

# Northumbria Research Link

Citation: Greer, J., Smailes, David, Spencer, H., Freeston, M. and Dudley, R. (2016) Recall of threat material is modulated by self or other referencing in people with high or low levels of non-clinical paranoia. *Journal of Behavior Therapy and Experimental Psychiatry*, 50. pp. 1-7. ISSN 0005-7916

Published by: Elsevier

URL: <http://dx.doi.org/10.1016/j.jbtep.2015.04.005>  
<<http://dx.doi.org/10.1016/j.jbtep.2015.04.005>>

This version was downloaded from Northumbria Research Link:  
<http://nrl.northumbria.ac.uk/id/eprint/34704/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

Recall of threat material is modulated by self or other referencing  
in people with high or low levels of non-clinical paranoia.

Authors: J. Greer<sup>1</sup>, D. Smailes<sup>2</sup>, H. Spencer<sup>3</sup>, M. Freeston<sup>1</sup> and R. Dudley<sup>2,4</sup>

Affiliations:

<sup>1</sup> Institute of Neuroscience, Doctorate of Clinical Psychology, Ridley Building,  
Newcastle University, Newcastle, United Kingdom

<sup>2</sup> Doctorate of Clinical Psychology, School of Psychology, Ridley Building, Newcastle  
University, Newcastle, United Kingdom

<sup>3</sup> Institute of Neuroscience, Department of Psychiatry, Newcastle University, Newcastle,  
United Kingdom

<sup>4</sup> South of Tyne Early Intervention in Psychosis Service, Northumberland Tyne and Wear  
Foundation NHS Trust, United Kingdom.

Address for correspondence: Robert Dudley, Doctorate of Clinical Psychology,  
Newcastle University, Ridley Building, Newcastle, NE1 7RU

Email: [r.e.j.dudley@ncl.ac.uk](mailto:r.e.j.dudley@ncl.ac.uk)

Tel: (UK) 0191 222 7925

Fax (UK) 0191 222 7520

## Abstract

### Background and objectives

Biased processing of threat-related material plays an important role in the development of paranoid thinking. This has been demonstrated by superior memory for threat-related information in patients who report persecutory delusions and in non-clinical paranoia-prone participants. This study examined how emotional was recalled having been encoded in relation to one self or to another person, in people high or low in paranoid ideation. It was predicted that people high in paranoia would recall more threat-related material about others than people low in paranoia owing to being particularly alert to threats from other people.

### Methods

Participants who reported high ( $N = 30$ ) or low ( $N = 30$ ) levels of paranoid thinking were presented with a series of threat-related and positive words and were asked to process them in terms of the self, or in terms of a fictional character.

### Results

As predicted, when words were process in terms of another person, the high paranoia group recalled more threat-related words than positive words, but when words had been processed in terms of the self, recall of threat-related and positive words did not differ. In contrast, there was no interaction between word-valence and referent in the low paranoia group.

### Limitations

These findings are drawn from an analogue sample. Replication in a sample of clinical participants who report persecutory delusions is required.

### Conclusions

People high in paranoid ideation recalled threat preferentially in relation to other people. Such information processing biases may help to understand the development and maintenance of persecutory beliefs.

Keywords: paranoia; persecutory delusions; recall of threat; self-reference effect.

## 1. Introduction

Paranoia is characterised by suspicion and mistrust of other people (Freeman & Garety, 1999; Manschreck & Khan, 2006). It is a common experience, with a third or more of people reporting mistrust of those around them (Freeman, 2007). It has been argued that paranoid thoughts are part of a hierarchy or continuum of paranoia (Freeman et al., 2005), with sub-clinical paranoid thoughts representing a milder, attenuated form of the persecutory delusions reported by people who have mental health problems (Fenigstein & Venable, 1992; Freeman, 2007). However, while sub-clinical paranoid thoughts are less distressing and pertain to less improbable events than persecutory delusions (Bentall & Udachina, 2013), many of the factors (e.g., reasoning biases, cannabis use, social adversity) that play a role in the development of persecutory delusions also appear to play a role in the development of paranoid thinking (e.g., Fine et al., 2007; Kelleher & Cannon, 2011). Thus, much can be learned about the development of persecutory delusions through the study of paranoid thinking in non-clinical participants.

Cognitive models of paranoia and persecutory beliefs specifically recognise a role for biased processing of threat-related material in the genesis and maintenance of these ideas (e.g., Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002). A number of studies have demonstrated that paranoia is associated with biases in attention towards threat-related information (see Green & Phillips, 2004, for a review). Meanwhile, another set of studies have demonstrated that paranoia is associated with memory biases for threat-related material. For example, Bentall, Kaney, and Bowen-Jones (1995) presented participants with a list of 36 words, which were threat-related, depression-related, or neutral. Control participants recalled more neutral words than threat-related words (recall for depression-related words fell between recall for threat-related and neutral words, and was not significantly different from either). In contrast, participants with persecutory delusions recalled more threat-related words than neutral words (again, recall for depression-related words fell between recall for threat-related and neutral words, and was not

significantly different from either). Similarly, Kaney, Wolfenden, Dewey and Bentall (1992) asked participants to read passages of prose that contained a mixture of threat-related and neutral propositions. When subsequently tested participants with persecutory delusions recalled fewer propositions overall than control participants. However, participants with persecutory delusions recalled more threat-related propositions than did control participants. This tendency towards better memory for threat-related material has also been demonstrated in non-clinical, paranoia-prone participants. For example, Larøi, D'Argembaue, and Van der Linden (2006) reported that non-clinical, paranoia-prone participants performed similarly to control participants when they were asked to recognise faces that had previously been presented to them with a happy expression. However, paranoia-prone participants were better than controls at recognising faces that had previously been presented to them with an angry expression.

Thus, in both clinical and non-clinical samples, paranoid thinking appears to be associated with biases involving remembering threat-related material. One variable that has not yet been examined in these studies is whether the to-be-remembered material is processed with reference to oneself or with reference to another person. This is important because (a) memory performance is modulated by whether a person processes information in terms of the self, or in terms of another person, (b) memory performance can be modulated by a person's beliefs, and (c) negative beliefs about the threat posed by others are at the heart of the experience of paranoid thinking.

Numerous studies in non-clinical participants have reliably shown that stimuli that are processed with reference to the self are more likely to be recalled than are stimuli that are processed with reference to another person (the self-reference effect; Rogers, Kuiper, & Kirker, 1977; Symons & Johnson, 1997). For example, in typical self-referencing studies, participants are presented with a series of trait adjectives (e.g., intelligent, shy) and, in separate conditions, whether that trait describes their personality or whether that trait

describes another person's (e.g., their best friend, their mother, the head of state) personality. Importantly, some studies have suggested that the emotional valence of the to-be-remembered stimuli interacts with this effect. For example, Miall (1986) reported that while participants who had been asked to process stimuli with reference to the self recalled more negative than positive phrases, participants who had been asked to process stimuli with reference to another person recalled more positive than negative phrases. Given that material that is consistent with a person's pre-existing beliefs is more likely to be recalled than is material that is inconsistent with such beliefs (e.g., Swan & Read, 1981; Story, 1998), the bias towards better recall of negative material in relation to the self was explained in terms of the task promoting self-evaluation and causing individuals to focus on their short-comings. Meanwhile, the bias towards better recall of positive material in relation to another (in this case, a friend) can be explained in terms of people generally holding positive beliefs about others. The pattern of results reported by Miall have not, however, been consistently replicated (e.g., Herbert, Pauli, & Herbert, 2011). This suggests that the effect is complex and may be modulated by a number of factors, including the identity of the other person that the to-be-recalled stimuli are processed with reference to. For example, if the 'other' is a familiar person—as in Bower and Gilligan's (1979) study, where the 'other' was the participant's mother—then participants may show the effect reported by Miall. This is likely to be because the majority of participants' beliefs about that other person can be accurately inferred (i.e., most participants will have positive beliefs about their mother). In contrast, when the 'other' is an unfamiliar, famous person (e.g., a politician), then participants may show a different response pattern, and this may be because participants' beliefs about that person are more difficult to infer.

The present study examined the association between sub-clinical paranoid thinking and memory biases for threat-related material and how this might be modulated by whether stimuli are processed in terms of the self, or in terms of another person. This was done using a memory paradigm in which a series of threat-related and positive words had to be processed

with reference to the self or with reference to an ‘other’ who was a fictional, neutral character. Given that paranoid thinking is strongly associated with negative, threat-related beliefs about others (e.g., that others are untrustworthy and hostile; Fowler et al., 2006), participants high in paranoid thinking should have negative, threat-related beliefs about a novel person, while participants who report low levels of paranoid thinking should not hold such beliefs about the same character. As in many other studies, we expected participants to demonstrate the self-reference effect. However, we also expected that, in paranoia-prone participants, there would be an interaction between word valence and referent (i.e., whether the word was processed in terms of the self, or in terms of another person). More specifically, we predicted that, when words had been processed in terms of another person, paranoia-prone participants would recall more threat-related than positive words, but that when words had been processed in terms of the self, paranoia-prone participants would recall a similar number of threat-related and positive words. In contrast, we predicted that no such interaction would be found in the control participants (i.e., those who report low levels of paranoid thinking). This was because the referent employed in the present study was a fictional character, about whom participants who report low levels of paranoid thinking were unlikely to have strongly valenced beliefs.

## 2. Method

### 2.1 Participants

Participants were 123 university and college students (19 males, 102 females) aged between 18 and 58 years ( $M = 24.70$ ,  $SD = 4.71$ ). While all participants completed the tasks and questionnaires described below, data analysis refers only to those participants who scored in the top and bottom quartiles on a measure of paranoid thinking (Fenigstein & Venable’s, 1992, Paranoia Scale; described in more detail in subsection 2.3.2). The low paranoia group consisted of 30 participants (4 males, 26 females) aged between 18 and 35 years ( $M = 24.60$ ,  $SD = 4.16$ ). The high paranoia group consisted of 30 participants (3 males, 27 females) aged between 18 and 32



years ( $M = 23.06$ ,  $SD = 3.45$ ). The two groups did not differ in terms of gender ( $p = .69$ ) or age ( $p = .24$ ).

## 2.2 Design

A mixed between- and within-subjects design was used. Independent variables were paranoia group (high or low on a measure of paranoid ideation), referent (whether words were processed in terms of the self or in terms of another person), and word valence (threat-related or positive). The dependent variable was the number of words recalled.

## 2.3 Materials and measures

### 2.3.1 Recall task

Stimuli were presented via two audio recordings (termed 'A' and 'B'). Each audio recording was of a woman reading 40 words, with one word presented every six seconds. In each recording, half of the words were positively-valenced and half were threat-related words. In each recording, words were presented in a fixed, random order.

The threat-related words were taken from Kinderman, Prince, Waller, and Peters (2003). However, 16 of these words were modified by changing their tense so that the threat-related word could be more easily matched to a positive word (e.g., 'reject' was used instead of 'rejected'). Each threat-related word was matched to a positive word in terms of imaginability, letter-length, and syllable length, using the MRC Linguistic Database (Wilson, 1988). The words employed are presented in Table 1.

Table 1 about here please

Five independent raters, who did not take part in the study, were asked to rate the 80 words in terms of pleasantness on a 7-point scale (1 = *extremely unpleasant*; 7 = *extremely pleasant*) and in terms of threat on a 7-point scale (1 = *extremely unthreatening*; 7 = *extremely threatening*). As expected, positive words were rated as being more pleasant ( $M = 5.46$ ,  $SD = 0.40$ ) than were

threat-related words ( $M = 2.28$ ,  $SD = 0.57$ ),  $t(4) = 7.96$ ,  $p < .001$ ,  $d = 3.56$ . Similarly, the threat-related words were rated as being more threatening ( $M = 5.21$ ,  $SD = 0.33$ ) than were positive words ( $M = 1.78$ ,  $SD = 0.82$ ),  $t(4) = 8.45$ ,  $p < .001$ ,  $d = 3.78$ .

### 2.3.2 Paranoid thinking

Proneness to paranoid thinking was assessed using the Paranoia Scale (PS; Fenigstein & Vanable, 1992). This scale is the most widely used measure of sub-clinical paranoid thinking (Freeman, 2008) and consists of 20 statements that describe aspects of paranoid thinking (e.g., “It is safer to trust no one”, “I sometimes feel as if I am being followed”, “Someone has it in for me”). Participants are asked to what extent each statement applies to them, using a 5-point scale (1 = *not at all applicable to me*; 5 = *extremely applicable to me*). Thus, scores can range from 20–100, with higher scores reflecting higher levels of paranoid thinking. Previous studies have shown that the PS has good psychometric properties (e.g., high levels of internal reliability:  $\alpha = .84$ ; acceptable test-retest reliability over a six month period:  $r = .70$ ; Fenigstein & Vanable, 1992) and that it is strongly correlated (e.g.,  $r = .71$  to  $.81$ ) with other paranoia measures (e.g., Green et al., 2008). In this sample, the PS had good internal reliability ( $\alpha = .88$ ).

### 2.3.3 Positive and negative affect

Levels of positive and negative affect were assessed using the Positive and Negative Affect Schedule Expanded Form (PANAS-X; Watson & Clark, 1994, 1999). This scale consists of 60 words that describe positive (e.g., cheerful, happy, proud) or negative (e.g., tired, sad, scared) feelings or emotions. Participants were asked to indicate to what extent they have experienced each feeling or emotion over the past week on a 5-point Likert scale (1 = *very slightly or not at all*; 5 = *extremely*). We calculated participants’ total scores on the Basic Negative Emotion Scales, which consists of 23 items, and their total scores on the Basic Positive Emotion Scales, which consists of 18 items. Thus, scores on the negative affect subscale could vary from 23 to 115, with higher scores reflecting higher levels of negative affect. Meanwhile, scores on the positive affect subscale could vary from 18 to 90, with higher scores reflecting higher levels of positive affect.

Previous studies have shown that the PANAS-X subscales correlate with other measures of positive and negative affect ( $r = .85$  to  $r = .91$ ; Watson & Clark, 1994, 1999) and that the subscales have good test-retest reliability (positive affect subscale:  $r = .70$ ; negative affect subscale:  $r = .71$ ; Watson & Clark, 1994, 1999) and acceptable levels of internal reliability (positive affect subscale:  $\alpha = .88$ ; negative affect subscale:  $\alpha = .85$ ; Watson & Clark, 1994, 1999). Both subscales had excellent internal reliability (negative affect subscale:  $\alpha = .94$ ; positive affect subscale:  $\alpha = .91$ ) in the present sample.

## 2.4 Procedure

The study was approved by a departmental ethics committee and was conducted in accordance with the principles of the Declaration of Helsinki. Participants were tested in groups of 15-30 and were informed that they were taking part in a memory task. However, they were told that the main focus of the study was on the vividness of their thoughts. Participants were told that they would listen to two sets of words and that for one set of words, they should imagine each word in relation to themselves (i.e., the self-referencing condition) and that for the other set of words, they should imagine each word in relation to a character in a story (i.e., the other-referencing condition). They were then presented with a written description of a scenario of the person in a university library. The stranger was the only other person in the library with them. The description was ambiguous to leave open scope for people to imagine the stranger as being friendly or sinister depending on their tendency to be trustful or suspicious of others. The library scenario was chosen because it is a situation which will be salient and familiar to university students. Five independent raters, who did not take part in the study, were presented with this same information and were asked to rate the character in the story in terms of how friendly and how sinister the stranger was. They were also asked how at ease and how threatened they might feel in the situation described in the scenario and were invited to make comments. The stranger and scenario were rated fairly neutral on all of these measures.

Participants were then presented with the first set of words. As they performed this task, for each word, participants were asked to rate how vivid their mental imagery was, when they imagined that word with reference to themselves or to the character in the story, using a 5-point scale (1 = *weak image*; 5 = *very strong image*). The order in which participants were asked to perform the self-referencing encoding and the other-referencing encoding was counter-balanced. Similarly, for half of the sample, recording A was used in the self-referencing condition and recording B was used in the other-referencing condition, and this was reversed for the other half of the sample (this counter-balancing remained valid when the high and low paranoia groups were created). Immediately after the presentation of the words had stopped, participants were asked to freely recall as many of the words as possible. This was a pen and paper task, and participants were given up to four minutes to recall as many words as possible.

### 3. Results

#### 3.1 Preliminary analyses: high and low paranoia groups

The low paranoia group consisted of the 30 participants who scored lowest on the PS (all scored below 32;  $M = 26.67$ ,  $SD = 3.13$ ), while the high paranoia group consisted of the 30 participants who scored highest on the PS (all scored above 50;  $M = 60.37$ ,  $SD = 6.53$ ). As one would have expected, the difference between the two groups differed in terms of scores on the PS was significant,  $t(58) = 25.48$ ,  $p < .001$ ,  $d = 6.58$ . Similarly, the two groups differed in terms of negative affect and positive affect. The high paranoia group reported higher levels of negative affect ( $M = 63.20$ ,  $SD = 20.33$ ) than did the low paranoia group ( $M = 39.83$ ,  $SD = 11.25$ ),  $t(45.25) = 5.51$ ,  $p < .001$ ,  $d = 1.42$ . The high paranoia group reported lower levels of positive affect ( $M = 46.17$ ,  $SD = 10.83$ ) than did the low paranoia group ( $M = 57.10$ ,  $SD = 12.28$ ),  $t(58) = 3.66$ ,  $p = .001$ ,  $d = 0.94$ . Importantly the effect size for group differences in paranoid thinking was 4 to 6 times greater than the effect size for group differences positive and negative affect, suggesting that while the two groups differed in mood, they differed primarily in terms of paranoid thinking.

### 3.2 Preliminary analyses: vividness of imagery

The high paranoia group ( $M = 3.21$ ,  $SD = 0.42$ ) and low paranoia group ( $M = 3.25$ ,  $SD = 0.38$ ) did not differ in terms of how vividly they processed each word,  $t(58) = 0.47$ ,  $p = .64$ ,  $d = 0.10$ . Thus, vividness is not considered in any subsequent analyses.

### 3.3 Paranoia-proneness, self- versus other-processing, and recall of threat-related material

Descriptive statistics for recall performance are presented in Table 2. A  $2 \times 2 \times 2$  (referent  $\times$  word valence  $\times$  paranoia group) mixed ANOVA revealed that there was a main effect of referent,  $F(1, 58) = 21.86$ ,  $p < .001$ , partial  $\eta^2 = .27$ . Participants recalled more words that were processed with reference to the self ( $M = 9.20$ ,  $SD = 4.29$ ) than words that were processed with reference to another ( $M = 6.82$ ,  $SD = 3.33$ ). In contrast, there was no effect of word valence,  $F(1, 58) = 0.18$ ,  $p = .67$ , partial  $\eta^2 = .00$ . That is, participants recalled a similar number of threat-related ( $M = 8.10$ ,  $SD = 3.79$ ) and positive words ( $M = 7.92$ ,  $SD = 3.59$ ). There was, however, a main effect of paranoia group,  $F(1, 58) = 6.55$ ,  $p = .013$ , partial  $\eta^2 = .10$ . The high paranoia group recalled more words ( $M = 18.10$ ,  $SD = 6.68$ ) than the low paranoia group ( $M = 13.93$ ,  $SD = 5.91$ ). None of the two-way interactions were significant (all  $p$ -values  $> .15$ ). Importantly, however, there was a significant three-way interaction between referent, word valence, and paranoia group,  $F(1, 58) = 9.70$ ,  $p = .003$ , partial  $\eta^2 = .14$ .

Table 2 about here please

#### 3.3.1 Investigating within-subject differences

This three-way interaction was investigated using two separate (one including only the low paranoia group, one including only the high paranoia group),  $2 \times 2$  (referent  $\times$  word valence) ANOVAs. As can be seen in Figure 1, there was a different pattern of responding in the high and low paranoia groups. In the low paranoia group, there was a main effect of referent,  $F(1, 29) = 8.53$ ,  $p = .007$ , partial  $\eta^2 = .23$ , no effect of word valence,  $F(1, 29) = 0.00$ ,  $p = 1.00$ , partial  $\eta^2 = .00$ ,

and no referent  $\times$  word valence interaction,  $F(1, 29) = 1.43, p = .24$ , partial  $\eta^2 = .05$ . In the high paranoia group, there was a main effect of referent,  $F(1, 29) = 13.54, p = .001$ , partial  $\eta^2 = .32$ , no effect of word valence,  $F(1, 29) = 0.26, p = .61$ , partial  $\eta^2 = .01$ , and a referent  $\times$  word valence interaction,  $F(1, 29) = 10.08, p = .004$ , partial  $\eta^2 = .26$ . Planned comparisons (two-tailed, independent group  $t$ -tests) revealed that the high paranoia group recalled more threat-related words than positive words when these had been processed with reference to the another person,  $t(29) = 3.08, p = .004, d = 0.51$ , but that there was no difference in their ability to recall threat-related words and positive words that had been processed with reference to the self,  $t(29) = 1.35, p = .19, d = 0.30$ .

Figure 1 about here please

### 3.3.2 Investigating between-groups differences

In addition to these analyses, we examined group differences in each condition (positive self; threat-self; positive-other; threat-other). Planned comparisons (two-tailed, independent group  $t$ -tests) revealed that the high paranoia group recalled more positive words processed with reference to the self than did the low paranoia group,  $t(58) = 2.78, p = .007, d = 0.72$ . The two groups did not differ in terms of their recall of threat-related words processed with reference to the self,  $t(58) = 1.03, p = .31, d = 0.26$ . Similarly, the two groups did not differ in terms of their recall of positive words processed with reference to another,  $t(58) = 0.39, p = .70, d = 0.10$ . However, the high paranoia group recalled more threat-related words processed with reference to another than did the low paranoia group,  $t(58) = 3.03, p = .004, d = 0.78$ .

## 4. Discussion

The present study examined whether processing to-be-remembered stimuli in terms of the self or in terms of another person modulated the recall of threat-related and positive material in paranoia-prone participants. As in previous research, participants demonstrated the self-reference effect (Symons & Johnson, 1997; i.e., they recalled more words that had been

processed with reference to the self than words that had been processed with reference to another person). One surprising finding was that the high paranoia group had a higher level of overall recall than the low paranoia group. This was not expected. The superior performance of the high paranoia group is perhaps owing to a heightened alertness of salient stimuli both positive and threat related.

In addition, and in line with our predictions, in paranoia-prone participants, there was a word valence  $\times$  referent interaction effect, such that paranoia-prone participants recalled more threat-related than positive words that had been processed with reference to another person, but their recall of threat-related and positive words that had been processed with reference to the self did not differ. In contrast, but again in line with our predictions, there was no word valence  $\times$  referent interaction effect in participants who reported low levels of paranoid thinking.

We interpret these findings as suggesting that paranoia-prone participants hold threat-related beliefs about others and so are more able to recall threat-related words that have been processed with reference to another person. In contrast, the present findings suggest that participants who report low levels of paranoid thinking hold essentially neutral beliefs about others, and so recalled a similar number of positive and threat-related words that had been processed in reference to another person. The use of a fictional, neutral character was probably crucial in achieving these results. Had participants been asked to process the words in terms of a friend, a relative, or a famous person, a different pattern of findings may well have emerged. For example, one would expect that participants who report low levels of paranoid thinking should hold positive beliefs about friends and relatives and so they would show biased recall for positive words that had been processed with reference to a friend or relative (as in Miall's, 1986, study).

Our finding of biased recall of threat-related words in paranoia-prone participants, under some conditions, is consistent with Larøi et al.'s (2006) report of a recognition bias for threat-related

faces in non-clinical, paranoia-prone participants. These analogue findings are in line with clinical studies that have reported recall biases towards threat-related material in psychosis patients with persecutory delusions (Kaney et al., 1992; Bentall et al., 1995). More broadly, these findings from studies that have employed memory-based paradigms are consistent with data showing attentional biases in patients with persecutory delusions and in non-clinical, paranoia-prone participants (Green & Phillips, 2004). Together, these findings provide support for models that have proposed biased processing of threat in the development of paranoid thinking (e.g., Bentall et al., 2001).

Moreover, the present findings extend previous research by demonstrating that biased memory for threat-related information in paranoia-prone participants thinking is modulated by how that information is processed (i.e., it is present for other-referenced but not self-referenced information). In previous studies, participants have been given no guidance about how to encode threat-related stimuli, or it has not been possible to ask participants to encode the stimuli in terms of different referents (e.g., if the to-be-remembered stimuli were faces). In contrast, we instructed participants to imagine each word either in reference to the self, or in reference to another person and found that paranoia-prone participants only recalled more threat-related material when it had been processed with reference to another person. These findings are wholly in line with previous research on the importance of threat beliefs in paranoid thinking, given that people tend to recall information that is consistent with their beliefs (e.g., Swan & Read, 1981; Story, 1998) and that people who experience paranoid thoughts hold threat-based beliefs about others (i.e., that others are hostile and devious; Fowler et al., 2006), but presumably do not hold these beliefs about themselves (i.e., that they are not hostile and devious).

Of course, it is recognised that there are several limitations that may affect this interpretation. First, in contrast to most studies that have examined the self-reference effect, we used a set of words that were not exclusively trait adjectives (e.g., as well as including words such as stupid and bad, we included words such as maim and wound). It is possible that we would report different effects if trait adjectives had been used and this should be examined in future



research. Second, we have interpreted our findings as reflecting better recall of threat-related information in paranoia-prone participants. However, it is possible that this better recall is a result of greater attention to threat-related words in paranoia-prone participants. Employing a different design (e.g., similar to that employed by Radomsky, Senn, Lahoud, & Gelfand, 2014) that controlled for possible effects of an attentional bias would be helpful in separating whether paranoia-prone participants demonstrate a memory bias for threat-related material that is independent of any attentional bias. Third, the focus of this study was on paranoid thinking, but predictions regarding participants' recall were largely driven by what we know about the beliefs about the self and others paranoia-prone participants typically hold. Assessing these beliefs (e.g., using Fowler et al.'s, 2006, Brief Core Schema Scale) would have been helpful, as it would have allowed us to directly examine the associations between individual differences in beliefs about the self and about others and performance on the recall task. Fourth, while previous researchers (Kinderman et al., 2003) have characterized the words employed here as threat words, many of these words could be considered not to be threat words, but simply negative words (e.g., reject, alone, mock). However, Kinderman et al. argued that these can be considered to be threat words in that they reflect threat to a person's social relationships. That being said, future research should examine the effect investigated here, but should make clear distinctions between different types of negative words – those that reflect physical threat, those that refer to social threat, as this was not possible in the present study. Finally, this study involved non-clinical participants and it is unclear whether the effects reported here would be observed in a study that employed a clinical sample. Research that addresses the question investigated here using a clinical sample is warranted.

Despite these limitations the results of the differential recall of threat related material in relation to others in people high in paranoid ideation may help us understand the maintenance of paranoid ideas. The net effect is a greater accessibility of threat related material in relation to other people, and this would presumably act as a potential risk factor to the development of more elaborated delusional beliefs. People high in paranoid ideas are

building up a bank of negative information about other people even in day to day and relatively benign interactions.

This may provide understanding of why paranoid ideas are so difficult to treat. Seemingly, it is not just the content of thought that needs to be considered but also differences in processes. Cognitive therapy for psychotic symptoms like persecutory beliefs is currently of modest value (Wykes et al. 2008; van der Gaag, Valmaggia, & Smit, 2014) and perhaps this is owing to these differences in processing of material. Typically, efforts are made to normalise paranoid thoughts (Dudley, Bryant, Hammond, Siddle, Kingdon & Turkington, 2007) and consider alternative explanations (Kingdon & Turkington, 2005). However, considering beliefs about others intentions and motives may well be a helpful process in developing a formulation that could serve as the basis for cognitive therapy for persecutory beliefs and that may lead to interventions that encourage people develop trust in others, and reduce their expectation of threat. That being said, it is clear that the present findings need to be replicated in a clinical sample before any implications concerning therapeutic interventions can be identified.

## 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., Kaney, S., & Bowen-Jones, K. (1995). Persecutory delusions and recall of threat-related, depression-related and neutral words. *Cognitive Therapy and Research, 19*, 331-343.
- Bentall, R. P., & Udachina, A. (2013). Social cognition and the dynamics of paranoid ideation. In D. L. Roberts & D. L. Penn (Eds.) *Social cognition in schizophrenia: From evidence to treatment* (pp. 215-244). New York: Oxford University Press.
- Bower, G. H., & Gilligan, S. G., (1979). Remembering information in relation to oneself. *Journal of Research in Personality, 13*, 420-432.
- Dudley, R., Bryant, C., Hammond, K., Siddle, R. D., Kingdon, D. G., & Turkington, D. (2007). Techniques in cognitive behavioural therapy: using normalising in schizophrenia. *Journal of the Norwegian Psychological Association, 44*, 562-571.
- Fengstein, A., & Venable, P. A. (1992). Paranoia and self-consciousness. *Journal of Personality and Social Psychology, 62*, 129-138.
- Fine, C., Gardner, M., Craigie, J., & Gold, I. (2007). Hopping, skipping, or jumping to conclusions? Clarifying the role of the JTC bias in delusions. *Cognitive Neuropsychiatry, 12*, 46-77.
- Fowler, D., Freeman, D., Smith, B., Kuipers, E., Bebbington, P., Bashforth, H., ... Garety, P. A. (2006). The Brief Core Schema Scales: psychometric properties and associations with paranoia and grandiosity in non-clinical and psychosis samples. *Psychological Medicine, 36*, 749-759.
- Freeman, D. (2007). Suspicious minds: the psychology of persecutory delusions. *Clinical Psychology Review, 27*, 425-457.

- Freeman, D. (2008). The assessment of persecutory ideation. In D. Freeman, R. P. Bentall, & P. Garety (Eds.) *Persecutory delusions: Assessment, theory, and treatment* (pp. 23-52). New York: Oxford University Press.
- Freeman, D., & Garety, P. A. (1999). Worry, worry processes and dimensions of delusions: An exploratory investigation of a role for anxiety processes in the maintenance of delusional distress. *Behavioural and Cognitive Psychotherapy*, 27, 47-52.
- Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *British Journal of Clinical Psychology*, 41, 331-347.
- Freeman, D., Garety, P. A., Bebbington, P. E., Smith, B., Rollinson, R., Fowler, D., ... Dunn, G. (2005). Psychological investigation of the structure of paranoia in a non-clinical population. *British Journal of Psychiatry*, 186, 427-435.
- Green, M. J., & Phillips, M. L. (2004). Social threat perception and the evolution of paranoia. *Neuroscience and Biobehavioral Reviews*, 28, 333-342.
- Herbert, C., Pauli, P., & Herbert, B. M. (2010). Self-reference modulates the processing of emotional stimuli in the absence of explicit self-referential appraisal instructions. *Social Cognitive and Affective Neuroscience*, 6, 653-661.
- Kaney, S., Wolfenden, M., Dewey, M. E., & Bentall, R. P. (1992). Persecutory delusions and recall of threatening propositions. *British Journal of Clinical Psychology*, 31, 85-87.
- Kelleher, I., & Cannon, M. (2011). Psychotic-like experiences in the general population: characterizing a high-risk group for psychosis. *Psychological Medicine*, 41, 1-6.
- Kinderman, P., Prince, S., Waller, G., & Peters, E. (2003). Self-discrepancies, attentional bias and persecutory delusions. *British Journal of Clinical Psychology*, 42, 1-12.
- Kingdon, D. G., & Turkington, D. (2005). *Cognitive therapy of schizophrenia*. London: Guilford Press.
- Larøi, F., D'Argembaue, A., and Van der Linden, M. (2006). The effects of angry and happy expressions on recognition memory for unfamiliar faces in delusion-prone individuals. *Journal of Behaviour Therapy and Experimental Psychiatry*, 37, 271-282.

- Manschreck, T. C., & Khan, N. L. (2006). Recent advances in the treatment of delusional disorder. *Canadian Journal of Psychiatry*, 51, 114-119.
- Miall, D. S. (1986). Emotion and the self: the context of remembering. *British Journal of Psychology*, 77, 389-397.
- Radomsky, A. M., Senn, J. M., Lahoud, M., & Gelfand, L. A. (2014). An informational pathway to the development of contamination-related memory bias. *Journal of Behaviour Therapy and Experimental Psychiatry*, 45, 339-342.
- Rogers, T. B., Kuiper, N. A., & Kirker, W. S. (1977). Self-reference and the encoding of personal information. *Journal of Personality and Social Psychology*, 35, 677-688.
- Story, A. L. (1998). Self-esteem and memory for favorable and unfavorable feedback. *Personality and Social Psychology Bulletin*, 24, 51-64.
- Swann, W. B., & Read, S. J. (1981). Acquiring self-knowledge: the search for feedback that fits. *Journal of Personality and Social Psychology*, 41, 1119-1128.
- Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: a meta-analysis. *Psychological Bulletin*, 121, 371-394.
- van der Gaag, M., Valmaggia, L. R., & Smit, F. (2014). The effects of individually-tailored formulation-based cognitive behavioural therapy in auditory hallucinations and delusions: a meta-analysis. *Schizophrenia Research*, 156, 30-37.
- Watson, D., & Clark, L. A. (1994). *The PANAS-X. Manual for the Positive and Negative Affect Schedule – Expanded Form*. Ames: The University of Iowa.
- Watson, D., & Clark, L. A. (1999). *The PANAS-X: manual for the Positive and Negative Affect Schedule – Expanded Form*. Ames: The University of Iowa.
- Wykes, T., Steel, C., Everitt, B., & Tarrier, N. (2008). Cognitive behaviour therapy for schizophrenia: effect sizes, clinical models, and methodological rigor. *Schizophrenia Bulletin*, 34, 523-537.



Table 1. To-be-remembered words

Threat-related Words		Positive Words	
abandon	insult	achieved	joy
agony	isolated	admire	lead
alone	jeer	adore	masterful
bad	kill	appointed	overcome
block	lonely	befriend	popular
blood	maim	calm	praise
collapse	manipulate	clever	prominent
controlled	mock	comfort	promote
criticize	pain	command	recommend
defeated	powerless	confident	resolute
dependent	reject	delight	respect
deprive	restrain	director	reward
deride	restrict	elegant	romance
deterred	ridicule	embrace	talented
failure	snigger	encourage	thrill
friendless	stupid	excite	triumph
helpless	ugly	favorite	warm
humiliate	worthless	honey	welcome
hurt	wound	honor	winning
inadequate	insult	invite	wise

Table 2. Recall performance in the low and high paranoia groups

	Low Paranoia Group	High Paranoia Group
	Mean words recalled (SD)	Mean words recalled (SD)
Self; threat	4.17 (2.44)	4.83 (2.56)
Self; positive	3.83 (2.39)	5.57 (2.45)
Other; threat	2.80 (1.63)	4.40 (2.39)
Other; positive	3.13 (1.50)	3.30 (1.82)



Figure 1. Number of threat related or positive words recalled by each group when processed in relation to the self or another.

