White Rose Research Online
eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk
Universities of Leeds, Sheffield and York

Deposited via The University of Sheffield.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/id/eprint/116595/

Version: Accepted Version

Article:
Udachina, A., Bentall, R.P., Varese, F. et al. (2017) Stress sensitivity in paranoia: poor-me paranoia protects against the unpleasant effects of social stress. Psychological Medicine, 47 (16). ISSN: 0033-2917

https://doi.org/10.1017/S0033291717001362

This article has been published in a revised form in Psychological Medicine [https://doi.org/10.1017/S0033291717001362]. This version is free to view and download for private research and study only. Not for re-distribution, re-sale or use in derivative works. © Cambridge University Press 2017.

Reuse
This article is distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND) licence. This licence only allows you to download this work and share it with others as long as you credit the authors, but you can't change the article in any way or use it commercially. More information and the full terms of the licence here: https://creativecommons.org/licenses/

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

UNIVERSITY OF LEEDS
University of Sheffield
UNIVERSITY of York

Psychological Medicine

Stress sensitivity in paranoia: poor-me paranoia protects against the unpleasant effects of social stress

--Manuscript Draft--

Manuscript Number:	PSM-D-16-00622R1
Full Title:	Stress sensitivity in paranoia: poor-me paranoia protects against the unpleasant effects of social stress
Article Type:	Original Article
Corresponding Author:	Alisa Udachina, PHD, DClin Psy, MRes Greater Manchester West NHS Foundation Trust Manchester, UNITED KINGDOM
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	Greater Manchester West NHS Foundation Trust
Corresponding Author's Secondary Institution:	
First Author:	Alisa Udachina, PHD, DClin Psy, MRes
First Author Secondary Information:	
Order of Authors:	Alisa Udachina, PHD, DClin Psy, MRes
	Richard P Bentall, PhD, D Clin Psy
	Filippo Varese, PhD, D Clin Psy, MRes
	Georgina Rowse, D Clin Psy
Order of Authors Secondary Information:	
Manuscript Region of Origin:	UNITED KINGDOM
Abstract:	Background: The attributional theory of paranoia suggests that paranoid beliefs may protect individuals from low self-esteem and distress (Bentall et al., 2001). The current study tested this theory by investigating a hypothesis that paranoid beliefs in combination with low perceived deservedness of persecution (poor-me beliefs) confer protection against the distress caused by social but not activity related stress. Methods. Paranoid symptoms, perceived deservedness of persecution, self-esteem, mood, and stress levels of individuals diagnosed with schizophrenia spectrum disorders (N=91) and healthy controls (N=52) were assessed in the context of daily life using the experience sampling method. Results. Individuals holding poor-me beliefs (poor-me individuals) showed blunted sensitivity to social but not activity stress. In contrast, individuals holding paranoid beliefs in combination with high perceived deservedness of persecution (bad-me individuals) showed heightened sensitivity to social stress. No consistent differences in reactions to activity stress emerged. Although both poor-me and bad-me individuals reported low self-esteem, this disturbance was particularly characteristic of bad-me individuals. Conclusions. The results suggest that poor-me paranoid beliefs may protect individuals against the distress associated with unpleasant social situations. The specificity of reactions to social stress is discussed in the context of wider literature. Future directions for research are suggested.

Powered by Editorial Manager® and ProduXion Manager® from Aries Systems Corporation

Manuscript
Click here to download Manuscript Stress sensitivity in paranoia - manuscript revised 1.docx

Stress sensitivity in paranoia: poor-me paranoia protects against the unpleasant effects of social stress

Abstract

Background: The attributional theory of paranoia suggests that paranoid beliefs may protect individuals from low self-esteem and distress (Bentall et al., 2001). The current study tested this theory by investigating a hypothesis that paranoid beliefs in combination with low perceived deservedness of persecution (poor-me beliefs) confer protection against the distress caused by social but not activity related stress.

Methods. Paranoid symptoms, perceived deservedness of persecution, self-esteem, mood, and stress levels of individuals diagnosed with schizophrenia spectrum disorders (N=91) and healthy controls (N=52) were assessed in the context of daily life using the experience sampling method.

Results. Individuals holding poor-me beliefs (poor-me individuals) showed blunted sensitivity to social but not activity stress. In contrast, individuals holding paranoid beliefs in combination with high perceived deservedness of persecution (bad-me individuals) showed heightened sensitivity to social stress. No consistent differences in reactions to activity stress emerged. Although both poor-me and bad-me individuals reported low self-esteem, this disturbance was particularly characteristic of bad-me individuals.

Conclusions. The results suggest that poor-me paranoid beliefs may protect individuals against the distress associated with unpleasant social situations. The specificity of reactions to social stress is discussed in the context of wider literature. Future directions for research are suggested.

Stress sensitivity in paranoia: poor-me paranoia protects against the unpleasant effects of social stress

Paranoia is a common symptom in individuals diagnosed with schizophrenia and it is estimated that 50% to 90% of these individuals experience paranoia (Moutoussis et al., 2007, Sartorius et al., 1986). Psychological mechanisms underlying paranoid beliefs have been a focus of research and theoretical debate (Freeman et al., 2010, Bentall et al., 2001, Freeman and Garety, 2014). One influential theory proposes that individuals prone to paranoia make excessively external personal attributions (i.e. blame other people) for negative events in order to avoid activation of latent negative self-schemas (Bentall et al., 1994). Such attributions are hypothesised to protect individuals from negative self-appraisals and consequent distress but lead to paranoid beliefs, such as that other people wish to harm the individual (Bentall et al., 1994). Empirical tests of the attributional model have yielded mixed results, suggesting both normal and low self-esteem in paranoid individuals (Lyon et al., 1994, Kinderman and Bentall, 1997, Freeman et al., 1998).

Other investigators have proposed that paranoid attributional style as a defence against negative self-appraisals is only present in one subtype of paranoid individuals, namely, those who believe that their persecution is undeserved (Trower and Chadwick, 1995, Chadwick et al., 2005). These researchers have argued that there are two types of paranoia: 'bad-me' and 'poor-me'. While individuals from both subgroups feel persecuted, bad-me individuals blame themselves and believe that their persecution is deserved. Poor-me individuals, on the other hand, believe that their persecution is unjustified and perceive others as bad. Consistent with this account, research has shown that bad-me paranoia is associated with anxiety, depression and low self-esteem (Freeman et al., 2001, Melo et al., 2006, Chadwick et al., 2005), whilst poor-me paranoia is associated with an externalising bias for

negative events (Melo et al., 2006). A recent study examined the temporal relationships between self-esteem and both bad-me and poor-me paranoia in daily life using the Experience Sampling Method (ESM; Udachina et al., 2012). The results showed that bad-me paranoia was associated with lower subsequent self-esteem, whereas poor-me paranoia was associated with higher subsequent self-esteem; bad-me beliefs in particular were associated with low self-esteem and low mood. Although initially poor-me and bad-me beliefs were thought to be two different kinds of paranoia (Trower and Chadwick, 1995), evidence suggests that poor-me and bad-me positions are not immutable but are nevertheless moderately stable. One study showed that beliefs about deservedness can fluctuate within the paranoid individuals, with some switching between bad-me and poor-me positions over a period of one month (Melo et al., 2006). Another investigation using ESM showed that while 80% of paranoid individuals preserved their poor-me or bad-me stances over a period of one week, fluctuations in deservedness beliefs occurred (Udachina et al., 2012).

Taken together, these more recent findings can be interpreted as evidence for the dynamic nature of the paranoid process, indicating that the bad-me phase of the paranoid process could be viewed as an augmentation of distress, while the poor-me phase could be seen as a defence against distress (Udachina et al., 2012). This is consistent with the revised attributional model of paranoia which proposes dynamic and non-linear relationships between attributions and self-concepts (Bentall et al., 2001). The model predicts highly unstable self-esteem in paranoid individuals, allowing for both normal and low self-esteem depending on recent life events. In support of this account, research has shown that instability of self-esteem and attributional judgements is a central feature of paranoia (Thewissen et al., 2008, Udachina et al., 2012).

Most research to date has shown that psychotic symptoms are associated with heightened sensitivity to stress (Myin-Germeys and van Os, 2007, Lataster et al., 2009,

Reininghaus et al., 2016, Palmier-Claus et al., 2012). The results of this body of research are consistent with the predictions of several models of psychosis which include stress as a vulnerability factor for psychosis (e.g., Zubin and Spring, 1977, Nuechterlein and Dawson, 1984). However, if poor-me paranoia were to be viewed as a defence against distress and low self-esteem, it is reasonable to expect that poor-me paranoia should be associated with low or at least normal sensitivity to negatively appraised (stressful) situations. To date no studies have examined whether perceived deservedness of persecution moderates reactions to stress.

Current study

We investigated reactivity to stress in poor-me and bad-me individuals and compared it to stress reactivity reported by previously paranoid individuals and healthy controls. Since perceived threat from other people in particular is central to paranoia and because growing evidence points to the importance of social factors in psychosis (Stilo et al., 2013, Cantor-Graae, 2007, Varese et al., 2012, Morgan and Gayer-Anderson, 2016, Bentall et al., 2014), we expected that the hypothesised differences in stress sensitivity would be observed in situations involving other people in particular, rather than other types of stressful situations. We therefore assessed stress sensitivity in two types of situations (i) stressful situations involving other people (social stress) and (ii) stressful situations involving unpleasant activities (activity stress). We predicted that in stressful social but not activity related situations poor-me individuals would display changes in self-esteem and mood similar to or smaller than those reported by healthy controls, and smaller than those reported by bad-me individuals. We used the ESM to address our hypotheses – a method that has previously been employed to study psychosis (e.g., Myin-Germeys et al., 2003, Thewissen et al., 2008), and which has been shown to be feasible, reliable and valid methodology (Palmier-Claus et al., 2011). There are several advantages to using ESM in psychological research, including high ecological validity and reduced memory bias (Myin-Germeys et al., 2003).

Methods

Participants

In total, 203 individuals entered the study. One hundred and thirty-eight individuals with an ICD-10 diagnosis of schizophrenia spectrum disorders (SSD; schizophrenia, delusional disorder, schizoaffective disorder, psychotic disorder not otherwise specified) were recruited from in- and outpatient healthcare facilities as well as voluntary organisations that support individuals with psychotic symptoms. Diagnoses were confirmed by clinical staff where possible. In addition, 63 healthy controls were recruited. Written informed consent was obtained from all the participants.

Of the 203 individuals who entered the study, 27 individuals with SSD and 6 healthy controls did not return the booklets and/or failed to comply with the protocol. A further 20 individuals with SSD and 5 controls completed fewer than 20 valid reports. The final sample therefore comprised 91 individuals with SSD and 52 control participants. Patient participants who dropped out/were excluded from the analyses due to insufficient number of valid reports did not differ from patient participants who were included on the Positive and Negative Syndrome Scale (Kay et al., 1988) total score, t (29,137)=0.89, p=.372.

Individuals with SSD were further divided into 3 groups according to their average ESM paranoia and perceived deservedness scores (see Measures). For this purpose, for each participant, (i) an average score over all the available ESM paranoia reports and (ii) an average score over all the available ESM deservedness reports was calculated. First, individuals with SSD were divided into currently paranoid and remitted groups according to a median split of their average ESM paranoia reports. Those with scores below 1.67 were considered remitted and the remaining participants were considered currently paranoid. Next, currently paranoid participants were divided into poor-me and bad-me according to a median

split of their average ESM deservedness scores. Participants with scores below 1.99 were considered poor-me and the remaining individuals were considered bad-me. Sociodemographic and clinical characteristics of the final sample are summarized in Table 1.

----------TABLE 1 ----------

Measures

The *Positive and Negative Syndrome Scale* (PANSS; Kay et al., 1987), administered in the form of a semi-structured interview, is a widely used measure of symptoms of schizophrenia. It has three sub-scales: a Positive Syndrome, a Negative Syndrome, and a General Psychopathology Scale; a total score can also be calculated. The PANSS has good reliability and validity (Kay et al., 1988).

ESM procedure and measures. The ESM is a structured diary technique which allows the assessment of symptoms, feelings, and behaviour in the context of daily life. During an initial meeting, each participant underwent a training session during which the ESM procedure was explained. Each participant also received an electronic wristwatch and a set of ESM self-assessment forms. Participants completed a practice form under the supervision of the researcher; potential obstacles to compliance were explored. The wristwatch was programmed to emit a signal (beep) at an unpredictable moment in each of ten 90-min time blocks between 7.30 a.m. to 10:30 p.m., on six consecutive days, resulting in 60 beeps per person. Participants were instructed to complete the forms immediately after each beep and to record the time of completion. The recorded times were later compared to the programmed beep schedule. Following previous methodological recommendations (Palmier-Claus et al., 2011), (i) reports completed later than 15 min after the beep and (ii) data from participants who completed fewer than 20 valid reports were excluded from the analysis. To enhance compliance with the procedure, all participants were contacted by

telephone during the assessment period. At the end of the assessment each participant handed in the forms and the watch.

Each ESM self-assessment form completed by the participants included a number of items rated on a 7-point Likert scales (1[not at all] to 7[very]) measuring the following variables.

Paranoia was calculated as the mean score on three statements derived from the Persecution and Deservedness Scale Persecution subscale (PaDS; Melo et al., 2009) ("I worry that others are plotting against me", "I feel that I can trust no-one", "I believe that some people want to hurt me deliberately") (Cronbach's alpha=.94). Principal components analysis (PCA) of the items identified one factor (eigenvalue >1), explaining 90% of the total variance.

Deservedness was calculated as the mean score on three statements derived from the PaDS Deservedness subscale (Melo et al., 2009), each associated with one of the paranoia items ("Do you feel you deserve others to plot against you?", "Do you feel you deserve to have no-one you can trust?", "Do you feel you deserve to be hurt?") (Cronbach's alpha=.90). For each item, scores were recorded only if a score on a related ESM persecution item was >1. PCA of the items identified one factor (eigenvalue >1), explaining 82% of the total variance.

Positive and negative affect was assessed using 9 adjectives. Principal components analysis (PCA) with Harris-Kaiser rotation on the raw within-subject scores identified 2 factors with eigenvalues >1 and explaining 66% of the total variance. Two factor-based scales were created. The *negative affect* scale included 'lonely', 'anxious', 'irritated', 'sad', and 'guilty' (Cronbach's alpha=.87) and the *positive affect* factor included 'cheerful', 'excited', 'relaxed' and 'satisfied' (Cronbach's alpha=.77).

Self-esteem was assessed as the mean score on four statements ('I like myself', 'I am a good person', 'I am ashamed of myself' [reverse-scored], 'I am a failure' [reverse-scored]) (Cronbach's alpha=.81). PCA of the items identified one factor (eigenvalue >1), explaining 64% of the total variance.

Social stress was calculated as the mean score on three statements ('I like this company' [reverse scored], 'Right now, I'd prefer to be alone', 'I'm enjoying myself' [reverse scored]) (Cronbach's alpha =.80). PCA of the items identified one factor (eigenvalue >1), explaining 72% of the total variance.

Activity stress was calculated as the mean score on three statements ('I'd rather be doing something else', 'I like this activity' [reverse scored], 'This activity is difficult') (Cronbach's alpha =.66). PCA of the items identified one factor (eigenvalue >1), explaining 61% of the total variance.

All the above measures have been used in previous ESM research and have been shown to be reliable and valid (Myin-Germeys et al., 2001, Udachina et al., 2012, Udachina et al., 2009).

Statistical analyses

Multilevel linear regression models were used to test the study hypotheses. These are a variant of the more commonly used unilevel linear regression analyses and are ideally suited for the analysis of ESM data, in which repeated observations (beep level) are nested within individuals (participant level) (Oorschot et al., 2009).

Differences in self-esteem, affect and stress levels. To investigate whether levels of self-esteem, affect, and stress differed across the four groups, we estimated a series of multi-level regression models testing whether the categorical variable 'group' [control; poor-me; bad-me; remitted] predicted current self-esteem, affect, and stress.

Stress sensitivity. To investigate whether the effects of social and activity stress on self-esteem varied across groups, a multilevel regression was carried out. In this regression, social stress, activity stress, the categorical variable 'group' [controls; poor-me; bad-me; remitted], 'social stress' x 'group' interaction, and 'activity stress' x 'group' interaction were entered as predictors of self-esteem. The predictor variables 'social stress' and 'activity stress' were entered simultaneously into the model in order to establish their mutual independence. The analyses were repeated for negative and positive affect as the dependent variables. In all these analyses, the interaction term *'group' x 'stress'* was of major interest as the main hypothesis concerned the differences in stress sensitivity across different groups.

Analyses were carried out with the XTMIXED module of Stata v.9.2. (StataCorp, 2007), providing non-standardized regression coefficients of the predictors in the multilevel model (b-values). All multilevel models were corrected for the *a priori* selected possible confounders 'gender' and 'age', which were entered as additional predictors. Main effects and interactions were assessed using the Wald test. When significant interactions were encountered, stratified analyses were conducted to clarify group differences using the LINCOM command of Stata.

Results

The intraindividual ranges of deservedness ratings in poor-me, bad-me, and remitted participants are presented in Supplementary Figure 1. In poor-me group, median deservedness scores equalled 1 for 91% of individuals (N=21), with two remaining individuals scoring between 1 and 2. In bad-me group, deservedness scores were >=2 for 91% of participants (N=21); 60% of participants scored >=3 (N=14). In the remitted group, deservedness scores were 1 for 76% of participants (N=22) and the remaining 24% scored between 2 and 5.5 (N=7). Consistent with previous research (Udachina et al., 2012), most

dramatic fluctuations in deservedness ratings over the assessment period were observed in the bad-me group, although some fluctuations also occurred in participants from poor-me and remitted groups.

Differences in self-esteem, affect and stress levels

The mean scores on study variables together with the results of statistical tests are shown in Table 2. It shows that self-esteem was lower in all patient groups compared to the controls; however, self-esteem was not as low in the poor-me as in the bad-me group. Negative affect was higher in bad-me and poor-me groups, than in remitted or control groups. However, negative affect was higher in bad-me than in poor-me group. Similarly, positive affect was lower in all patient groups than in the control group; bad-me and poor-me groups also scored lower than the remitted group.

----------TABLE 2 ----------

Stress sensitivity

Self-esteem. Across all participants, both social (β[SE]= -0.13[0.01], p<.001) and activity (β[SE]= -0.06[0.01], p <.001) stress were associated with decreased self-esteem. Analyses with 'group', 'group' x 'social stress', and 'group' x 'activity stress' as additional predictors revealed a significant 'group' x 'social stress' interaction (χ^2[3]=44.89, p<.001), indicating that the effect of social stress on self-esteem varied across the different groups (Table 3). The group x activity stress interaction, however, was non-significant (χ^2[3]=4.23, p=.237), suggesting that the effect of activity stress on self-esteem was similar across groups (also Table 3). Follow-up analyses showed that the decrease in self-esteem due to social stress was smaller in the poor-me group than in all other groups. In addition, the decrease in self-esteem was larger in the bad-me and the remitted groups than in the control group.

Finally, self-esteem decrease was larger in the bad-me group than in the remitted group (also Table 3).

----------TABLE 3----------

Negative affect. Across all participants, both social (β[SE]=0.21[0.01], p<.001) and activity (β[SE]=0.12[0.01], p<.001) stress were associated with increased negative affect. A 'group' x 'social stress' interaction was significant (χ^2[3]=23.44, p<.001) as was the 'group' x 'activity stress' interaction (χ^2[3]=13.43, p=.004) (Table 4). Follow-up analyses revealed that the increase in negative affect due to social stress was larger in the bad-me group than in any other group (also Table 4). The increase in negative affect due to activity stress was larger in the poor-me group than in the controls.

----------TABLE 4----------

Positive affect. Across all participants, both social (β[SE]= -0.38[0.02], p<.001) and activity (β[SE]= -0.17[0.01], p< .001) stress were associated with decreased positive affect. Analyses with 'group', 'group' x 'social stress', and 'group' x 'activity stress' as additional predictors revealed a significant 'group' x 'social stress' interaction (χ^2[3]=19.81, p<.001), and also a significant 'group' x 'activity stress' interaction (χ^2[3]=23.66, p<.001) (Table 5). Follow-up analyses revealed that the decrease in positive affect due to social stress was smaller in poor-me group as compared to all other groups. In addition, the decrease in positive affect due to activity stress was smaller in bad-me group than that in all other groups. Finally, the decrease in positive affect due to activity stress was larger in the controls than in the remitted group.

----------TABLE 5----------

Discussion

Our data generally support our predictions. In particular, when faced with stressful social situations, poor-me individuals' self-esteem and positive affect suffered the least compared to all other groups; poor-me participants' self-esteem seemed especially immune. In contrast, bad-me individuals were most sensitive to social stress, showing the largest decrease in self-esteem and the largest increase in negative affect than any other group. As predicted, no consistent between-group differences in sensitivity to activity stress emerged. The impact of activity stress on self-esteem was similar across groups. As for mood sensitivity to activity stress, poor-me participants reported a greater increase in negative affect than the controls, while bad-me participants reported the smallest decrease in positive affect. Consistent with earlier studies (Freeman et al., 2001, Melo et al., 2006, Chadwick et al., 2005, Melo and Bentall, 2013), we found that although poor-me beliefs were associated with lower than normal self-esteem and mood, this abnormality was less evident in poor-me than in bad-me group. Overall, our findings suggest that poor-me paranoia may protect vulnerable individuals against low self-esteem and distress associated with stressful social situations, but not other sources of stress.

Our results indicate that bad-me paranoia was associated with an exaggerated response to social stress, which is consistent with evidence showing that bad-me stance is characterised by marked instability of self-esteem and mood, presumably reflecting hypersensitivity to changes in social environment (Udachina et al., 2012). Hypersensitivity of bad-me individuals to social threat is also in line with the idea that self-esteem and self-esteem-relevant emotions have a functional value as they protect the individual against potential social exclusion (Leary et al., 1995). According to this theory, low self-esteem signals a dangerously close proximity to social exclusion, leading to hypervigilance towards potential social rejection. Higher self-esteem, on the other hand, indicates relative safety from

potential exclusion, thus allowing individuals to relax their guard. As this and previous research (Freeman et al., 2001, Melo et al., 2006, Chadwick et al., 2005, Udachina et al., 2012) show that bad-me beliefs are associated with highly negative self-concept, individuals holding bad-me beliefs would be expected to be hypersensitive to social context according to this theory.

While the mechanisms underlying the observed difference in reactions to social stress in poor-me and bad-me paranoia are unclear, one theory would suggest that the attributions individuals make for social events might be important (Bentall et al., 2001, Bentall et al., 1994). Briefly, this account argues that paranoid beliefs result from the repeated interpretation of negative events in terms of external personal causes (i.e. attributing negative events to other people). As previous research suggests that poor-me beliefs are associated with a tendency to attribute negative events to external causes (Melo et al., 2006), it is possible that such attributions were more prevalent among poor-me individuals, thus buffering their self-esteem and mood from social stress; bad-me individuals, on the other hand, were more likely to make internal attributions for unpleasant social interactions, leading to increased distress. We could further speculate, that the selective insensitivity to social (but not activity) stress associated with poor-me beliefs could be explained by better availability of external personal explanations in situations involving other people.

The reduced sensitivity of poor-me individuals to social stress contradicts most research which has shown heightened emotional sensitivity to stress, including social, in individuals with psychosis (see Myin-Germeys and van Os, 2007, for review). However, the vast majority of these studies did not differentiate between subgroups of individuals with psychosis. The results of investigations that have examined subgroups, however, are compatible with ours, especially given the evidence that poor-me beliefs are more prevalent in clinical populations than in subclinically paranoid individuals (Fornells-Ambrojo and

Garety, 2005, Melo et al., 2009). For example, one study showed that individuals with mild-to-moderate paranoia were more sensitive to social context, reacting with greater paranoia to social encounters with unfamiliar individuals (Collip et al., 2011). In contrast, highly paranoid individuals (predominantly diagnosed with schizophrenia), were indifferent to familiarity. Another study compared emotional sensitivity of individuals diagnosed with schizophrenia, individuals at ultra-high risk of psychosis (UHRP), and controls, finding that UHRP individuals were most reactive to social stress, while the emotional sensitivity of individuals diagnosed with schizophrenia was comparable to that of controls (Palmier-Claus et al., 2012). Importantly, in this study, individuals with significant levels of depression were excluded from the schizophrenia group. As depression is associated with bad-me paranoia (Udachina et al., 2012), it implies that poor-me beliefs prevailed in schizophrenia group.

The observation that the differences in stress sensitivity between bad-me and poor-me individuals were related specifically to social aspects of the environment is consistent with accumulating evidence highlighting the role of social factors in psychosis, including social adversity, migration and childhood abuse (Stilo et al., 2013, Cantor-Graae, 2007, Varese et al., 2012). These experiences can be thought of as "social defeat" or social exclusion experiences (Selten et al., 2013, Cantor-Graae, 2007). Further, several authors have argued that repeated exposure to defeat/social exclusion experiences may lead to stress sensitisation and this, in turn, may bring about psychotic symptoms (Selten et al., 2013, Collip et al., 2008). Other researchers have emphasised the role of impoverished social environment in the emergence of psychosis. Specifically, it has been proposed that florid persecutory delusions arise as a result of social isolation, populating an otherwise "barren interpersonal world" with complex networks of menacing characters (Hoffman, 2007; p. 1067). Of course, depression and associated social withdrawal often precede psychotic illness (Rietdijk et al., 2013, Hafner et al., 1993). It is possible that subclinical paranoia characterised by high

perceived deservedness of persecution (i.e. bad-me paranoia), low self-esteem, depression, and an increasing emotional cost of social encounters lead to a dramatic reduction in social interactions. This withdrawal culminates in the development of full-blown delusions and a decrease in perceived deservedness of persecution, i.e. poor-me paranoia. Whilst the switch to poor-me paranoia alleviates distress by blunting sensitivity to social stress, it also increases the likelihood of hospitalisation. Interestingly, one study (Morrison et al., 2006) found that in individuals with subclinical psychotic symptoms the intensity of psychotic symptoms was associated with a closing gap between self perceptions and self-ideals – a gap previously found to be associated with depression (Higgins et al., 1986).

Strengths and limitations

Our study was the first to examine the differences in reactions to stress in subgroups of paranoid individuals. Because the individuals' experiences were assessed in the context of their daily life, our findings have high ecological validity. Despite these strengths, our results should also be interpreted with a number of caveats in mind. First, the causal relationship between stress on the one hand, and self-esteem and affect on the other, cannot be conclusively established, as the analyses were cross-sectional. Second, the stressfulness of events was self-reported and therefore subjective. However, this should not present a problem as the study was concerned with the *impact* of these events on self-esteem and mood, rather than the stressfulness of the events per se.

Conclusions

In sum, we found that poor-me paranoid beliefs were associated with attenuated sensitivity and bad-me beliefs were associated with exaggerated sensitivity to social, but not activity stress. We also observed that, compared to bad-me paranoia, poor-me paranoia was

associated with higher self-esteem and lower negative affect. Our results are compatible with the attributional model of paranoia (Bentall et al., 2001), which suggests that in some circumstances paranoia may serve a protective function against low self-esteem and depression. Our findings also contribute to the debate about the continuity of paranoid experience (Collip et al., 2011, Freeman et al., 2010, Melo et al., 2006), suggesting that qualitative differences may exist between paranoid beliefs with different content.

References

BENTALL, R. P., CORCORAN, R., HOWARD, R., BLACKWOOD, N. & KINDERMAN, P. 2001. Persecutory delusions: A review and theoretical integration. *Clinical Psychology Review,* 21**,** 1143-1192.

BENTALL, R. P., DE SOUSA, P., VARESE, F., WICKHAM, S., SITKO, K., HAARMANS, M. & READ, J. 2014. From adversity to psychosis: pathways and mechanisms from specific adversities to specific symptoms. *Social Psychiatry and Psychiatric Epidemiology,* 49**,** 1011-1022.

BENTALL, R. P., KINDERMAN, P. & KANEY, S. 1994. The self, attributional processes and abnormal beliefs: Towards a model of persecutory delusions. *Behaviour Research and Therapy,* 32**,** 331-341.

CANTOR-GRAAE, E. 2007. The contribution of social factors to the development of schizophrenia: A review of recent findings. *Canadian Journal of Psychiatry-Revue Canadienne De Psychiatrie,* 52**,** 277-286.

CHADWICK, P. D. J., TROWER, P., JUUSTI-BUTLER, T. M. & MAGUIRE, N. 2005. Phenomenological evidence for two types of paranoia. *Psychopathology,* 38**,** 327-333.

COLLIP, D., MYIN-GERMEYS, I. & VAN OS, J. 2008. Does the concept of "Sensitization" provide a plausible mechanism for the putative link between the environment and schizophrenia? *Schizophrenia Bulletin,* 34**,** 220-225.

COLLIP, D., NICOLSON, N. A., LARDINOIS, M., LATASTER, T., VAN OS, J., MYIN-GERMEYS, I. & GROUP 2011. Daily cortisol, stress reactivity and psychotic experiences in individuals at above average genetic risk for psychosis. *Psychological Medicine,* 41**,** 2305-2315.

FORNELLS-AMBROJO, M. & GARETY, P. A. 2005. Bad me paranoia in early psychosis: A relatively rare phenomenon. *British Journal of Clinical Psychology* 44**,** 521-528.

FREEMAN, D. & GARETY, P. 2014. Advances in understanding and treating persecutory delusions: a review. *Social Psychiatry and Psychiatric Epidemiology,* 49**,** 1179-1189.

FREEMAN, D., GARETY, P., FOWLER, D., KUIPERS, E., DUNN, G., BEBBINGTON, P. & HADLEY, C. 1998. The London-East Anglia randomized controlled trial of cognitive-behaviour therapy for psychosis IV: Self-esteem and persecutory delusions. *British Journal of Clinical Psychology,* 37**,** 415-430.

FREEMAN, D., GARETY, P. & KUIPERS, E. 2001. Persecutory delusions: Developing the understanding of belief maintenance and emotional distress. *Psychological Medicine,* 31**,** 1293-1306.
FREEMAN, D., PUGH, K., VORONTSOVA, N., ANTLEY, A. & SLATER, M. 2010. Testing the Continuum of Delusional Beliefs: An Experimental Study Using Virtual Reality. *Journal of Abnormal Psychology,* 119**,** 83-92.
HAFNER, H., MAURER, K., LOFFLER, W. & RIECHERROSSLER, A. 1993. The influence of age and sex on the onset and early course of schizophrenia. *British Journal of Psychiatry,* 162**,** 80-86.
HIGGINS, E. T., BOND, R. N., KLEIN, R. & STRAUMAN, T. 1986. SELF-DISCREPANCIES AND EMOTIONAL VULNERABILITY - HOW MAGNITUDE, ACCESSIBILITY, AND TYPE OF DISCREPANCY INFLUENCE AFFECT. *Journal of Personality and Social Psychology,* 51**,** 5-15.
HOFFMAN, R. E. 2007. A social deafferentation hypothesis for induction of active schizophrenia. *Schizophrenia Bulletin,* 33**,** 1066-1070.
KAY, S. R., FISZBEIN, A. & OPLER, L. A. 1987. The Positive and Negative Syndrome Scale for schizophrenia. *Schizophrenia Bulletin,* 13**,** 261-276.
KAY, S. R., OPLER, L. A. & LINDENMAYER, J. P. 1988. Reliability and validity of the Positive and Negative Syndrome Scale for schizophrenics. *Psychiatry Research,* 23**,** 99-110.
KINDERMAN, P. & BENTALL, R. P. 1997. Causal attributions in paranoia and depression: Internal, personal, and situational attributions for negative events. *Journal of Abnormal Psychology,* 106**,** 341-345.
LATASTER, T., WICHERS, M., JACOBS, N., MENGELERS, R., DEROM, C., THIERY, E., VAN OS, J. & MYIN-GERMEYS, I. 2009. Does reactivity to stress cosegregate with subclinical psychosis? A general population twin study. *Acta Psychiatrica Scandinavica,* 119**,** 45-53.
LEARY, M. R., TERDAL, S. K., TAMBOR, E. S. & DOWNS, D. L. 1995. Self-esteem as an interpersonal monitor: The sociometer hypothesis. *Journal of Personality and Social Psychology,* 68**,** 518-530.
LYON, H. M., KANEY, S. & BENTALL, R. P. 1994. The defensive function of persecutory delusions: Evidence from attribution tasks. *British Journal of Psychiatry,* 164**,** 637-646.
MELO, S., CORCORAN, R., SHRYANE, N. & BENTALL, R. P. 2009. The Persecution and Deservedness Scale. *Psychology and Psychotherapy-Theory Research and Practice,* 82**,** 247-260.
MELO, S., TAYLOR, J. L. & BENTALL, R. P. 2006. 'Poor me' versus 'bad me' paranoia and the instability of persecutory ideation. *Psychology and Psychotherapy-Theory Research and Practice,* 79**,** 271-287.
MELO, S. S. & BENTALL, R. P. 2013. "Poor me' versus "Bad me' paranoia: The association between self-beliefs and the instability of persecutory ideation. *Psychology and Psychotherapy-Theory Research and Practice,* 86**,** 146-163.
MORGAN, C. & GAYER-ANDERSON, C. 2016. Childhood adversities and psychosis: evidence, challenges, implications. *World Psychiatry,* 15**,** 93-102.
MORRISON, A. P., FRENCH, P., LEWIS, S. W., ROBERTS, M., RAJA, S., NEIL, S. T., PARKER, S., GREEN, J., KILCOMMONS, A., WALFORD, L. & BENTALL, R. P. 2006. Psychological factors in people at ultra-high risk of psychosis: comparisons with non-patients and associations with symptoms. *Psychological Medicine,* 36**,** 1395-1404.

MOUTOUSSIS, M., WILLIAMS, J., DAYAN, P. & BENTALL, R. P. 2007. Persecutory delusions and the conditioned avoidance paradigm: towards an integration of the psychology and biology of paranoia. *Cogn Neuropsychiatry,* 12**,** 495-510.
MYIN-GERMEYS, I., DELESPAUL, P. & VAN OS, J. 2003. The Experience Sampling Method in psychosis research. *Current Opinion in Psychiatry,* 16**,** S33-S38.
MYIN-GERMEYS, I. & VAN OS, J. 2007. Stress-reactivity in psychosis: Evidence for an affective pathway to psychosis. *Clinical Psychology Review,* 27**,** 409-424.
MYIN-GERMEYS, I., VAN OS, J., SCHWARTZ, J. E., STONE, A. A. & DELESPAUL, P. A. 2001. Emotional reactivity to daily life stress in psychosis. *Archives of General Psychiatry,* 58**,** 1137-1144.
NUECHTERLEIN, K. H. & DAWSON, M. E. 1984. A heuristic vulnerability stress model of schizophrenic episodes. *Schizophrenia Bulletin,* 10**,** 300-312.
OORSCHOT, M., KWAPIL, T., DELESPAUL, P. & MYIN-GERMEYS, I. 2009. Momentary Assessment Research in Psychosis. *Psychological Assessment,* 21**,** 498-505.
PALMIER-CLAUS, J. E., DUNN, G. & LEWIS, S. W. 2012. Emotional and symptomatic reactivity to stress in individuals at ultra-high risk of developing psychosis. *Psychological Medicine,* 42**,** 1003-1012.
PALMIER-CLAUS, J. E., MYIN-GERMEYS, I., BARKUS, E., BENTLEY, L., UDACHINA, A., DELESPAUL, P. A. E. G., LEWIS, S. W. & DUNN, G. 2011. Experience sampling research in individuals with mental illness: reflections and guidance. *Acta Psychiatrica Scandinavica,* 123**,** 12-20.
REININGHAUS, U., KEMPTON, M. J., VALMAGGIA, L., CRAIG, T. K. J., GARETY, P., ONYEJIAKA, A., GAYER-ANDERSON, C., SO, S. H., HUBBARD, K., BEARDS, S., DAZZAN, P., PARIANTE, C., MONDELLI, V., FISHER, H. L., MILLS, J. G., VIECHTBAUER, W., MCGUIRE, P., VAN OS, J., MURRAY, R. M., WYKES, T., MYIN-GERMEYS, I. & MORGAN, C. 2016. Stress Sensitivity, Aberrant Salience, and Threat Anticipation in Early Psychosis: An Experience Sampling Study. *Schizophrenia Bulletin,* 42**,** 712-722.
RIETDIJK, J., ISING, H. K., DRAGT, S., KLAASSEN, R., NIEMAN, D., WUNDERINK, L., CUIJPERS, P., LINSZEN, D. & VAN DER GAAG, M. 2013. Depression and social anxiety in help-seeking patients with an ultra-high risk for developing psychosis. *Psychiatry Research,* 209**,** 309-313.
SARTORIUS, N., JABLENSKY, A., KORTEN, A., ERNBERG, G., ANKER, M., COOPER, J. E. & DAY, R. 1986. Early manifestations and first-contact incidence of schizophrenia in different cultures. *Psychological Medicine,* 16**,** 909-928.
SELTEN, J. P., VAN DER VEN, E., RUTTEN, B. P. F. & CANTOR-GRAAE, E. 2013. The Social Defeat Hypothesis of Schizophrenia: An Update. *Schizophrenia Bulletin,* 39**,** 1180-1186.
STATACORP 2007. *Stata Statistical Software, Release 9.2*, Stata Corporation, College Station, TX, USA.
STILO, S. A., DI FORTI, M., MONDELLI, V., FALCONE, A. M., RUSSO, M., O'CONNOR, J., PALMER, E., PAPARELLI, A., KOLLIAKOU, A., SIRIANNI, M., TAYLOR, H., HANDLEY, R., DAZZAN, P., PARIANTE, C., MARQUES, T. R., ZOCCALI, R., DAVID, A., MURRAY, R. M. & MORGAN, C. 2013. Social Disadvantage: Cause or Consequence of Impending Psychosis? *Schizophrenia Bulletin,* 39**,** 1288-1295.
THEWISSEN, V., BENTALL, R. P., LECOMTE, T., VAN OS, J. & MYIN-GERMEYS, I. 2008. Fluctuations in self-esteem and paranoia in the context of daily life. *Journal of Abnormal Psychology,* 117**,** 143-153.

TROWER, P. & CHADWICK, P. 1995. Pathways to defense of the self: A theory of two types of paranoia. *Clinical Psychology: Science and Practice,* 2**,** 263-278.
UDACHINA, A., THEWISSEN, V., MYIN-GERMEYS, I., FITZPATRICK, S., O'KANE, A. & BENTALL, R. P. 2009. Understanding the Relationships Between Self-Esteem, Experiential Avoidance, and Paranoia Structural Equation Modelling and Experience Sampling Studies. *Journal of Nervous and Mental Disease,* 197**,** 661-668.
UDACHINA, A., VARESE, F., OORSCHOT, M., MYIN-GERMEYS, I. & BENTALL, R. P. 2012. Dynamics of self-esteem in "Poor-Me" and "Bad-Me" paranoia. *Journal of Nervous and Mental Disease,* 200**,** 777-783.
VARESE, F., SMEETS, F., DRUKKER, M., LIEVERSE, R., LATASTER, T., VIECHTBAUER, W., READ, J., VAN OS, J. & BENTALL, R. P. 2012. Childhood adversities increase the risk of psychosis: A meta-analysis of patient-control, prospective and cross-sectional cohort studies. *Schizophrenia Bulletin,* 38**,** 661-671.
ZUBIN, J. & SPRING, B. 1977. Vulnerability: New view of schizophrenia. *Journal of Abnormal Psychology,* 86**,** 103-126.

Table(s)

Click here to download Table(s) Stress sensitivity in paranoia - Tables revised.docx

Table 1. Sociodemographic and clinical characteristics of the study sample (N=143).

	Controls N=52	Poor-me N=23	Bad-me N=23	Remitted N=45	F/X^2	Group differences
Age, mean (*SD*)	36.10 (12.90)	38.13 (12.84)	42.30 (11.47)	38.22 (10.91)	1.41	-
Gender, *n* female, (%)[a]	31 (60%)	7 (30%)	9 (40%)	24 (53%)	6.72	-
Achieved higher education, *n*	31 (60%)	1 (4%)	5 (22%)	9 (20%)		
Ethnicity, *n* (%)[a]						
White	51 (98%)	22 (96%)	20 (87%)	39 (87%)		
Asian	1 (2%)	1 (4%)	0 (0%)	2 (4%)		
Black	0 (0%)	0 (0%)	2 (9%)	1 (2%)		
Mixed	0 (0%)	0 (0%)	1 (4%)	3 (7%)		
Marital status, *n* (%)[a]						
Married or living together	20 (38%)	1 (4%)	8 (35%)	5 (11%)		
Widowed	1 (2%)	0 (0%)	1 (4%)	0 (0%)		
Divorced/Separated	1 (2%)	6 (26%)	2 (9%)	8 (18%)		
Never married	30 (58%)	16 (70%)	12 (52%)	32 (71%)		
Occupation, *n* (%)[a]						
Paid employment	33 (63%)	1 (4%)	1 (4%)	6 (13%)		
Voluntary employment	0 (0%)	3 (13%)	5 (22%)	5 (11%)		
Studying	11 (21%)	2 (9%)	1 (4%)	2 (4%)		
Unemployed	5 (10%)	16 (70%)	16 (70%)	32 (71%)		
Retired	3 (6%)	1 (4%)	0 (0%)	0 (0%)		
PANSS total score, mean (*SD*)	31.88 (2.35)	61.91 (14.88)	61.78 (11.03)	48.50 (14.49)	59.03***	C < poor-me, bad-me, R R < poor-me, bad-me
No of valid ESM observations, mean (*SD*)	49.08 (8.30)	41.65 (11.64)	39.09 (11.40)	42.62 (9.44)	7.28***	C > poor-me, bad-me, R

PANSS=Positive and Negative Syndrome Scale.

[a] Because of rounding percentages may not add up exactly to 100%.

Table 2. Mean scores (SD) for study variables (stratified by group) and group differences.

	Mean (SD)				X^2	Group differences
	Poor-me N=23	Bad-me N=23	Remitted N=45	Controls N=52		
Paranoia	3.95 (1.84)	4.13 (1.45)	1.10 (0.17)	1.04 (0.89)	312.09***	poor-me, bad-me > R, C
Deservedness	1.23 (0.23)	3.48 (1.25)	1.51 (1.02)	1.52 (1.05)	100.00***	bad-me > poor-me, R, C
Self-Esteem	4.85 (1.40)	4.17 (1.03)	5.58 (0.87)	6.11 (0.57)	98.18***	C > poor-me, bad-me, R R > poor-me, bad-me poor-me > bad-me
Positive affect	3.30 (0.98)	3.36 (0.88)	3.81 (1.18)	4.23 (0.74)	26.47***	C > poor-me, bad-me, R R > poor-me, bad-me
Negative affect	2.78 (1.10)	3.50 (1.33)	1.81 (0.87)	1.47 (0.47)	99.92***	C, R < poor-me, bad-me poor-me < bad-me
Social stress	3.00 (1.00)	3.16 (1.18)	2.69 (0.90)	2.27 (0.56)	26.69***	C < poor-me, bad-me, R R < bad-me
Activity stress	2.80 (0.82)	3.09 (0.71)	2.63 (0.64)	2.69 (0.49)	9.47*	bad-me > C, R

Separate means were calculated for each participant and subsequently aggregated to obtain group means. ESM=Experience Sampling Method. R=Remitted. C=controls. * p<.05; ** p<.01; *** p<.001.

Table 3. Multilevel model estimates B (*SE*) – effect of social and activity stress on self-esteem, stratified by group.

Independent variable	χ^2 for stress x group interaction	B *(SE)*, stratified by group				P values *(SE)* for pairwise group comparisons					
		C (n=52)	poor-me (n=23)	bad-me (n=23)	R (n=45)	C vs poor-me	C vs bad-me	C vs R	poor-me vs bad-me	poor-me vs R	bad-me vs R
Social stress	**44.89**	**-0.10** (0.01)	-0.02 (0.03)	**-0.27** (0.04)	**-0.17** (0.02)	.023 (0.03)	<.001 (0.04)	.011 (0.03)	<.001 (0.04)	<.001 (0.03)	.008 (0.04)
Activity stress	4.23	-0.06 (0.01)	-0.07 (0.02)	-0.12 (0.03)	-0.05 (0.02)	–	–	–	–	–	

Statistically significant associations (p<.05) are in bold. C=controls, R=remitted.

Table 4. Multilevel model estimates B (*SE*) – effect of social and activity stress on negative affect, stratified by group.

Independent variable	χ^2 for stress x group interaction	B *(SE)*, stratified by group				P values *(SE)* for pairwise group comparisons					
		C (n=52)	poor-me (n=23)	bad-me (n=23)	R (n=45)	C vs poor-me	C vs bad-me	C vs R	poor-me vs bad-me	poor-me vs R	bad-me vs R
Social stress	**23.44**	**0.19** (0.02)	**0.15** (0.03)	**0.35** (0.03)	**0.18** (0.02)	.228 (0.04)	<.001 (0.04)	.639 (0.03)	<.001 (0.04)	.453 (0.04)	<.001 (0.04)
Activity stress	**13.43**	**0.09** (0.02)	**0.20** (0.03)	**0.13** (0.03)	**0.13** (0.02)	<.001 (0.03)	.214 (0.04)	.084 (0.03)	.120 (0.04)	.072 (0.04)	.944 (0.04)

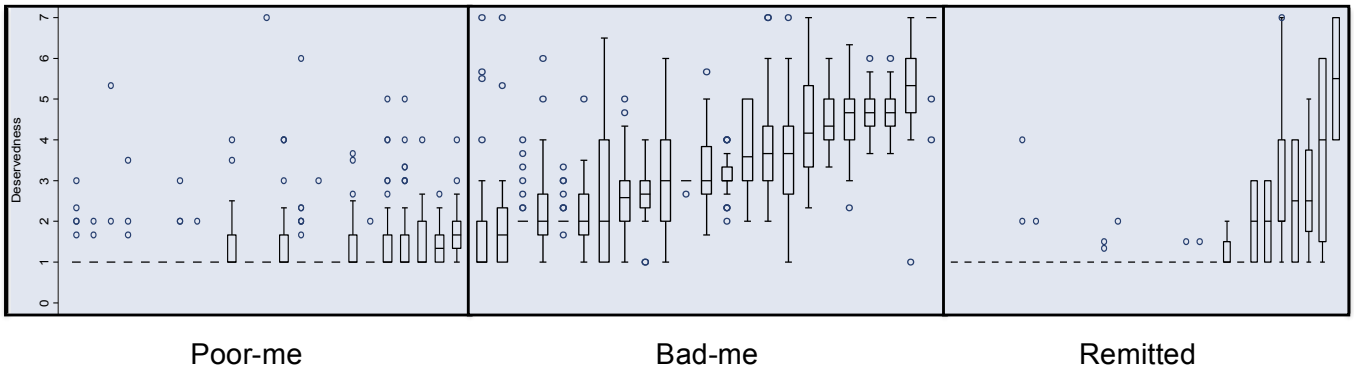
Statistically significant associations (p<.05) are in bold. C=controls, R=remitted.

Table 5. Multilevel model estimates B (*SE*) – effect of social and activity stress on positive affect, stratified by group.

Independent variable	χ^2 for stress x group interaction	B *(SE)*, stratified by group				P values *(SE)* for pairwise group comparisons					
		C (n=52)	poor-me (n=23)	bad-me (n=23)	R (n=45)	C vs poor-me	C vs bad-me	C vs R	poor-me vs bad-me	poor-me vs R	bad-me vs R
Social stress	**19.81**	**-0.41**	**-0.26**	**-0.47**	**-0.38**	<.001	.195	.495	<.001	.005	.075
		(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)
Activity stress	**23.66**	**-0.21**	**-0.15**	-0.01	**-0.14**	.150	<.001	.038	.003	.707	.004
		(0.02)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)	(0.05)	(0.04)	(0.05)

Statistically significant associations (p<.05) are in bold. C=controls, R=remitted.

Other Supplementary Material
Click here to download Other Supplementary Material
Supplementary Figure 1.pdf



Supplementary Figure F1. The intraindividual ranges of deservedness scores over 6 days of assessment in patients identified as poor-me (n=23), bad-me (N=23) and remitted (N=29). Each column represents a single participant. The thick horizontal line represents the median deservedness score for the participant. The tinted column represents interquartile range, and dots represent outliers. Note that in the remitted group some participants' deservedness scores were not calculated as their paranoia scores were below the threshold level. Data for these participants are therefore not shown.

Reviewer #1: This experience sampling study aims to investigate whether sensitivity to social stress in daily life (defined as the association between social stress and a) self-esteem, b) negative affect and c) negative affect) is attenuated in people with paranoia who belief the persecution is not deserved.

1. In the Abstract, the authors state that the current study tested the hypothesis that poor-me beliefs "...confer protection against the distress caused by stressful social but not activity-related stress" (p. 1, 2nd sentence). However, the design and analyses do not address (a sufficient number of) causal criteria that would allow for firm conclusions to be drawn as to whether distress is caused by social (or-activity-related) stress.

We appreciate the reviewer's comments. However, we would argue that we don't claim that our results are conclusive (in the abstract or anywhere in the paper), only that we set out to test a theory that suggests that paranoid beliefs may protect individuals from low self-esteem and distress. Although our findings are inconclusive, they do not falsify the tested theory. In addition, we clearly state that our findings are not conclusive in the Strengths and Limitations section of the paper.

Also, this sentence reads a little clumsy ("stressful social ... stress").

The sentence has now been changed to: "The current study tested this theory by investigating a hypothesis that paranoid beliefs in combination with low perceived deservedness of persecution (poor-me beliefs) confer protection against the distress caused by social but not activity related stress."

2. Overall, the Introduction is well written but omits some of the more recent work on psychological mechanisms underlying paranoid beliefs (p. 2, 2nd sentence: Freeman and Garety, 2014), social factors in psychosis/paranoia (p. 4, 2nd paragraph, 1st sentence: Bentall et al., 2014, Morgan and Gayer-Anderson, 2016)), and stress sensitivity in daily life in individuals at high-risk of developing psychosis (p. 4, 1st paragraph, 2nd sentence: Reininghaus et al., 2016)) - this should be added.

We have now added the listed references to the paper.

3. The authors refer to the association between social/activity-related stress and self-esteem as 'stress sensitivity' - to date, this has been predominantly used to refer to associations

between stress and negative/positive affect and I wonder whether it is the best term to use in the context of self-esteem as an outcome variable.

We have deliberated on this question. It is true that the majority of studies which have investigated the impact of stress in psychosis or schizophrenia have focussed on the impact of stress on positive and negative affect (also termed 'emotional reactivity/sensitivity) (Myin-Germeys et al., 2001, Myin-Germeys and Krabbendam, 2004), whilst a small number has also investigated the impact of stress on psychotic experiences (sometimes also termed 'psychotic reactivity' or 'behavioural sensitisation')(Myin-Germeys et al., 2005) (Myin-Germeys et al., 2005, Glaser et al., 2010). However, some researchers have used the term 'stress sensitivity' to refer to the impact of stress on psychosis (Reininghaus et al., 2016). In addition, the Oxford Dictionary provides the following definition for the word 'sensitive': "quick to detect or respond to slight changes, signals, or influences", suggesting that any reactivity to change could be viewed as 'sensitivity'. Therefore, on balance, we don't believe that the term 'stress sensitivity' has to be reserved exclusively to denote the effect of stress on affect.

4. Most experience sampling studies to date have additionally investigated event-related stress. What was the rationale for focusing specifically on social and activity-related stress (and not event-related stress)?

The decision to concentrate on activity vs social stress was made *a priori*. This is because we sought to distinguish between the stress arising from contacts with other people and other type of stress. Event related stress often involves social encounters, e.g., conversation with a family member, travelling on public transport.

5. Were there any differences in socio-demographic characteristics between those included vs. not included (p. 5)?

There were no differences for age or gender. However, this information is not included in the manuscript due to the lack of space.

6. How did the grouping of 'currently paranoid' and 'remitted' according to the median split of ESM paranoia items compare to the PANSS delusions item? Could this group variable be cross-validated against the PANSS?

Please see below the tests for positive, negative and general syndrome subscales of the PANSS. For space saving reasons, these details were omitted from the final manuscript.

PANSS, mean (*SD*)

	Controls N=52	**Poor-me N=23**	**Bad-me N=23**	**Remitted N=45**	**F**	**P value**	**Group differences**
PANSS-Positive	7.24 (0.65)	16.55 (5.40)	16.78 (3.97)	11.57 (3.73)	61.22	<.001	C < PM, BM, R R < PM, BM
PANSS-Negative	7.18 (0.39)	14.18 (4.99)	13.52 (4.91)	11.16 (4.18)	27.29	<.001	C < PM, BM, R R < PM
PANSS-General	17.47 (2.04)	31.18 (8.29)	31.48 (7.77)	25.77 (8.23)	36.09	<.001	C < PM, BM, R R < PM, BM

7. How was the multilevel data structure and clustering of ESM observations within subjects handled in the PCA of ESM measures?

For each of the ESM variables, PCA analyses were performed on all the data available for the seventh beep of the second day of ESM assessment. For example, to ascertain the factor structure of paranoia, paranoia score as recorded by each participant at the seventh beep of the seventh day was used. This yields one data point per participant, therefore avoiding the problem of nested structure of ESM data. This particular time point (seventh beep on the second day) was chosen a priori because in our previous studies this was the time point at which most data on paranoia was available.

8. I don't think it is entirely accurate to talk about 'stratified effect sizes' in the context of the lincom command. Please clarify.

This has now been changed to: “When significant interactions were encountered, stratified analyses were conducted to clarify group differences using the LINCOM command of Stata.”

9. In table 2-5, the coefficients, SE (or 95% CI), and exact p-values for the group differences should be presented. In table 3-5, these should address the actual hypothesis of the study: "We predicted that in stressful social but not activity related situations poor-me individuals would display changes in self-esteem and mood similar to or smaller than those reported by healthy controls, and smaller than those reported by bad-me individuals" (p. 4) (the text sometimes also reports differences between the bad-me group and other groups, which was not mentioned as a direct hypothesis in the Introduction). One reason why focusing on these

differences between poor-me individuals and the other three groups is that it might also help getting around potential issues with multiple testing.

Although the main focus of the study is the difference in sensitivity to stress between PM and BM groups, we report all the group differences available to us. These data provide additional reference points for comparison and may be of interest to others. As per the reviewer's request we have now expanded Table 3, 4 and 5 to include the exact P values and SEs for all group comparisons. However, we were unable to do the same for Table 2 due to space constraints.

10. The key findings of this study is that paranoia with low perceived deservedness of persecution attenuates sensitivity to social stress, whereas paranoia with high perceived deservedness accelerates social stress sensitivity - I wonder whether outcome (paranoia) and mechanism (stress sensitivity) have been confused already at the outset, in their hypotheses. Wouldn't it be at least equally plausible to hypothesize and test that stress sensitivity is the mechanism underlying paranoia, and this association is modified by different levels of perceived deservedness?

In our paper, we argue that the impact of social stress on emotions and self-esteem is moderated by paranoid beliefs and perceived deservedness of persecution, and that the impact of stress is attenuated in paranoid individuals who believe they don't deserve to be persecuted. We didn't treat 'paranoia' as an outcome variable – affect and self-esteem were the outcomes. An alternative hypothesis – the reviewer suggests – is that stress causes paranoia, but this relationship is moderated by perceived deservedness of persecution. There is certainly considerable evidence to suggest a causal link between stress and psychosis, but our findings do not testify against this hypothesis.

Reviewer #2: The authors investigate the relationship between poor-me vs bad-me paranoia and social stress sensitivity using an experience sampling approach. I think this is an excellent paper as we absolutely need further refinement in the psychological understanding of psychopathology. Both the introduction and discussion are well written and theoretically sound. Also the appropriate methodology was used. I do have some comments for improvement on the analytic approach.

1. In the result section of the abstract, the authors talk about poor-me beliefs being associated with blunted sensitivity to social stress etc. I think this is not an appropriate phrasing as it is not the actual beliefs that are being associated but rather individuals who

predominantly have these beliefs (as people may entertain both kind of beliefs), so this section needs rephrasing.

The abstract has now been changed to reflect this.

2. Following up on that, it would also be interesting to investigate variation in both beliefs within one person rather than between persons. Would it be possible to investigate whether the reported associations change within individuals when they switch from poor-me to bad-me or vice versa?

This is an interesting suggestion. We *a priori* chose a different approach to our data. However, we intend to further analyse the data for future publications.

3. When the authors create the groups, they use a median split to define paranoid vs remitted SSD patients. But, I am wondering whether this is the appropriate approach. You basically just divide the group into a more and a less paranoid group, but whether the latter group indeed is remitted is entirely depending on the severity of symptoms within the entire group. Would it possibly make more sense to divide them on a theoretical cut-off of for example an average score of 3 on the paranoia items?

It is true that the decision as to how to divide the participants into groups is not a straightforward one and we decided to use a median split, as this is the method that had been used in previous research. As there is no clear dividing line between paranoia absence vs paranoia presence, any chosen method of categorisation is potentially open to criticism.

4. A similar argument applies to the divide between poor-me and bad-me. Is it helpful to use a median split here or would it be better to again use a theoretical cut-off?

The point raised here is similar to the one presented above. Please see our previous comment.

5. The authors do not specify whether they have been using a random intercept model or a random intercept, random slope model? Since the focus is specifically on the interaction between group & stress, it would be more correct to use a random intercept, random slope model.

We followed the same strategy of analysis as used in the recent research published by the world leaders in ESM data analysis (Collip et al., 2011, Reininghaus et al., 2016, U. Reininghaus, 2016).

6. On page 11, the authors state: "Consistent with previous research (Udachina et al., 2012), most dramatic fluctuations in deservedness ratings over the 6 days of assessment were observed in the bad-me group, although some fluctuations also occurred in participants from poor-me and remitted groups". This is very interesting but is unclear how this was tested or what this observation is based on.

The above statement is based on the data presented in Figure 1 of Supplementary materials. As can be seen in this figure, the range of deservedness scores is considerably wider in the bad-me group.

7. A lot of analyses are being conducted, do you need to control for multiple testing?

Although we carried out a many comparisons, the p values for the main differences (PM vs BM) are robust all <.001 and are therefore.

Reviewer #3: Please enter your comments to the ===AUTHOR=== here.
This is a well-written paper in a growing body of literature related to paranoia and how it affects (different) individuals.

The introduction adequately describes the fields and gives a good review of the state of affairs as far as I can assess.

I have some minor comments:
+ the drop out rate is rather high in the patient sample compared to the normal controls; there is no systematic drop out but this can be related to the numbers; maybe better describe

In our experience of conducting several ESM studies involving psychotic individuals, the drop-out has consistently been higher amongst individuals with psychosis, due to a combination of factors, including lower motivation and worse organisational skills. The high drop-out from the patient group is also likely to be due to the fact that the study formed a part of a larger research project and

participant burden was higher than usual in our study. Unfortunately, we were unable to describe the reasons for drop-out in more detail than we already had on page 5 due to space limitations.

+ the poor me/bad me differentiation is based on cross sectional assessments and ESM based assessments. The latter may have created some artefacts; please discuss or clarify.

It is true that the differentiation of the clinical sample into bad-me, poor-me and remitted groups was based on ESM scores of paranoia and perceived deservedness. However, this shouldn't present a problem. While stress, emotions, self-esteem, paranoia, and deservedness are related to each other, they are nevertheless theoretically and empirically distinct concepts (see Table 2 in Udachina et al., 2012),

In our data, correlations (Spearman rho) of ESM mean scores aggregated per participant are the following:

	Paranoia	Deservedness	Sos stress	Act stress	Self-esteem	Neg affect
Deservedness	.47***					
Soc stress	.27*	.22*				
Act stress	.27*	.21*	.37***			
Self-esteem	-.50***	-.59***	-.36***	-.34**		
Neg affect	.59***	.53***	.36***	.39***	-.69***	
Pos affect	-.35***	-.20	-.46***	-.30**	.54***	-.38***

In addition, collinearity is a problem when two or more of predictor variables are closely related to each other. However, in our analyses paranoia and deservedness levels were moderators, as the main analyses estimated the relationship between stress and emotions/self-esteem and how this relationship varied at different levels of paranoia and deservedness. For the two of the above mentioned reasons spurious findings are extremely unlikely.

+ the poor me/bad me differentiation is variable and stable as well (over one week). It seems likely that the response of the individuals is based on topics (contextualised) and a result of learning (and coping). The article discusses this but I would have liked to see more thoughts about this in the discussion.

Unfortunately, we are unable to discuss this subject in more detail than we already have due to the space constraints specified by the journal.

References

COLLIP, D., NICOLSON, N. A., LARDINOIS, M., LATASTER, T., VAN OS, J., MYIN-GERMEYS, I. & GROUP 2011. Daily cortisol, stress reactivity and psychotic experiences in individuals at above average genetic risk for psychosis. *Psychological Medicine,* 41**,** 2305-2315.

GLASER, J. P., VAN OS, J., THEWISSEN, V. & MYIN-GERMEYS, I. 2010. Psychotic reactivity in borderline personality disorder. *Acta Psychiatrica Scandinavica,* 121**,** 125-134.

MYIN-GERMEYS, I., DELESPAUL, P. & VAN OS, J. 2005. Behavioural sensitization to daily life stress in psychosis. *Psychological Medicine,* 35**,** 733-741.

MYIN-GERMEYS, I. & KRABBENDAM, L. 2004. Sex differences in emotional reactivity to daily life stress in psychosis. *Journal of Clinical Psychiatry,* 65**,** 805-809.

MYIN-GERMEYS, I., VAN OS, J., SCHWARTZ, J. E., STONE, A. A. & DELESPAUL, P. A. 2001. Emotional reactivity to daily life stress in psychosis. *Archives of General Psychiatry,* 58**,** 1137-1144.

REININGHAUS, U., KEMPTON, M. J., VALMAGGIA, L., CRAIG, T. K. J., GARETY, P., ONYEJIAKA, A., GAYER-ANDERSON, C., SO, S. H., HUBBARD, K., BEARDS, S., DAZZAN, P., PARIANTE, C., MONDELLI, V., FISHER, H. L., MILLS, J. G., VIECHTBAUER, W., MCGUIRE, P., VAN OS, J., MURRAY, R. M., WYKES, T., MYIN-GERMEYS, I. & MORGAN, C. 2016. Stress Sensitivity, Aberrant Salience, and Threat Anticipation in Early Psychosis: An Experience Sampling Study. *Schizophrenia Bulletin,* 42**,** 712-722.

U. REININGHAUS, C. G.-A., L. VALMAGGIA, M. J. KEMPTON, M. CALEM, A. ONYEJIAKA, K. HUBBARD, P. DAZZAN, S. BEARDS, H. L. FISHER, J. G. MILLS, P. MCGUIRE, T. K. J. CRAIG, P. GARETY, J. VAN OS, R. M. MURRAY, T. WYKES, I. MYIN-GERMEYS AND C. MORGAN 2016. Psychological processes underlying the association between childhood trauma and psychosis in daily life: an experience sampling study. *Psychological Medicine* 46**,** 2799–2813.

UDACHINA, A., VARESE, F., OORSCHOT, M., MYIN-GERMEYS, I. & BENTALL, R. P. 2012. Dynamics of self-esteem in "Poor-Me" and "Bad-Me" paranoia. *Journal of Nervous and Mental Disease,* 200**,** 777-783.