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Investigating affective prosody in psychosis: A study using the Comprehensive Affective Testing System

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ABSTRACT

Affective prosody is substantially impaired in schizophrenia, yet little is known about affective prosody in bipolar disorder (BD). The aim of this study was to examine affective prosody performance in schizophrenia, schizoaffective disorder and BD on a newly released standardised assessment to further our understanding of BD performance. Fifty-four schizophrenia, 11 schizoaffective and 43 BD patients were compared with 112 healthy controls (HC) on four affective prosody subtests of the Comprehensive Affective Testing System (CATS). Schizophrenia patients showed a 10% reduction in accuracy on two subtests compared to HC. BD showed a trend for performance intermediary to schizophrenia and HC; and schizoaffective patients performed more like HC on these four affective prosody measures. Severity of current auditory hallucination, across all patients, was related to task performance on three of the measures. These data confirm that schizophrenia and BD have reduced affective prosody performance, with deficits in BD being less pronounced than schizophrenia. The schizoaffective results in this study should be interpreted with caution due to small sample size.

1. Introduction

Dysfunction of language and communication is omnipresent in schizophrenia. Recent literature supports the conception of language as a core higher-order cognitive dysfunction in the disorder (e.g., Mitchell and Crow, 2005; Rossell, 2006; Rossell and David, 2006). This language dysfunction is well represented in the DSM-IV diagnostic criteria for schizophrenia, with characteristic cardinal linguistic and communicative symptoms including the following: (1) positive symptoms such as disorganized speech, and (2) negative symptoms such as affective flattening in communication, or more commonly referred to as difficulties with affective prosody[1] (i.e., dysfunctional receptive affective prosody, that is, processing emotional meaning from pitch and melody alterations in speech, and expressive affective prosody, that is, communicating emotional meaning through using pitch and melody alterations during speech). Patients with auditory hallucinations in schizophrenia have poorer affective prosody performance when compared with schizophrenia patients with either no history of hallucinations (Rossell and Boundy, 2005), or no current hallucinations (Shea et al., 2007). The authors of this work suggest that difficulties perceiving prosodic features of speech (i.e. pitch and intonation) needed to accurately distinguish affective prosody that may contribute to the misattribution of speech events in persons with auditory hallucinations.

In contrast, both expressive and receptive prosody, has been poorly investigated in bipolar disorder (BD) (see Van Rheenen and Rossell (2013) for a review). There is growing evidence of mood influenced social cognitive impairments in BD (Langenecker et al., 2010; Venn et al., 2004). Examination of the impact of affective prosody in BD is important given the similarity of symptoms it shares with schizophrenia. To date, the authors are aware of only a handful of studies that have investigated receptive prosody in BD. Results are varied with findings from Bozikas et al. (2007), Hofer et al. (2010) and Murphy and Cutting (1990) demonstrating impaired processing of affective prosody in BD; and findings from

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[1] Affective prosody, that is, using prosodic elements (rhythm, stress or intonation) in speech to convey or express emotions, is distinguished from other types of prosody for example, semantic or linguistic prosody, which convey the form of utterance, that is not encoded by grammar or vocabulary choice.

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Edwards et al. (2001), Mitchell et al. (2004) and Vederman et al., (2012) finding affective prosody processing is intact. Further research is clearly needed.

Taken together, convincing evidence exists for a pervasiveness dysfunction of affective prosody in schizophrenia. In BD, understanding of prosody ability is less clear. One of the problems for this literature is the lack of universal assessment for affective prosody. Many reports have used experimental measures that have not been validated or examined for sensitivity. The Comprehensive Affective Testing System (CATS: Froming et al., 2006) is a recently constructed battery of both visual and auditory affective tasks that provide a standardised assessment. The affective prosody tasks use six emotions (happy, sad, angry, surprise, fear and disgust) and a neutral emotional state. The subtests are designed to test emotion matching with and without verbal denotation, emotional tone or prosodic processing with and without verbal denotation, and with conflicting or congruent semantic content. A male actor speaks on these prosodic subtests and the voice is digitized to maximize the quality of the sound. To date, the CATS has not been used to investigate affective prosody in schizophrenia or BD. In addition, schizoaffective disorder patients have usually been either included within a schizophrenia group or alternatively excluded due to mood episodes in other social cognitive research. Given its phenotypic overlap with both disorders we have investigated affective prosody performance in a separate group of schizoaffective disorder patients.

The current study examined the performance of schizophrenia, schizoaffective and BD patients in comparison to healthy controls on the four major affective prosody subtests of the CATS. Our primary aim was to examine the performance profile of BD patients in relation to schizophrenia and schizoaffective disorder to confirm whether deficits in BD are present. Based on previous literature it was predicted that patients with schizophrenia and schizoaffective disorder would be impaired on the four subtests compared to healthy controls, whilst BD would show intermediary performance. Our secondary aim was to confirm whether severity of auditory hallucinations was associated with affective prosody task performance. Affective prosody performance in the patients was predicted to correlate with auditory hallucinations (AH). Lastly, we aimed to investigate whether affective prosody performance was related to any further clinical variables. Performance was predicted to correlate with current severity of mood symptoms, both depression and mania.

2. Methods

2.1. Participants

The current study included 54 patients with schizophrenia, 11 patients with schizoaffective disorder and 43 patients with BD-I. Patients were recruited via community support groups and community care units and were all out-patients. Diagnosis was ascertained using the Structured Clinical Interview for DSM-IV (SCID: First et al., 1996). Current symptomology was acquired using the Positive and Negative Syndrome Scale (PANSS: Kay et al., 1987). AH were scored using item P3 on the PANSS and only rating AH. Ratings of depression and mania were made using the Beck Depression Inventory (BDI: Beck and Steer, 1987 with BDI > 13 being depressed) and the Bech-Rafaelsen Mania Rating Scale (MRS: Bech et al., 1979 with MRS > 8 being hypomanic), respectively. In the BD group, seventeen were euthymic and twenty-six depressed. Only patients with no other co-morbid Axis 1 diagnoses were included in the study. Demographic and clinical characteristics are presented in Table 1.

Within the schizophrenia group, all fifty-four were taking antipsychotic medication, five were also taking mood stabilizers, and eight were also taking antidepressants. Of the schizoaffective group, eleven were taking antipsychotic medication, eleven were taking mood stabilizers, and two were taking antidepressants. Of the BD patients, twenty were taking antipsychotic medication, thirty were taking mood stabilizers, ten were taking antidepressants and three participants were medication free.

One hundred and twelve healthy control participants were recruited via newspaper advertisements. Control participants were excluded if they had any history of psychiatric disorder or a first degree relative with either schizophrenia or BD (SCID: First et al., 1996). Participants from all four groups met the following criteria: (a) no history of neurological disorder or head trauma, (b) no current substance abuse or dependence (previous year), (c) English as first language, (d) between the ages of 18–65 years and (e) predicted IQ > 85 as scored by the National Adult Reading Test (NART: Nelson and Willison, 1991).

The study was carried out in accordance with the Declaration of Helsinki. The study had ethical approval from North Western Mental Health, Melbourne Victoria. Informed consent of all the participants was obtained after the study had been fully explained.

2.2. Tasks

2.2.1. Comprehensive Affective Testing System

Participants were tested with four of the 13 subtests from the Comprehensive Affective Testing System (CATS: Froming et al., 2006). The subtests are designed to test emotional tone or prosodic processing with and without verbal denotation, and with conflicting or congruent semantic content, taking approximately 20 min to complete. None of the subtests have practice items. Subtest order was counterbalanced. For each subtest overall accuracy and reaction time (RT) to both correct and incorrect answers was recorded. The four subtests are as follows:

(1) The emotional prosody discrimination (EPD) subtest includes pairs of non-affective sentences ($N=22$) read by the actor exhibiting happiness, sadness, anger, fright or neutrality in his voice. Participants indicate whether the sentence pairs reflect the same or different emotions.
(2) In the name emotional prosody subtest (NEP), one sentence ($N=22$) is read at a time by the actor. Participants select which emotion (happiness, sadness, anger, fright or neutrality) they believe the actor's voice expresses.
(3) During the conflicting prosody-attend to prosody subtest (CPP), participants are instructed to ignore the emotional meaning represented in the sentence ($N=32$) and focus on the emotional tone expressed by the voice.
(4) In reverse, during the conflicting prosody-attend to meaning subtest (CPM), the same sentences ($N=32$) are presented as in the previous subtest, however, participants are now asked to ignore the emotional tone expressed by the voice and focus on the emotional meaning represented in the sentence.

2.3. Statistical analysis

Demographic and clinical group differences were assessed via one-way between-groups analysis of variance (ANOVA) or Chi-Square tests. Task-related group differences were assessed via one-way between-groups ANOVA with Scheffe post-hoc tests. Due to group differences in the proportion of males and females across the groups, the ANOVAs were re-run with gender as a fixed factor. In addition, given that the BD group had euthymic and depressed members the ANOVAs were re-run with mood state (depressed, euthymic and hypomanic) as a fixed factor. Neither of the factors was significant for any of the prosody measures, and for brevity will not be presented. Given group differences in age and levels of education, a two-fold validity check was performed to examine the effects of these demographic variables; first, by using Pearson's product moment correlations between age, education and the eight affective prosody variables. Even using a stringent alpha of .01, the majority of variables were significantly correlated with age and education. Therefore, the eight ANOVA's were re-run with age and education as covariates; these are presented in Table 3. Relationships between task performance and the clinical characteristics from the PANSS, MRS and BDI were investigated using Pearson's product moment correlations (Table 4) (using $p < .01$), and with P3 (AH only) from the PANSS to investigate AH associations.

3. Results

3.1. Demographics

As can be seen in Table 1, the schizophrenia patients were significantly less educated and older than controls. Positive symptom ratings did not differ between the schizophrenia and schizoaffective groups, but these ratings were significantly higher than BD. There were no group differences on negative symptom ratings, mania or depression; and no differences between patient groups on age or years of illness onset.

3.2. Group comparisons

Table 2 displays the mean accuracy and RT data for the four subtests across the four groups. Table 3 shows the same group