Predictors of social cognition in patients with schizophrenia

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Abstract: The goal of this study is to explore neurocognitive, clinical and community functioning variables in order to predict "social reasoning" in a sample of patients with a diagnosis of schizophrenic disorder. Cognitive and community functioning, and social reasoning have been evaluated, together with the Positive and Negative Syndromes Scale (PANSS) and DSM-IV Global Assessment of Functioning (GAF), in a sample of 46 patients who met the DSM-IV criteria for schizophrenia. Our findings show that global functioning as reflected by GAF is the strongest predictor of the social reasoning as evaluated by the Wason's Selection Task (WST). Other community functioning variables such as the Life Skills Profile (LSP) sub-scores do not provide significant prediction of social reasoning. Similarly, neurocognitive measures, in terms of attention and contextual reasoning, have no predictive effect on social reasoning. Our findings show that social cognition should be considered as an additional cognitive domain more related to functional outcome.

Keywords: social cognition, contextual reasoning, sustained attention, community functioning, social reasoning, schizophrenia

Introduction

A wide range of studies indicate that persons with schizophrenia are prone to avoid social interaction and show a decrement in functioning as the demand of such interactions increases (Penn et al 1997; Abdi and Sharma 2004). "Social cognition" is the most recent construct that has been advocated to explain social dysfunction in schizophrenia (Nuechterlein et al 2004).

Researchers have become increasingly interested in the link between cognitive deficits and problems in social functioning (Bellack 1992; Penn et al 2004). Deficits in social cognition appear severe in schizophrenia, but this is a relatively new area of research with fewer studies supporting this finding (Pinkham et al 2003). An expert group opinion is that this construct deserves evaluation and ultimately treatment (Measurement and Treatment Research to Improve Cognition in Schizophrenia - MATRICS: www.matrics.ucla.edu).

Striking parallels between neurocognitive skills and social functioning have been found in terms of onset, vulnerability, and course, leading to the hypothesis that cognition supports social functionality or facilitates the acquisition of interpersonal skills (Pinkham et al 2003). It is believed that problems in cognitive functioning may affect the person's ability to learn, exhibit, and express social skills and behaviors (Morrison et al 1988; Bellack 1992; Penn et al 1997).

Even though social functioning is linked to neurocognitive abilities, this construct alone is unable to explain the observed deficits (Penn et al 1997). There is a wealth of evidence that cognition, social reasoning and competence are compromised in schizophrenia, but it is less clear how these factors interact (Green 1996; Green et al 2000) and other factors should also be considered.

The goal of this study is to explore neurocognitive, clinical and community functioning variables able to predict "social reasoning" in a sample of patients with a diagnosis of schizophrenic disorder. The Wason's Selection Task (WST) (Cosmides 1989) has been used to assess social reasoning, as one aspect of social cognition. The cognitive functioning has been assessed with the Continuous Performance Test (CPT) (Stratta et al 2000), and the Cognitive Bias Task (CBT) (Stratta et al 1999). Clinical symptoms as evaluated by the Positive and Negative Syndromes Scale (PANSS) (Kay 1992), DSM-IV Global Assessment of Functioning (APA 1994), and life skills by Life Skills Profile (Parker et al 1991) were also used as predictor variables along a logistic regression model.

Methods
Subjects
The subjects comprised 46 patients (24 men and 22 women) who met the DSM-IV criteria for schizophrenia (APA 1994), consecutively admitted for the treatment of a psychotic episode at Villa Serena Medical Center (VSMC), a psychiatry tertiary referral center. None of the patients had ever been hospitalized for more than 6 consecutive months, and all were relapsing multi-episode patients able to live in the community with a maintenance antipsychotic treatment; duration of illness

(years) is 17.13 (9.48 SD). The demographic details of the sample are shown in Table 1.

All the subjects provided written informed consent after a complete description of the study, according to the local institutional review board. The evaluation was made during the illness episode remission, immediately before discharge.

Procedure
Wason's Selection Task: the social reasoning was evaluated with the "social familiar version" (SFV) of WST (Wason 1966). This task is a card selection task in which the ability of people to reason in a logical fashion is explored. In the SFV the conditional rule is embedded within a story where it is necessary to check whether people are drinking underage. Performance is not time-limited. The Wason score is a dichotomous variable based on the subject response to the stimulus cards: wrong answer and correct answer.

The cognitive functioning was appraised with two neurocognitive tasks: the CPT, designed to evaluate sustained attention, and the CBT, which is thought to activate contextual reasoning. The choice of these tasks is based on literature evidence of social context processing abnormalities in schizophrenia (Penn et al 2002; Hemsley 2005).

The modified version by Servan-Schreiber et al (1996) of the CPT "A-X" has been used. In the statistical analysis,

Table 1 Wason's Selection Task logistic regression results (forward stepwise procedure with likelihood ratio) of the schizophrenic sample (n = 46)

Independent variables	Mean	SD	Score	df	Sig	R
Sociodemographic						
• Age	39.60	10.61	5.532	1	0.018	0.243
• Sex (M/F)	……	……	0.163	1	0.686	0.000
• Educational level	10.65	3.10	3.128	1	0.076	0.127
Neurocognitive						
• A prime CPT	0.82	0.15	2.249	1	0.133	0.068
• CBT converted score	13.43	16.38	2.890	1	0.089	0.129
Clinical (PANSS)						
• Positive score	18.82	6.20	6.728	1	0.009	0.297
• Negative score	22.02	5.20	0.000	1	0.979	0.000
• Cognitive Cluster score	18.10	6.08	0.706	1	0.400	0.000
• Total score	79.78	16.16	1.122	1	0.289	0.000
Community Functioning (LSP, GAF)						
• Self-care	31.63	5.80	0.020	1	0.885	0.000
• Non-turbulence	37.80	7.04	0.605	1	0.436	0.000
• Communication	19.10	3.49	1.024	1	0.311	0.000
• Social contacts	14.06	2.74	0.005	1	0.939	0.000
• Responsibility	15.21	3.11	0.084	1	0.771	0.000
GAF	35.63	15.33	5.495	1	0.019	0.275

Abbreviations: CBT, Cognitive Bias Task; CPT, Continuous Performance Test; GAF, Global Assessment of Functioning; LSP, Life Skills Profile; PANSS, Positive and Negative Syndromes Scale.

A prime (A´) was used, calculated as previously reported on the base of total false alarm rate (Stratta et al 1998a, 2000b). Higher scores indicate higher signal to noise discrimination.

To activate contextual reasoning we used a computerized version of the CBT designed by Goldberg et al (1994). Sixty trials have been administered to the subjects: each trial involves the presentation of a target card alone followed by two choice cards below. The subject was instructed to look at the target and then select one of the two choices that he/she preferred. The CBT cards differ in 5 binary dimensions: shape (circle/square), color (red/blue), number (one/two identical components), size (large/small), and contour (outline/filled with a homogeneous color). A "similarity index" between the targets and the subject's choices has been computed: it shows the number of identical dimensions and therefore range from 5 to 0. The task involves a converted score computed as reported by Goldberg et al (1994) and Stratta et al (1999), that is, high for an internally driven context-dependent behavior, and low for an externally driven context-dependent behavior.

The computerized CPT and CBT have been administered using MEL (Micro Experimental Laboratory) (Schneider 1988).

The current symptoms of the patients with schizophrenia have been assessed prior to testing using the PANSS (Kay 1992). The PANSS cognitive component was calculated summing the following 7 items: difficulty in abstract thinking, stereotyped thinking, cognitive disorganization, lack of judgment and insight, poor attention, tension, mannerism, and posturing according to Bell et al (1994) and Daneluzzo et al (2002).

We used the Global Assessment of Functioning (GAF) Scale (APA 1994) to rate patient's functioning. We also administered the Life Skills Profile (LSP), a measure that allows for the assessment of functioning in persons with schizophrenia (Parker et al 1991). The LSP provides a total score derived from 5 subscales that examine the following specific aspects of community functioning: Self-Care, Non-turbulence, Social Contact, Communication, and Responsibility.

Statistical analysis

A logistic regression analysis has been conducted to determine which variables predict wrong/right WST response, as dependent variable. The Statistical Package for the Social Sciences (SPSS 1992) has been used to determine the significance rating of each set of variables. Four blocks of independent variables (ie, sociodemographic, neurocognitive, clinical, and community functioning) have been included in the analysis. A forward stepwise procedure with likelihood ratio has been used in selecting variables to add or delete from the model.

Although WST response is a dichotomous variable, there is an underlying continuity of the score, and an independent variable is categorical. Therefore it has been considered suitable to use a logistic regression in this study.

Results

Wason test responses distinguished the total sample into a group of 30 subjects with wrong answer and 16 with correct answer to the task.

The stepwise logistic regression results reveal that of the four blocks of variables (ie, sociodemographic, neurocognitive, clinical, social skills, and functioning) only 3 variables entered in the final equation (Tables 1 and 2) with higher significance and Exp(B) for GAF (Table 3). Figure 1 shows the predicted probability of membership for right WST response: the classification table of observed vs predicted cases (Table 3) shows that the model performs fairly, with 80.43% of predicted cases assigned to the right category (90% for the wrong response and 62.50% for the right response).

Discussion

Social cognition concerns disparate areas of investigation (Penn et al 1997a). Although it seems obvious that social cognition could depend and interact with cognitive and community functioning, few attempts towards an integration of theory and findings have been made (van Beilen et al 2003). In this study we attempted to integrate the areas of neurocognition, clinical symptomatology, and community functioning, as well as

Table 2 Wason's Selection Task logistic regression results: independent variables entered in the final equation (n = 46)

Independent variables entered in equation	B	SE	Wald	df	Sig	R	Exp(B)
Age	−0.080	0.046	3.031	1	0.081	−0.149	0.922
PANSS Positive score	−0.026	0.090	0.087	1	0.767	0.000	0.973
GAF	0.077	0.035	4.683	1	0.030	0.241	1.080

Abbreviations: GAF, Global Assessment of Functioning; PANSS, Positive and Negative Syndromes Scale.

Table 3 Wason's Selection Task logistic regression model: classification table

	Predicted		
Observed	Wrong response	Right Response	Percent correct
Wrong response	27	3	90.00
Right Response	6	10	62.50
Overall			80.43

sociodemographic variables in order to evaluate their ability to predict social reasoning.

Our findings show that a community functioning variable as reflected by GAF is the strongest predictor of the social reasoning as evaluated by the WST. The GAF combines several dimensions of psychopathology on a single 100-point scale. Specifically, it combines behavioral anchors for a mix of psychological functioning, mostly symptoms, and social, occupational, and school functioning, mostly interpersonal interaction and role performance. The behavioral measures related to psychological functioning are joined to the measures for social, occupational, or school functioning by "or" statements, for example, "serious symptoms or any serious impairment in functioning" (Goldberg et al 2004).

What is appealing in the relationship that we found between the GAF and social reasoning is the explicit linking of

social reasoning to behavior, which could be a confirmation and an extension of previous observations on social cognition (Brennan et al 1984) reporting that social perception and cognition in schizophrenia predict the odds of being a patient significantly better than non-social cognition.

However the other community functioning variables used, the LSP sub-scores, did not provide significant prediction of the social reasoning evaluation. The Life Skills Profile (LSP) is a scale developed to assess function and disability in persons with schizophrenia in the community. Studies indicate that the LSP does detect differential levels of disability between hospital and community settings (Kirby et al 1997; Trauer et al 1997), these findings could lead to the hypothesis that these life skills could have a predictive value on social reasoning. This hypothesis is not supported by our findings.

Similarly, neurocognitive measures, in terms of attention and contextual reasoning, had no predictive effect on social reasoning. Impairment in multiple and diverse cognitive domains as well as general cognitive ability has been consistently observed (Heinrichs 1998). These deficits tend to correlate rather closely with a degree of social or occupational dysfunction (Hemsley 2004, 2005; Schenkel et al 2005). This leads to some evidence suggesting that specific neurocognitive deficits, such as context processing (Schneider 1988; Schenkel et al 2005), are linked to specific domains of community functioning, and to impairment not
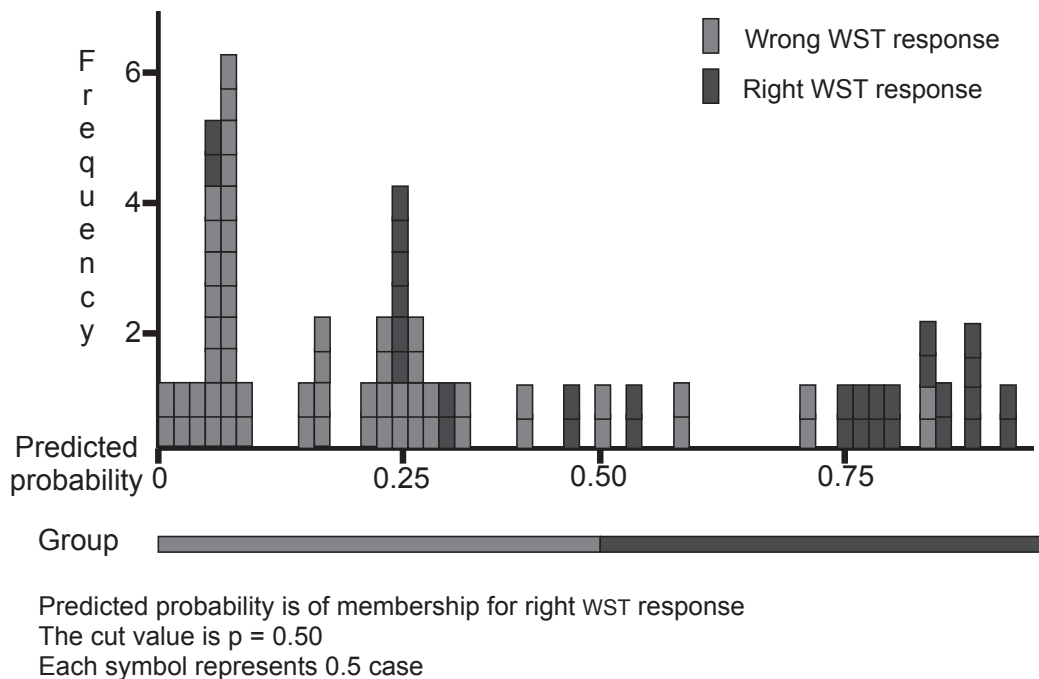

Figure 1 Wason's Selection Task (WST) logistic regression model: observed groups and predicted probabilities.

only in social functioning but also in the development of abnormal beliefs about others.

Recent literature suggests that social cognition is an independent module of intelligence separate from generalized cognitive abilities (Anderson et al 1999; Kanwisher 2000; Brune 2005). Our findings support this hypothesis further that social cognition should be considered as an additional cognitive domain more closely related to functional outcome than basic cognitive functions (Green 2004).

A second predictor in the logistic analysis we performed is the "positive" symptomatology. Some studies showed symptoms more strongly related than cognitive test scores to community functioning (Norman et al 1999). This predictor, taken together with the lack of prediction of the cognitive variables, leads us to the consideration of biases occurring during the social information processing. As previous studies noted, biases refer to a response style that is not necessarily indicative of poor performance (Penn et al 1997b). A similar bias is the self-serving attributional style associated with persecutory delusions (Penn et al 1997a) or the tendency for persons with schizophrenia to see unrelated events as connected and meaningful (Trauer 1996). From this perspective the influence of symptoms on social information processing could be considered not limited to biological factors but may include psychological mechanisms.

Lastly the third predictive factor is age, likely reflecting the crystallization and progression of incompetent behavioral styles, or a neurotoxic influence of the disorder.

Some possible pitfalls of this study have to be considered: the sample is relatively small and no comparison group with other mental disorders or with healthy control subjects has been evaluated. However the aim of this preliminary study is the investigation of the relationship between a well documented social cognition index and sociodemographic, neurocognitive, clinical, and community functioning. Another limitation is that we did not include antipsychotic medication dosage as a predictive variable. Although this is an interesting and relevant issue with possible influence on task performance, the possibility of a comparison among different doses of different drugs (eg, classical vs atypical antipsychotics) is very difficult and controversial.

Potential shortcomings could also derive from the use of WST as social cognitive reasoning measure. The debate regarding the interpretation of the task is considerable and alternative models have been proposed (Adolph 1999). Cosmides (1989) considers the task results as providing evidence for evolved mechanisms of reasoning about social exchange. Specifically, the findings from the Wason selection task support the hypothesis of an evolved skill to detect deception in the context of social contracts, because an ability to rapidly and reliably detect such deception would have been adaptive (Cosmides and Tooby 1992).

The notion of social cognition is relatively new, and more research is required. Controlled studies in larger samples are warranted to further explore the meaning of predictors of social cognition. The individualization of predictors could indicate the use of possible rehabilitation programs for persons with schizophrenia, both psychological and pharmacological, tailored to meet their social cognition deficits, thereby leading to a significant improvement in their everyday social functioning.

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