



## An experimental investigation of the impact of critical and warm comments on state paranoia in a non-clinical sample

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### ABSTRACT

**Background and objectives:** Interpersonal stress is key to the development and maintenance of paranoia. Much attention has been given to the impact of interpersonal stressors, such as criticism, on outcomes in psychosis. Less attention has been given to the potentially protective effects of positive interpersonal factors. This study tested experimentally whether criticism and warm comments elicited changes in state paranoia. Whether warm comments provided protective effects when participants faced subsequent social exclusion was also examined.

**Method:** A nonclinical sample (N = 97) was randomised to criticism, warm comments, or neutral comments conditions. Participants then played a virtual ball game (Cyberball), during which they were systematically excluded from the game. State paranoia was measured before and after the affective stimuli and after social exclusion. Self-esteem and trait paranoia were also measured.

**Results:** Paranoia levels increased following exposure to criticism ( $p = .011$ ). Paranoia was not significantly lower following exposure to warm comments ( $p = .203$ ). Warm comments did not provide protection against the effects of subsequent social exclusion. The warm comments condition was the only condition in which significant increases in paranoia were seen following social exclusion ( $p = .004$ ).

**Limitations:** Use of a non-clinical sample limits generalisation to clinical populations.

**Conclusions:** Criticism is sufficient to elicit increases in paranoia in non-clinical participants. Warm comments are insufficient to significantly reduce paranoia or provide protective effects against subsequent negative interpersonal experiences, highlighting the need to balance therapeutic warmth with amelioration of social stressors in paranoia.

### 1. Introduction

Delusions reflecting paranoid or persecutory themes are common and potentially distressing aspects of psychosis (Freeman & Garety, 2014; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002). However, there is a growing consensus that paranoid thinking is common within the general population and that clinical and non-clinical paranoia exist on a continuum (e.g. Elahi, Perez Algorta, Varese, McIntyre, & Bentall, 2017; Freeman, 2007). Interpersonal stress and sensitivity have been highlighted as key factors in the development and maintenance of paranoia (e.g. Bebbington et al., 2013; Freeman & Garety, 2014). A recent systematic review found a robust association between interpersonal sensitivity and paranoia in clinical and non-clinical samples (Meisel, Garety, Stahl, & Valmaggia, 2018). Social exclusion, one example of an interpersonal stressor, is purported to deprive individuals of a sense of belonging, self-esteem and control (Westermann, Kesting, & Lincoln, 2012) and contribute to delusion formation (Preti &

Cella, 2010).

A number of analogue studies have evaluated the relationship between experimentally manipulated social exclusion and paranoid thinking (Kesting, Bredenpohl, Klenke, Westermann, & Lincoln, 2013; Lincoln, Stahnke, & Moritz, 2014; Westermann et al., 2012). Increased state paranoia following social exclusion has been found to be mediated by decreases in self-esteem and moderated by baseline trait paranoia (Kesting et al., 2013). The use of particular emotion regulation strategies has also been found to moderate increases in state paranoia in response to social exclusion in individuals with high trait paranoia (Westermann et al., 2012). Furthermore, a study in which different explanations for social exclusion were provided found that conspiracy-based explanations (a proxy of paranoid thinking) had a short-term stabilising effect on self-esteem, but any benefits to such explanations were short-lived (Lincoln et al., 2014). Effects of social exclusion on paranoia levels were not assessed; however, as paranoia was only measured at baseline (Lincoln et al., 2014).

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Sensitivity to criticism is conceptualised as a key component of interpersonal sensitivity, a predictor of clinical and non-clinical paranoia (Meisel et al., 2018). Criticism is one dimension of expressed emotion (EE), a widely-researched measure of family environment, reflecting affective attitude and behaviours (Leff & Vaughn, 1985). Higher levels of caregiver ‘burden’ in psychosis have been associated with higher levels of negative EE dimensions including criticism (Kuipers, Onwumere, & Bebbington, 2010). EE studies have consistently found that criticism predicts poorer outcomes for individuals with, or at risk of, psychosis, including increased relapse rates and positive symptom severity (e.g. Alvarez-Jimenez et al., 2012; Barrowclough et al., 2003). Negative family atmosphere, as indexed by a measure of criticism and resignation, has been found to predict paranoia at 12-month follow-up (Hesse et al., 2015). Experimental work has found increased anxiety, anger, distress, and delusional preoccupation and conviction when individuals with psychosis are exposed to criticism (Finnegan et al., 2014). While criticism was included in an analogue study of social exclusion and paranoia (Kesting et al., 2013), the relative contributions of criticism and exclusion to paranoia increases could not be extricated due to paranoia not being measured after each manipulation.

Whether positive interpersonal factors, such as warmth, relate to better outcomes in psychosis, has received less attention. This relative imbalance has been argued to undervalue and disempower families by focusing on their influence as a risk factor and overlooking their potential protective role (Amaresha & Venkatasubramanian, 2012). Furthermore, inattention to positive factors may neglect potential mechanisms of change within family interventions (Claxton, Onwumere, & Fornells-Ambrojo, 2017). Evidence is emerging that family warmth and positive remarks may be protective for individuals who have experienced, or are at risk of experiencing, psychosis (Greenberg, Knudsen, & Aschbrenner, 2006; Lee, Barrowclough, & Lobban, 2014). Some studies have highlighted the combination of high warmth with moderate levels of family involvement as optimal (Breitborde, Lopez, Wickens, Jenkins, & Karno, 2007; Schlosser et al., 2010). Cognitive models of caregiving in psychosis hypothesise that both positive pre-existing relationships and positive caregiver responses to episodes of psychosis contribute to better outcomes (Kuipers et al., 2010). Mechanisms underlying protective effects of positive family factors are yet to be elucidated, but those posited include: buffering of stressful experiences, increased medication adherence and service engagement, and effects on cognitive processes implicated in the development of psychosis, such as ‘jumping to conclusions’ (Glick, Stekoll, & Hays, 2011; Lee, Barrowclough, & Lobban, 2011; Lee et al., 2014; Schlosser et al., 2010).

Self-esteem and interpersonal self-concepts have been purported to mediate the relationship between paranoia and interpersonal stress in clinical and non-clinical samples (Hesse et al., 2015; Kesting & Lincoln, 2013; Kesting et al., 2013). Multiple theories regarding the nature of the relationship between self-esteem and paranoia exist (e.g. Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001; Freeman & Garety, 2006). A review of these is beyond the scope of the current paper, but a recent review concluded that greater paranoia is associated with lower, more fluctuating, global self-esteem (Kesting & Lincoln, 2013).

This study aimed to extend investigation of potential protective effects of positive-interpersonal factors to paranoia specifically. A repeated-measures experimental design assessed the impact of two manipulations of interpersonal variables on state paranoia in a non-clinical sample. The first manipulation comprised exposure to affective stimuli (critical, warm, or neutral comments). The second manipulation was a social exclusion paradigm. It was predicted that changes in state paranoia in response to the affective stimuli would vary according to whether the comments were critical, warm, or neutral (Hypothesis 1). It was predicted that critical comments would be associated with increased paranoia (Hypothesis 1a) and warm comments with decreased paranoia (Hypothesis 1b). Neutral comments were not expected to affect paranoia (Hypothesis 1c). Impact of social exclusion was expected to vary, depending on whether participants had been exposed to

critical, warm, or neutral comments (Hypothesis 2). In the neutral condition, increased paranoia was expected following social exclusion (Hypothesis 2a). Consistent with emerging effects for protective effects of warmth, it was predicted that participants in the warm condition would not show significant increases in paranoia after social exclusion (Hypothesis 2b). No hypothesis was made regarding the effects of social exclusion in the criticism condition. It was considered possible that a cumulative effect of criticism, followed by social exclusion could occur, resulting in greater increases in paranoia (relative to the neutral condition). However, it was also acknowledged that there could possibly be attenuated effects in the criticism group due to reaching a ceiling of what was likely achievable in terms of increases in paranoia in an experimental setting in a non-clinical group. As paranoia scores could be influenced in either direction (or both, leading to a negligible effect), no specific prediction was made. Secondary analyses explored whether changes in state paranoia related to self-esteem and trait paranoia, given the strong evidence for a relationship between self-esteem and paranoia and that trait paranoia may moderate changes in state paranoia following social exclusion manipulations.

## 2. Material and methods

The study was approved by the University of Manchester Research Ethics Committee (reference: 14431).

### 2.1. Design

A 3 x 3 repeated-measures experimental design was employed, with time as a within-participants variable (T1: baseline, T2: following affective stimuli manipulation [critical, warm, or neutral comments], T3: following social exclusion manipulation (Cyberball) and condition as a between-participants variable (critical, warm, or neutral). The main outcome variable was state paranoia. Self-esteem was measured at the same three time points, and mood was measured at T3. Trait paranoia and depression were measured at baseline to determine equivalence.

### 2.2. Participants

An opportunity sample of 97 participants was recruited from the University of Manchester and general public. Using a repeated measures ANOVA test for interactions between group and time at T1 to T2 and T2 to T3, 30 participants per group would have 80% power with 5% significance to detect a small effect [ $d=0.2$ ] in the main outcome measure.<sup>1</sup> Inclusion criteria (determined via self-report) were minimum age of 18 years and English language proficiency. Individuals under the care of secondary care psychiatric services were excluded. The study was advertised as investigating effects of emotion on video game performance. Participants were paid for participation.

### 2.3. Measures

*Paranoia & Depression Scale* (PDS; Bodner & Mikulincer, 1998): state paranoia was measured using the paranoia sub-scale of the Paranoia & Depression Scale (PDS-P). The sub-scale includes seven items (e.g. “I feel that people talk about me”), measured on a 6-point scale (1 = Not at all, 6 = Very often). The depression sub-scale (PDS-D) comprises 10 items, measured on the same scale. The PDS-D, which is highly correlated with established measures of depression (Bodner & Mikulincer, 1998), includes multiple items that relate to negative appraisals of task performance (e.g. “I’m critical of my task performance”). The PDS-D was administered at T3 to assess whether cross-group differences might reflect differences in mood following task completion (as used in

<sup>1</sup> A small effect size was expected on the basis of a previous review of ‘paranoia induction’ paradigms (Ellett, Owens, & Berry, in submission).

Kingston & Ellett, 2014). The PDS, validated in non-clinical samples, has been shown to have good convergent and discriminant validity, and internal consistency (Bodner & Mikulincer, 1998). In the current sample, Cronbach's alpha for the PDS-P ranged from 0.79 to 0.81, indicating acceptable to good internal consistency. Cronbach's alpha was 0.92 for the PDS-D, indicating excellent internal consistency.

**Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965):** this 10-item self-report measure assesses agreement with statements relating to self-worth (e.g. "On the whole I am satisfied with myself") on a 4-point scale (Strongly agree to Strongly disagree). The RSES is a widely-used and validated measure of self-esteem with good reported internal consistency. In this sample, Cronbach's alpha ranged from 0.85 to 0.87. The RSES was designed for use as a trait measure. However, pilot work in a student sample (N = 42) identified significant RSES decreases following criticism and increases following warm comments. Therefore, the RSES was employed to evaluate fluctuations in self-esteem across time.

**Paranoia Scale (PS; Fenigstein & Venable, 1992):** this 20-item scale, designed for student samples, measures trait paranoia. Items (e.g. "It is safer to trust no one") are rated on a 5-point scale (1 = Not at all applicable to me, 5 = Extremely applicable to me) and the scale has previously demonstrated good internal consistency and adequate convergent and discriminant validity (Fenigstein & Venable, 1992). In the current sample, Cronbach's alpha was 0.90.

**Depression, Anxiety, and Stress Scale (DASS; Lovibond & Lovibond, 1995):** the DASS depression sub-scale comprises 14 items (e.g. "I felt down-hearted and blue") measured from 0 to 3 (0 = Did not apply to me at all, 3 = Applied to me very much, or most of the time) assessing the past week. The discriminant and concurrent validity of the DASS have been reported as good (Antony, Bieling, Cox, Enns, & Swinson, 1998) and internal consistency of the depression sub-scale as excellent (Crawford & Henry, 2003). In this sample, Cronbach's alpha was 0.90. Baseline equivalence across groups on the DASS was analysed using a one-way ANOVA, as depression is a predictor of paranoid thinking (e.g. Freeman et al., 2008).

#### 2.4. Affective stimuli manipulation

Prior to arrival participants were block randomised (block size = 30) to one of three conditions: Criticism, Warm Comments, or Neutral Comments. Following completion of baseline measures all participants were asked to rank ten descriptive characteristics from 1 to 10, where 1 = most like me, 10 = least like me. Criticism condition descriptors were negative traits (e.g. "dull"). Warm Comments condition descriptors were positive traits (e.g. "friendly"). Neutral condition descriptors were half positive and half negative.

Participants then read five separately presented paragraphs of text. In the Criticism and Warm Comments conditions, text content was determined by the five traits participants had ranked as most like them.<sup>2</sup> If a participant in the Criticism condition identified, for example, "dull" within the five traits most like them, they read a corresponding paragraph of text ("*One thing that bothers me about you, [participant's forename], is how dull you are. Other people think you're dull too. You really can be a bore to be around and people don't like getting stuck talking to you. Could you try to be a little bit more interesting? You're just not very exciting to be around.*"). Similarly, if a participant in the Warm Comments condition identified "friendly" in their top five traits, they read the corresponding text within the warm comments exposure

<sup>2</sup> It was predicted that if a participant did not feel that they were, for example, friendly, that extolling the virtues of their friendliness would be perceived as positively as if it were a trait they recognised in themselves. Likewise, text criticising them for being lazy was likely to be less effective if they did not identify as lazy. Hence, the inclusion of the ranking task aimed at maximising the effectiveness of the affective exposure.

("[Participant's forename], one of the things I really like about you is how friendly you are. You are one of the friendliest people around. You are so approachable and people find you very easy to talk to. It's really easy to introduce you to new people. Your friendliness puts people at their ease"). Generation of the paragraphs of text was informed by previous criticism research (Hooley et al., 2009). The five paragraphs of text were presented in a random order for all participants.

In the Neutral condition the five paragraphs of text were the same, regardless of responses in the ranking task. Neutral text comprised descriptions of situations, presumed to be low in affective content, that did not directly relate to the participant. For example, "[Participant forename], let me tell you a little bit about what I bought when I went shopping this week. I got toothpaste, toilet roll, milk, and juice. I also got some cereal and some bread. I needed some stamps, so I bought those too."

Descriptors and associated paragraphs of text were derived from piloting a larger pool of stimuli in a student sample (N = 42). Stimuli were selected for the main study if the associated text scored above average on an item-by-item manipulation check. Pilot work also ensured perceived neutrality of neutral stimuli. Neutral stimuli were only retained for the main study if associated text scored significantly closer to zero on relevant manipulation check items than criticism and warmth text.<sup>3</sup>

##### 2.4.1. Manipulation check

A manipulation check at T2 evaluated participants' perceptions of the affective stimuli manipulation. Manipulation check questions were adapted from the perceived criticism (Hooley & Teasdale, 1989) and perceived warmth scales (Schlosser et al., 2010). Participants responded to the following questions on a scale from 1 to 10 (1 = Not at all, 10 = Very): 1. Overall, how negative were the comments that you just read? 2. Overall, how upset did the comments make you feel? 3. Overall, how positive were the comments that you just read? 4. Overall, how happy did the comments make you feel? Criticism condition participants answered questions (1) and (2). Warm condition participants answered questions (3) and (4). Neutral condition participants answered all four questions. If the manipulation is effective, criticism stimuli should be rated as significantly more negative and upsetting than neutral stimuli. Similarly, warmth stimuli should be rated as significantly more positive and making participants feel happier than neutral stimuli.

##### 2.5. Social exclusion manipulation

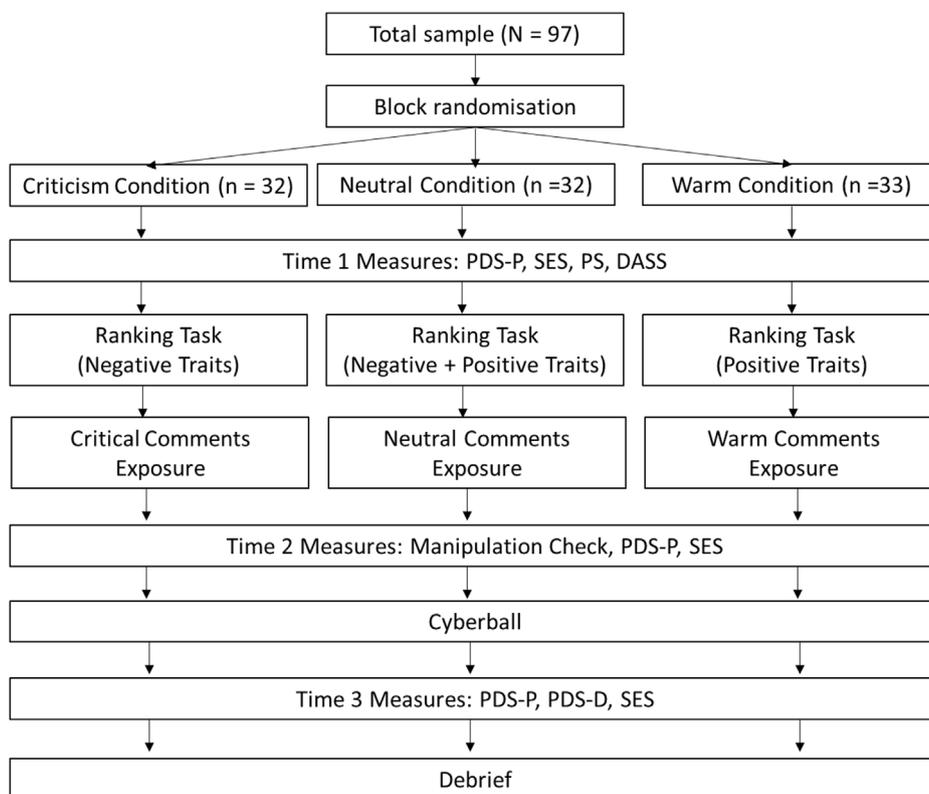
Cyberball (Williams, Cheung, & Choi, 2012) is a virtual ball-toss game in which the participant is systematically excluded from play. The social stress induced by exclusion when playing Cyberball has previously been linked to increased paranoid ideation in non-clinical participants (Kesting et al., 2013; Westermann et al., 2012). The online version of Cyberball 5.0 was run using an HTML5 compatible web-browser (Google Chrome). Written instructions told participants the game tested mental visualisation and they would be playing online against other players. The backdrop for the game was customised with a photograph of a school playground. The game involved 30 ball throws between the players. Participants received and passed the ball twice early on in the game and were then excluded while the other players continued to pass the ball between themselves.

##### 2.6. Procedure

Participants were block randomised to conditions prior to arrival (see Fig. 1).

The study was conducted in individual test cubicles. Following

<sup>3</sup> Further details of Affective Stimuli Manipulation development are given in Appendix 1.



NB: Order of presentation of measures was standardised across participants

Fig. 1. Study procedure.

consent, instructions were automated so that participants did not interact with the researcher again until debriefing. Questionnaire measures were completed using paper and pen, but all other aspects of the study were delivered via computer. Participants completed baseline measures and then completed the ranking task. Participants then typed their name into the computer, and were presented with five paragraphs of text, presented one after another. Text was either critical, neutral, or warm, depending on condition. Text was personalised with participants' names and content tailored based on responses in the ranking task. Participants then completed the manipulation check and other T2 measures before playing Cyberball. Finally, participants completed T3 measures before being debriefed. The study lasted approximately 40 min. A mood-check was completed during de-briefing. Participants expressing low mood or distress were offered a follow-up telephone call within 24-h and signposted to appropriate services. No participants reported persisting negative impact of the study.

## 2.7. Statistical analysis

Data were analysed using IBM SPSS Statistics 23. Normality of variables was assessed by comparing skewness and kurtosis z-scores to acceptable cut-offs ( $< 2.58$ ; Field, 2005) and plotting histograms. Variables with distributions that did not meet the assumption of normality were transformed using logarithmic transformations. Transformation resolved non-normality, primarily positive skewness, for the PDS-P, PS, DASS, and PDS-D. Transformed scores were used for subsequent analyses. However, raw means and standard deviations are reported, to aid interpretation. Some baseline comparison variables (e.g. age) remained non-normal following transformation; therefore, appropriate non-parametric tests were used. Missing data were replaced with the participant's mean for that scale where less than 10% of the data were missing. Participants with over 10% total missing data ( $n = 1$ ) or missing data on the main outcome measure ( $n = 3$ ) were

excluded from analyses. Hypotheses one and two were tested by looking for interactions using a 3 (time: state paranoia T1, T2, T3)  $\times$  3 (condition: criticism, warm, neutral) repeated measures mixed ANOVA. Condition was a between-participants factor and time a within-participants factor, with the dependent variable being PDS-P. Significant interactions were followed-up with paired *t*-tests. Hypotheses 1a, 1b, and 1c were tested using post-hoc tests for within-participants changes in paranoia from T1 to T2 in each condition. Hypotheses 2a and 2b were tested using post-hoc tests for within-participants changes in paranoia from T2 to T3 in each condition. Whether changes in state paranoia were moderated by baseline self-esteem or trait paranoia was investigated by running separate repeated measures ANOVAs for the different conditions, with self-esteem and trait paranoia entered as between-participants factors. Manipulation check data were analysed using independent samples *t*-tests. T3 PDS-D scores were analysed using a one-way ANOVA.

## 3. Results

Summary demographic data and study measures are shown in Table 1. Between-group comparisons revealed no significant baseline differences between conditions on any measures, indicating that randomisation had worked adequately and resulted in equivalent groups.

### 3.1. Manipulation check

Criticism stimuli were rated as significantly more negative than neutral stimuli (criticism mean = 7.84 [ $SD = 2.05$ ], neutral mean = 1.47 [ $SD = 1.66$ ],  $t(60) = -13.42$ ,  $p < .001$ ) and significantly more upsetting than neutral stimuli (criticism mean = 4.13 [ $SD = 2.46$ ], neutral mean = 1.13 [ $SD = 0.35$ ],  $t(32.31) = -6.82$ ,  $p < .001$ ). Warm Comments were rated as significantly more positive than neutral stimuli (warm comments

**Table 1**  
Demographic and study measures summary statistics.

Measure	Overall Mean (SD) (N = 93)	Criticism Group Mean(SD) (n = 32)	Neutral Group Mean (SD) (n = 30)	Warm Comments Group Mean (SD) (n = 31)
Age	23.85 (6.25)	25.09 (7.25)	23.63 (6.61)	22.77 (4.49)
Gender (% female)	60.22	68.75	60.00	51.61
Ethnicity (% White British)	53.76	59.38	53.33	48.39
Student status (%student)	83.87	81.25	86.67	83.87
PDS-P T1	13.80 (4.96)	12.87 (4.61)	13.90 (3.69)	14.65 (6.21)
RSES T1	30.75 (4.50)	31.38 (4.02)	30.28 (4.71)	30.55 (4.83)
DASS	5.96 (5.62)	5.78 (5.78)	6.57 (4.58)	5.55 (6.44)
PS	37.42 (11.40)	35.60 (10.05)	36.53 (9.77)	40.16 (13.77)
PDS-P T2	13.87 (5.33)	14.84 (5.06)	13.13 (3.79)	13.58 (6.71)
PDS-P T3	14.82 (5.71)	14.66 (4.50)	14.03 (4.70)	15.74 (7.51)
RSES T2	30.81 (4.60)	30.66 (4.22)	30.43 (4.99)	31.32 (4.70)
RSES T3	30.39 (4.85)	30.84 (4.39)	30.47 (5.10)	29.84 (5.16)
PDS-D T3	20.14 (9.49)	17.84 (7.47)	21.13 (9.82)	21.55 (10.80)

Note: Raw means and standard deviations presented. DASS = Depression, Anxiety, and Stress Scale, PDS-P = Paranoia and Depression Scale: paranoia sub-scale, PDS-D = Paranoia and Depression Scale: depression sub-scale, RSES = Rosenberg Self-Esteem Scale.

mean = 9.23[SD = 1.48], neutral mean = 3.37[SD = 2.14],  $t(51.33) = -12.40, p < .001$ ) and as making participants significantly more happy than neutral stimuli (warm comments mean = 7.60[SD = 1.94], neutral mean = 2.90[SD = 1.85],  $t(59) = -9.69, p < .001$ ). Therefore, criticism and warm comments appeared to effectively induce intended effects.

### 3.2. Effects of criticism, warm comments, and social exclusion on state paranoia

Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2(2) = 22.46, p < .001$ ). Therefore, the Huynh-Feldt correction was applied to relevant results. A 3 (time: state paranoia T1, T2, T3) x 3 (condition: criticism, warm, neutral) repeated measures ANOVA showed no main effect of time ( $F(1.70,152.86) = 2.76, p = .08$ ) or condition ( $F(2,90) = 0.02, p = .98$ ). However, there was a significant time x condition interaction ( $F(3.40,152.86) = 3.03, p = .026$ ), as depicted in Fig. 2.

The time x condition interaction was significant at T1 vs. T2 ( $F(2,90) = 4.94, p = .009$ ) and T2 vs. T3 ( $F(2,90) = 3.44, p = .036$ ). Therefore, changes in participants' state paranoia scores from T1 to T2 differed depending on whether they were exposed to critical, warm, or neutral text (supporting Hypothesis 1). The effects of subsequent exposure to social exclusion on state paranoia scores also varied as a function of whether participants had previously been exposed to

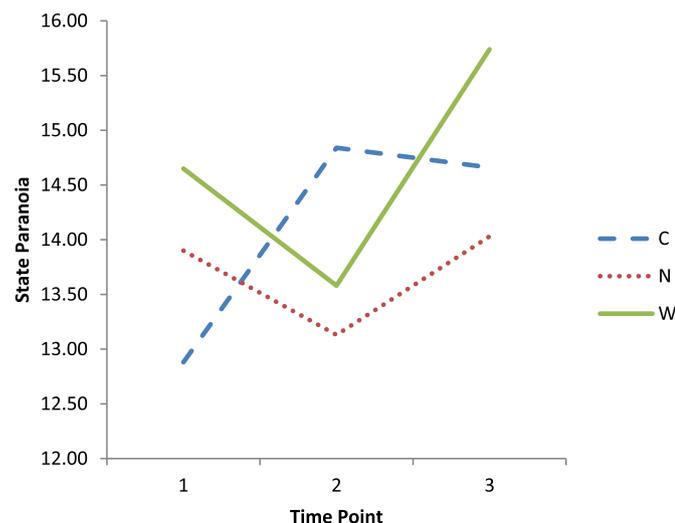


Fig. 2. Interaction between time and condition on state paranoia.

critical, warm, or neutral comments (supporting Hypothesis 2).

Follow-up paired t-tests revealed that in the criticism condition, state paranoia scores increased significantly from T1 to T2 ( $t(31) = -2.70, p = .011$ ), but did not change significantly from T2 to T3 ( $t(31) = 0.015, p = .988$ ). State paranoia scores were significantly higher at T3 than at T1 ( $t(31) = -2.61, p = .014$ ) in this condition. Therefore, criticism alone was enough to significantly increase participants' state paranoia (supporting Hypothesis 1a). Subsequent exposure to social exclusion did not further increase paranoia, which remained higher than baseline until study completion.

In the warm comments condition state paranoia scores showed a non-significant reduction from T1 to T2 ( $t(30) = 1.30, p = .203$ ), but then increased significantly from T2 to T3 ( $t(30) = -3.17, p = .004$ ). State paranoia scores did not differ significantly from T1 to T3 ( $t(30) = -0.622, p = .538$ ). Therefore, whilst warm comments were associated with reductions in state paranoia, these were not significant (contrary to Hypothesis 1b). Furthermore, subsequent exposure to social exclusion was associated with significant increases in paranoia, although not to levels higher than baseline (contrary to Hypothesis 2b).

In the neutral condition no significant changes in state paranoia were found from T1 to T2 ( $t(29) = 1.53, p = .138$ ), T2 to T3 ( $t(29) = -1.78, p = .085$ ), or T1 to T3 ( $t(29) = 0.112, p = .912$ ). Whilst neutral text was not expected to influence state paranoia (with Hypothesis 1c supported), the absence of an effect of Cyberball in this condition is noteworthy (and contrary to Hypothesis 2a).

Scores on the depression measure at T3 did not differ across conditions ( $F(2) = 1.08, p = .34$ ). As there were not differences across groups, mood was assumed not to significantly influence findings, and was therefore not further analysed or controlled for.

To summarise, as predicted, criticism alone was sufficient to induce increases in state paranoia. Subsequent exposure to social exclusion had no additive effect on paranoia. Warm comments induced only non-significant reductions in state paranoia; however, a rebound effect was observed, with state paranoia increasing sharply when participants were subsequently faced with social exclusion. Therefore, contrary to expectation, warm comments were not protective against the effects of social exclusion. Although participants in the warm comments condition did not end with significantly higher paranoia than at baseline, likely owing to the reduction prior to social exclusion, it was the only condition in which Cyberball was associated with increases in paranoia.

### 3.3. Supplementary analyses

#### 3.3.1. Moderation analyses of changes in state paranoia

Further analyses were conducted to examine whether significant changes in state paranoia were moderated by baseline self-esteem

(RSES) or trait paranoia (PS). Separate repeated measures ANOVAs were conducted for each condition, with the proposed moderator of interest entered as a between-participants variable and the repeated measures factor (PDS-P) as a within-participants variable. As significant paranoia changes were only found in the criticism and warm comments conditions, further analyses were not conducted for the neutral condition. In the criticism condition, the significant increase in state paranoia following exposure to criticism, was not moderated by trait paranoia ( $F(11,20) = 1.62, p = .207$ ). However, it was moderated by baseline self-esteem ( $F(11,20) = 2.64, p = .029$ ). In the warm comments condition, the significant increase in state paranoia following social exclusion was not moderated by trait paranoia ( $F(24,6) = 0.62, p = .816$ ) or baseline self-esteem ( $F(15,15) = 1.78, p = .138$ ).

### 3.3.2. Effects on self-esteem

A 3 (time: self-esteem T1, T2, T3)  $\times$  3 (condition: criticism, warm, neutral) repeated measures ANOVA showed no main effect of condition ( $F(2,90) = 0.126, p = .881$ ) or time ( $F(2,180) = 2.26, p = .108$ ) on self-esteem but a significant condition  $\times$  time interaction ( $F(4,180) = 4.05, p = .004$ ). The time  $\times$  condition interaction was significant at T1 vs. T2 ( $F(2,90) = 4.66, p = .012$ ) and T2 vs. T3 ( $F(2,90) = 6.50, p = .002$ ), so changes in self-esteem differed across conditions from T1 to T2 and from T2 to T3. Follow-up paired *t*-tests showed that in the warm comments condition self-esteem significantly increased from T1 to T2 ( $t(30) = -2.16, p = .039$ ), then significantly decreased from T2 to T3 ( $t(30) = 3.07, p = .005$ ). Follow-up *t*-tests in other conditions were non-significant ( $p > .05$ ).

To summarise, exposure to criticism was not associated with significant changes in self-esteem, even when paired with subsequent social exclusion. Exposure to warm comments was associated with significant increases in self-esteem. However, a sharp decrease in self-esteem from its elevated position, post-warm comments, was experienced when participants subsequently faced social exclusion. Neutral condition participants did not experience reductions in self-esteem following social exclusion.

## 4. Discussion

This study used an experimental paradigm to investigate the impact of positive and negative interpersonal stimuli on state paranoia in a non-clinical sample. Criticism elicited increases in state paranoia, which were maintained, but not increased, during subsequent social exclusion. Warm comments elicited non-significant decreases in paranoia and significant increases in self-esteem, which were subsequently counteracted by significant increases in paranoia and decreases in self-esteem in response to social exclusion. These results show empirically that exposure to criticism alone is sufficient to elicit increases in state paranoia in a non-clinical sample. This is consistent with studies that have found associations between criticism and increased levels of paranoia (Hesse et al., 2015), positive symptomatology more broadly (Barrowclough et al., 2003), and relapse (Alvarez-Jimenez et al., 2012) for individuals with psychosis. For individuals exposed to criticism, paranoia remained at an elevated level following subsequent social exclusion, although no further increases were observed. This is consistent with evolutionary accounts that emphasise the protective nature of paranoia, arguing that once paranoia is activated by interpersonal threat, it is slow to dissipate (Ellett & Chadwick, 2007; Ellett, Lopes, & Chadwick, 2003).

Contrary to expectation, warm comments did not elicit significant decreases in state paranoia, and were not protective against later social exclusion. In fact, social exclusion only significantly increased paranoia in the warm comments condition. The failure of warm comments to significantly reduce paranoia could reflect a number of factors. Whilst the manipulation check indicated that participants generally experienced warm comments positively, at task completion some participants described feeling uncomfortable receiving them. This aligns with

reports within compassion focused therapy literature that experiences of warmth and kindness are not unequivocally positive experiences for all people, particularly those with negative early attachment experiences (Gilbert, 2009). Exposure to secure attachment imagery has been associated with elevated paranoia levels in non-clinical participants with higher dispositional attachment anxiety (Hutton, Ellett, & Berry, 2017). Although attachment was not measured in the current study, this could potentially reflect the experience of a subset of participants. A further possibility is that although participants may have experienced comments as positive, this may have been insufficient to warrant changes in state paranoia, perhaps reflecting mistrust, likely heightened by the experimental context, regarding the intention behind comments.

Unexpectedly, warm comments appeared to render participants more vulnerable to deleterious effects of social exclusion. Participants may have been “lulled into a false sense of security” by the warm comments, leading them to expect a positive interpersonal experience. Increased paranoia post-social exclusion may reflect feeling destabilised and mistrustful in response to the unexpected negative experience. Although the current data cannot definitively explain this finding, potential mechanisms were considered. Firstly, elevations in attachment insecurity have been found to predict increased paranoia in clinical and non-clinical populations, with interpersonal distancing mediating this relationship (MacBeth, Schwannauer, & Gumley, 2008; Sitko, Varese, Sellwood, Hammond, & Bentall, 2016). Whilst the current study did not measure attachment, it is conceivable that exposure to personalised warm comments followed by social exclusion could increase attachment insecurity. A further possible explanation relates to the “shattered assumptions” concept (Janoff-Bulman, 1992), which is central to cognitive theories of psychological response to trauma (e.g. Ehlers & Clark, 2000). The extent to which events violate individuals' beliefs and assumptions, such as “the world is just”, has been found to predict levels of post-traumatic stress (e.g. Park, Mills, & Edmondson, 2012). Whether violation of assumptions contributed to effects found in the warm comments condition requires further investigation. Interpersonal sensitivity, which has been shown to predict paranoia (Meisel et al., 2018), has been purported to reflect a number of dimensions including fragility of inner self and need for approval (Boyce & Parker, 1989). Whilst the current study did not measure interpersonal sensitivity *per se*, its results can be interpreted within this framework. Sensitivity to criticism is conceptualised as an aspect of interpersonal sensitivity, and following warm comments with social exclusion would likely influence a need for approval in contrasting directions and potentially destabilise a “fragile inner self”.

The current findings are consistent with the notion that higher paranoia is associated with lower explicit self-esteem (Kesting & Lincoln, 2013). Increased paranoia following social exclusion in the warm comments condition was mirrored by a concurrent decrease in self-esteem. Furthermore, the impact of criticism on paranoia was moderated by baseline self-esteem. These results are consistent with models that conceptualise paranoia as arising from both low (Freeman & Garety, 2006) and fluctuating self-esteem (Bentall et al., 2001).

Strengths of the current study include the randomisation of participants to conditions and repeated measures experimental design. Measuring our primary outcome variable at three points allowed exploration of the effects of each manipulation (affective stimuli vs. social exclusion), which has not always been the case in previous studies (e.g. Kesting et al., 2013). Whilst repeated measurement was a key strength, it is possible that completing the state paranoia measure repeatedly may have alerted some participants to the study purpose. However, this is done routinely in other studies and employing a relatively short state paranoia measure and additional measures at each time point may have helped obscure the focus on paranoia. Cyberball did not elicit increases in paranoia in the neutral or criticism conditions, despite being associated with increased state paranoia in analogue samples previously. Effects found in previous studies have tended to be relatively small, with greater effects found in individuals with high trait paranoia (e.g.

Westermann et al., 2012) and when a negative feedback component has been included (e.g. Kesting et al., 2013). Negative feedback was not included in the current study as the relative contributions of social exclusion and negative feedback may have been conflated. Obtaining an adequately sized sample with high trait paranoia would have required screening large numbers of potential participants but may have shown greater increases in state paranoia. A further limitation of the study is that secondary analyses may have been underpowered to detect effects, as power was determined based solely on the main analysis. Whilst moderating effects of self-esteem were found in some conditions, no moderating effects of trait paranoia were found. This might have been expected, given previous study findings (e.g. Westermann et al., 2012), and may reflect inadequate power. Measures of mood were administered at T1 and T3, to determine whether there was baseline equivalence and evaluate whether any differences at T3 might relate to changes in mood. This approach followed that employed by Kingston and Ellett (2014). However, on reflection it would have been beneficial to include a measure of mood at T2, to enable clearer evaluation of whether mood changes had occurred during the two study manipulations.

The extent to which protective effects of warmth are found has been shown to vary cross-culturally (e.g. Lopez et al., 2004). Whilst the current sample was relatively diverse with respect to ethnicity, there was insufficient power to include ethnicity in analyses. The self-esteem measure used was originally designed as a trait measure. However, it was sensitive enough to detect changes within the warm comments condition, and changes have been found when the measure has been used repeatedly before (e.g. Kesting et al., 2013). Our finding that Cyberball did not influence self-esteem in the neutral condition converges with previous findings (Lincoln et al., 2014).

An analogue sample was recruited to explore factors influencing the non-clinical end of the paranoia continuum. This approach reduces confounders such as neuroleptic medication effects but limits generalisability of findings to clinical paranoia. Replication of the study with a clinical sample would increase generalisability, although potential ethical issues would require careful consideration. The experimental design afforded high reliability, with standardised stimuli exposure and ability to directly manipulate variables of interest. Ecological validity is limited as a brief experimental manipulation is unlikely to be directly comparable to, for example, experiences within family environments. However, the fact that each condition involved a double manipulation may more realistically reflect the multiple interpersonal stressors of daily life. Future research could include experience sampling methodology measures of perceived criticism and warmth and state paranoia within naturalistic contexts, in clinical and non-clinical samples.

Criticism has the potential to increase paranoia and as such, efforts to reduce exposure to criticism, for example within family interventions and work with staff teams, should continue to be a priority. The current findings, whilst preliminary, suggest that isolated experiences of warm comments may not be sufficient to offer improvements in symptomatology. Furthermore, failure to address social stressors may render one-off exposures to unconditional positivity potentially detrimental. As such, holistic approaches to working with individuals with (or at risk of) psychosis, are warranted, with resources invested in ameliorating stressors such as social exclusion. When systemic factors are not amenable to change, clinicians may need to take particular care to complement therapeutic warmth with a focus on factors such as resilience, assertiveness, and interpersonal problem-solving.

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#### Declaration of interest

None.

#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jbtep.2018.08.008>.

#### Appendix 1

A larger pool of potential descriptors was piloted within a student sample, to derive optimum stimuli for the main study. The process for descriptor selection involved calculation of average manipulation check scores for each potential descriptor's associated text. Criticism stimuli had a rating of "how negative" and "how upsetting" participants rated the associated text. Warmth stimuli had a rating of "how positive" and "how happy" participants rated the paragraph of associated text. To be included in the main study a descriptor's associated text had to have scored above the mean score for both manipulation check questions. For example, the average negative rating was 6.30 and upsetting rating was 4.69, across all of the criticism items' associated text paragraphs. One of the criticism items that was retained for the main experiment was "insensitive". The text associated with "insensitive" scored 9.00 for negative and 7.00 for upsetting, so the associated text was above average for the pool of criticism stimuli for negative and upsetting ratings.

To be selected for the main study, a descriptor had to be selected by at least one pilot participant within their Top 10 "Most like me" characteristics. This was necessary for the item to have received a rating on the relevant manipulation checks for the associated text. Where there was a choice, items that were selected more frequently were prioritised when selecting main study stimuli.

With regards to the neutral stimuli, neutrality was ensured by the associated text paragraphs being rated on all four manipulation check items – negative, positive, upsetting, and happy. To be considered neutral a paragraph of text had to score significantly closer to zero on the relevant manipulation check scales, than the criticism and warmth text.

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