

Social deficits associated with schizophrenia defined in terms of interpersonal Machiavellianism

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The social deficits of schizophrenia have been interpreted in an evolutionary context of Machiavellian social dexterity, stressing deficits in evolved psychological mechanisms that mediate the interpretation of affect and deceptive intention in others. A complementary hypothesis was tested, that patients with schizophrenia will be relatively non-Machiavellian compared to controls, and that social problems associated with the condition may reflect this relative social credulity. This hypothesis was addressed by assessing Mach IV psychometric scale performance in a group of 51 patients with schizophrenia and in 93 controls. Males, but not females, with schizophrenia scored significantly lower on the Mach IV scale than control groups. This result is interpreted in conjunction with the existing literature on social competence and sex differences in the symptomatology of patients with schizophrenia.

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Introduction

A number of researchers have drawn attention to the reduced social skills of people with schizophrenia (1–9). Cramer et al. (4) suggest that patients with schizophrenia ‘get it wrong’ during social interaction and misinterpret the ‘emotional states of others’. Mueser et al. (8) link poor facial recognition of emotional states with reduced social competence in subjects with schizophrenia. Lewis and Garver (7) found ‘impairment of affect recognition’ to be independent of medication, or whether symptoms in schizophrenia subjects were positive or negative.

Evolutionary models have been used to explain deficiencies in the social competence of people with schizophrenia. Crow (10–14) has argued that neuroanatomical abnormalities associated with schizophrenia initially arose during a period of rapid hominid brain evolution. This neocortical expansion was driven by increasingly complex hominid social interaction and language abilities (11). Baron-Cohen (15) argues that humans have an evolved ‘theory of mind’ that allows accurate judgements of the thoughts and intentions of others. He argues that this mechanism is absent

in people with autism, resulting in a ‘mind-blindness’, or lack of awareness that other people have minds. Frith and Corcoran (16; see also 17) have applied this reasoning to schizophrenia, but they contrast an autistic failure to recognize minds in others with incorrect conclusions about the mental states of others, specifically in the case of paranoid schizophrenia.

Both Crow and Baron-Cohen have based their evolutionary models, directly or indirectly, on the Machiavellian intelligence hypothesis (MIH) (18–20; see also 21), a synthesis of the ideas of a number of researchers that stresses social rather than technical proficiency as the primary selective pressure in human evolution. The MIH implies that the ability to interpret emotional affect and intention in others accurately has become incorporated into the evolved structures of the mind.

Following Crow, Baron-Cohen, and Frith and Corcoran, we postulate that patients with schizophrenia should perform differently from controls on tests of Machiavellian intelligence. While no test instrument has been developed with the MIH specifically in mind, an older instrument, namely

Table 1. Sample groups by age category and highest level of education

Sample group	n	Age (years)					Level of education ^a			
		18–24	25–34	35–44	45–54	≥55	No qualification	SC/UE	Technical	University degree
Schizophrenic males	31	6	6	12	6	1	13	9	3	6
Control males	49	12	24	9	2	2	1	18	13	17
Schizophrenic females	20	2	8	6	3	1	12	5	2	1
Control females	44	10	15	8	5	6	1	13	6	23

^aSC/UE, School Certificate or University Entrance.

the Mach IV scale (22), is available. This instrument is based explicitly on the writings of Machiavelli, and we suggest that it may be used to illuminate differences in social dexterity between schizophrenic patients and controls. We predict that patients with schizophrenia will be relatively non-Machiavellian compared to controls, and that social problems associated with the condition may reflect this relative social credulity. This hypothesis was addressed by assessing performance on the Mach IV scale in a group of 51 patients with schizophrenia and in 93 controls.

Material and methods

Subjects

The patient subjects consisted of 31 men and 20 women with chronic schizophrenia, undifferentiated by subtype, living in Auckland, New Zealand (Table 1). The majority of the schizophrenic subjects were in long-term care, while a small minority were out-patients living with their families in the community. More than 90% of the subjects were long-term ‘mental health consumers’ with care histories ranging from 5 to 30 or more years of symptoms.

The New Zealand Privacy Act (1993) (23) prevented direct access to patient medical files. Rather than using patient records for a DSM-IV (24) diagnostic classification, subjects were selected by their institutional care case-histories. Professional caregivers were asked to invite subjects with an established history of schizophrenia to participate in the study. Two subjects diagnosed with schizophreniform disorder and five subjects with affective disorders were excluded from the final sample pool. Subjects indicated demographic details by category, as this method was considered to be least intrusive (Table 1). With the exception of one individual, all subjects in this group were medicated. Although quantification of medication was not possible, medication is expected to have a conservative, prosocial effect on subject responses.

Following approval by the University of Auckland Ethics Committee, caregiving community

organizations were approached and subjects with schizophrenia were selected through the process described above. Written consent was obtained from all participating subjects, and they were each paid NZ\$5.00. A follow-up call was made to each subject’s social worker or home manager to confirm the patient’s diagnostic status and demographic details.

The control group consisted of 49 men and 44 women. As with the schizophrenic subjects, the control groups were predominantly New Zealand European. Control subjects were selected to include proportions by age, occupation and education that reflected the same demographic catchment as the schizophrenic sample. Control subjects were provided with information forms and signed consent forms, but were not paid.

The instrument

Subject Machiavellianism was measured with the Mach IV scale (22), a self-rated 7-point Likert instrument (where 1=strongly disagree, 4=no opinion and 7=strongly agree), composed of 20 statement items — 10 items keyed in agreement with Machiavellian statements, and 10 items keyed in disagreement (Table 3). An arbitrary constant of 20 points added by Christie and Geis (22) gives a theoretical neutral score of 100, and a possible score range of 40 to 160 points. The 20 Mach-IV item statements are classified into three main areas: (i) 9 items classified as dealing with views of human nature; (ii) 9 items classified as dealing with duplicitous tactics; and (iii) 2 items reflecting abstract morality (22) (Table 3). After Barber (25), the scale statements were slightly modified as follows. References to ‘men’ were altered to the gender-neutral expression ‘people’, and an Americanized reference in statement 11 was simplified. A history of significant sex differences in response patterns to the Mach IV scale (26, 27), together with evidence of sex differences in morphology and developmental course of schizophrenia (3, 28, 29), suggested that gender was a critical variable in this study.

Table 2. Mean Mach IV scores by sample groups: independent samples with Mann–Whitney *U*-test (two-tailed)

Sample	<i>n</i>	Mean (SD)	Control females	Control males	Schizophrenic females	Schizophrenic males
Schizophrenic males	31	85.1 (11.3)	<i>Z</i> =-0.24 <i>P</i> =0.81	<i>Z</i> =-2.7** <i>P</i> =0.007	<i>Z</i> =-1.3 <i>P</i> =0.18	
Schizophrenic females	20	90.2 (10.0)	<i>Z</i> =-1.3 <i>P</i> =0.19	<i>Z</i> =-0.89 <i>P</i> =0.37		
Control males	49	94.1 (13.2)	<i>Z</i> =-2.4* <i>P</i> =0.015			
Control females	44	87.8 (16.6)				

P*<0.05, *P*<0.01.

Similarities between the Machiavellian intelligence hypothesis (MIH) and the Mach IV scale structure make the two complementary for research. The MIH is interpreted as emphasizing awareness of and ability to function in a social context often characterized by interpersonal deception (Machiavellianism), requiring accuracy in interpreting behavioural cues of intentionality. The Mach IV subfactorial component, interpersonal ‘duplicitous tactics’, is described as ‘concerned with [Machiavellian] methods of dealing with people’ (30), and is comparable to the mechanisms of ‘interpersonal deception’ implied by the evolutionary hypothesis. Similarly, the subfactor component ‘views of human nature’ refers to ‘cognitions about people’ (31), in particular the degree of cynicism with regard to the motives and behaviour of others, which relates closely to the judgements utilized in ‘interpreting the mental states of others’. Although not designed to measure ‘Machiavellian intelligence’ in the evolutionary sense, the Mach IV ‘taps into’ the same key behavioural skills as the MIH and, indirectly, those used in theory of mind tasks.

While continuity between performance on the Mach IV scale and in theory of mind tasks may exist, the strategic social thinking manifest in Machiavellian attitudes is less direct, or concrete, than the specific identification of mental states typical of theory of mind tests.

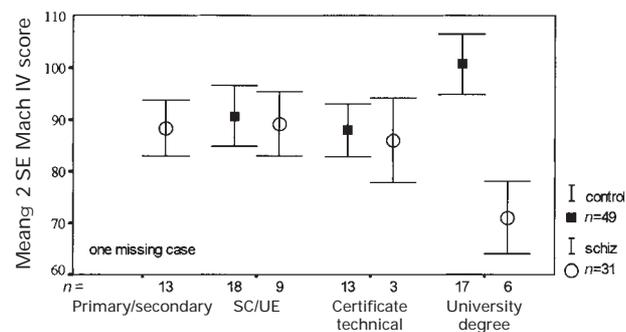


Fig. 1. Education: male schizophrenics vs. male controls (*N*=80). SC/UE, School Certificate or University Entrance.

Statistical tests

The 20 corrected ranked responses to questions in the Mach IV scale for each subject were entered using SPSS software (32). Although Likert scales are often treated as interval data, a more conservative approach was adopted by treating the data as ordinal and using non-parametric statistical tests. Means and standard deviations were calculated for all samples by sex. The independent-sample Mann–Whitney *U*-test was used to test for differences in mean rankings between sample group distributions. Demographic data were analysed using Kruskal–Wallis one-way analysis of variance (corrected for ties). The Kruskal–Wallis test was also used to explore between-group variability in statement responses. A two-tailed, 95% confidence interval (0.05) was used as the minimum level of significant probability of difference.

Results

The mean Mach IV scores by group are shown in Table 2. The female schizophrenic and female control groups did not differ significantly with regard to overall Mach IV score. The mean Mach IV score of male schizophrenics was significantly lower than that of the male control group, and the former were the lowest scoring of the four groups. Consistent with the majority of the Mach IV literature, male controls had significantly higher mean scores than female controls.

Kruskal–Wallis one-way ANOVA was performed in order to test the relationship between demographic variables of age and education and Mach IV score. Age was independent of Mach IV score for all sample groups. Education was independent of Mach IV score for female groups, but not for male groups. Schizophrenic males who had only received primary or secondary education had significantly higher Mach IV scores than those who had received tertiary education ($\chi^2=10.1$, *P*<0.05). An inverse relationship existed for male

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Table 3. The Mach IV scale (Christie and Geis, 1970) showing corrected mean rank scores (1 = low score, 4 = no opinion, 7 = high score) and Kruskal–Wallis *H* significance of difference for each item/intra-sex sample group comparison

Statement item	Schizophrenic males			Control males			Schizophrenic females			Control females		
	males	males	<i>H</i> statistic	males	males	<i>H</i> statistic	females	females	<i>H</i> statistic	females	females	<i>H</i> statistic
1 The best way to handle people is to tell them what they want to hear [Tactics+]	4.2	3.6	2.2	4.0	3.4	0.8	4.0	3.4	0.8	4.0	3.4	0.8
2 When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which might carry more weight [Tactics-]	2.9	2.7	0.5	2.5	2.4	0.5	2.5	2.4	0.5	2.5	2.4	0.5
3 Anyone who completely trusts anyone else is asking for trouble [Tactics+]	4.3	4.3	0.05	4.6	3.5	3.6*	4.6	3.5	3.6*	4.6	3.5	3.6*
4 It is hard to get ahead without cutting corners here and there [Views+]	4.2	4.3	0.04	4.8	3.7	4.2*	4.8	3.7	4.2*	4.8	3.7	4.2*
5 Honesty is the best policy in all cases [Tactics-]	2.3	3.2	4.4*	1.7	2.8	7.9**	1.7	2.8	7.9**	1.7	2.8	7.9**
6 It is safest to assume that all people have a vicious streak and it will come out when they are given a chance [Views+]	3.3	3.5	0.08	4.6	2.8	9.8**	4.6	2.8	9.8**	4.6	2.8	9.8**
7 Never tell anyone the real reason you did something unless it is useful to do so [Tactics+]	3.4	2.9	1.0	5.0	2.6	15.7***	5.0	2.6	15.7***	5.0	2.6	15.7***
8 One should take action only when sure it is morally right [Tactics-]	2.7	3.8	7.2**	2.5	3.8	5.9**	2.5	3.8	5.9**	2.5	3.8	5.9**
9 It is wise to flatter important people [Tactics+]	3.2	3.8	2.4	3.2	2.3	1.4	3.2	2.3	1.4	3.2	2.3	1.4
10 All in all, it is better to be humble and honest than important and dishonest [Morality-]	2.5	2.0	1.5	2.3	1.8	1.0	2.3	1.8	1.0	2.3	1.8	1.0
11 The saying 'there's a sucker born every minute' is wrong [Views-]	2.9	4.5	13.5***	3.5	4.0	0.8	3.5	4.0	0.8	3.5	4.0	0.8
12 People suffering from incurable diseases should have the choice of being put painlessly to death [Morality+]	3.3	5.7	22.5***	4.0	5.7	10.4**	4.0	5.7	10.4**	4.0	5.7	10.4**
13 It is possible to be good in all respects [Tactics-]	2.9	4.2	8.6**	3.2	4.6	5.4*	3.2	4.6	5.4*	3.2	4.6	5.4*
14 Most people are basically good and kind [Views-]	3.1	3.1	0.11	3.6	3.0	1.5	3.6	3.0	1.5	3.6	3.0	1.5
15 There is no excuse for lying to someone else [Tactics-]	3.1	4.2	6.3**	2.3	3.7	6.7**	2.3	3.7	6.7**	2.3	3.7	6.7**
16 Most people forget more easily the death of their father or mother than the loss of their property [Views+]	2.8	2.3	1.4	3.6	1.9	8.6**	3.6	1.9	8.6**	3.6	1.9	8.6**
17 Most people who get ahead in the world lead clean, moral lives [Views-]	3.5	5.4	15.0***	3.0	5.5	17.4***	3.0	5.5	17.4***	3.0	5.5	17.4***
18 Generally speaking, people won't work hard unless they're forced to do so [Views+]	3.2	3.4	0.08	3.9	3.0	3.3	3.9	3.0	3.3	3.9	3.0	3.3
19 The biggest difference between most criminals and other people is that criminals are stupid enough to get caught [Views+]	3.5	2.7	2.3	3.5	2.8	2.0	3.5	2.8	2.0	3.5	2.8	2.0
20 Most people are brave [Views-]	3.5	4.2	3.0	4.0	4.1	0.02	4.0	4.1	0.02	4.0	4.1	0.02

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

controls, with education to university degree level correlating significantly with the Mach IV score ($\chi^2 = 11.4$, $P < 0.01$). This complex result can be observed more clearly in Fig. 1.

Table 3 shows the results categorized by subject groups and each Mach IV item, with the mean corrected (i.e. the higher the score, the more Machiavellian the response) score reported for each item statement. Schizophrenic males scored significantly differently to control males on 7 of the 20 items. In each case their score was lower, indicating a less Machiavellian perspective. These significant results are spread across the three subfactorial components of the Mach IV scale. Compared to control males, schizophrenic males were more likely to agree with statements that unconditionally support the value of honesty and morality in social interaction.

The comparison between schizophrenic and control females was more complex. Although there was no significant overall difference in Mach IV score between the two groups, they differed significantly on 11 of the 20 specific items. Schizophrenic females were significantly different from female controls on 6 of the 7 items for which schizophrenic males differed from control males, and in the same non-Machiavellian direction. This would indicate that they, too, unconditionally value

honesty and morality. However, this viewpoint is balanced by their high scores, compared to female controls, on items 3, 4, 6 and 7, which indicate a highly suspicious or wary perspective on social interaction. Therefore, schizophrenic females performed quite differently on the Mach IV test compared to control females, although their overall scores do not reflect this. They differed significantly from schizophrenic males on only 2 of the 20 items (items 6 and 7).

Despite the significant difference in overall score between control males and control females, they differed significantly on only two specific items as well (items 3 and 9), which is only one more than would be expected by chance.

Note that both female and male schizophrenic patients tended to disagree with item 12, which may reflect their institutional experience rather than their disorder.

Discussion

This study demonstrates that patients with schizophrenia differ significantly from same-sex controls in strategic social thinking as measured by the Mach IV scale. Both male and female patients with schizophrenia, compared to controls, appear to be

relatively naive or credulous in that they are more likely to agree with statements emphasizing the value of honesty or moral correctness in social interaction. However, women with schizophrenia scored as highly Machiavellian on some items, reflecting a more cynical world-view. They appear to value honesty and morality, while at the same time remaining suspicious of the actions and motives of others.

Overall, our results support the prediction of low levels of Machiavellianism in patients with schizophrenia for males but not for females. Previous Mach IV research shows that females often score significantly lower than males (22, 33; but see 34), and the findings for the male and female control groups conform to this expected pattern. Following this trend, we would expect the female schizophrenic group also to score substantially lower than the schizophrenic males, but instead they had higher mean scores. In actual as well as relative terms, therefore, the data suggest that schizophrenic females are more socially robust than schizophrenic males. Our results may be consistent with the view that schizophrenic females are more socially adapted (3, 24, 35), as illustrated by their 'worldly' wariness, especially compared to control females, as exhibited by their replies to items 3, 4, 6 and 7.

Frith and Corcoran (16) have linked poor performance in theory of mind tasks specifically to subjects with paranoid schizophrenia. Can errors in social judgements be linked, therefore, to positive symptomatology? The relatively suspicious attitude of the schizophrenic females may be indicative of paranoia. However, it should be noted that these high Mach scores, when found in a general population, have been interpreted as reflecting a pragmatic, worldly cynicism (22). Since our study group was not differentiated by subtype, we do not know whether there were more paranoid patients in the female group relative to the male group. Further research with subjects screened by symptom subtype would help to clarify the results for the schizophrenic females in this study. Are they due to general paranoia or do they reflect social adaptation to a fundamentally credulous psychological make-up?

The male schizophrenic group unequivocally displayed low levels of Machiavellianism (low Mach). The Mach IV experimental literature demonstrates that low Mach scorers characteristically confuse affect signals and become emotionally aroused in social transactions, losing track of task goals (22). High Mach scorers, on the other hand, accurately assess affect, remain detached from the interpersonal exchange, and are 'highly effective [in] achieving the cognitively defined goals' (36).

Differences in behaviour between high and low Mach scorers are maximized in face-to-face situations, where there is scope for improvisation, or where affect is evoked in the interpersonal exchange (33).

Do low levels of Machiavellianism in schizophrenia help us to answer the question, raised by Cramer et al. (4), of 'why they get it wrong' in social interactions? Cramer et al. (4) have proposed the following perceptual/attention hypothesis: '[t]he problem may be due to an inability to organise meaningful material including emotional factors such that there is a failure to distinguish relevant from irrelevant material, which produces unfocused responding to social tasks'. The Mach IV experimental literature indicates that low Mach scorers (e.g. a schizophrenic male) tend to confuse social cues of intentionality with an accompanied unfocused affective arousal, and they wander from personal objectives in the social exchange. In general, the low Mach schizophrenic male will 'lose' in 'real-world' social interactions with high Mach scorers who, relatively speaking, are most other males in the wider community. Further research is needed to investigate the potential for using the Mach scale literature to inform communication strategies for, at least, male patients with schizophrenia. Possible areas where such insights may be useful are structured and unstructured interview situations, and family communication dynamics.

Another finding of the study was that the Mach IV score was negatively correlated with level of educational attainment for schizophrenic males, but positively correlated with it for control males. The results for the control males are consistent with the data for other Mach IV studies (33, 37, 38), which show a significant correlation between high levels of Machiavellianism and level of social or educational attainment. This expected relationship is reversed in the male schizophrenic data, where those patients with a university degree ($n=6$) had an average score of only 71. Behaviours predicted by such low scores (e.g. confusion of affect signals and naivety with regard to motivation and intention in others) suggest a position of social vulnerability, and may identify an 'at-risk' group.

Jones (39) and Jones and Offord (40) describe IQ as an independently inherited trait that favourably modifies the course of schizophrenia. While the results are ambiguous for female subjects, Jones (39) found a positive correlation between IQ and likelihood of marriage for males, suggesting that IQ predicts more functional relationships. However, Jones' research provides no indication of the quality or duration of marriages. Since this study

focused on patients with chronic schizophrenia, we do not have any data on well-educated patients who display a more benign course of illness. The Mach IV data may identify that proportion of high-IQ male patients with schizophrenia who have *not* succeeded in the community, as a group particularly vulnerable in the social context, but further study will be needed to establish whether this is the case.

Conclusions

To our knowledge, this is the first study to use the Mach IV scale to look at strategic social thinking in a group of patients with schizophrenia. It clearly demonstrates that both male and female patients with schizophrenia differ significantly from same-sex controls. The extent to which the results can be generalized is limited, as the samples are not random or representative. The study results suggest that further investigation of Mach IV performance by schizophrenia subtype is warranted. In addition, the relationship between Mach IV score and other cognitive measures, especially IQ, needs to be examined directly. Assessment of Mach IV performance in other psychiatric illnesses would also be useful, but given the different results obtained in this study for male and female patients with schizophrenia, there are no grounds for predicting a simple relationship between psychopathology and Machiavellianism. Finally, it is important to add the qualifier that the Mach IV is not a measure of psychopathology, and some individuals in the control group returned low scores on the scale.

The evolutionary argument for schizophrenia predicts that the expression of Machiavellianism in patients is part of a complex, genetically mediated behavioural phenotype. In a similar context, deficits in theory of mind tasks have been demonstrated in the parents of children with autism (41). There has been only limited research on phenotypic stability and heritability of Machiavellianism (42). Given the results presented here, it would be very interesting to examine the Mach IV performance of first-degree relatives of schizophrenic patients. Such a study would usefully inform evolutionary hypotheses concerning the maintenance of schizophrenia alleles in the general population (1).

Although this is an initial application of the instrument, our results indicate that the Mach IV scale may be a useful tool for measuring aspects of sociality in schizophrenia at the clinical, familial and population levels.

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