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Paranoid thinking, cognitive bias and dangerous neighbourhoods: Implications for perception of threat and expectations of victimisation

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Abstract:	<p>Background Information Paranoid thinking is prevalent in the non-clinical population and cognitive mechanisms of heuristic reasoning and jumping to conclusions bias contribute to its formation and maintenance.</p> <p>Aims The present study investigated the degree to which paranoia, perceived environmental risk, heuristic reasoning and jumping to conclusion bias (measured with the beads task) contribute to misinterpretation of neutral stimuli, and whether this informed judgements regarding vulnerability to threat and crime. It is also investigated whether impulsiveness is a confounding factor on the beads task.</p> <p>Methods Two hundred participants were recruited using a snowball-sampling method for a quantitative cross sectional study. Participants reported demographic information, three psychometric questionnaires and two experimental tasks via an online paradigm hosted by the Bristol Online Survey tool.</p> <p>Results Participants with high paranoia scores perceived their environment to be more dangerous than those with low scores. Participants with high paranoia scores also overestimated threat in neutral stimuli and had high expectations of future victimisation. Jumping to conclusions on the bead task did not predict fear of crime outcomes, but was predicted by impulsivity.</p> <p>Conclusions Participants who demonstrated paranoid thinking were more likely to reside in perceived dangerous neighbourhoods and overestimate threat. While this could indicate a paranoid heuristic, it is a potentially rational response to prior experiences of crime and victimisation. Implications and suggestions for future research are discussed.</p>

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3 **Paranoid thinking, cognitive bias and dangerous neighbourhoods: Implications for**
4 **perception of threat and expectation of victimisation.**
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Abstract

Background

Paranoid thinking is prevalent in the non-clinical population and cognitive mechanisms of heuristic reasoning and jumping to conclusions bias contribute to its formation and maintenance.

Aims

The present study investigated the degree to which paranoia, perceived environmental risk, heuristic reasoning and jumping to conclusion bias (measured with the beads task) contribute to misinterpretation of neutral stimuli, and whether this informed judgements regarding vulnerability to threat and crime. It is also investigated whether impulsiveness is a confounding factor on the beads task.

Methods

Two hundred participants were recruited using a snowball-sampling method for a quantitative cross sectional study. Participants reported demographic information, three psychometric questionnaires and two experimental tasks via an online paradigm hosted by the Bristol Online Survey tool.

Results

Participants with high paranoia scores perceived their environment to be more dangerous than those with low scores. Participants with high paranoia scores also overestimated threat in neutral stimuli and had high expectations of future victimisation. Jumping to conclusions on the bead task did not predict fear of crime outcomes, but was predicted by impulsivity.

Conclusions

Participants who demonstrated paranoid thinking were more likely to reside in perceived dangerous neighbourhoods and overestimate threat. While this could

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3 indicate a paranoid heuristic, it is a potentially rational response to prior experiences
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5 of crime and victimisation. Implications and suggestions for future research are
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7 discussed.
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3 **PARANOID THINKING, COGNITIVE BIAS AND DANGEROUS**
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5 **NEIGHBOURHOODS: IMPLICATIONS FOR PERCEPTION OF THREAT**
6
7 **AND EXPECTATIONS OF VICTIMISATION.**
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11
12 *Introduction*
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14 Delusional thinking (beliefs held to be true despite clear contradictory
15 evidence; Freeman & Garety, 2004) has attracted considerable investigation since the
16 paradigmatic shift from categorical to continuum-based models of mental disorder
17 (Garety & Freeman, 2013). Thinking of a delusional nature has been shown to be
18 prevalent in the non-clinical population (Johns & van Os, 2001). For example, a study
19 conducted by Verdoux, Maurice-Tison, Gay, van Os, Salamon and Bourgeois. (1998)
20 reported that one in ten non-clinical respondents believed that they were the victim of
21 a conspiracy. A more recent study by Cella, Sisti, Rocchi and Preti (2011) used latent
22 class analysis to examine data in eight hundred young adults, finding forty-one per
23 cent experienced paranoid thinking and a further thirty-one per cent held beliefs with
24 delusional content. Another study (Freeman et al., 2005) found that approximately a
25 third of non-clinical participants experienced paranoid thinking. In an experimental
26 study, Freeman et al. (2008a) subjected 200 participants to a virtual reality train ride,
27 populated by neutral characters. They found that a 'substantial minority' interpreted
28 the neutral characters as threatening, with over forty per cent experiencing some
29 paranoid thinking. There was also a positive association between self-reported
30 paranoia and constructs derived from the virtual reality measure.
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52 Whilst a number of cognitive mechanisms are associated with the formation
53 and maintenance of paranoid thinking, "jumping to conclusions" (JTC) reasoning bias
54 has been repeatedly implicated in experimental research looking at the phenomenon
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3 (Garety & Freeman, 2013). JTC is the tendency to use fewer data to reach a
4
5 conclusion before a reasoned decision can really be made. JTC bias is associated with
6
7 the rapid appraisal of anomalous or ambiguous stimuli to form a delusional
8
9 conclusion without due consideration of alternative explanations (Garety & Freeman,
10
11 2013).
12

13
14 A JTC bias has consistently been reported in individuals with delusional
15
16 thinking, indicating that individuals with delusional thinking patterns accept
17
18 hypotheses as correct on the basis of less evidence than controls (Fine, Gardner,
19
20 Craigie & Gold, 2007). Lincoln, Lange, Burau, Exner and Moritz (2010) found that
21
22 individuals with active delusions required fewer beads before making a decision, and
23
24 those with remissive delusions also required fewer beads than controls. So et al.
25
26 (2012) corroborated these findings in a one-year longitudinal study, finding JTC bias
27
28 prevalent in delusional clinical participants, and that this was stable across the period
29
30 of study.
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34 An association between paranoid thinking and JTC bias has also been shown
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36 in non-clinical populations. Freeman, Pugh and Garety (2008) demonstrated that
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38 approximately twenty per cent of participants displayed a JTC bias, and that this was
39
40 highly associated with being more convinced by personally held paranoid beliefs.
41
42 Persons can also JTC for a more prosaic reason than cognitive bias: impulsivity.
43
44 Impulsivity crosses a variety of mental disorders (Moeller, Barratt, Dougherty,
45
46 Schmitz, & Swann, 2001) and may also affect performance as commission errors (i.e.,
47
48 the failure to withhold a response) has been seen for both human and animal studies
49
50 (Wright, Lipszyc, Dupuis, Thayapararajah, & Schachar, 2014; Bizot & Thiébot,
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52 1996). Whilst there is considerable literature highlighting the utility of the beads task,
53
54 only one (Moritz & Woodward, 2005), to the author's knowledge, has controlled for
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3 impulsiveness. As psychotic individuals are reported to be more impulsive than
4
5 controls (Lee et al., 2011), it is of value to exclude impulsivity as an explanation for
6
7 JTC effects.
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10 Misinterpretation of anomalous experiences is a valid contributing factor in
11
12 the development and maintenance of paranoid delusional beliefs (Freeman &
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14 Freeman, 2008, p105) and a JTC bias may indicate inaccurate appraisals of neutral
15
16 stimuli (Garety & Freeman, 2013). In research, paranoid individuals overestimate
17
18 threat in neutral stimuli (Green & Phillips, 2004); display attentional bias towards
19
20 threatening stimuli (Salvatore et al., 2011); react quicker to 'paranoid words' than
21
22 controls on an emotional Stroop test (Bentall & Kaney, 1989); and perceive neutral
23
24 faces as angry (Pinkham, Brensinger, Kohler, Gur & Gur, 2011). The Freeman et al.
25
26 (2008a) virtual reality study revealed that paranoid participants perceived threat in
27
28 neutral characters within the virtual reality environment.
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32 Evidence suggests that prior victimisation leads to the development of
33
34 paranoid thinking (Mawby, 2007; Scott, Chant, Andrews, Martin & McGrath, 2007).
35
36 For example, Mawby (2007) reported that there was a significant association between
37
38 repeat exposure to crime and increased negative feeling towards neighbours and
39
40 neighbourhoods, as well as a consequent increased fear of crime. Furthermore,
41
42 traumatic victimisation is reported to be causally associated with an increase in
43
44 paranoid delusions (Scott et al., 2007). Increased exposure to crime can lead to
45
46 heightened anxiety (Breslau, Davis Andreski & Peterson, 1991) and in turn anxiety
47
48 has been shown to contribute to the formation of paranoid thoughts (Bentall et al.,
49
50 2009), with Freeman & Garety (2003, p.923) stating: "... in many cases delusions are
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52 a direct representation of emotional concerns, and that emotion contributes to
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3 delusion formation and maintenance” such that paranoid thinking can be described as
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5 “anxious fear” (Freeman et al., 2008b, p. 1130).
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8 There is an increased risk of being a victim of crime in urban areas (Brennan,
9
10 Moore & Shepherd, 2010), and epidemiological studies report that urbanisation
11
12 increases the risk of psychoses (Van Os, 2004; Sundquist, Frank & Sundquist, 2004).
13
14 Ellett, Freeman and Garety (2008) demonstrated how exposure to an urban
15
16 environment exacerbated pre-existing paranoid thinking, heightened anxiety, negative
17
18 beliefs about others and JTC reasoning bias. This conjunction of associations makes
19
20 causality for victimhood, paranoia and fear of crime difficult to determine.
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22
23 Heuristic reasoning (Tversky & Kahneman, 1974) may explain how prior
24
25 victimisation leads to paranoia. Corcoran et al. (2006) found participants used the
26
27 availability heuristic to predict future negative events based on experience of past
28
29 negative events. Bentall et al. (2008) found negative self-esteem and expectation of
30
31 future negative events correlated with paranoid thinking, indicating that prior
32
33 experiences contribute to future expectations. Bennett and Corcoran (2010) reported
34
35 corroborating findings in paranoid participants. Lastly, Preti and Cella (2010) posit
36
37 that a ‘paranoid heuristic’ may be employed by individuals to anticipate potential
38
39 threat.
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43 The present study sought to investigate whether non-clinical paranoid
44
45 individuals use heuristic reasoning and JTC to interpret neutral stimuli and if so, how
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47 this informs the judgements they form regarding their vulnerability to threat and
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49 crime. It also examined if the JTC task is affected by simple impulsivity. It was
50
51 hypothesised that: (1) there will be a positive association between living in a
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53 perceived dangerous neighbourhood and greater paranoid thinking; (2) participants
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55 who experience more paranoid thinking will overestimate threat / criminal intent, with
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3 perceived dangerous neighbourhoods and JTC bias acting as contributing factors; (3)
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5 greater paranoid thinking, more perceived dangerous neighbourhoods and higher JTC
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7 bias will predict high likelihood of crime expectations; and (4) that there will be a
8
9 positive association between greater impulsiveness and JTC bias. The present study
10
11 will allow for greater understanding of the interaction between paranoid thinking,
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13 perceptions of danger and expectations of crime, contributing to an understanding of
14
15 how judgements grounded in paranoid thinking influence our experiences of everyday
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17 anxiety as the potential victim of a crime. Insight will also be achieved into the
18
19 mechanisms and factors that contribute, such as affect and cognition.
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25 *Method*

26 *Design*

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28 A quantitative cross-sectional design was employed, utilising an opportunistic
29
30 snowball-sampling method. All data was collected online using the Bristol Online
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32 Survey (BOS; <http://www.survey.bris.ac.uk/>); the survey was initially promoted on
33
34 'Facebook', 'Twitter' and the 'Psychological research on the net' websites.
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36 Participants were required to provide demographic information, respond to three
37
38 standardised measures and complete two experimental tasks, all of which gathered
39
40 information within the BOS architecture. The University ethics committee approved
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42 the study.
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47 *Participants*

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49 Two hundred participants (M:F = 85: 115) were recruited for the study; their
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51 age ranged from 17 to 67 (M=31.29, SD=12.58). Eighty-one participants (40.5%)
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53 reported themselves to be from an urban neighbourhood; 72 (36%) reported to be
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55 from a suburban neighbourhood and 47 (23.5%) from a rural neighbourhood. Fifty-
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two (26%) participants reported that they had previously been diagnosed with a mental illness with 24 (12%) reporting depression, 10 (5%) reporting anxiety and 7 (3.5%) a dual diagnosis of depression and anxiety. A further 12 (6%) reported other mental illness diagnoses.

Measures

Paranoia Scale (Fenigstein & Venable, 1992)

The paranoia scale is a twenty-item, self-report measure for the assessment of paranoia within a non-clinical population. Each item is rated on a five-point scale, ranging from one (strongly disagree) to five (strongly agree). Total scores range from twenty to one hundred, with higher scores indicating greater paranoid thinking (Freeman et al., 2005).

The paranoia scale is reported to have strong alpha internal consistency, with a reliability of 0.84 (Fenigstein & Venable, 1992).

Fear of Crime and Prior Victimization Scale (Ferraro & LaGrange, 1992)

(Adapted)

This assessment consists of two subscales, measuring fear of crime and likelihood of crime respectively. For the present study, only an adapted likelihood of crime subscale was utilised. The likelihood of crime subscale consists of ten items, with participants required to rate the likelihood of being a victim of each item within the next year. A five-point rating scale is used, ranging from one ("absolutely won't happen to me") to five ("will happen to me"). The 'likelihood of being a victim in the next year' subscale is reported to have a strong alpha internal consistency, with reliability of 0.87 (Ferraro & LaGrange, 1992).

Barratt Impulsiveness Scale (Short Form) (BIS-15; Spinella, 2007)

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3 The BIS-15 is an adapted short form of the BIS-II (Barratt & Stanford, 1995).
4
5 It measures impulsivity across fifteen items, and is rated on a four-point scale (one
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7 equates to 'rarely/never' and four to 'almost always'). The BIS-15 was utilised in the
8
9 present study so as to ascertain whether JTC bias can be accounted for by
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11 impulsiveness. The BIS-15 has a reliability of 0.79, and a high correlation with the
12
13 full BIS-II ($r = 0.94$) (Spinella, 2007).
14
15

16 **Beads Task (Garety et al., 2005)**

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18 The beads task (Phillips & Edwards, 1966) is a measure of cognitive reasoning
19
20 to assess JTC bias. For the present study, a computerised version of the beads task
21
22 (Garety et al., 2005) was adapted for use within the BOS. The task was as per
23
24 standard instructions. The participant is presented with two jars: one had a ratio of
25
26 60:40 red to blue beads and the other had inverted proportions of the two colours
27
28 (figure 1). The participant was informed that one of the jars has been chosen, and that
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30 beads can be drawn from it until a decision is made regarding which of the two jars
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32 was chosen (figure 2). The 'number of draws to decision' was used to score the task.
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38 Insert Figures 1 and 2 here
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45 **Perception of Criminal Intent Vignettes**

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47 This measure consisted of ten neutral situational vignettes. Each vignette is
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49 designed to be realistic, mundane and internally consistent, in line with the
50
51 recommendations of Wason, Polonsky and Hyman (2002). Each individual measure
52
53 consisted of a neutral situational statement such as: "*There has been a violent*
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55 *incident. A man is leaning over the victim and has blood on his shirt*"; a neutral
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3 instruction: “Based only on the above statement, use the scale to rate how much you
4 agree with following statement”; and a possible conclusion: “The man has harmed
5 the victim”. Participants are asked to rate how strongly they agreed with the
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7 conclusion on a five-point scale, ranging from one (strongly disagree) to five
8
9 (strongly agree). There were five subjective and five objective vignettes.
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12

13 14 *Procedure*

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16 The measures were inputted into a research website using the BOS survey
17 building tool. In order to host the images required for the beads task, a separate
18 picture hosting website was developed (www.frpresearch.co.uk). The images were
19 taken with permission from the computerised beads task (Garety et al., 2005) and
20 sequenced appropriately.
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28 Participants were recruited through a snowball sampling method, utilising
29 online social media websites. A standardised message was created, with a link to the
30 survey, and shared amongst the author’s contacts. A request to forward the message to
31 others was also included. While this meant that the survey could potentially reach an
32 exponentially vast and heterogeneous audience, the BOS allowed for two hundred and
33 fifty responses, over the sample size estimate of one hundred and fifty, and sufficient
34 to accommodate any attrition in data and reduce the size of the confidence limits
35 around the results of the study.
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45 The full survey took approximately 20 minutes to complete. Upon completion,
46 participants were advised to follow a link to the participant debrief. This was hosted
47 on the same webpage as the beads task images. Results were automatically logged by
48 the BOS system.
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53 54 55 56 *Statistical Analysis*

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3 Results were extracted from the BOS system and imported into SPSS 21.0 for
4 analysis. All measures were found to be reliable, with Cronbach's alpha at minimum
5 'acceptable' for all tasks (table 1). Skewness and kurtosis were satisfactory for all
6 measures, falling within desired parameters following the removal of one outlier.
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20 **Results**

21 *Hypothesis 1*

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23 To test the hypothesis that perceived dangerous neighbourhoods would be
24 associated with paranoid thinking, a one-way ANOVA was run in order to ascertain
25 which neighbourhoods were perceived to be most dangerous. The one-way ANOVA
26 revealed that urban areas were perceived to be the most dangerous ($M=1.91$, $SD=.81$).
27 Perceived dangerousness differed significantly across neighbourhoods ($F(2,197) =$
28 15.43 , $p < .001$, $\eta_p^2 = .14$). Post hoc Bonferroni tests indicated that there were
29 significant differences between urban and rural neighbourhoods ($p < .001$) and
30 suburban and rural neighbourhoods ($p = .001$). There was a non-significant difference
31 between urban and suburban neighbourhoods ($p = .13$). Results indicate that
32 perceived dangerousness increases as the neighbourhood becomes more urbanised
33 (table 2).
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56 Insert Table 2 here
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To test for an association between perceived dangerousness and paranoid thinking a bivariate correlation analysis was conducted. Results indicated that perceived dangerousness of neighbourhood was modestly, but significantly, related to paranoid thinking, $r = .145$, 95% CI [-.023, .322], $p = .04$.

Hypothesis 2

In order to investigate whether paranoid participants overestimated threat / risk of criminal victimisation, and whether JTC bias¹, perceived dangerous neighbourhoods and mental illness contributed to the phenomenon, it was necessary to initially test for associations using a bivariate correlation analysis. Findings indicated that paranoid thinking was significantly associated with overestimation of threat / risk of criminal victimisation ($r = .321$, 95% CI [.173, .502], $p = <.001$); however there were no significant associations between the other variables and overestimation of threat / risk of criminal victimisation (table 3).

Insert Table 3 here

In order to investigate the degree to which paranoid thinking predicted the overestimation of threat / risk of criminal victimisation, a simple linear regression analysis was conducted. Findings indicated that paranoia predicted the overestimation of threat / risk of criminal victimisation, $\beta = 0.84$, 95% CI [.033, .139] $t(197) = 3.35$,

¹ Scores of '1', '2' and '15' on the beads task were excluded from analysis due to the potential for participants to incorrectly complete the task. This resulted in 60 participants being excluded from all analyses that included the beads task.

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3 $p = .001$. Paranoia predicted 5.4% of the variation in outcome scores (adjusted $R^2 =$
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10 .054).

11 *Hypothesis 3*

12 In order to investigate whether paranoid thinking, perceived dangerous
13 neighbourhoods, heuristic reasoning and JTC bias predict high likelihood of
14 victimisation expectations, a bivariate correlation analysis was initially conducted to
15 test for associations. Gender and mental health diagnoses were included in the
16 analysis as potential contributing factors. Results indicated that gender, paranoid
17 thinking and perception of neighbourhood as dangerous were all independently
18 associated with high likelihood of crime expectations. To untangle the degree to
19 which paranoia, perception of neighbourhoods as dangerous and gender could predict
20 high likelihood of crime expectations; a multiple linear regression was conducted.
21 Results indicated that a model constructed from paranoia, perception of
22 neighbourhoods as dangerous, and gender predicted a significant proportion of
23 variance in outcome scores, $R^2 = .14$, $F(3, 196) = 10.664$, $p = <.001$. Adjusted R^2
24 indicated that the model accounted for 12.7% of the variance. Females were more
25 likely than males to have high likelihood of victimisation expectations (table 4).
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Insert Table 4 here

51 *Hypothesis 4*

52 To investigate whether impulsiveness is a confounding factor for JTC effect
53 on the beads task, a two-tailed bivariate correlation analysis was conducted. Results
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3 indicated significant negative correlations between total impulsiveness (and two of
4
5 the three impulsiveness subscales) and scores on the beads task (table 5). This
6
7 demonstrates that a JTC bias is associated with impulsiveness, specifically motor ($r =$
8
9 $-.215, p = .002$) and non-planning impulsivity ($r = -.227, p = .007$).
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20 21 22 **Discussion**

23
24 The results from this study support those of Johns and Van Os (2001), Cella et
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26 al. (2011), Freeman et al. (2008) and others who find a non-trivial prevalence of
27
28 paranoid thinking in the general population. This is particularly apparent in urban
29
30 environments, corroborating the findings of Sundquist, Frank and Sundquist (2004)
31
32 and Ellett, Freeman and Garety (2011). Paranoia was also associated with greater
33
34 perceptions of danger in increasingly urbanised neighbourhoods. Of particular
35
36 significance were the findings that paranoid participants interpreted neutral social
37
38 vignettes as containing threat / risk of criminal victimisation, supporting previous
39
40 research (see Salvatore et al., 2011; Bentall & Kaney, 1989; Pinkham et al., 2011),
41
42 and had increased likelihood of victimisation expectations (see Bentall et al., 2008;
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44 Corcoran et al., 2006; Bennett and Corcoran, 2010). Interestingly, results did not find
45
46 an association between paranoia and JTC bias, which is contrary to the existing
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48 published literature (e.g., Garety & Freeman, 2013; Freeman, Pugh and Garety,
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50 2008.). It was found however, that there was an association between impulsiveness
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52 and the beads task.
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3 Our study indicates that neighbourhoods perceived as dangerous may
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5 contribute to the development of an individual's paranoid thinking. Previous research
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7 has indicated that the risk of victimisation was increased in urban environments
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9 (Brennan, Moore & Shepherd, 2010); that persons with mental vulnerability are more
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11 likely to be victims of crime (Hart, de Vet, Moran, Hatch, & Dean, 2012), and that
12
13 general paranoid thinking is greater within such neighbourhoods (Ellett, Freeman &
14
15 Garety, 2011). The availability heuristic (Tversky & Kahneman, 1974) can be utilised
16
17 to explain this association, as it is plausible that greater exposure to crime and
18
19 victimisation can lead to greater fear (Mawby, 2007) and expectations of future
20
21 victimisation (Bentall et al., 2008; Corcoran et al., 2006). Preti and Cella (2010, p.
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23 264) posit that “paranoid ideation is not per se pathological but may, under certain
24
25 circumstances, be even adaptive”. The authors argue that paranoia is itself a heuristic
26
27 that informs decision-making that maintains an individual’s sense of security. The
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29 findings of the present study tentatively support this hypothesis. The
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34 The present study found that paranoid participants interpreted neutral social
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36 stimuli as containing threat thus indicating vigilance for potential harm. Vigilance for
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38 threat, identified in this study and previous research (for review see Green & Phillips,
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40 2004), can potentially be interpreted as an evolutionary and adaptive rational trait
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42 when the ecological niche suggests it is required (Preti & Cella, 2010). The findings
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44 of the present study, that paranoid thinking and dangerous neighbourhoods predict
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46 high expectations of crime, appear to be rational and corroborate the explanation.
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49 *Beads task*

51 Findings relating to JTC bias in the present study were contrary to the existing
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53 published literature (see Garety & Freeman, 2013) and no association was found
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55 between paranoid thinking and JTC bias; however, an association was found between
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57 impulsiveness and the beads task. The finding that there is not an association between
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JTC bias and paranoid thinking in the current study is interesting; however, most significant research in support of the JTC phenomenon has been conducted with clinical samples (Garety et al., 2009) using the 85:15 ratio. Non-clinical research using the 60:40 proportions is less conclusive.

Perhaps more salient were the small association discovered between impulsiveness and the beads task. Motor and non-planning impulsiveness were significantly associated with the beads task, indicating that those who make decisions early on the beads task ‘act on the spur of the moment’ and ‘do not think carefully about their actions’ (Barratt & Stanford, 1995). This would indicate that unless carefully administered by the researcher, the JTC effect is potentially confounded, especially in participants with psychosis (Lee et al., 2011). Future studies using the beads task to measure JTC bias should consider controlling for impulsiveness.

Despite these findings, the beads task results should be perhaps viewed with caution in the present study. Whilst the current study’s adapted beads task made use of standardised instructions (Garety et al., 2005) it was apparent that a significant proportion of participants had difficulties following the procedure correctly. Scores of ‘1’ and ‘2’ were excluded from results due to the potential for comprehension errors as confounders. In future research, using the beads task outside of the laboratory, it is recommended that a practice run be conducted to maximise participant understanding, and the task further engineered to minimise such problems.

Limitations of study

The use of a snowball-sampling method allowed for considerable variance in the sample; however, the use of social media websites does create a potential selection bias; potentially excluding those populations most prone to paranoid thinking. Further limitations relate to the absence of certain measures from the present

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3 study: It would have been advantageous to control for intelligence as a confounding
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5 factor on the beads task. Furthermore, as research indicates that worry and anxiety are
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7 factors in delusion formation (Freeman & Garety, 2003) it would also have been
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9 beneficial to incorporate a reliable and valid anxiety measure into the present study,
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11 particularly as anxiety is a reported consequence of victimisation (Freeman and
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13 Freeman, 2008) and antecedent of paranoia (Bentall et al., 2009).
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16 *Conclusion*

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18 The findings from the present study add to existing literature on fear of crime,
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20 and provide further evidence that within the non-clinical population, individuals with
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22 a paranoid thinking style interpret threat in neutral stimuli and have high expectations
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24 of future victimisation; it is posited that dangerous neighbourhoods and use of
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26 availability heuristics contribute to this phenomenon. The present study also found an
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28 association between the beads task and impulsiveness; consequently, it is
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30 recommended that future studies utilising the measure control for impulsivity, and
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32 explore methods to increase ease of comprehension by participants.
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37 Future research should further investigate the role of worry in expectations of
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39 victimisation, and the role that this plays in the formation of paranoid thinking. It is
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41 also important to further research how the use of paranoid heuristics (Preti & Cella,
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43 2010) informs judgements of criminal responsibility / intent and the degree to which
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45 this is pathological. This will allow for greater understanding of biases that inform
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47 everyday social decision-making.
48

49 **Conflict of Interest**

50
51 None.

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53
54
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57 commercial, or not-for-profit sectors.
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Supplementary materials

Supplementary materials can be accessed via direct communication with the corresponding author.

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Figure 1: Standardised instruction screenshot for beads task

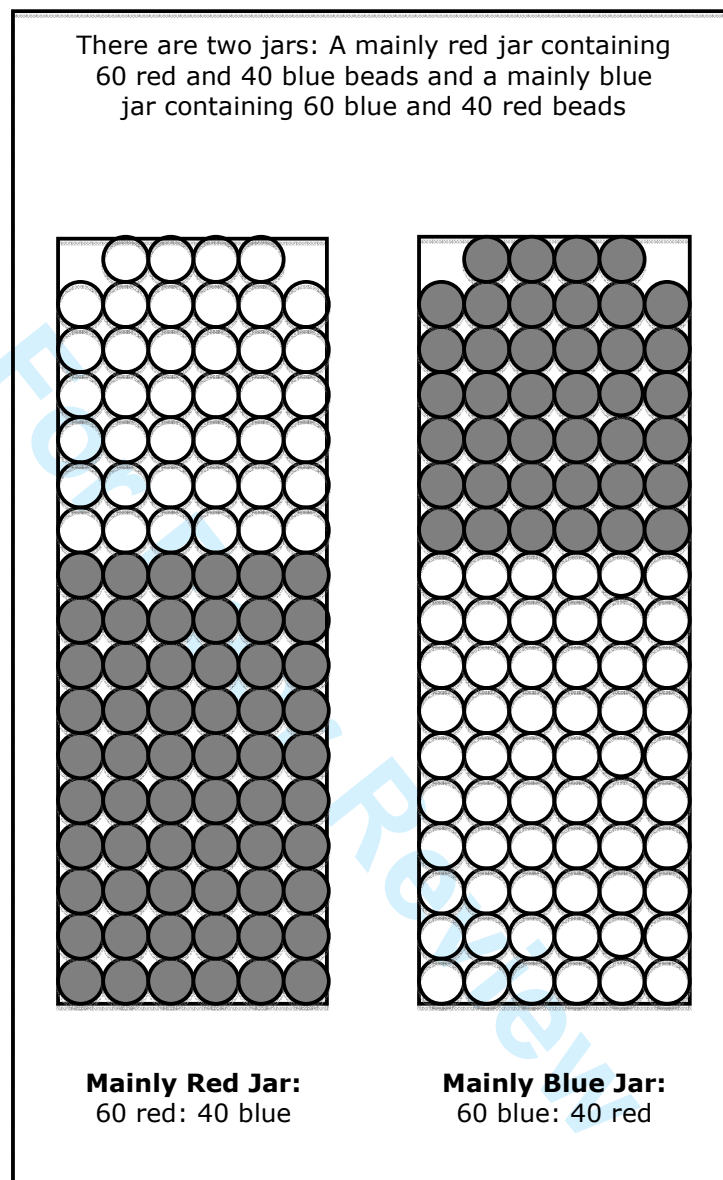


Table legend: shaded circles represent red beads, open circles blue beads.

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Figure 2: The beads task. This depicts the fifth bead to be drawn.

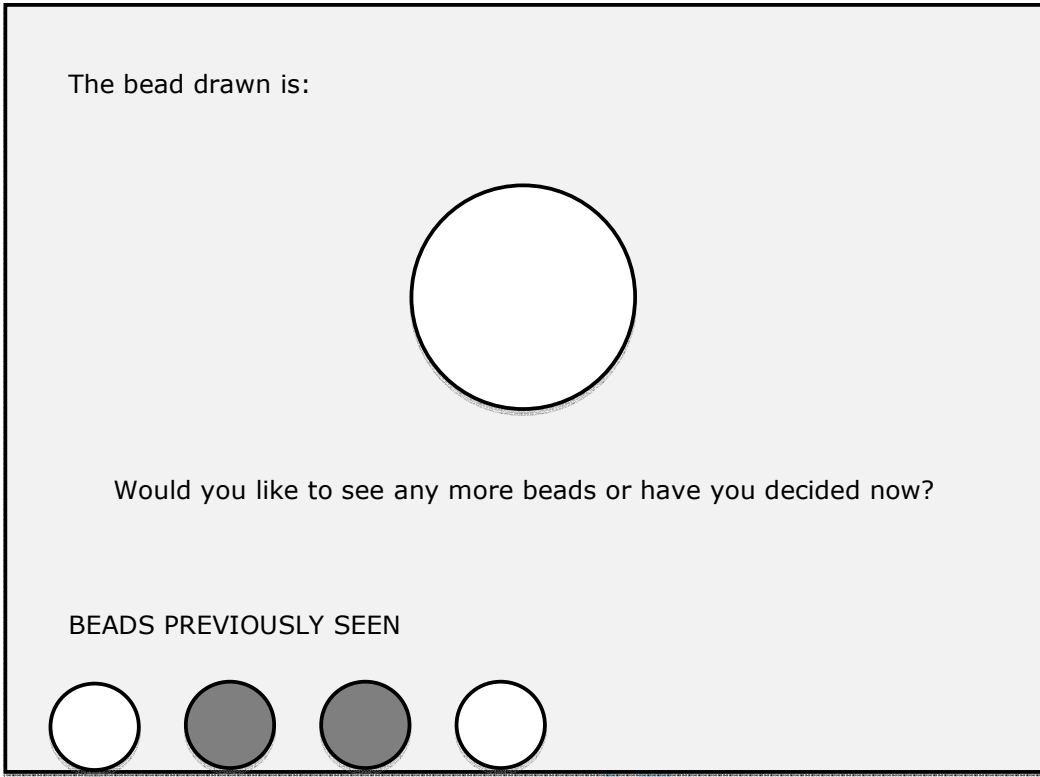


Table 1: Cronbach's alpha, mean and standard deviations for measures utilised in the present study.

		Cronbach's alpha	Mean	SD
Paranoia Scale		.913	48.24	13.60
Likelihood of Crime Scale		.854	25.81	5.91
BIS – 15	Total	.818	39.61	6.80
	Motor	.784	11.50	3.03
	Attention	.753	12.11	2.90
	Non-planning	.704	16.03	3.12
Beads Task		.959	10.10	2.96
Social Perception Vignettes		.781	28.71	4.92

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Table 2: Descriptive statistics for perceived dangerousness ratings by neighbourhood.

	N	Mean	SD	SE	95% confidence interval for mean	lower	higher
Urban	81	1.91	.81	.090	1.73	2.09	
Suburban	72	1.68	.73	.086	1.51	1.85	
Rural	47	1.19	.45	.066	1.06	1.32	

Table 3: Correlation matrix describing associations between overestimation of threat / risk of criminal victimisation and variables; and high likelihood of victimisation expectations and variables.

	Overestimation of threat / risk of criminal victimisation			High likelihood of victimisation expectations		
	<i>r</i>	<i>p</i>	SE	<i>r</i>	<i>p</i>	SE
Paranoia	.321 [.173, .502]	<.001**	.084	.178 [.008, .356]	.044*	.084
Beads task	-.032 [-.171, .135]	.715	.077	-.015 [-.184, .180]	.865	.094
Dangerous neighbourhood	.033 [-.167, .235]	.711	.098	.303 [.136, .414]	<.001**	.071
Mental illness	-.020 [-.154, .187]	.820	.088	-.118 [-.271, .033]	.184	.078
Gender				.203 [.053, .381]	.021*	.080
Overestimation of threat / risk of criminal victimisation				-.006 [-.209, .182]	.945	.102

Table Legend: 95% confidence intervals for *r* reported in parenthesis. Confidence intervals and standard errors based on 140 bootstrap sample. * $p = <.005$ ** $p = <.001$.

Table 4: Variables that predict high likelihood of crime expectations

	<i>B</i> (95% CI)	SE β	β	<i>p</i>
Constant	15.544 [12.132, 19.700]	1.875		.005*
Paranoia	.071 [.016, .114]	0.025	.163	.005*
Dangerous Neighbourhoods	1.832 [.914, 2.724]	0.477	.236	.005*
Gender	2.411 [.338, 4.062]	0.867	.202	.015*

Table legend: Linear model of predictors of high likelihood of victimisation expectations, with 95% confidence intervals reported in parenthesis. Confidence intervals and standard errors based on 200 bootstrapped samples * significant $p = <.005$

Table 5: Associations between impulsiveness and the beads task

	Beads Task		
	<i>r</i>	<i>p</i>	SE
Impulsiveness (total)	-.265 [-.413, -.109]	.002*	.076
Impulsiveness (motor)	-.215 [-.306, -.065]	.011*	.074
Impulsiveness (attention)	-.156 [-.306, .000]	.065	.078
Impulsiveness (non-planning)	-.227 [-.367, -.054]	.007*	.077

Table legend Correlation matrix describing associations between beads task and impulsiveness. 95% confidence intervals for *r* reported in parenthesis. Confidence intervals and standard errors based on 140 bootstrap sample. *significant $p = <.05$