$). Illness duration was the only statistically significant predictor of positive symptoms at our conservative < 0.001 threshold, although both attachment anxiety and avoidance were significant predictors at the < 0.01 level. Attachment anxiety was the only statistically significant predictor of general psychopathology at the < 0.001 level. No unique predictors were found to explain a significant proportion of the negative symptoms subscale and the overall model was non-significant ($R^2=0.03$). The results did not change after adjustment for the site variable, except that the site became predictive

Table 2
PANSS subscales and specific items by RQ Attachment Style, means (S.D.).

PANSS	Attachment style				ANOVA (d.f. = 3420) *F*-value	Tukey HSD post-hoc comparisons	Effect size η^2
	Secure (n = 153)	Fearful-avoidant (n = 90)	Preoccupied (n = 57)	Dismissing-avoidant (n = 120)			
PANSS total	62.8 (21.7)	73.3 (22.4)	73.2 (23.6)	71.3 (25.0)	5.72		0.04
Positive symptoms	13.1 (5.4)	16.4 (6.5)	16.3 (6.4)	15.5 (6.7)	7.82	S < F	0.05
P3 Hallucinatory behaviour	1.3 (0.7)	2.2 (1.5)	1.7 (1.2)	1.9 (1.4)	12.8	S < F S < D	0.09
P4 Excitement	1.8 (1.0)	2.6 (2.4)	2.3 (1.1)	2.0 (1.2)	5.75	S < F	0.04
P6 Suspiciousness/ persecution	2.2 (1.3)	3.1 (1.4)	3.1 (1.3)	2.8 (1.4)	11.26	S < F S < P S < D	0.08
General symptoms	31.4 (10.9)	37.1 (11.1)	37.2 (11.4)	35.0 (12.9)	6.24	S < F	0.04
G2 Anxiety	1.9 (1.2)	2.9 (1.4)	2.8 (1.2)	2.2 (1.4)	13.36	S < F S < P	0.09
G3 Guilt feelings	1.7 (1.1)	2.3 (1.4)	2.4 (1.2)	1.9 (1.2)	6.87	S < P	0.05
G4 Tension	2.0 (1.2)	2.7 (1.3)	2.7 (1.2)	2.4 (1.3)	7.04	S < F	0.05
G6 Depression	1.8 (1.0)	2.7 (1.3)	2.7 (1.3)	2.1 (1.3)	14.88	S < F S < P	0.10

RQ = the Relationship Questionnaire (Bartholomew and Horowitz, 1991). PANSS = the Positive and Negative Syndromes Scale (Kay et al., 1987). To control for multiple testing, only statistically significant (at $p < 0.001$) between-group differences are presented.

Table 3
Pearson correlations between RQ attachment dimensions and PANSS items and scale scores (n = 500).

	Attachment dimensions	
PANSS items	Anxiety	Avoidance
P1 Delusions	0.147*	
P3 Hallucinatory behaviour	0.151*	0.180*
P6 Suspiciousness/persecution	0.183*	0.173*
G1 Somatic concern	0.199*	
G2 Anxiety	0.276*	0.156*
G3 Guilt feelings	0.293*	
G4 Tension	0.217*	
G6 Depression	0.317*	
G15 Preoccupation	0.124*	
PANSS subscales		
Positive	0.173*	0.125*
Negative	0.017	0.089
General psychopathology	0.203*	0.106
Total score	0.153*	0.133

* $p < 0.001$.

of negative symptoms (data not shown). This suggests that negative symptoms are not associated with any attachment dimension but only with the site differences in these symptoms.

4. Discussion

4.1. Main findings

This study used a large pooled sample of patients with psychosis from three countries to test whether there were associations between attachment patterns and distinct psychopathology dimensions. In line with our hypotheses, attachment anxiety was associated with both psychotic and affective symptoms of psychosis and attachment avoidance was associated with specific positive symptoms of paranoia and hallucinations. In contrast to our predictions, attachment avoidance did not predict negative symptoms.

As expected, securely attached patients had lower levels of psychopathology. Secure attachment style is associated with a capacity to adaptively regulate negative affect, a positive self-image, and a tendency seek support from others (Mikulincer and Shaver, 2012) all of which may promote resilience in response to the development of mental health problems including psychosis.

Overall, we found evidence for differential relations between specific attachment styles and symptoms dimensions. Patients with high attachment anxiety, i.e. preoccupied and fearful attachment demonstrated more severe positive symptoms, such as suspiciousness/persecution, excitement and a number of general affective symptoms: anxiety, tension, depression, and guilt feelings. These findings are consistent with previous research demonstrating associations between attachment anxiety and both positive and affective symptoms of psychosis. High levels of attachment anxiety are characterised by sensitivity to interpersonal threat, poor self-efficacy and a tendency to be overwhelmed by negative affect; all of which may increase vulnerability to the development of both affective and psychotic symptoms (Korver-Nieberg et al., 2014; Gumley et al., 2014a, 2014b; Ponizovsky et al., 2013). Consistent with previous research (Mikulincer and Shaver, 2012), attachment anxiety was significantly associated with depression in our sample. We therefore included depression in the regression models to investigate the independent contributions of attachment and depression to symptoms. We found that both attachment anxiety and attachment avoidance explained a significant proportion of variance even when depression was controlled. The finding supports the notion of the function of the attachment system in affect regulation, that is, to provide a sense of security in stressful situations (Bowlby, 1988; Fonagy et al., 1991). Consistent with this theory, people with high attachment anxiety underregulate their affect and intensify their distress expression, whereas individuals with attachment avoidance downregulate their distress by using avoidance strategies (Bartholomew, 1990).

In line with previous research (Berry et al., 2008; Ponizovsky et al., 2007) and theoretical formulations which conceptualise avoidant attachment as a deactivation of the attachment system and affect, we hypothesised associations between dismissing-avoidant attachment and negative symptoms. Results from this large cross-cultural data set suggest that avoidant-dismissing attachment may be conceptually related to positive symptoms of psychosis such as hallucinations and paranoia rather than to negative symptoms. Nevertheless, as hypothesised, we found that emotional withdrawal and passive social withdrawal were associated with the dismissing-avoidant attachment style. Though statistically non-significant according to our more stringent 0.001 level criterion, the findings warrant further investigation. It may be that avoidant attachment is more important in understanding the development of these particular types of negative symptoms compared to other types of negative symptoms.

There was also a positive association between the dimensional measure of attachment avoidance and positive symptoms. A number of previous studies have reported associations between attachment avoidance and paranoia in both clinical and non-clinical samples (Korver-Nieberg et al., 2014, 2013). High levels of attachment avoidance are associated with negative beliefs about

Table 4a
Linear model of predictors of the positive symptom scale PANSS.

	b (Confidence intervals 95%)	SE B	*β*	*p*
Step 1				
Age	−0.05 (−0.11, 0.08)	0.03	−0.12	0.09
Illness duration	0.13 (0.06, 0.20)	0.03	0.27	<0.001
Depression	0.74 (0.35,1.12)	0.20	0.18	<0.001
Step 2				
Age	−0.05 (−0.11, 0.01)	0.03	−0.11	0.11
Illness duration	0.12 (0.06, 0.19)	0.03	0.25	<0.001
Depression	0.45 (0.42, 0.86)	0.21	0.11	0.03
Anxiety	0.13 (0.03, 0.24)	0.05	0.13	<0.01
Avoidance	0.13 (0.03, 0.23)	0.05	0.12	<0.01

R^2=0.07 for step 1; ΔR^2=0.03 for step 2 ($p<0.001$), total R^2=0.10.

Table 4b
Linear model of predictors of the negative symptom scale PANSS.

	b (confidence intervals 95%)	SE B	*β*	*p*
Step 1				
Age	−0.03 (−0.10, 0.06)	0.04	−0.05	0.54
Illness duration Depression	0.09 (0.01, 0.18)	0.05	0.15	0.05
	0.51 (−0.01, 1.02)	0.26	0.10	0.05
Step 2				
Age	−0.03 (−0.10, 0.06)	0.04	−0.05	0.54
Illness duration Depression	0.09 (−0.01, 0.18)	0.05	0.14	0.05
	0.09 (−0.09, 1.01)	0.28	0.09	0.10
Anxiety	−0.04 (−0.18,0.10)	0.07	−0.03	0.55
Avoidance	0.15 (0.09, 0.28)	0.07	0.10	0.04

R^2=0.02 for step 1; ΔR^2=0.01 for step 2 (p=0.107), total R^2=0.03.

Table 4c
Linear model of predictors of the general symptom scale PANSS.

	b (confidence intervals 95%)	SE B	*β*	*p*
Step 1				
Age	−0.05 (−0.16, 0.07)	0.06	−0.06	0.424
Illness duration	0.20 (0.08, 0.33)	0.06	0.23	0.002
Step 2				
Age	−0.04 (−0.15, 0.06)	0.05	−0.06	0.413
Illness duration	0.18 (0.06, 0.30)	0.06	0.20	0.004
Anxiety	0.47 (0.29, 0.65)	0.09	0.25	<0.001
Avoidance	0.20 (0.02, 0.38)	0.09	0.10	0.033

R^2=0.04 for step 1; ΔR^2=0.08 for step 2 ($p<0.001$), Total R^2=0.12.
RQ=the Relationship Questionnaire (Bartholomew and Horowitz, 1991).
PANSS=the Positive and Negative Syndromes Scale (Kay et al., 1987).

others and social withdrawal; both of which have been implicated in cognitive models of paranoia (Freeman et al., 2002).

Previous studies have reported associations between avoidant attachment and hallucinations (Ponizovsky et al., 2013; Dozier, 1990; Arbucke et al., 2012). Previous research has also found evidence of associations between avoidant attachment and critical and threatening themes in voice hearing (Berry et al., 2012) and it has recently been proposed that attachment theory may advance our understanding of the mechanisms underlying distressing voices and help to explain well-established associations between interpersonal traumas and voice-hearing (Read and Gumley, 2008; Longden et al., 2012). Avoidant attachment was associated with hallucinations, persecution and anxiety. In this respect, our findings are similar to recent research emphasising an underlying mechanism for positive symptoms (MacBeth et al., 2011), as well as research finding that early maladaptive schemas (e.g., mistrust/abuse schema) is associated with psychotic, but not negative, symptoms of schizophrenia (Bortolon et al., 2013).

4.2. Strengths and limitations

A major methodological strength of this study is that it deals with a larger pooled sample of patients with schizophrenia and non-affective psychoses than previous studies. This allowed testing hypotheses in a large sample originating from different countries. A substantial proportion of our findings are consistent with expectations based on attachment theory and support the value of attachment theory in understanding psychosis and also support the validity of self-reported adult attachment styles by patients with psychosis.

Our study has also limitations. The first is related to the attachment measure used. The RQ is a typological measure, which is not widely used in contemporary attachment research which favours multi-item inventories. Since the RQ conceptual prototypes (styles) are regions in a two-dimensional anxiety-avoidance space, their use instead of the continuous scales influences precision of measurement. Therefore, to overcome this weakness, we applied both a more conservative definition of attachment category, as well as the dimensional approach. Despite the fact that the RQ has been developed primarily on low-risk, non-clinical student samples, it demonstrated a reasonable degree of convergence between self- and informant ratings (Griffin and Bartholomew, 1994).

A second methodological limitation that needs to be considered in interpreting the findings is the cross-sectional nature of the data, which precludes inferences concerning causation. It is therefore equally plausible that the experience of psychosis itself leads to insecure attachment or a third variable, such as neuroticism or other personality characteristics may influence the development of both insecure attachment and symptoms. Therefore longitudinal, prospective designs controlling for potential confounds are essential to study causal directions in the relationship between attachment and psychosis.

A third methodological limitation relates to the multiple analyses that were performed and the consequent risk of Type I errors, particularly given our large sample size. In order to avoid over interpreting findings, we opted to interpret findings at a conservative *p*-value of 0.001. We also present effect sizes to permit an evaluation of the strengths of associations between each attachment and symptom measure. Finally, despite the methodological strengths of our study, we should acknowledge that a substantial proportion of the variance in positive symptoms still remains unexplained.

4.3. Further research

It is now established that trauma can contribute to the development of psychosis and be associated with worse outcomes. Our findings suggest that insecure attachment may be an important mechanism through which trauma exerts its effects on psychosis. Future research should investigate how attachment anxiety interacts with trauma to influence specific symptoms of psychosis. Our findings also suggest that it may be useful to consider the role of attachment avoidance in the development and maintenance of specific positive symptoms such as paranoia and hallucinations. Furthermore, future studies should investigate associations between attachment avoidance and more sensitive measures of specific types of negative symptoms that are more theoretically linked to attachment avoidance such as emotional numbing, social anhedonia and apathetic social withdrawal.

4.4. Clinical implications

There is growing recognition that attachment theory has considerable potential relevance for clinical work, adding to our understanding of how interpersonal styles might impede

engagement with services and therapies (Bucci et al., 2015). Attachment theory generates hypotheses about the types of therapeutic interactions that could modify attachment styles or maximise the potential for therapeutic change in individuals with different types of insecure attachment (Mallinckrodt, 2010). For example, individuals with dismissing attachment may benefit from interventions which encourage them to focus on their emotional reactions, whereas those with preoccupied attachment would benefit from approaches which minimise the focus on emotional distress. There is also evidence to suggest that attachment working models can change as a result of significant interpersonal experiences and psychological therapy is hypothesised to provide a means of revising maladaptive beliefs and strategies of affect regulation (Taylor et al., 2015).

Another possible way to enhance attachment security in insecurely attached individuals is the use of neuropeptide oxytocin as demonstrated by a study in non-clinical sample (Buchheim et al., 2009). That trial found that after a single dose of intranasally administered oxytocin, 69% of insecure subjects increased in their rankings of prototypical "secure attachment" phrases and decreased in overall ranking of the "insecure attachment" phrases, particularly, the "insecure-preoccupied" phrases (Buchheim et al., 2009). Moreover, recent clinical trials revealed that intranasal oxytocin has anxiolytic and antipsychotic properties (Feifel et al., 2010) and improves "mentalization" and social perception in patients with a diagnosis of schizophrenia (Pedersen et al., 2011). Further clinical trials with extended clinical samples mapping changes in social cognition and "attachment state of mind" in response to oxytocin as add-on to psychological and pharmacological therapies could be useful (Gumley et al., 2014a, 2014b).

In conclusion, this study is the largest most comprehensive study assessing attachment and symptoms of psychosis to date. Attachment anxiety is associated with the severity of positive and affective symptoms of psychosis, independent of cultural differences. Both attachment anxiety and avoidance were associated with severity of hallucinations and persecution. Combined with a growing body of literature, our findings suggest that insecure attachment may be a potentially importance mechanism to consider in the development of theoretical models of and treatments for psychosis.

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