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The dynamics of attachment insecurity and paranoid thoughts: An experience sampling study

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Abstract

It has been proposed that insecure attachment can have adverse effects on the course of psychosis once symptoms have emerged. There is longitudinal evidence that increased insecure attachment is associated with increased severity of psychotic symptoms. The present study examined whether in the flow of daily life attachment insecurity fluctuates, whether elevated stress precedes the occurrence of attachment insecurity, and whether elevated attachment insecurity precedes the occurrence of paranoia. Twenty clinical participants with a psychosis-spectrum diagnosis and twenty controls were studied over six consecutive days using the experience sampling method (ESM). The findings revealed that fluctuations in attachment insecurity were significantly higher in the clinical group, that elevated stress predicted a subsequent increase in attachment insecurity, and that elevated attachment insecurity predicted a subsequent increase in paranoia; this effect was not observed in auditory hallucinations once co-occurring symptoms were controlled for. Finally, although previous ESM studies have shown that low self-esteem precedes the occurrence of paranoia, attachment insecurity continued to predict paranoia even when self-esteem was controlled for. The findings suggest that attachment security may be associated with a lower risk of paranoia, and that psychological interventions should address attachment beliefs and work towards establishing a sense of attachment security.

1. Introduction

There has been growing interest in the role attachment plays in psychosis. Research suggests that the development of insecure attachment can increase vulnerability to subsequent psychosis (Read and Gumley, 2008), and can have adverse effects on its course once symptoms have emerged (Berry et al., 2007a). Insecure attachment is often associated with suboptimal early-life caregiving environments and can be understood within the framework of affect regulation (Berry et al., 2007a) which proposes that primary caregivers function as a 'safe haven' from which children can seek comfort and reassurance during distressing and stressful times (Mikulincer and Florian, 2001). When primary caregivers however fail to alleviate distress by being unresponsive or unavailable to the child's bid for proximity, negative working models about the

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self and others begin to develop (Mikulincer and Shaver, 2012) and can increase sensitivity to future stress, criticism, and negative responses from others (Berry et al., 2007a). According to adult attachment theory (Bowlby, 1973; Hazan and Shaver, 1994) these early working models are highly accessible throughout the lifespan and continue to guide behaviour in future attachment related interactions (Main et al., 1985). It has also been proposed that, in times of stress, the differing attachment styles may be associated with different strategies of regulating affect, which may subsequently have meaningful effects on mental health (Mikulincer and Florian, 2001).

A large and influential epidemiological study found evidence for an association between insecure adult attachment and schizophrenia (Mickelson et al., 1997), and although this association has been replicated in non-clinical (Berry et al., 2007b; Berry et al., 2006; Korver-Nieberg et al., 2014; Meins et al., 2008) and clinical samples (Berry et al., 2007a; Gumley et al., 2014; Korver-Nieberg et al., 2014; Korver-Nieberg et al., 2015; Ponizovsky et al., 2007; Ponizovsky et al., 2013) it has been suggested that it could be more informative to explore such associations in relation to specific symptoms of psychosis (Bentall, 2004). Such specificities can provide a clearer understanding of how certain psychological mechanisms are meaningfully related to the experiences of individuals with psychosis (Bentall and Fernyhough, 2008) and, in turn this information may help clinicians focus psychological interventions appropriately. Bentall and Fernyhough (2008) proposed that insecure attachment can facilitate a paranoid attributional style so that, in the presence of other cofactors, paranoia develops as a consequence. This hypothesis has been supported by several recent findings showing specific links between insecure attachment and paranoia in both subclinical (Pickering et al., 2008) and clinical (Wickham et al., 2015) cross-sectional studies.

While the cross-sectional approach has been useful in beginning to outline an association between insecure attachment and paranoia, it is limited to a “snapshot” of information collected at a single time point. The information it provides cannot ascertain temporal associations, and consequently it is not entirely obvious how insecure attachment impacts on the course of psychosis, especially in relation to the maintenance of symptoms in daily life. Berry and colleagues (2008) have suggested that symptom maintenance can be understood within an attachment theory framework. In their longitudinal study they found that an increase in positive and negative symptoms was associated with increased levels of insecure attachment. Although the authors propose that fluctuations in symptoms can be meaningfully related to fluctuations in attachment style, a more intensive assessment is needed to examine how attachment insecurity is associated with the onset of specific psychotic symptoms in the flow of everyday life.

Bowlby, the father of attachment theory, conceptualised adulthood attachment as resulting from both early attachment histories and contextual factors (Bowlby, 1973). Based on the idea that working models of past relationships assist a person in new situations, attachment style has largely been viewed as being continuous across both time and contexts (Brumbaugh and Fraley, 2006). However, it has been noted that attachment can change in the long-term during the course of life (Davila et al., 1997), and it is possible that attachment representations (currently activated schemas about the self and others) may actually fluctuate even over short periods of time. Several longitudinal studies have observed considerable attachment fluctuations regardless of whether attachment was repeatedly measured across the life span, within several months, or in a shorter time frame of a week (Baldwin and Fehr, 1995; Kirkpatrick and Hazan, 1994; Scharfe and Bartholomew, 1994; Waters et al., 2000). Such fluctuations have led to the conceptualisation that both state and trait internal models of attachment may exist concurrently, and that global and specific attachment models may be held by the individual (Pierce and Lydon, 2001). Trait models are associated with attachment behaviours that are considered to occur consistently over time, while behaviours towards others that are considered to occur temporarily and inconsistently reflect state models (Chaplin et al., 1988). Baldwin and Fehr (1995) have made the case for attachment fluctuations as not resulting from unreliable assessment tools, but rather reflecting variability that is meaningfully impacted by contextual cues.

The experience sampling method (ESM) can enable a more detailed understanding of such fluctuations in the flow of daily life. ESM is an approach which employs a self-assessment tool to capture the frequency, intensity, and patterning of momentary mental processes and behaviours (Csikszentmihalyi and Larson, 1987), such as stress, current symptoms, current activity, and positive and negative affect (Varese et al., 2011). Compared to other longitudinal methods previously employed

in attachment research, ESM employs a more intensive assessment schedule involving multiple assessments per day, therefore enabling to a more fine-grained examination of attachment and attachment fluctuations on the presenting difficulties of individuals with psychosis. Since the information is recorded in a temporal fashion, ESM enables researchers to examine the underlying psychological mechanisms that are associated with the onset of psychotic symptoms (Myin-Germeys et al., 2009). Previous ESM studies of paranoia have focused on emotion and self-esteem, showing that both are highly fluctuating in paranoid patients (Thewissen et al., 2008; Thewissen et al., 2011), and that the onset of paranoid symptoms is typically preceded by low self-esteem and elevated negative affect (Thewissen et al., 2008; Thewissen et al., 2011).

The first objective of the present study was to test whether, in everyday life, there are fluctuations in attachment. It was predicted that a higher degree of fluctuations will be present in the clinical group than the control group. The second objective of the study was to test whether, in everyday life, reports of paranoid experiences are significantly predicted by preceding elevated attachment insecurity. Third, we investigated whether an increase in attachment insecurity in paranoid patients is related to elevated stress. Since research has suggested that comorbid symptoms might confound the predictors of paranoia (Pickering et al., 2008), this study also examined the specificity of this relationship by testing whether the experience of paranoia is preceded by elevated attachment insecurity once auditory hallucinations are controlled for, and also whether attachment insecurity preceded the occurrence of hallucinations. Finally, because low self-esteem has been associated with paranoia in previous ESM studies, we sought to determine whether the effect of attachment insecurity on paranoia survived after self-esteem had been controlled for.

2. Methods

2.1. Participants and procedure

Twenty clinical participants with schizophrenia spectrum diagnoses (schizophrenia, paranoid schizophrenia, schizoaffective, and non-specified psychosis) were recruited from outpatient facilities in North West England. Nineteen were taking antipsychotic medication at the time of testing. In addition 20 healthy controls with no history of mental health difficulties were recruited through flyers, e-mails, and from the University of Liverpool research participation panel. Between-group differences on demographic variables were tested using analysis of variance (ANOVA) and Pearson's χ^2 test. No significant differences were observed for age and sex, however participants in the clinical group spent fewer years in education (Table 1).

Nineteen from the clinical group and seven from the control group completed the study using a palm pilot (MAKE: Pilot Inc., TYPE: Tungsten E2), all other participants used paper diaries; based on preference/availability of palm pilots. Past research has shown that the two methods are compatible, and that compliance rates are similar (Green et al., 2006). The 'Experience Sampling Program' (version 4.0) (Barrett and Feldman, 2000), installed on the palm pilots emitted a signal (bleep) at variable time points within ten equal time intervals between 8am – 10pm, over 6 consecutive days. The palm pilot beeped loudly for up to 13 minutes until the screen was tapped using a stylus pen. Long and loud beeps give people the opportunity to answer more trials by not missing assessment points (Christensen et al., 2003). Each question appeared on the palm pilot screen individually, and participants responded by pressing a number with a stylus pen. The palm pilot would shut off if left untouched for two minutes. All responses included in the analyses were completed within 15 minutes of tapping the screen.

Participants who completed the study using paper diaries received six pocket sized booklets each consisting of 10 ESM assessment forms. A pre-set text message from Google Calendar prompted participants to complete the ESM assessment form and to record the time of completion. Assessment forms that were answered within 15 minutes of receiving the text message were retained for analysis as trials completed outside this time frame are less reliable and considered invalid

(Delespaul, 1995). Participants who did not have a mobile phone, or who preferred not to use their own were provided with one for the duration of the study.

Participants met with the researcher twice. During the first meeting the researcher conducted the Positive and Negative Syndrome Scale (Kay et al., 1987) with the clinical group, administered the Relationship Questionnaire (Bartholomew and Horowitz, 1991), and explained the ESM procedure. At this meeting participants completed a practice ESM assessment form/palm pilot trial to ascertain the procedure was understood. Throughout the course of the sampling period participants were encouraged to contact the researcher if they had any questions, or if the palm pilot/pre-set text messages malfunctioned. During the final meeting, participants returned the ESM assessment forms/palm pilots to the researcher, and received reimbursement for their participation.

2.2. Measures

2.2.1. Questionnaire level measures

2.2.1.1. Positive and Negative Syndrome Scale (Kay et al., 1987)

The presence and severity of positive and negative psychotic symptoms as well as general psychopathology were assessed in the clinical group using the 30-item PANSS semi-structured clinical interview, with a reference period of a week. Items were scored on 7-point Likert scales ranging from 1 (absent) to 7 (extreme). The three subscales have good reliability and validity (Kay et al., 1988).

2.2.1.2. Relationship Questionnaire (Bartholomew and Horowitz, 1991)

Trait attachment was assessed using 4 short paragraphs describing prototypical attachment styles: secure, preoccupied, dismissing, and fearful. Participants were asked to select one attachment style that best describes them, and then rate each style on a 7-point Likert scale. For the purpose of this study a binary secure vs. insecure attachment variable was created. The insecure category comprises of those who self-identified as preoccupied, dismissing, and fearful.

2.2.2. Momentary level measures

2.2.2.1. ESM Paranoia

State paranoia was defined as a mean score of two statements that were rated on 7-point Likert scales. The statements assessed suspiciousness and paranoid ideation: "Right now I worry that others are plotting against me", "I believe that some people want to hurt me deliberately", (Cronbach's $\alpha = 0.89$), and were derived from the Persecution and Deservedness Scale (Melo et al., 2009), and have been used in previous ESM studies (Udachina et al., 2012; Varese et al., 2011). Principal component analysis (PCA) confirmed that both items loaded on one factor (eigenvalue > 1), explaining 90% of the variability.

2.2.2.2 ESM Auditory Hallucinations

State auditory hallucinations were assessed using one item "Right now I hear voices that other people can't hear". This item assessed the presence and intensity of auditory hallucinations, and has been used in a previous ESM study (Varese et al., 2011). A voices present or absent variable was created as scores on the auditory hallucination variable were bimodal.

Previous research has similarly found that auditory hallucinations are ‘on/off’ phenomena rather than experiences that increase and decrease continuously like paranoia (Oorschot et al., 2012).

2.2.2.3. *ESM Attachment Insecurity*

State attachment insecurity was defined as a mean score of six statements that were rated on 7-point Likert scales. The statements assessed feelings about the self and others: “I have found it difficult to depend on others”, “I have found myself wanting to maintain a distance from others”, “I have found it difficult to trust others completely”, “The thought that others might leave me was constantly on my mind”, “I am not worthy of other’s attention and affection”, “I worry that others don’t really want to be close to me” (Cronbach’s $\alpha = 0.89$). The statements were adapted from the Adult Attachment Style (AAS) questionnaire (Collins and Read, 1990). PCA identified 1 factor (eigenvalue > 1), explaining 64% of the variability.

2.2.2.4. *ESM Self-Esteem*

State self-esteem was assessed using four statements that were rated on 7-point Likert scales. PCA identified one factor (eigenvalue > 1), explaining 55% of the variability. State self-esteem was defined as the mean score of four items: “I am ashamed of myself” [reverse scored], “I am a failure” [reverse scored], “I like myself”, and “I am a good person”, (Cronbach’s $\alpha = 0.72$). These statements have previously been used in ESM studies (Thewissen et al., 2008; Thewissen et al., 2011; Udachina et al., 2012).

2.2.2.5 *ESM Stress*

State activity related stress was assessed using three statements that were rated on 7-point Likert scales. PCA identified one factor (eigenvalue < 1), explaining 59% of the variability: “I’d rather be doing something else”, “This activity is difficult” [reverse coded], “I like this activity”, (Cronbach’s $\alpha = 0.58$). State social stress was assessed using three statements that were rated on 7-point Likert scales. PCA identified one factor (eigenvalue > 1), explaining 55% of the variability: “I like this company”, “I’d prefer to be alone” [reverse coded], “I’m enjoying myself”, (Cronbach’s $\alpha = 0.63$). These statements have previously been used in ESM studies (Udachina et al., 2012; Varese et al., 2011)

3. Analyses

3.1. *Statistical Analysis*

ESM data have a hierarchical structure, in which longitudinal observations are clustered within individuals. The data are ideally suited to explore the dynamic within-subject temporal associations between attachment and paranoia using multilevel linear regression modelling. Multilevel regression models are an extension of the more common unilevel linear regression methods (Hox, 1998). The effect sizes are represented by standardised regression coefficients (β) for multilevel models with continuous outcomes, and by odds-ratios (OR) for multilevel models with binary outcomes. The multilevel regression models were analysed in STATA 10 (StataCorp, 2007), and estimated using the STATA XTREG module for models with continuous outcomes, and the STATA XTGEE module for binary outcomes. In the analyses of attachment and self-esteem, time points across days (i.e. the first assessment completed by participants on each day) were excluded as they are regarded not to measure momentary fluctuations. In the case of missing assessments, non-consecutive assessments were used in analyses. 53% of the clinical sample and 75% of the non-clinical sample alerts were responded to within the 15 minute timeframe which were used in the analysis.

Multilevel regression models were estimated to explore between-group differences on ESM measures of paranoia, auditory hallucinations, attachment insecurity, and attachment fluctuations. Multilevel regression analyses were also used to validate the ESM measure of attachment insecurity against the binary RQ measure of attachment. Finally, longitudinal multilevel models were estimated only on the clinical group to explore the primary hypotheses of this study: 1) whether elevated stress led to subsequent increase in attachment insecurity 2) whether elevated attachment insecurity led to a subsequent increase in paranoia (i.e. at subsequent assessment points) when controlling for auditory hallucinations (and vice versa to test for specificity of this effect), and 3) to determine whether the effect of attachment insecurity on paranoia survived after self-esteem was controlled for.

4. Results

4.1 Validating ESM attachment insecurity measure

To validate ESM attachment against the RQ (scored as secure or insecure), a multilevel linear regression analysis was carried out with the ESM attachment score as the dependent variable and the binary RQ variable as the independent variable. The insecure group reported significantly higher ESM attachment insecurity scores ($M = 2.271$, $SD = 1.158$), compared to the secure group ($M = 1.265$, $SD = 0.757$), ($\beta = 0.906$, $SE = 0.288$, $p = 0.002$, 95% CI [0.342 - 1.470]). The mean value represents the average score across all observations.

4.2 Associations between ESM attachment insecurity and RQ attachment styles (Table 2)

To explore the associations between ESM attachment insecurity and the Likert ratings of the individual RQ attachment styles a Pearson's correlation was carried out. Findings revealed a strong negative association between ESM attachment insecurity and secure RQ attachment ($r = -0.42$), and a strong positive association with fearful RQ attachment ($r = 0.54$). Although significant associations were found between ESM attachment insecurity and dismissive ($r = 0.18$) and preoccupied ($r = 0.14$) attachment these associations were modest (all $ps < 0.001$).

4.3 Between-groups differences on the ESM measures

To test for between-group differences on the ESM measures, several multilevel models were estimated with 'group' (0 = control, 1 = clinical) as a predictor of ESM paranoia, attachment insecurity, and auditory hallucinations. The clinical group reported a higher mean level of paranoia ($M = 2.981$, $SD = 1.908$) compared to the control group ($M = 1.086$, $SD = 0.236$), ($\beta = 1.147$, $SE = 0.253$, $p < 0.001$, 95% CI [0.650 - 1.643]); a higher mean level of attachment insecurity ($M = 2.554$, $SD = 1.244$) compared to the control group ($M = 1.183$, $SD = 0.227$), ($\beta = 1.235$, $SE = 0.247$, $p < 0.001$, 95% CI [0.751 - 1.718]); and a higher mean level of auditory hallucinations ($M = 0.463$, $SD = 0.427$) compared to the control group ($M = 0.007$, $SD = 0.026$), ($OR = 126.890$, $SE = 190.898$, $p = 0.001$, 95% CI [6.651 - 2421.036]).

4.4 Between-group differences on attachment fluctuations

To explore whether groups differed on fluctuations in attachment insecurity, a multilevel linear regression was carried out using the absolute change values as the dependent variable and group membership as the independent variable. The absolute change values were calculated by taking the absolute difference between the ESM attachment scores between assessment points (this gives higher values when there are larger differences between the scores between two time points but ignores the direction of change which is appropriate when conducting group comparisons of the magnitude of fluctuations). A greater

degree of fluctuations in attachment insecurity was found in the clinical group ($M = 0.516$, $SD = 0.338$), than in the control group ($M = 0.187$, $SD = 0.196$), ($\beta = 0.560$, $SE = 0.140$, $p < 0.001$, 95% CI [0.286 - 0.834]).

4.5 Does elevated stress predict attachment insecurity?

To explore whether elevated stress predicted the occurrence of attachment insecurity, multilevel linear regression models were estimated with attachment insecurity as the dependent variable, and either activity stress or social stress and attachment insecurity (both measured at the previous assessment point) as the independent variables. In the case of the activity related measure, the results revealed that an increase in attachment insecurity was predicted by a preceding elevated level of activity related stress ($\beta = 0.075$, $SE = 0.034$, $p = 0.029$, 95% CI [-0.143 - -0.008]). However the same model with social stress revealed only a trend level effect ($\beta = 0.154$, $SE = 0.082$, $p = 0.060$, 95% CI [-0.315 - 0.004]). These findings should be treated with caution because of the relative low reliability of the ESM stress measures.

4.5 Does attachment insecurity predict paranoia?

To test whether attachment insecurity predicted the occurrence of paranoia, a multilevel linear regression model was estimated with paranoia as the dependent variable, and attachment insecurity and paranoia (both measured at the previous assessment point) as the independent variables. The results revealed that an increase in paranoia was predicted by a preceding elevated level of attachment insecurity ($\beta = 0.173$, $SE = 0.041$, $p < 0.001$, 95% CI [0.092 - 0.253]). This effect remained significant after controlling for concurrent auditory hallucinations ($\beta = 0.139$, $SE = 0.042$, $p = 0.001$, 95% CI [0.057 - 0.221]).

4.6 Does attachment insecurity predict paranoia while controlling for self-esteem?

To determine whether attachment insecurity continued to predict the occurrence of paranoia in the presence of self-esteem, and concurrent auditory hallucinations, a multilevel linear regression model was estimated with paranoia as the dependent variable, and attachment insecurity, paranoia, and self-esteem (all at the previous assessment point) as the independent variables. The results revealed that the occurrence of paranoia continued to be followed by elevated attachment insecurity ($\beta = 0.140$, $SE = 0.042$, $p = 0.001$, 95% CI [0.058 - 0.223]), and not by self-esteem, ($\beta = 0.010$, $SE = 0.042$, $p > 0.001$, 95% CI [-0.073 - 0.092]).

4.7 Does attachment insecurity predict auditory hallucinations?

As a final test of the specificity of the relationship between attachment insecurity and paranoia, a multilevel linear regression model was estimated with auditory hallucinations as the dependent variable, and attachment insecurity and auditory hallucinations (both measured at the previous assessment point) as the independent variables. The results revealed that the presence of auditory hallucinations was predicted by a preceding elevated level of attachment insecurity ($OR = 1.285$, $SE = 0.145$, $p < 0.05$, 95% CI [1.030 - 1.603]). This effect was no longer significant after controlling for concurrent paranoia ($OR = 1.210$, $SE = 0.138$, $p > 0.05$, 95% CI [0.967 - 1.513]).

5. Discussion

In this study we sought to measure momentary attachment using experience sampling, and to examine the relationship between these representations and paranoid thoughts in the context of daily life of individuals with psychosis. The main finding was that elevated attachment insecurity was followed by increases in paranoid thinking, even when self-

esteem was controlled for, and that this effect was specific to paranoia but not to hallucinations, once co-occurring symptoms were controlled for.

Although our ESM measure of attachment insecurity was necessarily brief and arguably rudimentary, the strong negative association between mean momentary attachment insecurity measured by ESM and the secure attachment ratings on the RQ suggest that the ESM assessments had some validity. The validity of the ESM ratings was also supported by the fact that those participants who self-described as insecure on the prototypical RQ styles also showed less secure attachment on the ESM ratings than the self-described securely attached participants. However, there were at best modest associations between the momentary ESM attachment measures and the preoccupied and dismissive attachment ratings on the RQ. Hence, the ESM measure appears to be a relatively non-specific indicator of attachment insecurity, which shows to be highly associated with fearful attachment ratings on the RQ.

As noted in the introduction, attachment theorists from Bowlby onwards have suggested that attachment behaviours and internal working models may fluctuate over even short periods, as internal working models become activated by context. It has been proposed that these fluctuations can be driven by tentatively held beliefs about the self and others (Davila et al., 1997). Thus, those who fluctuate may be highly uncertain about their attachment-related thoughts and feelings, for example about the extent to which they can depend and trust others and the extent to which they can become emotionally close to others. In contrast, those who do not fluctuate are considered more likely to hold higher levels of certainty (Davila et al., 1997). These fluctuations may have been responsible for the modest correlations observed between the ESM attachment insecurity ratings and the preoccupied and dismissive attachment ratings on the RQ.

Our results also indicate that some people may fluctuate more than others in their attachment representations. We observed that the clinical group not only reported higher levels of attachment insecurity, but also a higher degree of attachment fluctuations than the control group, suggesting that these individuals, who have a psychosis-spectrum diagnosis, may have internal working models that are described by Davila and colleagues (1997) as 'incoherent'. These authors propose that such models may develop as a result of dysfunctional early care-giving environments that disrupt the development of coherent understandings of the self and others, and that fluctuations in attachment may therefore be a manifestation of these tentatively held beliefs. It has consistently been reported that psychosis is associated with a wide range of early adverse experiences (Varese et al., 2012). Some of these experiences of parental separation (Agid et al., 1999) neglect (Bentall et al., 2012; Sitko et al., 2014) victimisation through means of sexual abuse (Read et al., 2005), and of being unwanted at birth (Myhrman et al., 1996) may result in disruptions to the development of early secure attachment relationships, and may subsequently lead to the development of incoherent self/others beliefs that fluctuate over time.

Although a number of studies have suggested that insecure attachment can increase vulnerability to developing psychosis (Read and Gumley, 2008), there have been non previous studies exploring the extent to which attachment insecurities are associated with the onset of psychotic symptoms in the flow of daily life. Our findings revealed for the first time, that the occurrence of paranoid thoughts is preceded by elevated attachment insecurity, suggesting that, in everyday life, attachment representations may be important in paranoia. Our findings also reveal that an increase of attachment insecurity is preceded by elevated activity related stress, and marginally preceded by elevated social stress which suggests that these findings can be understood within an affect regulation framework. It has been proposed that low self-esteem is common in individuals with paranoia (Bentall et al., 2001; Garety and Freeman, 1999), and it has therefore been argued that self-esteem is a triggering factor in paranoia, especially since experience sampling studies have demonstrated that low self-esteem precedes the occurrence of paranoid thinking (Thewissen et al., 2008; Thewissen et al., 2011). Our findings revealed that, when self-esteem was controlled for, attachment insecurity still predicted and preceded paranoid thinking, suggesting that attachment representations may play a more important role in paranoid experiences.

Our findings further indicate the specificity of this effect by demonstrating that there was no relationship between attachment insecurity and auditory hallucinations once paranoia had been controlled for. This kind of specificity is important as it points to the psychological mechanisms that are involved in specific symptoms. In a separate ESM study, for example, the experience of auditory hallucinations was shown to be specifically associated with dissociative experiences, and elevated

levels of dissociation led to a subsequent increase in hallucinatory experiences but not paranoid thinking (Varese et al., 2011). Mapping these pathways may be extremely useful for clinical practice where appropriate psychological mechanisms can be targeted during therapeutic interventions.

The findings should be interpreted in the context of several limitations. First, some participants used paper methods of data collection whereas others used an electronic method. Although it might be thought that the traditional paper diary method would be associated with poor compliance, it has been demonstrated that compliance rates are similar for both paper diary methods and electronic diary methods (Green et al., 2006). Second, the sample size might be criticized as being relatively small (20 per group), and further larger studies are needed to confirm our findings. However, it should be noted that the hierarchical nature of our data involves repeated measures of the same individual, and high statistical power and reliability can be achieved using relatively small sample sizes (Zirkel et al., 2015). Third, as mentioned previously, the ESM attachment measure appears to be a non-specific indicator of attachment insecurity, which limits our understanding about specific associations between differing attachment styles and symptoms as considered in previous cross-sectional studies using clinical samples. Dozier et al. (1991) and Dozier and Lee (1995) for example found an association between the dismissing-avoidant attachment style and paranoia. Ponzovsky et al., (2011) found that preoccupied attachment was associated with paranoia. Wickham et al., (2015) found that both attachment avoidance and attachment anxiety were both associated with paranoia. Other researchers have however also shown that insecure attachment is associated with hallucinations (Berry et al., 2012; Korver-Nieberg et al., 2015), a finding which was not supported by our data once comorbid symptoms were controlled for; more recently however, some researchers have proposed that there may be links between how different attachment styles are associated with the appraisal of auditory hallucinations (Berry & Bucci, 2016). Despite these limitations, it is important to note that our ESM attachment measure was validated against the RQ, and showed to be highly associated with the fearful ratings on that scale. Moreover, both theoretical considerations (ex. Davila et al., 1997) and the fluctuations observed in this study suggest that specific attachment styles may partly reflect differing levels of stability in attachment anxiety and avoidance. Future studies need to address whether attachment styles reflect this kind of dynamic instability. Finally, although the ESM method is longitudinal, it is important to be cautious about making inferences of causality from the data; in particular there may be other confounding factors that we were unable to measure.

To our knowledge, this is the first study exploring the temporal relationship between momentary attachment insecurity and symptoms of psychosis. There are several important clinical and theoretical implications. The findings demonstrate that attachment can fluctuate over very short periods of time, and that fluctuations in attachment representations appear to be more pronounced in individuals with psychosis compared to healthy controls. Therefore, to obtain a greater understanding of one's attachment representations, in addition to assessing attachment security, it may be informative to assess the level of attachment stability. Since experience sampling can be quite a laborious process for participants, the development of a quicker and easier to administer measure of attachment fluctuations may be preferable for clinical purposes. The findings suggest that secure attachment may be associated with a lower risk of paranoia. This observation has the implication that, in therapeutic work, therapists should focus their interventions on addressing attachment beliefs, and work towards establishing a sense of attachment security. Finally, in concert with previous epidemiological and cross-sectional studies that show an association between attachment insecurity and paranoia (Pickering et al., 2008; Wickham et al., 2015) the present findings suggest that policies that promote optimal relationships with caregivers in childhood may help to promote population mental health.

Conflict of interest

None.

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Highlights

- Attachment insecurity and fluctuations in attachment insecurity were higher in the clinical group compared to the control group.

- Elevated stress predicted a subsequent increase in attachment insecurity.
- Elevated attachment insecurity predicted a subsequent increase in paranoia, and not auditory hallucinations once co-morbid symptoms were controlled for, suggesting specificity of the effect.
- Elevated attachment insecurity continued to predict paranoia when self-esteem was controlled for.

Table 1

Demographics and between-group differences.

	Clinical (n=20)	Control (n=20)	t/ χ^2
Age	41.05 (12.53)	35.05 (14.11)	t(38) = 0.16 ns
Years of Education	10.95 (2.37)	12.75 (1.33)	t(29.91) = -2.96**
Sex	16 males	15 males	χ^2 (1) = 0.14 ns
Positive PANSS Symptoms	47.14	na	
Negative PANSS Symptoms	34.57	na	
General PANSS Symptoms	39.19	na	
PANSS Total Psychopathology	120.90	na	
Diagnosis	Schizophrenia = 6 Psychosis NOS = 4 Schizoaffective = 2 Paranoid Schizophrenia = 8	na	

Note. Means, standard deviations, and between-group differences are presented for age, education, and sex. Total mean scores are presented for the Positive and Negative Syndrome Scale (PANSS). Frequencies are presented for diagnosis. na = not applicable; NOS = not otherwise specified; ns = non-significant

** $p < 0.01$

Table 2

Pearson correlations between RQ attachment styles and ESM attachment insecurity

	1	2	3	4	5
1 Preoccupied RQ	-				
2 Dismissive RQ	-0.12***	-			
3 Fearful RQ	0.19***	-0.12***	-		
4 Secure RQ	-0.28***	-0.16***	-0.57***	-	
5 ESM attachment insecurity	0.14***	0.18***	0.54***	-0.42***	-

Note. *** $p < 0.001$