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Re-examination of the Language of Psychotic Subjects

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To investigate whether language in schizophrenia deteriorated progressively, 11 schizophrenic subjects, 9 manic subjects and 9 controls were re-tested after an interval of three years using the computer-assisted syntactical analysis technique of Morice. In 13 of the 16 linguistic variables described as hallmarks of schizophrenic speech decline, deterioration was noted in schizophrenics in the direction predicted and relative to the manic and control groups. The deterioration was most pronounced in complexity and integrity of speech. One variable remained unchanged and two (semantic variables) showed marginal improvement. It was concluded that language, and in particular syntax, does deteriorate in the schizophrenic process.

Morice & Ingram (1982), using a computer-assisted grammatical analysis technique, reported syntactic changes in the spoken language of schizophrenic patients, sufficient to discriminate them from manic patients and control subjects. They suggested that this approach might be of considerable use in the diagnosis of schizophrenia. Fraser *et al* (1986), in replicating this study, excluded chronic schizophrenics and examined 50 acute schizophrenics (five years or less since onset of first symptoms) and 50 recently diagnosed manics.

The preceding paper reports a markedly lower linguistic complexity and fluency, and more errors in language, in a chronic schizophrenic group than in an acute schizophrenic group, and gives three possible explanations: poor linguistic performance may simply reflect an overall deterioration of cognitive function as the disease progresses; a subgroup with poor outcome may be characterised from the outset by poor linguistic function; or lack of opportunity for social interaction in the institution may result in an 'atrophy of disuse'. It was necessary therefore to follow, over several years, the linguistic competence of a group of acute-onset briefly hospitalised schizophrenics and manics to see in particular how stable specific linguistic variables were.

Method

Subjects

Between two and three years after the recordings were made for the Fraser *et al* (1986) replication, we traced 11 schizophrenics from the original group of 51, eight manics from the original group of 50, one manic whose language recording had not been included in the original study but who in other ways fulfilled the original criteria for inclusion, and nine controls from the original group of 50 hospital out-patient volunteers and students. In total, thus, 11 schizophrenics, 9 manics and 9 controls were involved, primarily chosen on the basis of availability of individuals who as closely as possible could be matched for age, sex, education and social class. The basis for diagnosis is described in the preceding paper.

All subjects were re-recorded (by the same method, described in Morice *et al* (1982)) by the original interviewer, KK, with the exception of four controls and one schizophrenic who were re-recorded according to the same protocol by WIF. The schizophrenics and manics were all re-recorded in out-patient clinics or day hospitals. The controls were re-recorded in their workplaces or homes.

None of the schizophrenics were in open employment but all had day-hospital places. Two manics had acquired jobs in the intervening period; the rest were attending day hospitals. In the intervening years three of the schizophrenics had experienced in-patient care lasting, in total, eight, six and ten weeks respectively. None of the subjects at the time of re-recording had become long-term in-patients. At the time of collection of the original speech sample, both illness groups were receiving equivalent (and large) amounts of antipsychotic medication (see preceding paper). At the time of speech-sample re-recording, patients were rated clinically on four-point scales for overall clinical condition (recovered, improved, unchanged, worse); negative schizophrenic symptoms; mood; and active psychosis.

The subjects in the original study were unaware of the nature of the study. Their ignorance was no longer possible to maintain at follow-up; subjects knew then that "it was to do with the way that people communicated in mental illness" at the start of the second interview.

Language analysis

Samples of free speech of 1000 words were collected as described in the preceding paper. The variables which had been found (see preceding paper) to differentiate significantly between acute and chronic schizophrenics and controls, by significant reduction in linguistic complexity, fluency, integrity and co-ordination of speech, were, in the complexity family, mean length of utterance (MLUA), percentage of sentences with embedding (PSEMB), mean depth of embedding (MDEMB), and mean number of

TABLE I
Scores of test samples and original groups

	Samples (n = 29)						*Original groups (n = 151)*					
	Schizophrenic		*Manic*		*Normal*		*Schizophrenic*		*Manic*		*Normal*	
	Mean	*s.d.*	*Mean*	*s.d.*	*Mean*	*s.d.*	*Mean*	*s.d.*	*Mean*	*s.d.*	*Mean*	*s.d.*
Complexity												
MLUA	9.43	2.37	8.00	1.60	11.10	1.80	9.38	2.22	8.95	1.53	10.68	1.79
PSEMB	40.30	9.40	32.60	40.40	12.80	38.56	11.36	58.25	9.49	45.36	9.02	
MDEMB	1.27	0.11	1.21	0.24	1.31	0.17	1.29	0.15	1.30	1.12	1.37	0.15
MCON	0.04	0.02	0.02	0.03	0.04	0.03	0.037	0.037	0.03	0.03	0.05	0.04
Fluency												
PFSR	1.02	0.51	1.10	0.80	1.08	0.60	1.02	0.63	1.04	0.60	0.95	0.47
PRW	1.57	1.10	1.20	0.70	1.30	0.90	1.53	1.21	1.28	0.93	0.87	0.63
DYSIN	7.90	3.90	5.10	2.60	5.20	2.10	7.26	3.74	5.72	2.88	5.27	2.20
Integrity												
PSYN	25.60	6.40	20.52	11.20	21.30	8.10	24.38	9.16	19.80	7.57	16.78	5.47
PSYNSEM	1.57	1.10	0.42	0.35	0.77	1.20	2.16	0.93	0.83	0.25	0.05	0.23
PSEM	1.90	1.30	0.70	0.35	1.02	1.40	2.90	3.79	1.33	1.60	0.11	0.35
PWFM	74.20	8.39	79.10	8.40	78.60	8.10	74.97	9.44	79.74	7.73	83.34	5.14
POM	48.20	13.90	47.00	15.20	50.30	15.50	44.60	16.60	49.10	17.80	57.97	18.69
ERR	30.50	0.80	23.30	1.07	23.30	13.70	30.60	17.12	26.04	13.20	16.92	8.67
Co-ordination												
MCCA	0.04	0.03	0.07	0.04	0.08	0.06	0.07	0.06	0.06	0.05	0.09	0.04
MCCO	0.04	0.02	0.04	0.02	0.04	0.03	0.04	0.03	0.04	0.02	0.05	0.03
MCSO	0.10	0.04	0.12	0.075	0.10	0.01	0.102	0.05	0.09	0.05	0.14	0.06

sentences with co-ordinated clauses not at top level (MCON); in the fluency family, percentage of false starts (PFSR), percentage of repeat words (PRW), and dysfluency index (DYSIN); in the integrity family, percentage of syntactic errors (PSYN), percentage of syntactic and semantic errors (PSYNSEM), percentage of semantic errors (PSEM), percentage of well formed major utterances (PWFM), percentage of errors of omission (POM), and error score (ERR); and in the co-ordination family, mean number of sentences co-ordinated by 'and' (MCCA), mean number of clauses with other types of co-ordination (MCCO), and mean number of sentences with other types of co-ordination (MCSO). The initial scores on these variables were compared with the scores at follow-up 2–3 years later. A null hypothesis would be that these 16 variables would show no further linguistic deterioration in the schizophrenic subjects over time. A corollary would be that manic subjects who were clinically improved at the time of retest would not improve on these linguistic variables.

Results

As in the original groups, the schizophrenics were significantly younger than the manics and controls: mean ages 24.7 years (s.d. 5.8), 32 years (s.d. 14.2), and 33.1 years (s.d. 15.12) respectively ($F = 4.29$; $P < 0.05$). No other social or educational variables were significantly different. The follow-up samples of schizophrenic, manic and control subjects were linguistically representative of the original groups in the Fraser *et al* (1986) study (Table I). The differences between test and re-test scores on the 16 key variables were compared for schizophrenics and controls using a Mann–Whitney *U* Wilcoxon rank sum *W* test. On no variable was a statistically significant difference reached. The mean differences between test and re-test of the 16 key variables for schizophrenics, manics and controls were calculated and subjected to a one-way analysis of variance. Data were analysed using programs from the Statistical Package for the Social Sciences (Nie *et al*, 1975). On re-test, values of 13 of the 16 key variables deteriorated in schizophrenics in the direction expected while one remained unchanged and two marginally improved ($\chi^2 = 6.25$, $P < 0.01$). The mean change scores of the three groups on the linguistic variables and the ANOVA results are shown in Table II. On re-test the linguistic variables of the control group remained stable relative to those of the patient groups.

All 16 change scores for the control group remained within one standard deviation of the original control group mean. The mean length of utterance (MLUA), percentage of embedded sentences (PSEMB) and mean number of sentences co-ordinated by 'and' (MCCA) deteriorated significantly in schizophrenics. It is particularly noticeable that complexity variables decreased dramatically in schizophrenics compared with manic subjects.

The raw scores of the variables in each of the families were *Z*-transformed, and total scores for complexity, integrity, fluency and co-ordination were obtained by summing the *Z* scores of variables in each family. For

TABLE II
Change scores on key linguistic variables

	Controls	*Manics*	*Schizophrenics*	F[1]	*Significance*	*Schizophrenic change*[2]
Complexity						
MLUA	−1.13	1.45	−0.93	5.55	0.01*	D
PSEMB	−6.33	7.81	−8.70	5.76	0.008*	D
MDEMB	−0.08	0.06	−0.12	2.29	0.06	D
MCON	0.00	0.02	−0.02	2.34	0.12	D
Fluency						
PFSR	0.27	0.15	0.33	0.18	0.83	D
PRW	0.01	0.42	0.76	1.80	0.17	D
DYSIN	0.04	1.26	2.38	1.15	0.33	D
Integrity						
PSYN	0.81	1.79	5.58	0.58	0.56	D
PSYNSEM	−0.11	−0.32	−0.44	0.22	0.80	I
PSEM	−0.22	−0.62	−0.51	0.26	0.60	I
PWFM	−0.80	−1.49	−5.54	0.59	0.50	D
POM	−6.53	3.90	3.43	1.05	0.36	D
ERR	3.89	1.44	7.73	0.29	0.74	D
Co-ordination						
MCCA	−0.05	0.02	−0.02	3.84	0.03	D
MCCO	−0.00	0.01	−0.01	1.06	0.36	D
MCSO	0.02	0.02	0.00	0.14	0.87	NC

1. Analysis of variance.
2. D = deterioration, I = improvement, NC = no change.
* Significant.

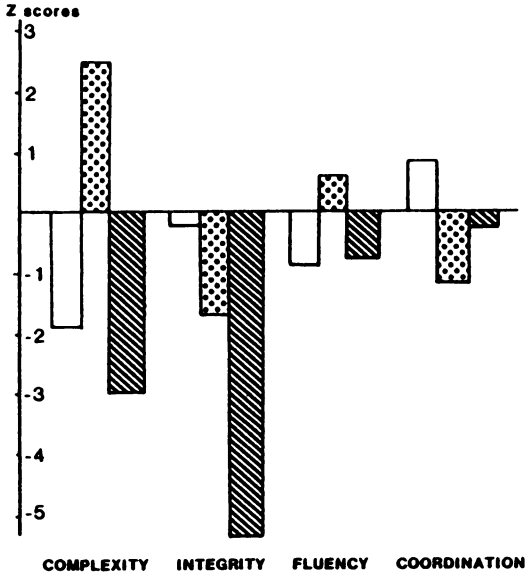

FIG. 1 Change (*Z*) scores in the four principal linguistic families showing consistent deterioration in schizophrenia, and improvement in complexity and fluency in mania (□ controls, ⊡ manics, ▨ schizophrenics).

example, a complexity score was obtained from the sum of the *Z*-transformed scores for MLUA, PSEMB, MCON and MDEMB (Fig.1).

Clinical states

Because of the small numbers in each cell, the clinical ratings were collapsed into 0/1 and 2/3. The clinical rating scores at the time of re-test were compared with the linguistic change scores using a Mann–Whitney *U* test. The clinical ratings revealed that six schizophrenics seemed clinically 'well' or 'improved' at the time of re-examination (scores 0 and 1), and five were 'unchanged', had 'deteriorated' (scores 2 and 3) or had detectable signs of continuing psychosis. Two manics were still elated and clinically ill at follow-up; all the others were rated as clinically 'fully recovered'. Notwithstanding the absence of obvious clinical deterioration in most schizophrenics, their linguistic variables showed global and pronounced deterioration (Table II). Although those schizophrenics clinically rated as still ill or deteriorated showed even greater decline in complexity of language, integrity, fluency and co-ordination, this did not reach statistical significance (MLUA, $U=7$; MDEMB, $U=6$; DYSYN, $U=24$; MCCA, $U=23$) ($U=5$ for significance, $P<0.05$ one-tailed).

For the most clinically deteriorated and psychotic schizophrenic, the mean length of utterance (MLUA)

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dropped from 15.6 to 9.6; the percentage of well formed utterances (PWFM) dropped from 88.5 to 71.8; the dysfluency index (DYSIN) increased from 7.8 to 8.4, and the mean depth of embedding (MDEMB) fell from 1.57 to 1.05 – the bottom of the range for sentence complexity. The two manic subjects who were clearly elated at follow-up also showed decreased depth of embedding of their sentences, MDEMB falling from 1.18 to 1.07 and from 1.17 to 1.08.

Mean depth of embedding (MDEMB) was consistently reduced in those schizophrenics and manics who were rated as clinically deteriorated ($n = 7$) compared with those rated as 'well' ($n = 13$) (MDEMB, $U = 20$; $P < 0.05$ two-tailed).

Discussion

We are not aware of other studies of psychotic language involving the systematic syntactical analysis of subjects' language over a prolonged interval.

Despite the small numbers in this study, the results help to clarify the finding of the preceding paper that the utterances of chronic schizophrenics are less complex and fluent and more error-ridden than those of acute schizophrenics. In particular, these results suggest that possible confounding factors suggested in the preceding paper do *not* account for this intra-subject deterioration. The schizophrenics' language was impoverished and degraded with the passage of time. None of the schizophrenic or manic subjects had spent prolonged periods in hospital in the intervening years. The decline in schizophrenic scores could not be explained as due to the subjects' being caught by chance in relapse: only one was clearly psychotic at re-test. It cannot be claimed that deterioration in language is an inevitable feature in schizophrenia: only that language seemed to deteriorate in those schizophrenics who remained in contact with the mental health service. This linguistic deterioration in schizophrenics was not matched by a similar deterioration in the language of manics; rather the contrary. We were not in a position to select subjects randomly from the original cohort of schizophrenics, manics and normals because of the limitations imposed by numbers, availability, and age, sex and social class, the latter two being powerful influences on linguistic production. Possible cumulative effects of medication are unlikely to have been a cause, because the apparent linguistic deterioration in schizophrenics was not matched by a similar deterioration in the language of manics – rather the contrary – and to the best of our knowledge the two groups had continued on equivalent doses of maintenance medication in the intervening years. The imperviousness of linguistic performance to medication effects is supported by Ragin *et al* (1989) and is the subject of a paper by Thomas (in preparation).

It may seem surprising that whereas most of the patients seemed to have improved clinically, language – a major index of schizophrenic functioning – had deteriorated. The communication function which our simple clinical scale taps is thought disorder, which is a crude measure of pragmatic aspects of language. Our language instrument taps syntactic aspects.

The improvement in values of linguistic variables in manics is as impressive as the deterioration in schizophrenics. In Table II, the first two significant variables – MLUA and PSEMB – show a decrease for schizophrenics and controls and an increase for manics, suggesting possibly that the apparent deterioration among schizophrenic patients may in fact be simply improvement among the manic group. However, linguistic variables should not be taken in isolation, and when families of variables are compared this straightforward solution has to be discounted. Schizophrenic speech clearly degrades in all families of variables.

It is important to note that all the *syntactic* variables deteriorated in schizophrenic. The two of Thomas's variables which did not deteriorate in the anticipated way were *semantic* variables, which marginally improved. Both required rather subjective decisions about meanings (semantic errors), which, unlike the other variables, were not objectively grammar-ruled, and in Morice's studies achieved lowest inter-rater reliability. However, our schizophrenic and manic subjects were treated and not actively ill, and less prone to produce puzzling expressions at re-recording. In general, the technique has proved stable over time with different interviewers in the diagnosis of schizophrenia and in the study of the schizophrenic process.

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