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ORIGINAL PAPER

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# Insight, cognitive dysfunction and symptomatology in schizophrenia

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**Abstract** Lack of insight is frequent in schizophrenia and usually influences negatively both patient's treatment and prognosis. This study aimed to investigate the relationship between insight, symptomatology and cognitive dysfunctions in schizophrenia using the PANSS five-factor model (modified from Gaag et al. in Schizophr Res 85:280–287, 2006). Forty patients diagnosed with chronic schizophrenia (DSM-IV) were evaluated with the scale to assess unawareness of mental disorder (SUMD), the PANSS and a neuropsychological battery. Spearman correlation and linear regression analyses were performed to investigate the relationship between clinical, neurocognitive and insight measures. The SUMD current and past awareness of symptoms score showed a correlation with WCST indices (correct answers and non-persevering errors). The negative and disorganization factor of the PANSS showed a positive correlation with current and past awareness of symptoms. However, when submitted to a linear regression model only the disorganization factor emerged as significant contributor for insight. Considering that the core items of the "disorganization factor" of the PANSS are related to cognition (e.g., poor attention, difficult in abstract thinking), insight is associated cognitive symptoms although no direct relationship between insight and neuropsychological tests was observed.

**Key words** insight · schizophrenia · neurocognition · psychopathology · PANSS factors

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## Background

Impairment of insight is one of the most frequently observed symptoms in schizophrenia, even after the remission of the psychotic episode. It influences compliance to treatment and the prognosis of the disease [2, 3]. Eighty to 85% of the patients show either partial or no insight of the disorder [3, 24, 35].

In the last decade, impairment of insight in schizophrenia has been frequently associated with the neurocognitive functioning, especially of the frontal brain region [20, 17, 19, 23, 26, 31, 32, 34, 38]; in only two studies there was also an association with parietal region deficits [23, 31].

The Wisconsin card-sorting test is the most widely used test to measure frontal functions. It has shown a high correlation with various measures of insight, reinforcing the importance of frontal lobes and executive functions to the ability to recognize illness and its symptoms [17, 21, 29]. Using other method (the Luria–Nebraska battery), McCabe et al. [22] also found an association between frontal functions and insight. Drake and Lewis [12] concluded that perserveration, attention and working memory correlate with lack of insight. They propose that tasks requiring the subjects to manipulate abstractions and then explicitly explaining their responses may provide a better model of the neuropsychological deficits involved.

However, the results are not yet conclusive. Other authors did not find a relationship between insight and frontal dysfunction [7, 9, 10]. Goodman et al. [15] and Donohoe et al. [11] suggest that the relationship between insight and cognition in schizophrenia is associated to a global cognitive impairment, involving memory, attention and intellectual efficiency tasks, rather than a specific frontal impairment.

The aim of this paper is to investigate the relationship between insight, cognition and psychopathology in schizophrenia.

## Materials and methods

### Participants

The sample included 40 stable outpatients (75% men and 25% women), aged between 18 and 50 years (mean = 34.0; S.D. = 7.4 years) of the Schizophrenia Research Program (PROJESQ) of the Instituto de Psiquiatria do Hospital das Clínicas, Faculty of Medicine, University of São Paulo, Brazil. All met the diagnostic criteria for schizophrenia according to the DSM-IV [4] and had at least 5 years of education. They were taking antipsychotics, half of the sample was considered refractory and was medicated with clozapine, the other patients were mainly on risperidone or olanzapine; the medication dose remained constant for at least 2 weeks before the evaluation. Thirty patients were diagnosed with paranoid schizophrenia, and ten, with residual schizophrenia. The exclusion criteria were: (a) dependence of substances or other psychiatric disorders of Axis I, (b) a history of traumatic brain injury and/or other neurological disorders, (c) any disease that may have an impact on the central nervous system, (d) mental retardation. A total of 15% of the sample ($n$ = 6) had between 5 and 8 years of education; 65% ($n$ = 26), between 9 and 11; and 20% ($n$ = 8), between 12 and 16 years of education. All the participants volunteered to the study, and all had signed an informed written consent. The research was carried out in accordance with the latest version of the Declaration of Helsinki and approved by the Ethics Committee of the Hospital das Clinicas, Sao Paulo, Brazil.

### Insight and psychopathology assessment

The Portuguese versions of the Scale to Assess Unawareness of Mental Disorder (SUMD) [13] and the Positive and Negative Syndrome Scale (PANSS) [6] were applied by a senior trained psychiatrist who was unaware of the results of the neuropsychological battery. The application of the tests was carried out without previous knowledge of the rating scale results.

### Neuropsychological assessment

The neuropsychological battery consisted of the following instruments: (a) Attention and executive functions: Continuous performance test-II [8]; trail making test [27], [33], Wisconsin card sorting test [16] and Stroop color-word test [33]; (c) Visuospatial functions: Line judging and orientation [5]; face recognition [5] and Rey complex pictures [28]. For the evaluation of the average intellectual efficiency, the Revised Wechsler intelligence scale vocabulary and block design subtests [36] were applied. It was applied in two sessions of approximately ninety minutes each by a skilled neuropsychologist. Considering that this neuropsychological battery is not validated for the Brazilian population, only the raw results were considered.

### Data analysis

We used the five-factor model of the PANSS as proposed by Gaag et al. [14] in two different ways. First, we used the five-factor model that covers all thirty items of the PANSS; second, we used only the items that were included in all the tenfold cross-validation of the confirmatory factor analysis. In this case, only some of the items of the PANSS ("core items") are included in each of the five-factor model. For example, the "disorganization factor" is composed of stereotyped thinking (N7), poor attention (G11), disorientation (G10), conceptual disorganization (P2) and difficult in abstract thinking (N5) (see Table 3 of the paper by [14]).

The seven general and summary indices of the SUMD were correlated with the raw scores of the neuropsychological tests and with the PANSS scores of the five-factor model [14] using Spearman's test. Mann–Whitney test was used for comparisons between groups and either the Chi-square test or the Fisher exact test were used to test group homogeneity. Separate stepwise regression analyses were performed for each insight dimension. In each case the insight dimension was entered as the dependent variable, and all those neuropsychological and symptomatological variables that correlated with insight dimension at a 1% level of significance were entered as the independent variables.

All analyses were performed using the SPSS 14.0 package (SPSS Inc., Chicago, IL, USA).

## Results

In the SUMD there were high scores in the items "current awareness of symptoms" (mean = 3.4, S.D. = 1,5, range 0–5), "past awareness of symptoms" (mean = 3.4, S.D. = 1.5, range 0–5) and "awareness of perception of others for symptoms" (mean = 3.8, S.D. = 1.5, range 0–5). These three items showed a significant correlation ($P \leq 0.01$) with some measurements of the Wisconsin Card Sorting Test (see Table 1). In relation to the psychopathology, there were significant correlations ($P \leq 0.01$) between SUMD's "current awareness of symptoms" and "past awareness of symptoms" and the negative factor (PANSS) and disorganization factor (PANSS) modified (Table 1).

When separate stepwise regression analyses were performed for each insight dimension, the psychopathology was more significant than neuropsychology. In each case, the insight dimension was entered as the dependent variable, and all those variables that correlated with each insight dimension at a 5% level of significance were entered as the independent variables.

**Table 1** Correlations (Spearman) between neuropsychological tests#, PANSS factors# and the SUMD# (with uncorrected $p$ for multiple comparisons)

| | SUMD current awareness of symptoms | SUMD past awareness of symptoms | SUMD awareness of perception of others for symptoms |
|---|---|---|---|
| WCST number of correct answers | −0.406 (0.009)* | | −0.403 (0.01)* |
| WCST number of non-perserverative errors | 0.406 (0.009)* | 0.403 (0.01)* | |
| Positive factor | | | |
| Negative factor | 0.441 (0.004)* | 0.422 (0.007)* | |
| Disorganization factor | 0.527 (0.001)* | 0.500 (0.001)* | |
| Excitement factor | | | |
| Emotional distress factor | | | |

#Only significant results are included
*Rho (level of significance)

**Table 2** Results of model of fit for explanatory variable of dimensions of insight as measured by the SUMD

| Dependent variable | Explanatory variable (modified disorganization factor of the PANSS) | | |
|---|---|---|---|
| | Standardized-coefficient | *t* | *P* |
| SUMD current awareness of symptoms | 0.497 | 3.527 | 0.001 |
| SUMD past awareness of symptoms | 0.485 | 3.419 | 0.002 |

The modified disorganization factor (only "core" items of the PANSS, as described above) was the only factor that emerged as the significant explanatory variable of the SUMD dimensions (Table 2).

The sample was divided in two groups, one medicated with Clozapine ($N = 20$) and the other, with different antipsychotics, whose daily doses were converted to equivalents of Chlorpromazine ($N = 20$) [37]. These two groups were similar in relation to sex, marital status and diagnosis. However, the group of patients taking Clozapine had more previous hospitalizations than the group with other antipsychotics ($P = 0.010$). The group taking Clozapine showed a poorer performance in the copy of the Rey complex figure ($P < 0.001$). There were no significant differences on other neuropsychological tests and on PANSS factors.

## Discussion

In this study, the significant correlations between insight and neuropsychological tests were limited to scores of the Wisconsin card-sorting test ("number of corrected answers" and "nonperseverative errors"). A relationship between WCST performance and insight is also reported in other studies [17, 19–21, 23, 26, 29, 38]. Nevertheless, the authors observed that the most significant relationship is between insight and the "number of perseverative answers" of the WCST [17, 20, 32, 38].

In the meta-analysis of Aleman et al. [1] the correlation between insight and the WCST was smaller in schizophrenic patients than in psychotic patients; the schizophrenic patients showed a higher correlation between insight and global cognitive deficits. According to the authors, patients with schizophrenia have more severe negative symptoms and cognitive impairments than patients with other kind of psychotic disorders, implying that other cognitive domains, e.g., intellectual efficiency, may influence insight. According to Laws [18], the WCST is usually denominated a "frontal-executive" task and has been widely used in studies with schizophrenic and neurologic patients. However, one should consider that a good performance in this task requires multiple cognitive processes (e.g., attention, abstraction, working memory, categorization and the executive control of all these functions); motivation and cooperation may contribute to performance on the test. Shallice [1988, apud 19] emphasizes to investigate a specific cognitive deficit it is previously necessary to evaluate if the patient has global impairments such as low IQ or signs of intellectual deterioration, so that it is possible to examine the factors that contribute to the low performance in a specific test.

We were not able to demonstrate that global functions were impaired in our sample, because we did not include a control sample. However, the fact that our sample includes chronic and also refractory patients, with a long duration of disease and predominance of negative symptoms, may suggest they have a global cognitive impairment. The mean intellectual efficiency of our sample (88.8; S.D. = 12.8) is lower than the population mean.

According to the literature, it has been suggested that the impairment of insight in schizophrenia may be associated with positive, negative or disorganized symptoms, or it could be an independent symptom constituted of another dimension of the disorder [3, 25, 30, 32].

In our sample, although there were negative correlations between the modified negative and the disorganization factors of the PANSS with indices related to the SUMD current and past awareness of symptoms, when these variables are entered in a linear regression model only the disorganization factor modified emerged as the statistically significant contributors for insight. Although Gaag et al. [14] called one of the five-factors of the PANSS "disorganization", the way we considered this factor only include items that are related to cognition [stereotyped thinking (N7), poor attention (G11), disorientation (G10), conceptual disorganization (P2) and difficulty in abstract thinking (N5)]. Although there was no relationship between neuropsychological tests and insight, we could establish that insight was influenced by these cognitive symptoms (comprising the modified disorganization factor of the PANSS) as measured by the PANSS.

Several limitations of this study should be considered: the lack of a control group, the small size of the sample and the difficult to measure a multidimensional concept such as insight. The possibility that other factors, such as psychological, social and cultural, might also contribute to insight, may attenuate the influence of cognition in the awareness of disease in schizophrenic patients.

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