Category fluency performance in patients with schizophrenia and bipolar disorder: The influence of affective categories

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Abstract

Semantic fluency (SF) and phonological fluency (PF) were examined in large groups of schizophrenia patients, bipolar patients and controls. As well as standard SF categories (animals and food), fluency to two affective categories, happy and fear was measured, i.e. participants were asked to produce as many words as they could that resulted in or are associated with fear or happiness. Schizophrenia patients showed SF and PF deficits. Bipolar patients showed PF deficits. Thus, PF is argued to be a good cognitive marker in both disorders. Severity of delusions was related to SF performance in all patients. The patient groups showed different patterns on the affective categories compared to controls: the bipolar patients were better and produced more words, especially to the happiness category, and the schizophrenia patients were impaired and produced less words. The results suggest an interesting interaction between psychotic illnesses, fluency and emotion.

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1. Introduction

Semantic or category fluency (SF) deficits in schizophrenia are well established and are argued to be a better trait marker for genetic liability than phonological or letter fluency (PF) deficits (Szoke et al., 2005; Zalla et al., 2004). In comparison, fluency performance in bipolar disorder is understudied: a handful of studies, in small samples, have suggested PF but not SF deficits (Lebowitz et al., 2001; Kremen et al., 2003). PF deficits are related to alogia in schizophrenia (Stolar et al., 1994) and thought disorder in bipolar disorder (Dixon et al., 2004); alternatively, SF deficits have been related to delusions (Rossell et al., 1999). Schizophrenia and bipolar disorder are both characterised by affective perception deficits. To date, no study has examined whether verbal affect production is impaired in schizophrenia or bipolar disorder. This study aims to: (1) provide a larger group comparison of schizophrenia and bipolar subjects on SF and PF tasks to confirm whether SF or PF is the better cognitive marker; (2) confirm which of the three identified psychotic symptoms from the
literature, alogia, thought disorder or delusions, are related to SF and PF performance; and (3) examine verbal production of affective categories: happy and fearful. Patients with schizophrenia are predicted to have reduced affective category production. Conversely, bipolar patients are speculated to show enhanced affect production due to residual pressure of speech that is most noticeable in affective situations (whether positive or negative).

2. Subjects

Two patient samples were recruited from the inpatient and outpatient departments of Liverpool Hospital, Sydney and a research register held at the Mental Health Research Institute, Melbourne. 62 patients were diagnosed as DSM IV schizophrenia (38 male/24 female) and 48 as bipolar disorder (14 male/34 female) using the Diagnostic Interview for Psychosis (Castle et al., 1997). Bipolar patients were all currently euthymic; although all had recently had a manic episode, this may have resulted in minor residual psychotic symptoms. No patient had a history of ECT. Patient groups were matched for age of onset (first diagnosis) (schizophrenia 22.8 (5.9) and bipolar 22.6 (7.8)) \([p=0.8]\). 30 male and 18 female healthy controls were also recruited by advertisement in two local job centres. All subjects tested were between the ages of 18 and 55 years, had an estimated pre-morbid IQ as scored by the National Adult Reading Test (NART; Nelson, 1982) of \(>90\), and were excluded if they had a neurological or co-existing psychiatric condition. Groups were matched for age (controls 37.1 (11.4), schizophrenia 40.2 (11.1) and bipolar 39.5 (10.8)) \([p=0.3]\) and years in education (controls 14.6 (2.8), schizophrenia 13.9 (2.9) and bipolar 15.0 (3.2)) \([p=0.2]\). Groups were not matched for NART IQ (controls 114 (9.9), schizophrenia 107 (12.1) and bipolar 114 (10.2)) \([F(2,157)=8.9, p<0.001]\), schizophrenia patients had lower IQ than the bipolar and control groups. Additionally, there were more males in the control and schizophrenia samples \([\text{chi-squared}=13.2, p<0.001]\). Patients with schizophrenia were taking atypical antipsychotics (70%), typical antipsychotics (28%) or no medication (2%). The bipolar group was prescribed mood stabilisers (55%), atypical antipsychotics (8%), typical antipsychotics (8%), combination of medications (18%) or no medication (11%). Assessments using the Schedule of Positive Symptoms (SAPS) and Schedule of Negative Symptoms (SANS) (Andreasen and Olsen, 1982) established the patient groups were matched for mean current positive symptoms (schizophrenia: 1.7 (0.9), bipolar: 1.5 (0.9)) \([p=0.2]\), but not for negative symptoms (schizophrenia: 1.3 (0.7), bipolar: 0.8 (0.1)) \([p=0.001]\).

3. Task

Subjects were asked to orally produce words (I) from four categories (SF): animals, food, fear and happy, and (II) starting with four letters (PF); F, A, M and S. Sixty seconds was allowed for each category or letter. For the two ‘affective categories’, fear and happy, a category example was defined as ‘objects or events that can result in or are associated with fear or happiness’. The following examples were provided, fear—crocodile and happy—dancing. The total number of words generated for each category or each letter was calculated. Errors (category inappropriate words for SF and proper nouns for PF) and perseverations (PE) were subtracted from these totals to give the scores reported.

Table 1

<table>
<thead>
<tr>
<th>Task</th>
<th>Variable</th>
<th>Controls N=48</th>
<th>Schizophrenia N=62</th>
<th>Bipolar N=48</th>
<th>One-way ANOVA: F, p, SNK</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF</td>
<td>Total score</td>
<td>62 (17.6)</td>
<td>52 (14.7)</td>
<td>61 (17.7)</td>
<td>4.9, (p=0.001), S&lt;B and C</td>
</tr>
<tr>
<td></td>
<td>Animals</td>
<td>21.2 (5.4)</td>
<td>17.2 (4.9)</td>
<td>19.4 (5.4)</td>
<td>4.8, (p=0.001), S&lt;B and C</td>
</tr>
<tr>
<td></td>
<td>Food</td>
<td>18.4 (7.5)</td>
<td>15.7 (6.4)</td>
<td>16.8 (6.5)</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>Happy</td>
<td>12.5 (4.9)</td>
<td>10.9 (4.5)</td>
<td>14.4 (5.9)</td>
<td>5.4, (p=0.001), S&lt;C&gt;B</td>
</tr>
<tr>
<td></td>
<td>Fear</td>
<td>10.6 (4.5)</td>
<td>8.7 (3.5)</td>
<td>10.3 (5.4)</td>
<td>2.9, (p=0.03), S&lt;B and C</td>
</tr>
<tr>
<td>PF</td>
<td>Total score</td>
<td>59 (19.5)</td>
<td>47 (16.7)</td>
<td>52 (16.9)</td>
<td>6.5, (p=0.001), S and B&lt;C</td>
</tr>
</tbody>
</table>

SF—semantic fluency, PF—phonological fluency, SNK—Student Newman–Keuls post-hoc test, S=schizophrenia, B=bipolar and C=controls.
4. Statistical analysis

Fluency scores are displayed in Table 1. Fluency scores were subjected to two 3 \times 4 repeated measures ANOVA with a between subjects factor of group (controls, bipolar and schizophrenia) and 4 within subjects factors of category (animals, food, fear and happy) or letter (F, A, M and S). As NART IQ and sex ratio were different across groups they were initially entered as covariates, there was however no interaction between group and either of these two variables; thus, they were removed as covariates. Planned post-hoc one-way ANOVA were conducted to investigate significant interactions and Bonferroni corrected for multiple comparisons (\(z = 0.025\)).

5. Results

5.1. Category fluency

The 3 \times 4 repeated measure ANOVA revealed a main effect of group; schizophrenia patients (13.4) had a lower mean score than bipolar patients (14.8) and controls (15.7) \((F(2,153)=4.1, p=0.02)\). There was a main effect of category \((F(1,153)=8.2, p=0.005)\); with the most words produced for animals (19.2), then food (16.9), then happy (12.6) and last fear (9.9). There was an interaction of group and category \((F(2,153)=3.6, p<0.03)\) (see Table 1). Schizophrenia patients produced the least animal and fear words. There were no group differences for the food category. Bipolar patients produced the most happy category words, followed by the controls then the schizophrenia patients. The SF score was correlated with the patients global alogia score \((r=-0.34, p<0.05)\); schizophrenia: \(r=-0.39, p<0.05\); bipolar: \(r=-0.37, p<0.04\).

5.2. Letter fluency

The 3 \times 4 repeated measure ANOVA revealed a main effect of group; schizophrenia (12.2) and bipolar patients (12.7) had a mean score less than controls (14.6) \((F(2,153)=4.3, p=0.02)\). There was no main effect of letter and no interaction between group and letter. The PF score was correlated with the patients global alogia score \((r=-0.40, p<0.001)\) (also for groups independently, schizophrenia: \(r=-0.39, p<0.05\); bipolar: \(r=-0.37, p<0.04\)).

6. Discussion

The data confirmed that both SF and PF are good cognitive trait markers in schizophrenia, with significant deficits reported on both fluency conditions. The study also established that a large group of bipolar patients showed significant PF but not SF deficits, and that schizophrenia and bipolar groups showed equivalent PF performance. These data suggest that PF is a cognitive trait marker for both schizophrenia and bipolar disorder, and potentially for psychosis. Further work is needed to confirm that other disorders with psychotic features also demonstrate a PF deficit (i.e. psychotic depression compared with non-psychotic depression), and that illness confounds, like lengthy hospitalisations, do not interact with the findings. Completing this study with first episode patients would therefore be beneficial. The author argues for a trait rather than state marker, as the majority of individuals in both patient samples were stable with minimal levels of residual symptoms.

This data confirmed that poor fluency, SF and PF, was related to alogia in schizophrenia and also showed a similar relationship exists for bipolar patients. Additionally, SF deficits were related to the experience of delusions (also reported in Rossell et al., 1999). Rossell has argued fluency deficits reflect a semantic store of words that is idiosyncratically and illogically organised. Thus, such individuals are more liable to generate idiosyncratic, implausible, delusional ideas. In this study, patients with delusions compared with non-currently deluded patients certainly did produce more category inappropriate words (errors), thus idiosyncratic responses on the SF task (deluded \(N=50\): mean errors=1.5 (S.D. 2.7), non-deluded \(N=60\): mean errors=0.5 (S.D. 2.0)) \((F(1,109)=4.9, p<0.03)\).

All participants produced more words to the non-affect categories than the affect categories on the SF task (also reported in Tabert et al., 2001). Further, there was an interesting group interaction on the affective categories; where schizophrenia patients produced significantly less words on all categories,
and did not show a disproportionate impairment for the affective categories. In contrast, for the category ‘happy’, bipolar patients produced significantly more words than controls. Bipolar patients were currently euthymic and presumably were not influenced by illness mood state induction. Thus, they demonstrated a trait bias towards producing more illness appropriate happy words than healthy controls. Further study should investigate whether this is also the case for sad category words, and the possible interactions with this task and depressive and manic states.

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References


