Psychological Medicine

cambridge.org/psm

Original Article

*Joint senior author; these authors did similar contribution.

Cite this article: Rodriguez V *et al* (2019). Jumping to conclusions at first onset of psychosis predicts longer admissions, more compulsory admissions and police involvement over the next 4 years: the GAP study. *Psychological Medicine* **49**, 2256–2266. https://doi.org/10.1017/S0033291718003197

Received: 16 October 2017
Revised: 19 September 2018
Accepted: 26 September 2018
First published online: 5 November 2018

Key words:
Clinical outcome; first-episode psychosis; jumping to conclusions; reasoning bias; psychosis

Author for correspondence:
Victoria Rodriguez, E-mail: victoria.rodriguez@kcl.ac.uk

CAMBRIDGE UNIVERSITY PRESS

Jumping to conclusions at first onset of psychosis predicts longer admissions, more compulsory admissions and police involvement over the next 4 years: the GAP study

Victoria Rodriguez[1], Olesya Ajnakina[1], Simona A. Stilo[1], Valeria Mondelli[2], Tiago Reis Marques[1], Antonella Trotta[3], Diego Quattrone[3], Poonam Gardner-Sood[1], Marco Colizzi[1], Benjamin D. Wiffen[1], Paola Dazzan[1], Marta Di Forti[3], M Aurora Falcone[1,2], Anthony S. David[1,*] and Robin M. Murray[1,*]

[1]Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK; [2]Department of Psychological Medicine, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK and [3]Social, Genetics and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

Abstract

Background. Jumping to conclusions (JTC), which is the proneness to require less information before forming beliefs or making a decision, has been related to formation and maintenance of delusions. Using data from the National Institute of Health Research Biomedical Research Centre Genetics and Psychosis (GAP) case–control study of first-episode psychosis (FEP), we set out to test whether the presence of JTC would predict poor clinical outcome at 4 years.
Methods. One-hundred and twenty-three FEP patients were assessed with the Positive and Negative Syndrome Scale (PANSS), Global Assessment of Functioning (GAF) and the probabilistic reasoning 'Beads' Task at the time of recruitment. The sample was split into two groups based on the presence of JTC bias. Follow-up data over an average of 4 years were obtained concerning clinical course and outcomes (remission, intervention of police, use of involuntary treatment – the Mental Health Act (MHA) – and inpatient days).
Results. FEP who presented JTC at baseline were more likely during the follow-up period to be detained under the MHA [adjusted OR 15.62, 95% confidence interval (CI) 2.92–83.54, $p = 0.001$], require intervention by the police (adjusted OR 14.95, 95% CI 2.68–83.34, $p = 0.002$) and have longer admissions (adjusted IRR = 5.03, 95% CI 1.91–13.24, $p = 0.001$). These associations were not accounted for by socio-demographic variables, IQ and symptom dimensions.
Conclusions. JTC in FEP is associated with poorer outcome as indicated and defined by more compulsion police intervention and longer periods of admission. Our findings raise the question of whether the implementation of specific interventions to reduce JTC, such as Metacognition Training, may be a useful addition in early psychosis intervention programmes.

Introduction

Psychosis, especially schizophrenia, may be a disabling condition and classically is associated with poor clinical outcome. Nonetheless, recent findings confirm that prognosis is not universally poor and that the course need not be one of inexorable decline (Hopper *et al.*, 2007; Morgan *et al.*, 2014; Revier *et al.*, 2015). Interest has therefore shifted towards identifying predictors of outcome for treatment planning in order to ameliorate the adverse impact of the illness (White *et al.*, 2009; Juola *et al.*, 2013; Friis *et al.*, 2016).

Neurocognitive deficits and negative symptoms are important drivers of disability in psychosis (Breier *et al.*, 1991; Wieselgren *et al.*, 1996; Ho *et al.*, 1998; Green *et al.*, 2000; Lipkovich *et al.*, 2009; Faber *et al.*, 2011), as is social cognition (Couture *et al.*, 2006; Fett *et al.*, 2011; Pinkham, 2014). However, which aspects of cognition are most predictive of prognosis remains elusive.

One area to attract attention in this regard is reasoning and cognitive biases (van Hooren *et al.*, 2008). Jumping to conclusions (JTC) defines a tendency to form beliefs and to make a decision about an event without having enough information about it, sometimes referred to as data-gathering bias (Freeman *et al.*, 2008). JTC plays a central role in psychological and neuropsychological theories of delusions as it is considered to lead to the rapid acceptance of implausible ideas and to prevent consideration of more realistic alternative explanations of events (Freeman and Garety, 2014). A recent meta-analysis (Dudley *et al.*, 2016) summarized evidence that people with psychosis make decisions on the basis of little evidence, have a more extreme reasoning style than people with other mental health conditions or healthy controls

and that JTC is linked with a higher probability of having delusions. Moreover, there is evidence that such hasty reasoning is predictive of less improvement over time in delusions (So *et al.*, 2014).

In her theoretical model of psychosis, Garety *et al.* (2001) proposed JTC as one of the biased conscious appraisal processes which are crucial in contributing to the perception of anomalous experiences as personally significant and externally caused when the subject is in search for an explanation (Garety *et al.*, 2001). Garety and Freeman (1999) found empirical support for JTC, externalizing attributional biases and deficits in understanding social situations and the intentions of others, to be specific biases in these processes (Garety and Freeman, 1999). Interestingly, these biases and deficits, which are considered to be part of social cognition, are also included in similar constructs as metacognition (Lysaker *et al.*, 2005, 2013), which has led to the development of specific intervention programmes, as the Metacognition Training designed by Moritz and Woodward, which has specific modules dedicated to the bias (Moritz and Woodward, 2007). This latter intervention has been reported to improve positive symptoms (Aghotor *et al.*, 2010; Moritz *et al.*, 2011, 2013; Favrod *et al.*, 2014) in patients with schizophrenia, which renders the JTC bias as especially interesting for research into the outcome of the disorder.

There is also evidence of a link between JTC and the more classic construct of neurocognition. JTC has been shown to be negatively associated with neuropsychological performance in FEP samples (Falcone *et al.*, 2015*a*; González *et al.*, 2017), but also with lower IQ scores among healthy relatives of patients with schizophrenia (Van Dael *et al.*, 2006) and controls with high levels of psychotic experiences (Mortimer *et al.*, 1996; Van Dael *et al.*, 2006). Nonetheless, whether the relationship between neurocognition and JTC moderate the link with positive symptoms remains elusive (Andreou *et al.*, 2015).

To the best of our knowledge, only one study has examined whether JTC moderates outcome of the disorder by measuring its impact on functional outcome (Andreou *et al.*, 2014). The results did not support a predictor role of the bias, although this may have been because of the length of follow-up was only 6 months and the sample was small. We decided to examine reasoning bias as a possible predictor of the course and clinical outcome in the medium to long term, using data from a well-characterized sample of patients presenting to psychiatric services for the first time with psychosis. The aim of our study was to examine independent associations between JTC and clinical outcome at 4 years after the first contact with mental health services. For this purpose, we selected remission and several clinical outcomes of service use such as days of admissions, use of the Mental Health Act (MHA) for involuntary treatment and instances of police involvement during an admission to a psychiatric unit.

As JTC has been related in several studies to the presence of delusions (Falcone *et al.*, 2015*a*; McLean *et al.*, 2016), and to a lesser extent to persistence of delusion severity (Falcone *et al.*, 2015*b*), we hypothesized that those patients who presented more severe reasoning bias at baseline would have worse clinical prognosis.

Methodology

Participants

Participants for this study were recruited as part of the National Institute of Health Research Biomedical Research Centre Genetics and Psychosis (GAP) study conducted in South London, UK. Further details of the study are available in Di Forti *et al.* (2015). Briefly, the GAP study comprised individuals aged 18–65 years who presented to the psychiatric services of the South London and Maudsley (SLaM) National Health Service (NHS) Foundation Mental Health Trust between December 2005 and October 2010 with a first-episode of psychosis (FEP) [International Classification of Diseases (ICD)-10; F20-F29 and F30-F33; and Diagnostic and Statistical Manual of Mental Disorders (DSM)–IV; 295.1–298.9] (WHO, 1992; American Psychiatric Association, 2000). Diagnosis at the moment of recruitment was determined by administration of the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) (WHO, 1994) and was later validated by using the computerized Operational Criteria system (version 2004) (McGuffin *et al.*, 1991). Cases were excluded if there was evidence of: (1) psychotic symptoms precipitated by an organic cause; (2) transient psychotic symptoms resulting from an acute intoxication as defined by ICD-10; (3) head injury causing clinically significant loss of consciousness; and (4) learning disability (IQ < 70) as assessed by the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) (Wechsler, 1997). The original GAP sample comprised $N = 431$ FEP cases; of these, information on JTC at baseline was available for 123 cases [28% of the original GAP sample (Falcone *et al.*, 2015*a*)]. This subsample with information on JTC did not differ significantly from the full GAP sample in terms of gender, age, education level, diagnosis or ethnicity (online Supplementary Table S1). Further, 83% ($N = 102$) of the subsample ($N = 123$) was successfully traced 4 years after first contact with mental health services. Therefore, data presented here are based on these 102 cases. Ethical permission was obtained from the SLaM and the Institute of Psychiatry Research Ethics Committee. All patients gave informed written consent after reading a detailed information sheet.

Measures at baseline

Socio-demographic characteristics

Demographic data were collected using the Medical Research Council (MRC) Socio-demographic Schedule modified version (Mallett *et al.*, 2002) and supplemented by clinical records. For educational level, we divided the sample into three categories: no qualification, school education (GCSE, 'O' levels and 'A' levels) and tertiary education (vocational, college, university or professional qualification). We dichotomized the domains of employment (employed *v.* unemployed), marital (in a stable relationship *v.* no relationship) and living arrangements status (independent living *v.* no independent living). For lifetime use of alcohol and illegal drugs, we collected data from the GAP baseline measures, and split both into ever used (1) *v.* never used (0). Lifetime use of cannabis was assessed with the Cannabis Experience Questionnaire modified version (Di Forti *et al.*, 2009), dividing patients into those who reported ever having used cannabis (1) and those who reported never having used it (0). Ethnicity was self-ascribed using categories employed by the 2001 UK Census (http://www.ons.gov.uk/ons/guide-method/census/census-2001/index.html). Due to small numbers in some ethnic categories, we combined them into three broad ethnic groups: white (all white groups), black (all black groups) and other (encompassing Asian, mixed ethnicity and other ethnicities).

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

Clinical assessments at baseline

Duration of untreated psychosis (DUP) was defined as the difference between the date of the appearance of the first positive psychotic symptom and the date of initiation of treatment with antipsychotics, in weeks (Norman and Malla, 2001).

The baseline diagnoses were made from interviews and mental health records utilizing the Operational Criteria Checklist (McGuffin *et al.*, 1991) and were grouped using ICD-10 into: affective psychosis group (patients diagnosed with codes F30–33) or schizophrenia-spectrum disorders group (ICD-10 codes F20–29) (Trotta *et al.*, 2016). For those who did not meet the criteria based on ICD-10, we extracted the diagnosis from the same OPCRIT assessment based on DSM-IV, grouping them into: affective psychosis (patients diagnosed with bipolar disorder, manic episode with psychosis or major depression with psychotic features – codes 296–296.9-) or schizophrenia-spectrum disorder (for schizophrenia, schizoaffective disorder, delusional disorder and psychotic disorder NOS – codes 295.1–295.9 and 297.1–298.9-).

Symptomatology at baseline was rated on the Positive and Negative Syndrome Scale (PANSS) (Kay *et al.*, 1987), from face-to-face interviews in the week preceding the assessment. The 30 items that comprise the scale are divided into positive, negative and general psychopathology scales. A confirmatory factor analysis (CFA) was conducted of the Wallwork/Fortgang five-factor model (Wallwork *et al.*, 2012). This Wallwork/Fortgang five-factor model has been shown to be the most robust PANSS factorial solution for exploring symptom profiles in FEP patients (Langeveld *et al.*, 2013) and has previously used in this sample (Ajnakina *et al.*, 2016, 2017). Global Assessment of Functioning (GAF) was used to measure both overall symptoms severity and disability associated with the illness at the study entry (Endicott *et al.*, 1976). We complimented the GAF with the Clinical General Impression scale (CGI) (Guy, 1976).

Baseline general intelligence was assessed using a brief version of the WAIS-III (Wechsler, 1997) which includes a standardized set of five tasks (Information, Block Design, Matrix Reasoning, Digit Symbol Coding and Digit Span) to give a prorated intelligence quotient (IQ).

Jumping to conclusions

For the measurement of the JTC bias, participants had to complete both versions of the probabilistic reasoning 'Beads' Task (Garety *et al.*, 2005), with beads in 85:15 and 60:40 ratios. Participants are shown two jars containing coloured beads in opposite ratios (e.g. in one of them, the proportion was 85 black *v.* 15 orange, and in the other, the ratio was reversed). Beads are then drawn from one of the two jars (randomly chosen by the computer), one at a time. After each draw, the participants can either make a guess about which jar the beads come from or request a new bead. Participants will only have a single trial in which they can ask as many beads as they need to make their final decision. The two main variables classically extracted from the 'Beads Task' are: a continuous variable defined as the numbers of draws before making a decision, so-called 'draws to decision' (DTD); and a dichotomous variable (JTC/no JTC), in which JTC bias has been operationally defined as reaching a decision after fewer than three beads (Garety *et al.*, 2005).

In this study, dichotomous rating was preferred since the distribution of the DTD variable is not normal, the colour of each drawn and the sequence could influence the next decision; and there is a better fit with clinical validity of the dichotomous approach, as we are mainly interested in identifying the extreme responders from the rest. Moreover, the use of dichotomous scoring seems to be superior in predicting change in delusion conviction (So *et al.*, 2012). Consequently, and based on previously published papers using different types of Beads Tasks, we considered a hasty decision on any of the two versions of the task, to be evidence of the tendency to JTC (Garety *et al.*, 2005; Ross *et al.*, 2011; Jolley *et al.*, 2014; So *et al.*, 2014; So and Kwok, 2015).

Tracing patients at follow-up

Approximately 4 years (mean = 4.0, S.D. = 0.13) after first contact with psychiatric services for psychosis, we sought to trace all FEP cases included in the original GAP study with JTC scores available at baseline and who had given consent for their clinical records to be accessed at follow-up. A thorough database search was carried out using the electronic psychiatric records that are the primary clinical record keeping system within the SLaM Trust [Electronic Patient Journey System (ePJS)]. To trace those patients who dropped out from the services, we contacted their last known general practitioners via mail seeking further information about the patient's whereabouts and health; then patients themselves were contacted wherever possible. All deaths and emigrations up to and including those that occurred during the final year of follow-up were identified by a case-tracing procedure with the Office for National Statistics for England and Wales and the General Register Office for Scotland. Further details are available in Ajnakina *et al.* (2017).

Data at follow-up

At follow-up, extensive information was extracted across clinical and social domains, and patterns of care, from electronic psychiatric clinical records using the WHO Life Chart Schedule (LCS) extended version (Sartorius *et al.*, 1996).

Clinical outcomes

Remission was defined as an absence of overt psychotic symptoms for ⩾6 months similar to earlier work conducted in the same geographical region (Morgan *et al.*, 2014; Revier *et al.*, 2015) and in line with Operational Criteria (Andreasen *et al.*, 2005) using information extracted from clinical records. This measure of remission was neither dependent on absence of non-psychotic symptoms (e.g. depressed mood, neurotic manifestations), nor on whether patients were receiving treatment with antipsychotic medications during remission.

Service use

Utilising the LCS extended version (Sartorius *et al.*, 1996) and excluding hospital admission on first contact with mental health services for psychosis, we extracted detailed information on circumstances of each re-admission including all compulsory admissions (i.e. admissions exercised under MHA legislation) and instances when police was involved at the time of, or shortly before, hospital admissions throughout the 4-year follow-up period. Compulsory admission under the MHA has been previously used for analysing pathways of care in similar samples of the area of South London (Davies *et al.*, 1996; Morgan *et al.*, 2005*b*); and more recently instances of police involvement has been also applied to measure pattern of care in this same sample (Ajnakina *et al.*, 2017). Using the admission and discharge dates for each re-admission, we calculated the total length of inpatient stays in psychiatric wards during the entire follow-up period.

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

Analyses

All analyses were conducted in STATA release 14 (STATACorp, 2015).

Descriptive statistics

The basic characteristics of the sample including sociodemographics (gender, age, ethnicity and educational level) and clinical information (DUP, diagnosis and length of follow-up) were described using frequencies, percentages, mean and standard deviations (S.D.), median and interquartile ranges (IQRs). The comparisons between FEP groups based on the presence or not of the bias were made using χ^2, Student's t test or Wilcoxon–Mann–Whitney tests when appropriate. Normality of all variables was assessed computing Shapiro–Wilk normality test. For the investigation of cross-sectional relationships at follow-up between JTC and clinical outcome, we ran Wilcoxon–Mann–Whitney tests for 'days of hospitalization' as it is not normally distributed, and χ^2 for the three dichotomous categorical variables: MHA intervention, police intervention and remission (yes/no). Effect sizes were calculated for all the statistical tests using Cohen's d for t test and Cramer's v. (Φc) for χ^2. When Mann–Whitney test is used, effect sizes from z values were calculated.

Confirmatory factor analysis

The detailed description of methods employed to conduct CFA using this sample is available in Ajnakina *et al.* (2016). Briefly, CFA was conducted to evaluate the statistical fit (Stefanovics *et al.*, 2014) of the Wallwork/Fortgang five-factor model of psychosis (Wallwork *et al.*, 2012) in this sample. This model includes positive (P1, P3, P5, G9), negative (N1, N2, N3, N4, N6 and G7), excited (P4, P7, G8 and G14), disorganized/concrete (P2, N5, G11) and depressed (G2, G3, G6) factors; which were used as confounders for regression analyses.

Association analysis

The main hypothesis was tested by four regressions with the dichotomous rating of JTC as the dependant variable (JTC = 1; no JTC = 0): A negative binomial regression for the not normally distributed count-dependent variable 'days of hospitalization' as it was over dispersed; and logistic regression analyses for the binary variables (clinical remission, MHA intervention and police intervention). These regressions were calculated both unadjusted and adjusted for age, gender, ethnicity, IQ, symptom dimensions and functional level measured by GAF. In the regression model for predicting days of admission, we performed further adjustment of the model including the dichotomy variables of MHA and police intervention, as they both could be confounders for longer admission.

Results

Follow-up was successfully completed for 82.9% ($n = 102$) of baseline patients, with a total of 17.1% lost ($n = 21$). Of those 21, two (1.6%) had died, six (4.9%) had emigrated, four (3.3%) were excluded as we did not have available information on follow-up and in nine (7.3%) the attempt at contact was unsuccessful. When comparing baseline sociodemographic characteristics of those subjects lost at follow-up with those included, we did not find any significant difference in age, gender, educational level, ethnicity nor diagnosis (please refer to the online Supplementary Table S2). Nonetheless, we found significant differences in baseline symptomatology, with more severe symptoms in the lost subjects compared with those who completed follow-up [positive subscale of PANSS 16.6 *v.* 13.52, respectively; $t_{(113)} = 0.21$, $p = 0.03$; GAF symptom subscale 42.22 *v.* 52.8, respectively, $t_{(105)} = 2.11$, $p = 0.04$]. Hence, it is not possible to reject the possibility of attrition bias.

Table 1. Sociodemographic and clinical characteristics of the entire sample ($n = 123$)

Baseline characteristics	*N* (%)
Gender	
Male	75 (61.0)
Female	48 (39.0)
Age (years), mean (S.D.)	29.5 (10.03)
DUP (weeks), mean (S.D.)	42.88 (133.94)
FU (years), median (IQR)	4 (3–5)
Ethnicity	
By self-report	
White	46 (37.4)
Black	52 (42.3)
Other	25 (20.3)
Diagnosis according to ICD-10 and DSM-IV (OPCRIT)	
Schizophrenia spectrum	92 (74.8)
Affective psychosis	31 (25.5)
Education level	
No qualification	21 (17.7)
School education	40 (33.6)
Tertiary education	58 (48.7)

S.D., standard deviation; IQR, interquartile range; DUP, duration of untreated psychosis; FU, follow-up.

Patient characteristics at baseline

Sociodemographic and clinical information of the baseline sample is shown in Table 1. The mean age at first contact was 29.4 years (S.D. = 10.03); $n = 75$ (61%) of the sample were men, 38% were of white ethnicity and $n = 58$ (49%) had tertiary education. Of the total 123 patients, $n = 63$ (51.2%) had shown JTC and $n = 92$ (74.8%) had received a diagnosis of a schizophrenia-spectrum disorder.

Table 2 shows the comparison of baseline sociodemographic and clinical characteristics between patients with and without JTC bias (JTC/no JTC groups). We found no statistically significant differences in age, gender, DUP, follow-up time, ethnicity or educational level. In terms of lifetime substance use, there were no statistically significant differences regarding consumption of cannabis by JTC. As far as social functioning is concerned, no difference was found in employment or marital status according to JTC, but there was a significant difference in living arrangements, with a higher proportion of non-independent living in those presenting the bias [46.8% *v.* 27.1%; $\chi^2_{(1)} = 5$, $p = 0.03$].

The baseline clinical status characteristics are presented in Table 3. There was no statistically significant difference in diagnosis between JTC groups ($p = 0.72$). To our surprise, we did not find significant differences in scores on the Positive Symptoms

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

Table 2. Description and comparison of sociodemographic at baseline of patients with and without JTC bias

	Number (%)		Statistics		
Descriptive at baseline	No JTC $n = 60$ (48.7%)	JTC $n = 63$ (51.2%)	Tests (df)	Effect size (95% CI)	p value
Gender			$\chi^2_{(1)} = 1.76$	$V = -0.12$	0.19
Male	33 (55.0)	42 (66.7)			
Female	27 (45.0)	21 (33.3)			
Age (years), mean (s.d.)	29.02 (9.64)	29.89 (10.45)	$t_{(121)} = -0.48$	$d = -0.09$ (−0.44 to 0.26)	0.63
DUP (weeks), mean (s.d.)	13.98 (6.51)	5.36 (1.98)	$t_{(81)} = 1.28$	$d = 0.28$ (−0.15 to 0.71)	0.21
FU (years), median (IQR)	4.1 (3–5)	3.94 (3–5)	$t_{(100)} = 0.76$	$d = 0.15$ (−0.23 to 0.54)	0.45
Ethnicity					
By self-report			$\chi^2_{(2)} = 2.67$	$V = 0.15$ (0.13–0.33)	0.26
White	26 (43.3)	20 (31.7)			
Black	21 (35.0)	31 (49.2)			
Other	13 (21.7)	12 (19.1)			
Substance use					
Cannabis			$\chi^2_{(1)} = 1.15$	$V = -0.1$ (−0.09 to 0.28)	0.28
No	13 (21.7)	19 (30.2)			
Yes	47 (78.3)	44 (69.8)			
Alcohol			$\chi^2_{(1)} = 0.3$	$V = -0.05$ (−0.09 to 0.24)	0.56
No	8 (14.6)	11 (18.3)			
Yes	47 (85.4)	49 (81.7)			
Other drugs			$\chi^2_{(1)} = 0.12$	$V = -0.03$ (−0.09 to 0.22)	0.73
No	29 (52.7)	33 (55.9)			
Yes	26 (47.3)	26 (44.1)			
Education level			$\chi^2_{(2)} = 0.42$	$V = 0.06$ (−0.13 to 0.23)	0.81
No qualification	10 (16.7)	11 (18.6)			
School education	19 (31.7)	21 (35.6)			
Tertiary education	31 (51.6)	27 (45.8)			
Employment status			$\chi^2_{(1)} = <0.01$	$V = -0.001$ (−0.09 to 0.09)	0.99
Employed	15 (26.3)	16 (26.2)			
Unemployed	42 (73.7)	45 (73.7)			
Marital status			$\chi^2_{(1)} = 0.03$	$V = 0.02$ (−0.09 to 0.19)	0.87
Steady relationship	16 (27.6)	32 (26.2)			
No relationship	42 (72.4)	87 (73.7)			
Living arrangements			**$\chi^2_{(1)} = 5$**	$V = 0.2$ (0.09 to 0.39)	**0.03**
Independent living	43 (72.9)	33 (53.2)			
No independent living	16 (27.1)	29 (46.8)			

JTC, jumping to conclusions; s.d., standard deviation; IQR, interquartile range; df, degrees of freedom; FU, follow-up. Bold highlights statistically significant values at $p < 0.05$.

subscale of the PANSS (14.78 ± 6.11 *v.* 13.27 ± 5.38; $p = 0.22$). We found significant differences in IQ (mean of 85.95 ± 14.31 for those presenting JTC and 94.96 ± 13.94 for those without the bias; $d = 0.64$ $p = 0.001$). Functionality measured by the GAF scale was worse in patients with JTC (mean of 55.38 ± 16.7) than the patients without it (mean of 61.92 ± 16.63; $t = 2.02$; $d = 0.39$; $p = 0.05$).

Clinical presentation over the follow-up period

The comparison of clinical outcome domains during follow-up is presented in Table 4. Fifty-eight per cent ($n = 29$ of 50) of the individuals with the bias and 64% ($n = 31$ of 48) of those without JTC achieved remission criteria in the long term; this difference was not statistically significant ($\chi^2 = 0.45$, df = 1, $p = 0.5$).

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

Table 3. Description and comparison of clinical and functional state at baseline of patients with and without JTC bias

	N (%)/mean (s.d.)/median (IQR)		Statistics		
Clinical at baseline	No JTC $n = 60$ (49%)	JTC $n = 63$ (51%)	Tests (df)	Effect size (95% CI)	p value
DUP (weeks), mean (s.d.)	13.98 (6.51)	5.36 (1.98)	$t_{(81)} = 1.28$	$d = 0.28$ (−0.15 to 0.71)	0.21
Diagnosis according to ICD-10 and DSM-IV (OPCRIT)			$\chi^2_{(1)} = 0.13$	$V = -0.03$ (−0.09 to 0.22)	0.72
Schizophrenia spectrum	44 (73.3)	48 (76.2)			
Affective psychosis	16 (26.7)χ^2	15 (23.8)			
PANSS					
Positive Scale, mean (s.d.)	13.27 (5.38)	14.78 (6.11)	$z = -1.24$	$r = -0.12$	0.22
Negative Scale, mean (s.d.)	14.45 (5.83)	15.78 (6.32)	$z = -1.07$	$r = -0.10$	0.29
General, mean (s.d.)	29.07 (7.4)	29.19 (6.68)	$z = -0.01$	$r = -0.0002$	0.99
IQ, mean (s.d.)	94.96 (13.94)	85.95 (14.31)	**$t = 3.33$**	$d = 0.64$ (0.25–1.02)	**0.001**
GAF symptoms, mean (s.d.)	53.24 (20.67)	48.96 (18.97)	$z = 1.3$	$r = 0.13$	0.19
GAF disability, mean (s.d.)	61.92 (16.63)	55.38 (16.7)	**$t_{(104)} = 2.02$**	$d = 0.39$ (0.01–0.78)	**0.046**
CGI, mean (s.d.)	2.9 (1.46)	3.5 (1.31)	**$t_{(106)} = -2.24$**	$d = -0.43$ (−0.81 to −0.05)	**0.03**

JTC, jumping to conclusions; s.d., standard deviation; IQR, interquartile range; df, degrees of freedom; DUP, duration of untreated psychosis; PANSS, Positive and Negative Symptoms Scale; GAF, Global Assessment of Functioning; CGI, clinical global impressions. Bold highlights statistically significant values at $p < 0.05$.

Table 4. Comparison of clinical outcome during follow-up of patients with and without JTC

	Median (IQR)/N (%)		Statistics		
Clinical outcome	No JTC $n = 60$ (49%)	JTC $n = 63$ (51%)	Tests (df)	Effect size (95%CI)	p value
Days of hospitalization	15.5 (0–93.5)	56 (20–158)	**$z = -2.08$**	$r = -0.20$	**0.04**
Remission			$\chi^2_{(1)} = 0.45$	$V = -0.07$ (−0.1 to 0.28)	0.5
Yes	31 (64.6)	29 (58.0)			
No	17 (35.4)	21 (42.0)			
Mental health act			**$\chi^2_{(1)} = 6.24$**	$V = 0.29$ (0.13–0.52)	**0.01**
Yes	13 (37.1)	27 (65.8)			
No	22 (62.9)	14 (34.1)			
Police intervention			$\chi^2_{(1)} = 3.62$	$V = 0.22$ (0.11–0.46)	0.06
Yes	12 (34.3)	23 (56.1)			
No	23 (65.7)	18 (43.9)			

JTC, jumping to conclusions; IQR, interquartile range; df, degrees of freedom. Bold highlights statistically significant values at $p < 0.05$.

Service use over the follow-up period

The comparison of service use variables during follow-up are also presented in Table 4.

In the follow-up period, on average, patients presenting JTC had more inpatient days (median = 56, IQR = 20–158), than those without the bias (median = 15.5, IQR = 0–93.5; $U = -2.08$, $p = 0.04$). A higher proportion of patients with the JTC bias ($N = 27$, 65.8%) were detained under the MHA than those without JTC [$N = 13$, 37.1%; $\chi^2_{(1)} = 6.24$; $p = 0.01$]. The percentage subject to police involvement in compulsory admission during follow-up shows a tendency to be higher in the patients with JTC [$N = 23$ (56.1%) out of 41] than in those without the bias [12 (34.3%) out of 35], but this did not reach significance [$\chi^2_{(1)} = 3.62$; $p = 0.06$].

Predicting effects of JTC on long-term clinical outcome

Predictor effects of JTC on long-term clinical outcome are presented in Table 5.

Regression analyses showed that the presence of JTC predicted more inpatient days [IRR = 2.18, 95% confidence interval (CI) 1.01–4.72, $p = 0.05$] and more proneness to intervention under the mental health act (OR 5.9, 95% CI 2.04–17.05, $p = 0.001$) and by the police (OR 4.18, 95% CI 1.46–11.98, $p = 0.008$) in the moment of admission. After adjusting for age, gender, ethnicity, IQ and symptoms and disability measured by GAF, the effect remained significant for days of hospitalization (adjusted IRR = 5.03, 95% CI 1.91–13.24, $p = 0.001$), use of the MHA (adjusted OR 15.62, 95% CI 2.92–83.54, $p = 0.001$) and police involvement (adjusted OR 14.95, 95% CI

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

Table 5. Predicting effects of JTC on long-term clinical outcome

Clinical outcome	IRR/OR (95% CI) Unadjusted	Pseudo R^2/Tjur R^2	Adjusted[a]	Pseudo R^2/Tjur R^2
Days of hospitalization	**2.18*** (1.02–4.65)	0.05	**5.03*** (1.91–13.24)[b]	0.04
IRR (95% CI)			0.47 (0.12–1.88)	
Remission (yes:no)	0.74 (0.29–1.86)	0.027		0.155
OR (95% CI)			**15.62*** (2.92–83.54)	
Mental Health Act (yes:no)	**5.9**** (2.04–17.05)	0.173		0.424
OR (95% CI)			**14.95*** (2.68–83.34)	
Police intervention (yes:no)	**4.18*** (1.46–11.98)	0.152		0.429
OR (95% CI)				

JTC, jumping to conclusions; IRR, incident rate ratio; OR, odds ratio; CI, confident interval. Bold highlights statistically significant values
*$p < 0.05$ **$p < 0.001$.
[a]Adjusted for age, gender, ethnicity, IQ, symptom dimensions and GAF disability.
[b]Mental health act and police intervention was also added as confounders for days of admission.

2.68–83.34, $p = 0.002$). There was no predictive effect on remission.

Additionally, all the OR with 95% CIs and p values for all covariates of four full regression models are presented in the online Supplementary Table S3.

Discussion

The presence of JTC at baseline was associated with subsequent greater risk of compulsory admissions under the MHA and higher risk of police intervention at follow-up, confirming our preliminary hypothesis. Why that should be is as yet unclear. One possible explanation is that JTC is related to behaviours such as impulsivity, beyond general cognitive and executive impairments, although evidence for this association has not been demonstrated conclusively (Moritz and Woodward, 2005; Rubio *et al.*, 2011; Lunt *et al.*, 2012); however, the studies claiming to look at this association have not employed a specific measure of impulsivity.

Another possible explanation for our findings could be a relationship between data-gathering bias and risk of aggressive behaviour or violence. The link between schizophrenia and violence has been previously studied (Fazel *et al.*, 2009), but it has been challenging to identify the processes underlying this association. Despite discrepancies in the literature, neurocognition seems to be one of the core risk factors for violence, mediated by several proximal and more direct risk factors (O'Reilly *et al.*, 2015). In addition, it has been shown that positive psychotic symptoms, including persecutory ideation, increase the risk of minor and serious violence (Swanson *et al.*, 2006). Given the relationship between JTC and the proneness and maintenance of delusion ideation, this could also explain part of the association of JTC and the higher need for police and MHA interventions in the moment of admission.

One mediating factor may be insight. Preliminary work on this cohort showed that JTC bias and cognition were each associated with poorer recognition of illness (Wiffen *et al.*, 2010). Furthermore, the relationship between JTC and insight has been explored in schizophrenia patients in forensic settings and it was found a direct correlation between the information patients consider in making decisions and their clinical insight (Kuokkanen *et al.*, 2016). Given that poor clinical insight was found to be a risk factor for violence, and following the same rationale (Alia-Klein *et al.*, 2007), lack of insight could be a possible additional explanation for the need of police intervention in those presenting hasty-decision style; and indeed poor insight is strongly associated with involuntary treatment in hospital (David *et al.*, 1992). Thus, insight could have had an impact in the association between JTC and the intervention of police and MHA, so further studies focusing on the relationship between JTC and insight should be encouraged. Nonetheless, the interpretation of the need for police intervention as a proxy for social or behavioural disruption should be cautious. Previous work from the same area found that the higher police involvement at the time of admission in the African Caribbean group was explained by the greater likelihood of such families to seek help from police themselves in these situations than white British families (Morgan *et al.*, 2005*b*).

The other effect predicted by JTC was number of days of hospitalization. This outcome is one of the most employed markers of service use in order to study the clinical course of psychosis (Johnstone *et al.*, 1990; Geddes *et al.*, 1994; Takei *et al.*, 1998; Lehtinen *et al.*, 2000; Cahn *et al.*, 2002; Möller *et al.*, 2002; Thara, 2004; Nordentoft *et al.*, 2010; Heslin *et al.*, 2016). As JTC is thought to be critical in delusion formation by contributing to erroneous interferences (Garety *et al.*, 1991), it is reasonable to expect an effect on inpatient length of stay.

Contrary to our hypothesis, an association between JTC and remission rates at follow-up was not significant. As noted above, JTC is linked to with the persistence of delusion ideation (Falcone *et al.*, 2015*b*) and hence less improvement in delusions over time (So *et al.*, 2014). As our remission outcome was based on Remission in Schizophrenia Working Group (RSWG) (Andreasen *et al.*, 2005) which includes delusions, we expected that the presence of reasoning bias at baseline would have been inversely related to the achievement of remission at follow-up. One of the reasons for the lack of effect could have been a ceiling effect for our sample, as reported rates of RSWG remission range between 48% and 61% for first-episode patients (Lambert *et al.*, 2010); and in our patients, the percentages of remission were above that range.

The relationship between the presence of JTC and cognitive impairments has been widely studied in both schizophrenia patients and healthy participants, especially with working memory (Garety *et al.*, 2013), executive functions (Woodward *et al.*, 2009; Rubio *et al.*, 2011), verbal memory (Keefe *et al.*, 2005; Lee and

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

Park, 2005; Forbes *et al.*, 2009; Fatouros-Bergman *et al.*, 2014) and cognitive processing speed (Ochoa *et al.*, 2014). The potential effect of neurocognition on clinical outcome is well known (Lam *et al.*, 2014). In our study, we found a negative association between IQ and JTC, but the associations in the regression models remain statistically significant when IQ was added as a confounder in the adjusted model. Nonetheless, the evidence supporting the association between some neurocognitive domains and JTC talks in favour of encouraging new studies with bigger samples to include not only IQ but also other cognitive measures as confounder factors in the association of JTC and clinical outcome.

Our evidence that the presence of JTC appears to be linked to poor outcome variables makes it a potential target for therapies aiming to improve the prognosis of the illness. There is a body of literature showing that changes in JTC are directly linked with changes in symptomatology (Dudley *et al.*, 2013; Sanford *et al.*, 2013; Garety *et al.*, 2015). Furthermore, psychotherapeutic interventions have been developed for overcoming biases in metacognition, including JTC, which have been proven to be effective in reducing the tendency to make hasty decisions and in improving outcome for people with psychosis, such as the Maudsley Review Training Programme (Waller *et al.*, 2011), Metacognitive Training (MCT) (Moritz *et al.*, 2014*a*, 2014*b*) and Social Cognition and Interaction Training (SCIT) (Roberts *et al.*, 2014). Our study raises the question of whether the implementation of these specific interventions to reduce JTC may be a useful addition in early psychosis intervention programmes.

Limitations and strengths

Among the main limitations in our study are the lack of inclusion of more neurocognitive measures and the small sample size, which limited the inclusion of more confounders in the regression models. Nonetheless, a general IQ measure was used as confounder. Another limitation is the lack of information regarding co-morbid diagnosis at baseline and follow-up that may have had an impact in clinical outcome. A potential methodological limitation is the information bias arising from loss and missing data at follow-up. Although we completed follow-up for 82.9% of patients, we found statistically significant differences in symptomatology between those who completed the follow-up and those who were lost. Specifically, those lost participants had higher scores in the subscale of positive symptoms of PANSS. Our findings may therefore not be generalizable to the more severely affected patients. Lastly, it should be noted that by only performing one trial per version, as widely used in JTC Beads Tasks, may allow results to be affected by miscomprehension (Balzan *et al.*, 2012), with a tendency to overestimate the presence of JTC.

On the other hand, one of the strengths of our study is the inclusion in the regression analyses of ethnicity and other important socio-demographic confounders. It has been shown in previous works with a sample from the same area that there exists a higher risk of compulsory admission and longer admission among African–Caribbean and black African patients (Morgan *et al.*, 2005*a*; Ajnakina *et al.*, 2017), but a strong association between JTC and compulsory admission remained in our study after adjusting by ethnicity.

Conclusions

JTC is a data-gathering bias that has been consistently proved to be associated with psychotic patients. Our study found that its presence at FEP is associated with worse clinical outcome, reflected by more days of admissions, greater need for compulsory hospitalization and police intervention. This raises the question of whether more efforts should be devoted to developing and applying therapies focusing on JTC as possible target.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0033291718003197.

Acknowledgements. This study represents independent research funded by the National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) at South London and Maudsley NHS Foundation Trust and King's College London.

References

Aghotor J, Pfueller U, Moritz S, Weisbrod M and Roesch-Ely D (2010) Metacognitive training for patients with schizophrenia (MCT): feasibility and preliminary evidence for its efficacy. *Journal of Behavior Therapy and Experimental Psychiatry* **41**, 207–211.

Ajnakina O, Trotta A, Oakley-Hannibal E, Di Forti M, Stilo SA, Kolliakou A, Gardner-Sood P, Gaughran F, David AS, Dazzan P, Pariante C, Mondelli V, Morgan C, Vassos E, Murray RM and Fisher HL (2016) Impact of childhood adversities on specific symptom dimensions in first-episode psychosis. *Psychological Medicine* **46**, 317–326.

Ajnakina O, Lally J, Di Forti M, Kolliakou A, Gardner-Sood P, Lopez-Morinigo J, Dazzan P, Pariante CM, Mondelli V, MacCabe J, David AS, Gaughran F, Murray RM and Vassos E (2017) Patterns of illness and care over the 5 years following onset of psychosis in different ethnic groups; the GAP-5 study. *Social Psychiatry and Psychiatric Epidemiology* **52**, 1101–1111.

Alia-Klein N, O'Rourke TM, Goldstein RZ and Malaspina D (2007) Insight into illness and adherence to psychotropic medications are separately associated with violence severity in a forensic sample. *Aggressive Behavior* **33**, 86–96.

American Psychiatric Association (2000) *Diagnostic and Statistical Manual of Mental Disorders: DSM-IV*, 4th Edn. Washington, DC: American Psychiatric Publishing.

Andreasen NC, Carpenter WT, Kane JM, Lasser RA, Marder SR and Weinberger DR (2005) Remission in schizophrenia: proposed criteria and rationale for consensus. *American Journal of Psychiatry* **162**, 441–449.

Andreou C, Treszl A, Roesch-Ely D, Köther U, Veckenstedt R and Moritz S (2014) Investigation of the role of the jumping-to-conclusions bias for short-term functional outcome in schizophrenia. *Psychiatry Research* **218**, 341–347.

Andreou C, Schneider BC, Balzan R, Luedecke D, Roesch-Ely D and Moritz S (2015) Neurocognitive deficits are relevant for the jumping-to-conclusions bias, but not for delusions: a longitudinal study. *Schizophrenia Research. Cognition* **2**, 8–11.

Balzan RP, Delfabbro PH, Galletly CA and Woodward TS (2012) Over-adjustment or miscomprehension? A re-examination of the jumping to conclusions bias. *Australian & New Zealand Journal of Psychiatry* **46**, 532–540.

Breier A, Schreiber JL, Dyer J and Pickar D (1991) National Institute of Mental Health longitudinal study of chronic schizophrenia. Prognosis and predictors of outcome. *Archives of General Psychiatry* **48**, 239–246.

Cahn W, Hulshoff Pol HE, Lems EBTE, van Haren NEM, Schnack HG, van der Linden JA, Schothorst PF, van Engeland H and Kahn RS (2002) Brain volume changes in first-episode schizophrenia: a 1-year follow-up study. *Archives of General Psychiatry* **59**, 1002–1010.

Couture SM, Penn DL and Roberts DL (2006) The functional significance of social cognition in schizophrenia: a review. *Schizophrenia Bulletin* **32**, S44–S63.

David A, Buchanan A, Reed A and Almeida O (1992) The assessment of insight in psychosis. *The British Journal of Psychiatry* **161**, 599–602.

Davies S, Thornicroft G, Leese M, Higgingbotham A and Phelan M (1996) Ethnic differences in risk of compulsory psychiatric admission among

representative cases of psychosis in London. *British Medical Journal (Clinical Research Ed.)* **312**, 533–537.

Di Forti M, Morgan C, Dazzan P, Pariante C, Mondelli V, Marques TR, Handley R, Luzi S, Russo M, Paparelli A, Butt A, Stilo SA, Wiffen B, Powell J and Murray RM (2009) High-potency cannabis and the risk of psychosis. *The British Journal of Psychiatry* **195**, 488–491.

Di Forti M, Marconi A, Carra E, Fraietta S, Trotta A, Bonomo M, Bianconi F, Gardner-Sood P, O'Connor J, Russo M, Stilo SA, Marques TR, Mondelli V, Dazzan P, Pariante C, David AS, Gaughran F, Atakan Z, Iyegbe C, Powell J, Morgan C, Lynskey M and Murray RM (2015) Proportion of patients in south London with first-episode psychosis attributable to use of high potency cannabis: a case-control study. *The Lancet. Psychiatry* **2**, 233–238.

Dudley R, Daley K, Nicholson M, Shaftoe D, Spencer H, Cavanagh K and Freeston M (2013) 'Jumping to conclusions' in first-episode psychosis: a longitudinal study. *British Journal of Clinical Psychology* **52**, 380–393.

Dudley R, Taylor P, Wickham S and Hutton P (2016) Psychosis, delusions and the 'jumping to conclusions' reasoning bias: a systematic review and meta-analysis. *Schizophrenia Bulletin* **42**, 652–665.

Endicott J, Spitzer RL, Fleiss JL and Cohen J (1976) The global assessment scale. A procedure for measuring overall severity of psychiatric disturbance. *Archives of General Psychiatry* **33**, 766–771.

Faber G, Smid HGOM, Van Gool AR, Wunderink L, Wiersma D and van den Bosch RJ (2011) Neurocognition and recovery in first episode psychosis. *Psychiatry Research* **188**, 1–6.

Falcone MA, Murray RM, Wiffen BDR, O'Connor JA, Russo M, Kolliakou A, Stilo S, Taylor H, Gardner-Sood P, Paparelli A, Jichi F, Di Forti M, David AS, Freeman D and Jolley S (2015*a*) Jumping to conclusions, neuropsychological functioning, and delusional beliefs in first episode psychosis. *Schizophrenia Bulletin* **41**, 411–418.

Falcone MA, Murray RM, O'Connor JA, Hockey LN, Gardner-Sood P, Di Forti M, Freeman D and Jolley S (2015*b*) Jumping to conclusions and the persistence of delusional beliefs in first episode psychosis. *Schizophrenia Research* **165**, 243–246.

Fatouros-Bergman H, Cervenka S, Flyckt L, Edman G and Farde L (2014) Meta-analysis of cognitive performance in drug-naïve patients with schizophrenia. *Schizophrenia Research* **158**, 156–162.

Favrod J, Rexhaj S, Bardy S, Ferrari P, Hayoz C, Moritz S, Conus P and Bonsack C (2014) Sustained antipsychotic effect of metacognitive training in psychosis: a randomized-controlled study. *European Psychiatry* **29**, 275–281.

Fazel S, Gulati G, Linsell L, Geddes JR and Grann M (2009) Schizophrenia and violence: systematic review and meta-analysis. *PLoS Medicine* **6**, e1000120.

Fett A-KJ, Viechtbauer W, Dominguez M-G, Penn DL, van Os J and Krabbendam L (2011) The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: a meta-analysis. *Neuroscience and Biobehavioral Reviews* **35**, 573–588.

Forbes NF, Carrick LA, McIntosh AM and Lawrie SM (2009) Working memory in schizophrenia: a meta-analysis. *Psychological Medicine* **39**, 889–905.

Freeman D and Garety P (2014) Advances in understanding and treating persecutory delusions: a review. *Social Psychiatry and Psychiatric Epidemiology* **49**, 1179–1189.

Freeman D, Pugh K and Garety P (2008) Jumping to conclusions and paranoid ideation in the general population. *Schizophrenia Research* **102**, 254–260.

Friis S, Melle I, Johannessen JO, Røssberg JI, Barder HE, Evensen JH, Haahr U, Ten Velden Hegelstad W, Joa I, Langeveld J, Larsen TK, Opjordsmoen S, Rund BR, Simonsen E, Vaglum PW and McGlashan TH (2016) Early predictors of ten-year course in first-episode psychosis. *Psychiatric Services (Washington, DC)* **67**, 438–443.

Garety PA and Freeman D (1999) Cognitive approaches to delusions: a critical review of theories and evidence. *The British Journal of Clinical Psychology* **38**, 113–154.

Garety PA, Hemsley DR and Wessely S (1991) Reasoning in deluded schizophrenic and paranoid patients. Biases in performance on a probabilistic inference task. *The Journal of Nervous and Mental Disease* **179**, 194–201.

Garety PA, Kuipers E, Fowler D, Freeman D and Bebbington PE (2001) A cognitive model of the positive symptoms of psychosis. *Psychological Medicine* **31**, 189–195.

Garety PA, Freeman D, Jolley S, Dunn G, Bebbington PE, Fowler DG, Kuipers E and Dudley R (2005) Reasoning, emotions, and delusional conviction in psychosis. *Journal of Abnormal Psychology* **114**, 373–384.

Garety PA, Gittins M, Jolley S, Bebbington P, Dunn G, Kuipers E, Fowler D and Freeman D (2013) Differences in cognitive and emotional processes between persecutory and grandiose delusions. *Schizophrenia Bulletin* **39**, 629–639.

Garety P, Waller H, Emsley R, Jolley S, Kuipers E, Bebbington P, Dunn G, Fowler D, Hardy A and Freeman D (2015) Cognitive mechanisms of change in delusions: an experimental investigation targeting reasoning to effect change in paranoia. *Schizophrenia Bulletin* **41**, 400–410.

Geddes J, Mercer G, Frith CD, MacMillan F, Owens DG and Johnstone EC (1994) Prediction of outcome following a first episode of schizophrenia. A follow-up study of Northwick Park first episode study subjects. *The British Journal of Psychiatry* **165**, 664–668.

González LE, López-Carrilero R, Barrigón ML, Grasa E, Barajas A, Pousa E, González-Higueras F, Ruiz-Delgado I, Cid J, Lorente-Rovira E, Pélaez T, Ochoa S and Ochoa S (2017) Neuropsychological functioning and jumping to conclusions in recent onset psychosis patients. *Schizophrenia Research* **195**, 366–371.

Green MF, Kern RS, Braff DL and Mintz J (2000) Neurocognitive deficits and functional outcome in schizophrenia: are we measuring the 'right stuff'? *Schizophrenia Bulletin* **26**, 119–136.

Guy W (1976) *ECDEU Assessment Manual for Psychopharmacology*. Rockville, MD: US Department of Health, and Welfare, 534–537

Heslin M, Lappin JM, Donoghue K, Lomas B, Reininghaus U, Onyejiaka A, Croudace T, Jones PB, Murray RM, Fearon P, Doody GA, Dazzan P, Craig TJ and Morgan C (2016) Ten-year outcomes in first episode psychotic major depression patients compared with schizophrenia and bipolar patients. *Schizophrenia Research* **176**, 417–422.

Ho B-C, Nopoulos P, Flaum M, Arndt S and Andreasen NC (1998) Two-year outcome in first-episode schizophrenia: predictive value of symptoms for quality of life. *American Journal of Psychiatry* **155**, 1196–1201.

Hopper K, Harrison G, Janca A and Sartorius N (2007) *Recovery from Schizophrenia an International Perspective*. New York, NY: Oxford University Press.

Johnstone EC, Macmillan JF, Frith CD, Benn DK and Crow TJ (1990) Further investigation of the predictors of outcome following first schizophrenic episodes. *The British Journal of Psychiatry* **157**, 182–189.

Jolley S, Thompson C, Hurley J, Medin E, Butler L, Bebbington P, Dunn G, Freeman D, Fowler D, Kuipers E and Garety P (2014) Jumping to the wrong conclusions? An investigation of the mechanisms of reasoning errors in delusions. *Psychiatry Research* **219**, 275–282.

Juola P, Miettunen J, Veijola J, Isohanni M and Jääskeläinen E (2013) Predictors of short- and long-term clinical outcome in schizophrenic psychosis – the Northern Finland 1966 Birth Cohort study. *European Psychiatry* **28**, 263–268.

Kay SR, Fiszbein A and Opler LA (1987) The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin* **13**, 261–276.

Keefe RSE, Eesley CE and Poe MP (2005) Defining a cognitive function decrement in schizophrenia. *Biological Psychiatry* **57**, 688–691.

Kuokkanen R, Lappalainen R, Repo-Tiihonen E, Tiihonen J and Aho-Mustonen K (2016) Cognitive insight, clinical insight, and reasoning in schizophrenia: a pilot study in a forensic setting. *Journal of Forensic Psychology Practice* **16**, 253–267.

Lam BYH, Raine A and Lee TMC (2014) The relationship between neurocognition and symptomatology in people with schizophrenia: social cognition as the mediator. *BMC Psychiatry* **14**, 138.

Lambert M, Karow A, Leucht S, Schimmelmann BG and Naber D (2010) Remission in schizophrenia: validity, frequency, predictors, and patients' perspective 5 years later. *Dialogues in Clinical Neuroscience* **12**, 393–407.

Langeveld J, Andreassen OA, Auestad B, Faerden A, Hauge LJ, Joa I, Johannessen JO, Melle I, Rund BR, Røssberg JI, Simonsen E, Vaglum P and Larsen TK (2013) Is there an optimal factor structure of

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press

the Positive and Negative Syndrome Scale in patients with first-episode psychosis? *Scandinavian Journal of Psychology* **54**, 160–165.

Lee J and Park S (2005) Working memory impairments in schizophrenia: a meta-analysis. *Journal of Abnormal Psychology* **114**, 599–611.

Lehtinen V, Aaltonen J, Koffert T, Räkköläinen V and Syvälahti E (2000) Two-year outcome in first-episode psychosis treated according to an integrated model. Is immediate neuroleptisation always needed? *European Psychiatry* **15**, 312–320.

Lipkovich IA, Deberdt W, Csernansky JG, Sabbe B, Keefe RS and Kollack-Walker S (2009) Relationships among neurocognition, symptoms and functioning in patients with schizophrenia: a path-analytic approach for associations at baseline and following 24 weeks of antipsychotic drug therapy. *BMC Psychiatry* **9**, 44.

Lunt L, Bramham J, Morris RG, Bullock PR, Selway RP, Xenitidis K and David AS (2012) Prefrontal cortex dysfunction and 'Jumping to Conclusions': bias or deficit? *Journal of Neuropsychology* **6**, 65–78.

Lysaker PH, Carcione A, Dimaggio G, Johannesen JK, Nicolo G, Procacci M and Semerari A (2005) Metacognition amidst narratives of self and illness in schizophrenia: associations with neurocognition, symptoms, insight and quality of life. *Acta Psychiatrica Scandinavica* **112**, 64–71.

Lysaker PH, Gumley A, Luedtke B, Buck KD, Ringer JM, Olesek K, Kukla M, Leonhardt BL, Popolo R and Dimaggio G (2013) Social cognition and metacognition in schizophrenia: evidence of their independence and linkage with outcomes. *Acta Psychiatrica Scandinavica* **127**, 239–247.

Mallett R, Leff J, Bhugra D, Pang D and Zhao JH (2002) Social environment, ethnicity and schizophrenia. *Social Psychiatry and Psychiatric Epidemiology* **37**, 329–335.

McGuffin P, Farmer A and Harvey I (1991) A polydiagnostic application of operational criteria in studies of psychotic illness. *Archives of General Psychiatry* **48**, 764.

McLean BF, Mattiske JK and Balzan RP (2016) Association of the jumping to conclusions and evidence integration biases with delusions in psychosis: a detailed meta-analysis. *Schizophrenia Bulletin* **43**, 344–354.

Möller H-J, Bottlender R, Gross A, Hoff P, Wittmann J, Wegner U and Strauss A (2002) The Kraepelinian dichotomy: preliminary results of a 15-year follow-up study on functional psychoses: focus on negative symptoms. *Schizophrenia Research* **56**, 87–94.

Morgan C, Lappin J, Heslin M, Donoghue K, Lomas B, Reininghaus U, Onyejiaka A, Croudace T, Jones PB, Murray RM, Fearon P, Doody GA and Dazzan P (2014) Reappraising the long-term course and outcome of psychotic disorders: the AESOP-10 study. *Psychological Medicine* **44**, 2713–2726.

Morgan C, Mallett R, Hutchinson G, Bagalkote H, Morgan K, Fearon P, Dazzan P, Boydell J, McKenzie K, Harrison G, Murray R, Jones P, Craig T, Leff J and AESOP Study Group (2005*a*) Pathways to care and ethnicity. 1: sample characteristics and compulsory admission. *British Journal of Psychiatry* **186**, 281–289.

Morgan C, Mallett R, Hutchinson G, Bagalkote H, Morgan K, Fearon P, Dazzan P, Boydell J, McKenzie K, Harrison G, Murray R, Jones P, Craig T, Leff J and AESOP Study Group (2005*b*) Pathways to care and ethnicity. 2: source of referral and help-seeking. *British Journal of Psychiatry* **186**, 290–296.

Moritz S and Woodward TS (2005) Jumping to conclusions in delusional and non-delusional schizophrenic patients. *The British Journal of Clinical Psychology* **44**, 193–207.

Moritz S and Woodward TS (2007) Metacognitive training in schizophrenia: from basic research to knowledge translation and intervention. *Current Opinion in Psychiatry* **20**, 619–625.

Moritz S, Kerstan A, Veckenstedt R, Randjbar S, Vitzthum F, Schmidt C, Heise M and Woodward TS (2011) Further evidence for the efficacy of a metacognitive group training in schizophrenia. *Behaviour Research and Therapy* **49**, 151–157.

Moritz S, Veckenstedt R, Bohn F, Hottenrott B, Scheu F, Randjbar S, Aghotor J, Köther U, Woodward TS, Treszl A, Andreou C, Pfueller U and Roesch-Ely D (2013) Complementary group Metacognitive Training (MCT) reduces delusional ideation in schizophrenia. *Schizophrenia Research* **151**, 61–69.

Moritz S, Andreou C, Schneider BC, Wittekind CE, Menon M, Balzan RP and Woodward TS (2014*a*) Sowing the seeds of doubt: a narrative review on metacognitive training in schizophrenia. *Clinical Psychology Review* **34**, 358–366.

Moritz S, Veckenstedt R, Andreou C, Bohn F, Hottenrott B, Leighton L, Köther U, Woodward TS, Treszl A, Menon M, Schneider BC, Pfueller U and Roesch-Ely D (2014*b*) Sustained and 'sleeper' effects of group metacognitive training for schizophrenia. *JAMA Psychiatry* **71**, 1103.

Mortimer A, McKay A, Quemada I, Clare L, Eastwood N and McKenna P (1996) Delusions in schizophrenia: a phenomenological and psychological exploration. *Cognitive Neuropsychiatry* **1**, 289–304.

Nordentoft M, Øhlenschlæger J, Thorup A, Petersen L, Jeppesen P and Bertelsen M (2010) Deinstitutionalization revisited: a 5-year follow-up of a randomized clinical trial of hospital-based rehabilitation versus specialized assertive intervention (OPUS) versus standard treatment for patients with first-episode schizophrenia spectrum disorder. *Psychological Medicine* **40**, 1619–1626.

Norman RM and Malla AK (2001) Duration of untreated psychosis: a critical examination of the concept and its importance. *Psychological Medicine* **31**, 381–400.

O'Reilly K, Donohoe G, Coyle C, O'Sullivan D, Rowe A, Losty M, McDonagh T, McGuinness L, Ennis Y, Watts E, Brennan L, Owens E, Davoren M, Mullaney R, Abidin Z and Kennedy HG (2015) Prospective cohort study of the relationship between neuro-cognition, social cognition and violence in forensic patients with schizophrenia and schizoaffective disorder. *BMC Psychiatry* **15**, 155.

Ochoa S, Haro JM, Huerta-Ramos E, Cuevas-Esteban J, Stephan-Otto C, Usall J, Nieto L and Brebion G (2014) Relation between jumping to conclusions and cognitive functioning in people with schizophrenia in contrast with healthy participants. *Schizophrenia Research* **159**, 211–217.

Pinkham AE (2014) Social cognition in schizophrenia. *The Journal of Clinical Psychiatry* **75**, 14–19.

Revier CJ, Reininghaus U, Dutta R, Fearon P, Murray RM, Doody GA, Croudace T, Dazzan P, Heslin M, Onyejiaka A, Kravariti E, Lappin J, Lomas B, Kirkbride JB, Donoghue K, Morgan C and Jones PB (2015) Ten-year outcomes of first-episode psychoses in the MRC ÆSOP-10 study. *The Journal of Nervous and Mental Disease* **203**, 379–386.

Roberts DL, Combs DR, Willoughby M, Mintz J, Gibson C, Rupp B and Penn DL (2014) A randomized, controlled trial of Social Cognition and Interaction Training (SCIT) for outpatients with schizophrenia spectrum disorders. *The British Journal of Clinical Psychology* **53**, 281–298.

Ross K, Freeman D, Dunn G and Garety P (2011) A randomized experimental investigation of reasoning training for people with delusions. *Schizophrenia Bulletin* **37**, 324–333.

Rubio JL, Ruiz-Veguilla M, Hernández L, Barrigón ML, Salcedo MD, Moreno JM, Gómez E, Moritz S and Ferrín M (2011) Jumping to conclusions in psychosis: a faulty appraisal. *Schizophrenia Research* **133**, 199–204.

Sanford N, Lecomte T, Leclerc C, Wykes T and Woodward TS (2013) Change in jumping to conclusions linked to change in delusions in early psychosis. *Schizophrenia Research* **147**, 207–208.

Sartorius N, Gulbinat W, Harrison G, Laska E and Siegel C (1996) Long-term follow-up of schizophrenia in 16 countries. A description of the International Study of Schizophrenia conducted by the World Health Organization. *Social Psychiatry and Psychiatric Epidemiology* **31**, 249–258.

So SH and Kwok NT (2015) Jumping to conclusions style along the continuum of delusions: delusion-prone individuals are not hastier in decision making than healthy individuals. *PLoS ONE Public Library of Science* **10**, e0121347.

So SH, Freeman D, Dunn G, Kapur S, Kuipers E, Bebbington P, Fowler D and Garety PA (2012) Jumping to conclusions, a lack of belief flexibility and delusional conviction in psychosis: a longitudinal investigation of the structure, frequency, and relatedness of reasoning biases. *Journal of Abnormal Psychology* **121**, 129–139.

So SH, Peters ER, Swendsen J, Garety PA and Kapur S (2014) Changes in delusions in the early phase of antipsychotic treatment – an experience sampling study. *Psychiatry Research* **215**, 568–573.

STATACorp (2015) Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.

Stefanovics EA, Elkis H, Zhening L, Zhang XY and Rosenheck RA (2014) A cross-national factor analytic comparison of three models of PANSS symptoms in schizophrenia. *Psychiatry Research* **219**, 283–289.

Swanson JW, Swartz MS, Van Dorn RA, Elbogen EB, Wagner HR, Rosenheck RA, Stroup TS, McEvoy JP and Lieberman JA (2006) A national study of violent behavior in persons with schizophrenia. *Archives of General Psychiatry* **63**, 490.

Takei N, Persaud R, Woodruff P, Brockington I and Murray RM (1998) First episodes of psychosis in Afro-Caribbean and White people. An 18-year follow-up population-based study. *The British Journal of Psychiatry* **172**, 147–153.

Thara R (2004) Twenty-year course of schizophrenia: the Madras Longitudinal Study. *Canadian Journal of Psychiatry. Revue Canadienne De Psychiatrie* **49**, 564–569.

Trotta A, Iyegbe C, Di Forti M, Sham PC, Campbell DD, Cherny SS, Mondelli V, Aitchison KJ, Murray RM, Vassos E and Fisher HL (2016) Interplay between schizophrenia polygenic risk score and childhood adversity in first-presentation psychotic disorder: a pilot study. *PLoS ONE* **11**, e0163319.

Van Dael F, Versmissen D, Janssen I, Myin-Germeys I, van Os J and Krabbendam L (2006) Data gathering: biased in psychosis? *Schizophrenia Bulletin* **32**, 341–351.

van Hooren S, Versmissen D, Janssen I, Myin-Germeys I, à Campo J, Mengelers R, van Os J and Krabbendam L (2008) Social cognition and neurocognition as independent domains in psychosis. *Schizophrenia Research* **103**, 257–265.

Waller H, Freeman D, Jolley S, Dunn G and Garety P (2011) Targeting reasoning biases in delusions: a pilot study of the Maudsley Review Training Programme for individuals with persistent, high conviction delusions. *Journal of Behavior Therapy and Experimental Psychiatry* **42**, 414–421.

Wallwork RS, Fortgang R, Hashimoto R, Weinberger DR and Dickinson D (2012) Searching for a consensus five-factor model of the Positive and Negative Syndrome Scale for schizophrenia. *Schizophrenia Research* **137**, 246–250.

Wechsler D (1997) *Wechsler Adult Intelligence Scale®*, 3rd Edn. San Antonio, TX: The Psychological Corporation.

White C, Stirling J, Hopkins R, Morris J, Montague L, Tantam D and Lewis S (2009) Predictors of 10-year outcome of first-episode psychosis. *Psychological Medicine* **39**, 1447–1456.

WHO (1992) *The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines*. Geneva

WHO (1994) *Schedules for Clinical Assessment in Neuropsychiatry: Version* 2, *Manual*.

Wieselgren IM, Lindström E and Lindström LH (1996) Symptoms at index admission as predictor for 1–5 year outcome in schizophrenia. *Acta Psychiatrica Scandinavica* **94**, 311–319.

Wiffen B, Falcone MA, O'Connor J, Russo M, Murray R and David A (2010) Bias or deficit? Differences in IQ and insight in first episode psychosis patients who demonstrate a 'jumping to conclusions' response to the beads task. *Schizophrenia Research* **117**, 446.

Woodward TS, Mizrahi R, Menon M and Christensen BK (2009) Correspondences between theory of mind, jumping to conclusions, neuropsychological measures and the symptoms of schizophrenia. *Psychiatry Research* **170**, 119–123.

https://doi.org/10.1017/S0033291718003197 Published online by Cambridge University Press