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ScienceDirect
Schizophrenia Research 102 (2008) 254–260
SCHIZOPHRENIA RESEARCH
www.elsevier.com/locate/schres

Jumping to conclusions and paranoid ideation in the general population

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Received 11 January 2008; received in revised form 14 March 2008; accepted 25 March 2008
Available online 28 April 2008

Abstract

An association of a 'jumping to conclusions' (JTC) reasoning style and delusions has been repeatedly found. The data-gathering bias has been particularly implicated with higher levels of delusional conviction in schizophrenia. For the first time the symptom, psychological and social correlates of jumping to conclusions are examined in a large general population sample. This is based upon the recognition that delusional ideation in non-clinical populations is on a continuum of severity with delusions in psychosis. Two hundred individuals completed a probabilistic reasoning task and assessments of paranoid ideation, intellectual functioning, affective symptoms, anomalies of experience, cognitive flexibility, illicit drug use, social support, and trauma. The jumping to conclusions reasoning bias was found in 20% of the non-clinical sample. JTC was strongly associated with higher levels of conviction in paranoid thoughts and the occurrence of perceptual anomalies, but not with the presence of affective symptoms. The results indicate that jumping to conclusions is a reasoning bias specifically associated with levels of delusional conviction, and is not a product of generally high levels of distress and affect. The association of jumping to conclusions with the types of anomalies of experience seen in psychotic disorders is intriguing, and consistent with recent dopamine dysregulation theories and the importance of reasoning to perception. The study is a further illustration of the need to consider the dimensions of delusional experience separately.

Keywords: Delusions; Reasoning; Hallucinations; Cognitive; Schizophrenia

1. Introduction

The idea that reasoning biases contribute to the development and maintenance of delusions – strong beliefs resistant to change – is inherently plausible (Freeman and Freeman, 2008). It is now well-established that one half of people with delusions 'jump to conclusions' on a probabilistic reasoning task compared with 10–20% of individuals without delusions (see reviews by Fine et al., 2007; Freeman, 2007; Garety et al., 2007). In clinical groups JTC has been found to be associated with levels of delusional conviction, but not with delusion distress, anxiety or depression (Garety et al., 2005). Limited data gathering is likely to facilitate the strong acceptance of one explanation. JTC has also been found in individuals at high risk of psychosis (Broome et al., 2007) and in relatives of people with psychosis (Van Dael et al., 2006). The association of jumping to conclusions with non-clinical delusional ideation has been infrequently studied and the findings are mixed (Colbert and Peters, 2002; Van Dael et al., 2006; McKay et al., 2006). There has not been

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doi:10.1016/j.schres.2008.03.020

a definitive study of JTC and non-clinical delusional ideation. The previous studies have had a small number of participants (typically students) and the ranges in non-clinical delusional ideation have been limited. It may also be important that the previous studies differ in whether delusional conviction has been considered, and whether the analysis has controlled for intellectual functioning and basic demographic information.

In this paper we address two questions concerning a large non-clinical general population sample: What proportion show jumping to conclusions? And what are the symptom, psychological and social correlates of jumping to conclusions? 10–20% of the general public were expected to show the reasoning bias. It was predicted that the bias would be associated with conviction in delusional ideas and cognitive flexibility, but not with levels of anxiety and depression (Garety et al., 2005). We also predicted that jumping to conclusions would be associated with anomalies of experience such as mild sensory distortions and hallucinations. Evidence is accumulating that hallucinatory experience and delusions share underlying mechanisms (e.g. Allen et al., 2006), and dopamine dysregulation, thought to produce such anomalous experience, has been linked to jumping to conclusions (Moore and Sellen, 2006; Menon et al., 2008). It was also thought possible that jumping to conclusions would be associated with social isolation due to fewer opportunities to consider alternative explanations. Finally, JTC was examined in relation to a number of additional psychological and social factors (e.g. worry, traumatic events, illicit drug use) in an exploratory analysis.

2. Method

Two hundred members of the general public were tested on the probabilistic reasoning task as part of a baseline assessment for a virtual reality study of paranoia (Freeman et al., 2008). The current report concerns previously unreported tests of associations between the baseline assessments used in the study.

2.1. Participants

A representative sample of the adult local population was recruited via distribution of a leaflet to 20,000 households in local south London postcodes. The postcodes score highly on indexes of deprivation, consistent with the inner city location. Approximately 350 people responded to the advertisement. Seven individuals reporting a history of Axis One severe mental illness (e.g. schizophrenia, bipolar disorder) were excluded. Two individuals with a history of epilepsy were also excluded because of potential virtual reality side effects (Freeman, in press). One hundred male and one hundred female participants were tested. The occupationally based National Statistics Socio-economic Classification was used to categorise participants (Office for National Statistics, 2005). The study had received approval from the local research ethics committee. Participants were not aware at any stage that the focus of the research was on paranoia.

3. Measures

3.1. Jumping to conclusions

Jumping to conclusions was assessed with a probabilistic reasoning task known as the 'beads task'. Participants are shown a jar with 60 black beads and 40 yellow beads ('the mainly black jar') and a jar with 40 black beads and 60 yellow beads ('the mainly yellow jar'). The jars are then hidden from view and the participant told that one of the jars has been selected by the experimenter. The participant is asked to request as many coloured beads as they would like before deciding from which of the two hidden jars the beads are drawn. The key variable employed here is the number of beads requested before making a decision, with two items or fewer classified as 'jumping to conclusions' (Garety et al., 2005). The draws-to-decision variable is dichotomised to identify the most extreme reasoning style and because beads differ in informational value (it is not an interval scale). Participants were encouraged to write down the beads drawn in order to reduce the task demands on working memory.

3.2. Intelligence

3.2.1. Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999)

The WASI is a nationally standardised short and reliable measure of intelligence linked to the Wechsler Adult Intelligence Scale — Third Edition (Wechsler, 1997). The Vocabulary and Matrix Reasoning subtests were used in the current study.

3.3. Delusional ideation

3.3.1. Green et al. Paranoid Thoughts Scale (Green et al., 2008)

The G-PTS is a thirty-two item trait measure of paranoia, assessing ideas of reference (e.g. 'It is hard to stop thinking about people talking about me behind my back') and ideas of persecution (e.g. 'I was convinced there was a conspiracy against me'). Each item is rated

on a 5-point scale referring to the past month. Higher scores indicate greater levels of paranoid thinking. The questionnaire includes eight item subscales for delusional conviction, preoccupation, and distress. The questionnaire has been psychometrically evaluated in clinical and non-clinical populations. The internal consistency of the scale and test-retest reliability is good. Convergent validity has been shown with the Paranoia Scale (Fenigstein and Vanable, 1992), Psychotic Symptoms Rating Scale (Haddock et al., 1999) and paranoid items of the PDI (Peters et al., 1999).

3.4. Affective symptoms and associated processes

3.4.1. Depression anxiety stress scales (Lovibond and Lovibond, 1995)

The DASS is a 42-item instrument with three subscales measuring current symptoms of depression, anxiety, and stress. Each of the subscales consists of 14 items with a 0–3 scale (0=did not apply to me at all, 3=applied to me very much). Higher scores indicate higher levels of emotional distress.

3.4.2. Penn State worry questionnaire (Meyer et al., 1990)

The PSWQ is the most established measure of trait worry style and has been used in non-clinical and clinical populations (see review by Startup and Erickson, 2006). Each of the sixteen items are rated on a 5-point scale. Higher scores indicate a greater tendency to worry.

3.4.3. Worry domains questionnaire (Tallis et al., 1992)

The WDQ assesses the occurrence of a range of common (non-paranoid) worries (i.e. in contrast to the PSWQ the scale assesses content). It has good psychometric properties (see Startup and Erickson, 2006). The scale contains 25 items using a five-point rating scale (not at all — extremely). Higher scores indicate greater levels of worry.

3.4.4. Catastrophising interview (Vasey and Borkovec, 1992)

The catastrophising interview is an experimental assessment of worry (see review of procedures by Davey, 2006). Individuals are asked what worries them about their main worry and this question is repeated for all their subsequent answers. The procedure is terminated when no further responses are given (i.e. the person can think of no more worries in the chain). Each answer is counted as a catastrophising step. Increasing numbers of catastrophising steps indicate a greater worry style.

3.4.5. Brief core schema scales (Fowler et al., 2006)

This measure, developed with non-clinical and psychosis groups, has 24 items each rated on a five-point scale (0–4). Four sub-scale scores are derived: negative beliefs about self, positive beliefs about self, negative beliefs about others and positive beliefs about others. Higher scores reflect greater endorsement of items.

3.4.6. Interpersonal sensitivity measure (Boyce and Parker, 1989)

This is a 36-item scale designed to assess interpersonal sensitivity defined as undue and excessive awareness of, and sensitivity to, the behaviour and feelings of others. Self-statements are rated on a four-point scale (1=very unlike self, 2=moderately unlike self, 3=moderately like self, 4=very like self). High scores indicate greater interpersonal sensitivity.

3.5. Belief flexibility

3.5.1. Cognitive flexibility (Martin and Rubin, 1995)

This is a 12-item self-report scale assessing awareness that in any given situation there are options and alternatives, and the willingness and confidence to be flexible. Items are scored on a six point scale (strongly agree to strongly disagree). Higher scores indicate greater levels of flexibility.

3.6. Perceptual anomalies

3.6.1. Cardiff anomalous perceptions scale (Bell et al., 2006)

This 32 item questionnaire, developed in both non-clinical and psychosis groups, assesses perceptual anomalies such as changes in levels of sensory intensity, distortion of the external world, sensory flooding, and hallucinations. A higher score represents the reporting of a greater number of perceptual anomalies.

3.6.2. Maudsley addiction profile (Marsden et al., 1998)

The MAP was developed with a large sample from a substance abuse clinic. Respondents are asked directly about the use over the past month of illicit drugs including cannabis, cocaine powder, crack cocaine, heroin, amphetamines, and methadone.

3.7. Social factors

3.7.1. Life stressor checklist (Wolfe and Kimerling, 1997)

The checklist asks respondents about the occurrence of a range of severe life events (e.g. serious accident, physical attack, sexual abuse). If the respondent reports

the occurrence of an event, subsequent questions ask when the event happened, whether the person thought at the time serious harm or death could result, and whether feelings of intense helplessness, fear or horror occurred. Only events that reached the severity criterion related to post-traumatic stress disorder diagnosis were scored. The total number of traumatic events, the total number of victimisation events, the number of childhood traumatic events, and the number of traumatic events in the past year were used. The psychometric properties of the measure are reported by McHugo et al. (2005).

3.7.2. Social support questionnaire (Sarason et al., 1987)

The short-form of the well-established SSQ (Sarason et al., 1983) was used. Each of the seven items has two parts. The first part assesses the number of people the respondent believes they can turn to in times of need (e.g. 'Whom can you really count on to be dependable when you need help?). The second part measures the degree of satisfaction with that support. Two scores are derived: number of perceived availability score and the satisfaction score. Higher scores indicate greater perceptions of social support.

3.7.3. Social and emotional loneliness scale for adults (DiTommaso and Spinner, 1993)

This 37 item self-report questionnaire, developed in a non-clinical sample, has three subscales: romantic, family, and social loneliness. Each item is rated on a 7-point scale (Strongly disagree–Strongly agree). Higher scores indicate greater levels of loneliness.

3.8. Analysis

There were two steps to the analysis, which was carried out using SPSS Version 12.02 (SPSS, 2004). The first determined which, if any, of the variables had a direct association with jumping to conclusions: each variable was modelled separately using a logistic regression controlling for age, sex, ethnicity, intellectual functioning, socio-economic status, and level of education. The key hypotheses concerning delusional conviction, anomalous experiences, cognitive flexibility, anxiety, depression and social isolation were tested and then the exploratory factors. The second step included all the independent variables. A logistic regression was carried out using the exploratory modelling technique backward elimination (Hocking, 1976). Variables were removed one by one chosen by the variable with the largest p-value until all variables had p-values less than 0.10. All hypothesis testing was two-tailed, and 95% confidence intervals (CI) are reported.

4. Results

4.1. Demographic and clinical data

The average age of the participants was 37.5 (SD = 13.3) (minimum = 18, maximum = 77). The mean IQ score was 104.6 (SD = 12.0) (minimum = 69, maximum = 133). Further basic information on the participants is presented in Table 1. There is a spread of participants across socio-economic categories, and the proportion in each category is broadly representative of the United Kingdom population. It can be seen that there is a good range in the clinical scores of the participant group (Table 2).

4.2. Jumping to conclusions

Jumping to conclusions was present in 40 of the 200 participants (20%). Jumping to conclusions resulted in significantly more errors on the task. 45% of the individuals who jumped to conclusions, compared with 16% of the other participants, decided that beads were being

Table 1
Demographic data on the study participants

Variable	Number (%)
Sex	
Male	100 (50%)
Female	100 (50%)
Ethnicity	
White	135 (67.5%)
Black Caribbean	18 (9%)
Black African	9 (4.5%)
Black other	5 (2.5%)
Indian	6 (3%)
Pakistani	1 (0.5%)
Other	26 (13%)
Highest education level achieved	
None	11 (5.5%)
GCSE	39 (19.5%)
AS/A level	30 (15%)
Diploma/foundation	27 (13.5%)
Degree	55 (27.5%)
Postgraduate diploma	34 (17%)
Doctoral degree	4 (2%)
Socio-economic classification [national figure]	
Higher professional occupations	16 (8%) [11.1%]
Lower managerial and professional occupations	57 (28.5%) [22.4%]
Intermediate occupations	17 (8.5%) [10.0%]
Small employers and own account workers	12 (6%) [7.6%]
Lower supervisory and technical occupations	8 (4%) [9.1%]
Semi-routine occupations	17 (8.5%) [12.8%]
Routine occupations	13 (6.5%) [9.3%]
Never worked and long term unemployed	33 (16.5%) [3.8%]
Not classifiable (students)	27 (13.5%) [13.7%]

Table 2
Assessment scores

	Mean	SD	Minimum	Maximum
Paranoia total	48.8	19.6	32	143
Paranoia conviction	12.5	5.1	8	37
Paranoia preoccupation	11.3	4.8	8	33
Paranoia distress	12.5	5.7	8	40
Anxiety	4.5	5.1	0	31
Depression	7.2	8.6	0	39
Penn State Worry	45.7	14.8	16	80
Worry domain	29.4	18.8	25	108
Perceptual anomalies	7.4	6.2	0	26

drawn from the incorrect jar, chi square (df=1)=16.36, p<0.001. There was a trend for intellectual functioning to be lower in the JTC group (mean=101.3, SD=12.6) compared with the non JTC group (mean=105.4, SD=11.7), t=−1.96, df=198, p=0.051, CI: −8.3, 0.0.

Only higher levels of conviction in paranoid ideas and experiences of perceptual anomalies were significant individual predictors of JTC (see Table 3). Cognitive flexibility, anxiety, depression, and the number of social supports were not significantly associated with JTC. Similarly, the exploratory factors were not significantly associated with JTC. When all the independent variables were analysed together there were six significant associations with JTC (see Table 4). Level of conviction in paranoid ideas was a strong predictor of JTC. For a ten point rise in levels of conviction, there is a 75 times greater likelihood of JTC. Higher levels of paranoia distress and perceptual anomalies were also strongly associated with JTC. However, higher overall levels of endorsement of paranoid ideation were associated with a lower likelihood of JTC.

Table 3
Logistic regressions controlling for age, sex, ethnicity, education, socio-economic status and intellectual functioning

Variable	OR	SE	p-value	95% CI
Primary tests				
Paranoia conviction	1.08	0.041	0.046*	1.00, 1.17
Anomalous experiences	1.07	0.031	0.024*	1.01, 1.14
Cognitive flexibility	1.04	0.031	0.238	0.98, 1.10
Anxiety	0.99	0.037	0.686	0.92, 1.06
Depression	1.02	0.022	0.477	0.97, 1.06
No. of social supports	0.89	0.105	0.286	0.73, 1.10
Exploratory tests				
Paranoia total	1.02	0.010	0.140	1.00, 1.04
Paranoia preoccupation	1.00	0.044	0.922	.092, 1.09
Paranoia distress	1.07	0.036	0.081	0.99, 1.14
Use of illicit drugs	2.12	0.470	0.109	0.85, 5.34
Satisfaction with social support	0.99	0.231	0.977	0.63. 1.56
Romantic loneliness	1.01	0.010	0.618	0.99, 1.03
Family loneliness	1.03	0.014	0.068	1.00, 1.05
Social loneliness	1.02	0.012	0.184	0.99, 1.04
Worry Penn State	0.99	0.015	0.417	0.96, 1.02
Worry domain	1.00	0.011	0.753	0.98, 1.02
Worry catastrophic	1.04	0.025	0.087	0.99, 1.10
Interpersonal sensitivity	0.99	0.014	0.578	0.97, 1.02
Negative self	0.96	0.077	0.664	0.82, 1.11
Positive self	1.00	0.044	0.948	0.92, 1.09
Negative other	1.07	0.041	0.084	0.99, 1.16
Positive other	0.93	0.046	0.116	0.85, 1.02
No. lifetime trauma	1.03	0.083	0.741	0.87, 1.21
No. lifetime victimisation	0.99	0.132	0.913	0.76, 1.28
Childhood abuse	1.10	0.466	0.831	0.44, 2.75
Recent trauma	0.90	0.545	0.842	0.30, 2.61

* p<0.05, ** p<0.01.

Table 4
Backward elimination logistic regression

Variable	OR	SE	p-value	95% CI
Age	1.06	0.016	<0.001**	1.03, 1.10
Sex				
Male	–	–	–	–
Female	2.30	0.441	0.059	0.97, 5.46
Paranoia total	0.85	0.064	0.010*	0.75, 0.96
Paranoia conviction	1.54	0.150	0.004**	1.15, 2.07
Paranoia distress	1.33	0.120	0.017*	1.05, 1.69
Worry domain	0.98	0.014	0.075	0.95, 1.00
Positive other	0.91	0.046	0.041*	0.83, 1.00
Anomalous experience	1.11	0.036	0.004**	1.03, 1.19

* p<0.05, ** p<0.01.

5. Discussion

The study demonstrates that jumping to conclusions occurs in the non-clinical general population, albeit at a much lower rate than has been found in clinical groups. Testing two hundred people enabled forty non-clinical individuals with the JTC bias to be studied, the largest sample of non-clinical JTC to be investigated. The correlates of the reasoning bias were clear. Consistent with the clinical literature it was the strength with which delusional ideas were held, not simply their presence, which was associated with the data gathering style. Reasoning biases are unlikely to lead to the occurrence of delusional thoughts, but they are likely to contribute to their acceptance. More broadly, it needs to be kept in mind by researchers that hypotheses need to specify which aspect of delusional experience they are attempting to explain (see Freeman, 2007). The second clear association is of the data-gathering bias with anomalies of experience. This is consistent with Garety and Hemsley (1994) finding an association of self-reports of anomalous events and JTC in individuals with delusions. It is also consistent with theoretical accounts which hypothesize that both anomalies of experience and changes to decision-making processes arise from a core cognitive dysfunction underlying schizophrenia (e.g. Hemsley, 2005). However it should be noted

that there was multiple hypothesis testing which raises the likelihood of Type 1 error.

The variables not associated with jumping to conclusions are also of interest. JTC is not simply related to trait levels of affect, though whether state changes in emotion are important remains untested. The experimental task was also unrelated to self-report of flexibility in thinking or levels of social support. The former finding is consistent with failures to find an association of need for closure and JTC (Freeman et al., 2006). Research is needed to establish the cause of the JTC bias. Speculations on the causes have concerned the goals of reasoning (Dudley and Over, 2003), the threshold at which an explanation is accepted (Moritz and Woodward, 2004), the confirmatory (or disconfirmatory) reasoning bias (Freeman et al., 2005; Moritz and Woodward, 2006), the availability of explanations (Freeman et al., 2004) and executive functioning (Garety et al., 2005). The causes of JTC will only be determined in experimental studies that go beyond detection of associations and use designs that examine the effects of manipulating the variables of interest. Similar causal tests are needed to establish the relationship of the reasoning bias to delusional experience.

Role of funding source

Funding for this study was provided by a Fellowship awarded by the Wellcome Trust to Daniel Freeman. The Wellcome Trust had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

Contributors

Daniel Freeman designed the study and wrote the paper. All authors commented upon and added to the paper. Katherine Pugh carried out the data collection.

Conflict of interest

The authors have no conflict of interest.

Acknowledgement

The research was supported by a Wellcome Trust Fellowship awarded to Daniel Freeman.

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