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Diminished humour perception in schizophrenia: Relationship to social and cognitive functioning

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ABSTRACT

This study attempted to confirm that humour recognition deficits previously found in schizophrenia are specific to the condition and not attributable to other parameters such as depression or anxiety. Secondarily, we explored any possible cognitive or social functioning correlates to humour recognition deficits. A total of 60 participants (20 outpatients with schizophrenia, 20 psychiatric control participants and 20 control participants) underwent a 64-question humour task in addition to a battery of standard cognitive tests and Social Functioning Scales. In order to compare the three groups of participants, we conducted an analysis of variance (ANOVA) and post-hoc *t*-tests on neuropsychological measures, social functioning measures, and the primary outcome, humour recognition. The schizophrenia group showed significant and substantial deficits in humour recognition compared to the healthy control group, $t(38) = 5.1$, $P < 0.001$, ES = −1.55 and the psychiatric control group, $t(38) = 3.6$, $P = 0.001$. In the schizophrenia group, humour recognition correlated positively with general intellectual functioning (NART) $r = .45$, $P = 0.04$, social reasoning (WAIS-III Comprehension) $r = .54$, $P = 0.01$, executive functioning (WCST-CC) $r = .69$, $P = 0.001$ and social adjustment ratings (SASS scores), $r = .54$, $P = 0.02$. These findings support the assertion that humour recognition deficits in schizophrenia are specific to the condition and not attributable to other factors such as depression or anxiety. Furthermore, humour recognition deficits in schizophrenia may perhaps be preferentially associated with deficiencies in set shifting and semantic cognition.

1. Objectives of the study

The capacity to perceive humour represents a specialized higher-order cognitive ability, reliant on both intellectual and social proficiencies. Exploring the cognitive underpinnings of humour could perhaps help elucidate the precise nature of higher-order intellectual functions and their possible role in psychopathological conditions. Prior studies have implicated humour perception deficits in schizophrenia (Corcoran et al., 1997; Polimeni and Reiss, 2006a). Therefore, possessing a better understanding of humour perception deficits may enhance our understanding of the core cognitive impairment associated with schizophrenia.

A humorous stimulus has the ability to instigate a brief multi-second period of reflexive laughter and concomitant feelings of pleasure. Even without a laughter response, people are generally aware when others are attempting to be funny. A good sense of humour can enhance psychological well-being and enrich social relationships (Graham, 1995; Kelly, 2002; Larsen and Zvjezdana, 2008; Thorson et al., 1997). Humour may even impart modest physiological benefits such as boosting immunity (Bennett et al., 2003; Martin, 2001). A few evolutionary theorists have explored the potential raison d'être of humour and laughter (Polimeni and Reiss, 2006b; Vaid, 1999; Weisfeld, 2006). Most of these evolutionary hypotheses concentrate on humour's general ability to enhance social cooperation (Polimeni and Reiss, 2006b; Jung, 2003).

Since Ancient Greece, philosophers and scientists have pondered the elemental characteristics of laughter and humour (Bremmer, 1997). Humour theories have generally emphasized one of three essential themes: (1) humour reflects a set of incongruous conceptualizations, (2) humour involves repressed sexual or aggressive impulses and (3) humour elevates social status by expressing superiority or saving face. Veatch has perhaps put forward the most precise formulation of humour (Veatch, 1998). Veatch incorporates the established premise that humour contains two incongruous elements. However, in Veatch's formulation, one element is socially acceptable while the other violates or contradicts the "subjective moral order". Veatch defines this moral order

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as the "rich cognitive and emotional system of opinions about the proper order of the social and natural world". Thus, humour purportedly contains a set of two or more incongruent ideas with one of these elements violating an established social norm.

About a half-dozen fMRI experiments have attempted to locate anatomical areas associated with humour perception in normal subjects (Bartolo et al., 2006; Goel and Dolan, 2007; Mobbs et al., 2003; Moran et al., 2004; Reiss et al., 2008; Samson et al., 2008; Wild et al., 2006), while one fMRI study has done so in subjects with schizophrenia (Marjoram et al., 2006). The most recent studies have yielded relatively consistent results. Although no two studies display identical activation patterns, a general outline is beginning to emerge. For example, in a recent representative study, the left temporal–parietal junction, left anterior temporal lobe and left inferior frontal cortex seemed to be preferentially activated during humour processing (Samson et al., 2008). Utilizing event-related fMRI, Goel and Dolan (2007) attempted to reveal greater specificity around the various components of humour. Their experiments suggest that humour-induced frontal-temporal activations represent the juxtaposing of mental sets whereas ventral medial prefrontal cortex activity may reflect the affective experience associated with humour appreciation. Furthermore, Goel and Dolan propose that the experience of a social norm violation, a key element of humour according to Veatch (1998), produces activations in four cerebral areas – left orbital frontal cortex, right posterior temporal gyrus, left cuneus and right amygdala.

In patients with schizophrenia, deficits in humour appreciation have been consistently demonstrated (Bozikas et al., 2007a; Corcoran et al., 1997; Polimeni and Reiss, 2006a; Tsoi et al., 2008). To determine humour impairment, these research groups have utilized different humour measurements – each with its own specific strengths and limitations. Using a 128-item humour questionnaire, our group previously reported a rather large effect size of 1.94 between patients with schizophrenia and healthy controls (Polimeni and Reiss, 2006a). This result suggests that humour deficits in schizophrenia are not trivial and could perhaps help elucidate the underpinnings of altered cognition in schizophrenia. Thus, humour could serve as a sort of probe to explore the cognitive inner-workings of schizophrenia. As our grasp of humour improves, both at the psychological and brain level, so perhaps can our understanding of schizophrenia.

The primary purpose and unique aspect of our study was to directly test the specificity of the previously identified humour deficit in schizophrenia using a psychiatric control group in addition to healthy controls. A positive result would suggest that humour recognition deficits do not reflect general psychiatric experiences (e.g., disruptions to one's social interactions and day-to-day patterns, entering the mental health care system, and receiving psychiatric treatment) or general emotional turmoil (e.g., symptoms of depression or anxiety). Our secondary purpose was to administer a battery of wide-ranging cognitive tests and Social Functioning Scales with the hope of detecting potential associations with humour impairment. This could perhaps implicate the most salient cognitive components underlying impaired humour recognition in schizophrenia, as well as exploring real world outcomes of humour impairment. The latter possibility is related to the known association of cognitive deficits with poorer outcomes in schizophrenia (Bowie et al., 2006; Danion et al., 2007; Hamaoui et al., 2006), and humour being a higher order form of cognition.

2. Methods and materials

A total of 60 participants were recruited by newspaper or poster advertisements and word of mouth at the Health Sciences Centre, Winnipeg. Ethical approval for the study was obtained from the local Research Ethics Board. After a full explanation of the study, participants agreed to take part by way of written informed consent and were provided a $50 stipend. General inclusion criteria were that all participants had to be fluent in English and between the ages of 18 and 65. General exclusion criteria were a history of head injury, mental retardation, epilepsy or other neurological disorder and a Folstein's Mini-Mental State Exam (MMSE; Folstein et al., 1975) score of less than 28. Testing took between 2 and 4 h. Table 1 describes and compares the demographic characteristics of the three participant groups: schizophrenia, clinical control, and healthy control.

The schizophrenia group consisted of 20 outpatients. A diagnosis of schizophrenia by *DSM-IV-TR* criteria (APA, 2000) was confirmed by one of two Psychiatrists (J.P.R. and J.P.) using the Mini International Neuropsychiatric Interview (M.I.N.I. 5.0.0; Sheehan et al., 1998). In addition, clinical assessments were conducted, using the Positive and Negative Symptoms of Schizophrenia Scale (PANSS; Kay et al., 1987), Calgary Depression Scale for Schizophrenia (CDSS; Addington et al., 1992), and Hamilton Depression Inventory (HAM-D; Hamilton, 1960). All 20 patients were taking antipsychotic medication at the time of testing (18 atypical, 1 typical, 1 both typical and atypical). Mean chlorpromazine equivalent dose of antipsychotic medication was 358 mg/day (SD 390 mg/day). HAM-D scores fell within the normal to mildly depressed range of 0–13.

The clinical control group consisted of a total of 20 treated and relatively stable psychiatric outpatients with a diagnosis of either a primary depressive or anxiety disorder. A primary depressive or anxiety disorder using *DSM-IV-TR* criteria was confirmed by one of two Psychiatrists (J.P.R. and J.P.) using the Mini International Neuropsychiatric Interview (M.I.N.I. 5.0.0; Sheehan et al., 1998). Each clinical control group participant was assessed using the HAM-D. Clinical control group participants were excluded if they scored above 18 on the HAM-D, in order to avoid cognitive deficits associated with severe depression. Eighteen of the 20 participants in the psychiatric control group had described a recent history of appreciable dysphoria (i.e., depressive disorder, adjustment disorder with depressed mood, post-traumatic stress disorder).

A total of 20 healthy comparison participants were screened using the Mini International Neuropsychiatric Interview Screen (M.I.N.I. 5.0.0; Sheehan et al., 1998) to rule out any recent or current psychiatric history.

2.1. Materials

2.1.1. Self-report questionnaires

After demographic data was collected, participants filled out the following self-report questionnaires: Social Functioning Scale (SFS; Birchwood et al., 1990); Social Interaction Anxiety Scale (SIAS; Mattick and Clarke, 1998); Revised Social Anhedonia Scale (RSAS; Eckblad et al., 1982); Snaith–Hamilton Pleasure Scale (SHAPS; Snaith et al., 1995) and the Social Adaptation Self-Evaluation Scale (SASS; Bosc et al., 1997). The SFS is a self-report questionnaire developed for outpatients with schizophrenia. The SIAS is a self-report questionnaire that measures subjective anxiety during social situations. The RSAS is a true–false questionnaire that measures diminished pleasure derived from interpersonal interactions. The SHAPS measures the present state of anhedonia. The SASS is self-report inventory to assess level of social adjustment.

2.1.2. Cognitive tests

All participants completed the following series of cognitive tests (Table 2): National Adult Reading Test (NART; Nelson and Willison, 1991; Morrison et al., 2000), Wisconsin Card Sorting Test (WCST; Heaton, 1981); Controlled Oral Word Association Test (COWAT; Benton et al., 1983); a category fluency test; Stroop Color-Word