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The Impact of the Obsessive-Compulsive Disorder on the Cognitive Function in the Early Stage of Schizophrenia

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Abstract
Introduction: *Epidemiological studies have emphasized that the obsessive-compulsive disorder (OCD) occurs with an unexpectedly high frequency in association with schizophrenia (12%) compared to the general population (1-2%). Starting from this premise there is growing interest in the thorough research of the impact of the obsessive-compulsive symptomatology on various clinical variables, on the functioning and the evolution of patients suffering from schizophrenia. Although most of the studies focused on the chronic stage of the psychosis, there were also studies aiming at the early stages of schizophrenia. The latter suggested that the effect of obsessive-compulsive symptoms in schizophrenia depends on the stage of the disease, the obsessive-compulsive symptoms causing more severe cognitive alterations in chronic schizophrenics and exerting protective effects in the early stages of schizophrenia.*
Objective: *This study aims on the one hand to verify the hypothesis of the protective effect of obsessive-compulsive symptoms on cognition in the early stage of schizophrenia and, on the other hand, to test the hypothesis that the cognitive functioning of patients diagnosed with schizophrenia and associated OCD is independent from the severity of the obsessive-compulsive disorder.*
Method: *We have used three groups of patients aged up to 26 years, including patients diagnosed with schizophrenia and/or OCD according to DSM IV-TR, which we have compared from the point of view of social and demographic characteristics, of the severity of psychotic, obsessive-compulsive symptoms and of the cognitive functioning, by using psychometric scales and selected neurocognitive tests aimed at cognitive domains which are typically affected in schizophrenia and OCD.*
Results: *The patients suffering from schizophrenia and OCD proved to be better educated, to possess more professional skills than their counterparts who suffer from pure schizophrenia, being also distinguished by the highest rate of OCD spectrum disorder and schizophrenia family antecedents and especially mood disorder family antecedents. Hence, they have a high heritability for the diseases they suffer from. From the point of view of psychosis severity, these patients are placed in an intermediate position, with much higher scores than OCD patients, but much lower than pure schizophrenics, at positive and general symptom PANSS subscales, but also at the total PANSS score. As to the severity of obsessive-compulsive symptoms, there were no significant differences in schizophrenics compared to classic OCD patients, which suggests that this type of symptoms is expressed, clinically speaking, similarly in both groups. However, differences were spotted in the analysis of cognitive tests: patients suffering from schizophrenia associated with OCD showed much better results in connection to processing speed, memory and cognitive flexibility measured by TMT test part B than pure schizophrenics. The Stroop test also showed much better results in the comorbid group versus their counterparts without OCD in the word reading and colour naming subtests, these being positively correlated with the patients' educational level. There were no clinical correlations between Y-BOCS total scores and the psychological test scores; however, most of the psychological test scores were significantly correlated with PANSS total score. There was no correlation between the severity of obsessive-compulsive symptoms and the severity of psychosis measured by Y-BOCS and PANSS scales. In order to find a statistic model for the classification of patients we have used the linear discriminant analysis, which, after cross-validation correctly classified the patients in a percentage of 84.4% in one of the three categories: schizophrenia, OCD or schizophrenia with associated OCD.*
Conclusions:*The results of this study prove that obsessive-compulsive symptoms, regardless of their degree, may represent protection factors on the cognitive functioning of patients in the early stage of schizophrenia.*
Key words: *schizophrenia, obsessive-compulsive disorder, cognition*

I. Introduction

Although the general trend is to consider schizophrenia as being a heterogeneous disorder from the phenomenological point of view and, therefore, secondary disorders, such as depression, panic disorder or obsessive-compulsive disorder (OCD) are frequently ignored (Lee et al, 2009), more and more studies draw the attention on the fact that more than one third of the patients with schizophrenia show obsessive-compulsive symptoms (OCS), significant from the clinical point of view (Berman et al, 1995; Bland et al, 1987; Porto et al, 1997), that 12,1% of the schizophrenic patients meet even the criterias of OCD and that every fourth schizophrenic patient reports obsessive, intrusive ideas, generating distress and adjacent compulsions (Achim et al, 2011; Poyurovskyet al., 2012).

Because the prevalence rates of OCD are higher in schizophrenia (4-5 times) than in the general population (1-2%) (Murphy et al, 2010) and because the research has signalled the fact that OCD may represent a factor of negative prognostic in schizophrenia (Huang et al, 2000), lately it is notices an active increase of the interest for this association of disorders.

Hwang and Opler introduced, in 1994, the concept of schizo-obsessivity, referring to a dual diagnosis of schizophrenia and OCD or obsessive-compulsive symptoms.

Although it was noticed that the treatment with antipsychotics may also induce or exaggerate the obsessive-compulsive symptoms and may even induce the OCD (Byerly et al, 2005; Khullar et al, 2001; de Haan et al, 2002; Poyurovsky et al, 2004), in particular those antiserotoninergic (Schirmbeck et al, 2011), increased rates of obsessive-compulsive symptoms (17.1%,) and OCD (7.3%,) were noticed both in the first episode of schizophrenia (Poyurovsky et al., 1999; de Haan et al., 2004; Sterk et al, 2011; de Haan et al., 2013), as well as in patients not exposed to antipsychotics (Poyurovsky et al., 1999). In patients with a risk of mental disorder were recorded average prevalences of 12,1% (Shioiri et al., 2007; Niendam et al., 2009; Bechdolf et al., 2011; Sterk et al., 2011; Hur et al., 2012) for the obsessive-compulsive symptoms and of 5,2% (Shioiri et al., 2007; Niendam et al.,2009; Rubino et al., 2009; Bechdolf et al., 2011; Fontenelle et al., 2011; DeVylder et al,2012; Fusar-Poli et al., 2012; Sterk et al., 2011) for OCD.

Certain studies were focused on the early stages of schizophrenia and suggested that obsessive-compulsive specific symptoms might have an effect also on other clinical variables or on the global functionality (Poyurovsky et al., 1999; Üçok et al, 2011; deHaan et al, 2005), while other studies reported a low subjective state of well-being and a diminished quality of life even in the early stages of disease (deHaan et al, 2012).

It is well-known the fact that patients with schizophrenia show neuropsychological deficits in areas such as memory, language, attention and executive functions (Fioravanti et al, 2005). Several studies evaluated the relation between the neuropsychological functioning and obsessive-compulsive symptoms in schizophrenia, trying to find a specific pattern of cognitive defects (Lysaker et al, 2002), but the results have shown conflicting. One study found a correlation between high levels of obsessive-compulsive symptoms and a weaker delayed visual memory, and a decrease in cognitive flexibility measured by the Wisconsin Card Sorting Test (WCST) and the Trail Making Test (TMT) (Berman et al, 1998). The study suggests that cognitive impairment can be used to correctly classify the majority of schizophrenic patients, either in the obsessive-compulsive group, either in the non-obsessive-compulsive one, with a precision of more than 80%. Other studies as well have found an association between obsessive-compulsive symptoms and poor executive functioning as measured by WCST (Hwang et al, 2000; Lysaker et al, 2002), but there have been other studies which have failed to find any connection with WCST or other tests of executive functioning (Tiryaki et al, 2010; Tumkaya et al, 2009; Hermesh et al, 2003; Ongűr et al, 2005; Whitney et al, 2004).

Borkowska et al. (2003), by using selected tests of the function of the frontal lobe, noticed that the patients with schizophrenia are the most severely affected, on the second place being the schizophrenics associating OCD, and on the last place the ones with OCD. Thus, the authors raise the hypothesis of the effect of obsessive-compulsive symptoms in schizophrenia that would be dependent on the stage of the disease, obsessive-compulsive symptoms causing severe alterations in chronic schizophrenics and with possible protective effect in schizophrenics found at the onset. The study led by Lee et al. (2009) also finds that OCD may have a protective effect on certain cognitive functions, at least in the early stages of schizophrenia (higher IQ and better scores on the Stroop test and verbal fluency test, related to the executive functioning).

In this study we aim to test the hypothesis according to which the presence of obsessive-compulsive symptoms in the early stage of schizophrenia exercises a protective effect, from the cognitive point of view, on the disease, and their severity is not associated to a higher damaging of the executive function controlled by the frontal cortex.

II. Method

2.1. Subjects

The recruitment of patients for participation in the study was carried out according to a set of criteria of inclusion and exclusion, which resulted in three samples of patients. The study group included 64 patients aged between 18 and 26 years, diagnosed with schizophrenia (26 patients), schizophrenia and OCD (17 patients) or OCD (21 patients) according to DSM IV-TR (APA, 2000), who underwent a recent rebound effect (requiring hospitalization or corrective therapeutic intervention to avoid the confusion that would create in residual patients between obsessions and delusions with partial criticism), but did not receive antipsychotic treatment for more than three weeks for the current episode (to limit the emerging of obsessive-compulsive symptoms under treatment). Also, they had a negative history of mental retardation, severe head trauma, another significant organic disease, significant neurological disorders, and abuse/addiction of substances in the last 6 months, other diseases preventing the neurological or psychometric assessment).

To identify the obsessions and compulsions in the presence of psychotic symptoms, we followed the suggestions of the authors Bottas et al. (2005): a repetitive act was considered compulsion only if it was in response to an obsession and if it was not as a response to a delusional idea (eg. the repetitive verification as response to paranoid fears is not compulsion, nor the compulsive washing of hands due to some imperative hallucinations); a recurrent idea, intrusive, was not considered an obsession if it pivoted around a delusional theme (ex. ideas of persecution or reference).

We have selected the patients meeting, at the same time, the criterias of diagnostic for schizophrenia and OCD and we excluded the schizophrenics who, if did not meet the criteria for OCD, had prominent obsessive-compulsive symptoms defined by the presence of at least 2 symptoms in at least 2 different areas of obsessions and/or compulsions (according to the recommendation of Byerly et al. from 2005). The reason of this exclusion was represented by the precise research of the possible differences between the categories of schizophrenic patients, as well the removal of possible interference which the presence of some minor obsessive-compulsive symptoms might create in the clinical and neuropsychological assessment.

The study was approved by the Ethics Commission of Prof.Dr.Al.Obregia Clinical Psychiatric Hospital, Bucharest, Romania, and the informed approval was obtained from all patients, after a broad explanation of this study's purpose.

2.2. Neuropsychological assessments

In this study were compared three lots of patients, one with schizophrenia and OCD , one with schizophrenia and the third one with OCD, using three selected tests of the executive function with frontal origin: TMT part A and B (Reitan, 1958), Stroop Colour and Word Test (Golden, 2002) and Rey Auditory Verbal Learning Test (RAVLT) – Romanian version. Thus, we tried to test cognitive areas known to be deficitary in schizophrenia, but also the features of the obsessive-compulsive disorder. These tests are easily managed, short as time, useful to test the visual attention, mental flexibility and the memory coefficient.

Both parts of the TMT test consisted in 25 circle distributed on a sheet of paper. In part A, the circles are numbered from 1 to 25 and the patient must draw lines connecting them increasingly. In part B, the circles include both numbers (1-13), and (A-L), the patient must draw lines connecting the circles in an ascending pattern, but with the task to alternate between numbers and letters (eg 1-A-2-B-3-C etc.). The results obtained are assessed in the number of seconds needed to complete the task, therefore, high score point out a higher alteration. TMT part A measured the psychomotric speed, the attention and the visual-spatial abilities, while part B needs more cognitive abilities, in terms of mental flexibility and work memory.

The Stroop Colour and Word Test is based on the observation that individuals can read words faster than they can identify and name colours. The tested cognitive dimension is associated with the cognitive flexibility, the resistance to the interference of other outer stimuli, with the creativity and the psychopathology, these influencing the individual's ability to cope with the cognitive stress. The test implies 3 basic scores. The gross score of words represents the number of items completed at the words page in 45 seconds. The gross score of colours is the number of items completed at the colours page and the gross score colour/word is given by the number of items completed on the page of colours/words. The errors are not being counted although they determine a lower total score, since the patient must correct himself/herself, by repeating that item. The T score is computed by subtracting from the gross score of colour/word predicted for colour/word.

Rey Auditory-Verbal Learning Test is a neuropsychological tool used to assess declarative episodic memory. It provides scores to determine the immediate memory, the learning of new words, the memorizing of information after a period of time and the memory of recognition. In the first part, to the patient is read loudly a list of 15 words, in the rhythm of 1/second and is asked, at the end, to reproduce how many words he/she remembers, in any order, without repetition, as much as possible. It is noted that the number of correct words, double (repeated 2-several times), wrong (which are not found in the list). The operation is repeated 5 times and the scores are noted for each trial. In the second part, at minimum 20 minutes after the last reading, to the patient

it is read a text where he/she must recognize the words he/she heard in the list of words. Correct and wrong answers are being noted.

In our study, the parameters which are statistically analyzed within the RAVLT test are represented by the sum of trials (the sum of the number of words correctly reproduced in each of the 5 trials), the learning rate (the difference between the sum of the trials and the product between the number of trials and the value obtained at the first trial), the curve of doubles (the sum between the number of words repeated in all trials, offering an index of impromptitude), the curve of errors (the sum between the number of words which are not in the list in all trials, offering an index of mnemonic infidelity), the volume of correct recognitions (the number of words correctly recognized in the text read, of maximum 15), the volume of wrong recognitions (the number of words wrongly identified in the text read, of maximum 15).

2.3. Clinical assessments

SCID-I/P (the Structured Clinical Interview for DSM IV Axis I Disorders, Patient Edition (First et al, 2002) was used to diagnose schizophrenia and OCD. For the clinical assessments of severity of the symptoms of schizophrenia and those of obsessive-compulsive, we used the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987) and the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al., 1989). The scales Clinical Global Impression – Severity (CGI-S) (Guy, 1976) and Global Assessment of Functioning (GAF) (APA 2000) shall signal the global clinical impression on the severity of schizophrenia and, where appropriate, of the OCD, namely the functioning level of each patient. To track and quantify the anxious and depressive symptoms, we applied the Hamilton Anxiety Scale (HAM-A) (Hamilton, 1959) and the Hamilton Depression Rating Scale (HAM-D) (Hamilton, 1960).

All patients filled in a form to collect socio-demographic data and personal and family psychiatric history, the information being validated by the data in the medical records and/or by those provided by a significant family member

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2.4. Statistical analysis

The informations collected from the patients were introduced in a data base Apache Open Office 4.1.0. The statistical analysis were performed by using the programs R (version 3.1.2.) ("Pumpkin Helmet" (c) R Core Team, 2014) and SAS-University Edition (SAS-University-Edition 2014). Regarding the inferential statistics, the algorithm was the following: for the category variables was used either a χ^2 test for ratios (if each category was present/absent in at least 5 cases at sampling), either a Fisher's exact test (where the previously mentioned condition was not met). Both tests were two-sided. Also, it was report, when possible, a confidence interval of 95%, representing either the value of the ratio difference, either the relative risk (risk ratio).

For continuous variables, initially, it was assessed whether the distributions could be assessed by a normal distribution and it was performed an ANOVA test. If the normality hypothesis could not be supported, a Kruskal-Wallis test was used. If multiple tests were needed, were used procedures protecting against type I errors (Bonferroni, the "sampling without replacement" procedure). If 2 samples were analyzed, a two-sample Student's test was used with the Satterthwaite approximation for uneven variants. All tests were deemed significant from the statistical point of view at a sensitivity level of α=0, 05.

III. Results

Demographic, personal history and hereditary-collateral features are also showing in table 1. The distribution by gender in the lot to be studies was of 19,23% men and 80,77% women, in the sample of schizophrenics, 57,14% men and 42,86% women in the one with OCD patients and in the sample of patients with schizophrenia and OCD was registered a percent of 47,05% men and one of 52,95% for women. Although there is a difference (p=0,022 at the χ^2 test) regarding the distribution by gender in the 3 lots of patients, which is not overlapped with the relatively uniform distribution in the general population, of 1:1, both for schizophrenia, as well as for OCD, our study was based on the inclusion in the order of presentation of the patients meeting the criteria taken into account in research and it did not intend to use the patient's gender as main variable in the study. The average age of patients, upon the entry into the study was of 23.3 years (D.S. = 2.39) for the lot with schizophrenia, 23.09 years (D.S. = 2.34) for the lot with OCD and 23, 64 years (D.S. = 1.76) for the comorbid one.

Regarding the place of birth, were tracked statistical differences between the lots of schizophrenics and the comorbid one, on the one side, and between the lot of patients with schizophrenia and the one with OCD, on the other side, regarding the ratio of births in the urban environment ($p < 0.01$, sensitivity level $\alpha = 1\%$), the patients with pure schizophrenia having the place of birth evenly distributed between the urban and the rural environment, compared to the patients with OCD and those with schizophrenia and OCD who were mostly born in the urban environment. Upon the statistical analysis, no differences were detected regarding the marital status (p=0.6115 at the Kruskal-Wallis test).

However, important statistical differences were recorded in terms of educational level of the patients in the 3 lots. After the Bonferroni correction, it was noticed that the educational level of patients with pure schizophrenia is significantly lower than of those associating OCD or compared to the patients with OCD (p=0.014, namely p=0.003). Also, the occupational level of the patients with schizophrenia and OCD is different from the one of pure schizophrenics, being a lot closer to the occupational level of patients with OCD ($p < 0.01$ at the Bonferroni correction between the lot with schizophrenia and the one with OCD, sensitivity level $\alpha = 1\%$). The analysis performed on the onset age of the psychotic symptoms in the lots with schizophrenia, namely the onset age of the obsessive-compulsive symptoms in the lots with OCD (Two-Sample Welch t test two-sided) did not detect significant differences, although the onset of obsessive-compulsive symptoms is significantly earlier than the psychotic one in the comorbid lot (p=0.0001, at the Matched-Paired t test two-sided). However, it is noticed the fact that, in patients where schizophrenia and OCD co-exist, the onset of OCD precedes the onset of schizophrenia in 70,59% of cases, while in 29,4% of cases the onset takes places relatively simultaneously, the obsessive-compulsive symptoms being able to represent a prodromal feature in the onset of psychosis, as shown in the study of Üçok et al. (2011). In the lot with pure schizophrenics, the onset of the disease occurred acute, reactive, in 38,46% of cases, while in the lot of schizophrenics associating OCD, the reactive onset of psychosis occurred in 47,05% of cases. The acute onset is considered one of the positive predictors of long-term evolutionary in schizophrenia.

Upon the statistical analysis of the family history the value $p < 0.0001$ obtained at the χ^2 test significantly differentiated the lot of patients with schizophrenia associated with OCD, compared to the one with pure schizophrenia or the one with OCD, regarding both the history of affective disorders in first degree relatives, as well as those of schizophrenia in their families. Also, in the comorbid lot it was registered the highest ratio of family history of disorders in the spectrum of OCD (p=0.004 at the χ^2 test).

The patients with OCD had the lowest number of hospitalizations (average= 1.33; D.S.= 0.73), followed at distance by those with schizophrenia associated with OCD (average= 4.05; D.S.= 3.34) and by those with schizophrenia (average= 4.07; D.S.= 2.81), the statistical analysis showing the lot with OCD with a statistically significant lower number of hospitalizations compared to the lot of schizophrenics or the comorbid one, who had a similar number of psychiatric hospitalization for schizophrenia (adjusted p= 0.0008 schizophrenic versus OCD; adjusted p= 0.0034 OCD versus schizophrenia associated with OCD).

The analysis of variables such as the duration of the disease until joining the study and the duration of the disease until the first treatment showed differences with a statistical significance between the lot of pure schizophrenics and the one with OCD (p=0.0006, sensitivity level α=1%, namely $p < 0.0001$, sensitivity level α=1%), as well as between the lot with OCD and the comorbid one (p=0.0487, sensitivity level α=5%, namely $p < 0.0001$, sensitivity level α=1%). There were no significant statistic differences between the 2 lots of schizophrenics with/without associated OCD.

Upon the entry into the study, the global functioning level, assessed with the GAF scale, was significantly better in patients with OCD compared to patients with schizophrenia (IC95% for the difference of arithmetic mean rank -40.53 to -14.00) or those in the comorbid lot (IC95% for the difference of arithmetic mean rank 3.41 to 32.29). Upon the formal exclusion of patients with OCD from the research, there were noticed significant statistical differences between the lots of schizophrenia, those also associating OCD having a much higher level of overall functioning compared to their opponents without OCD (p=0.03068). Regarding the Y-BOCS scale, in the statistical analysis was used a Student two-sample two-sided test with the Satterhwaite approximation for uneven variants which detected no difference between the patients with schizophrenia and those with OCD ($p>0.05$) in terms of the total YBOCS score. Therefore, there are no global severity differences of the obsessive-compulsive image between the lot of schizophrenic patients with OCD and the one of patients with OCD.

Taking into account the scores obtained on the HAM-D scale we found no differences between the 3 lots of patients at the One-Way ANOVA test (p=0.6600). As well, the anxiety degree assessed by using the HAM-A scale did not differentiate any lot in particular, the averages of the scores being close to all the 3 samples (p=0.6489 at the One-Way ANOVA test). The highest total scores on the PANSS scale were recorded in the lot of schizophrenics (average= 96.42, D.S. = 12.60), followed by the lot of schizophrenics also associating OCD (average= 80.58, D.S. = 15.72), on the 3rd place being ranked the patients with OCD (average= 50.76, D.S. = 11.71). The statistical analysis of the total scores on the PANSS scale detected statistically significant differences between all the 3 lots (p adjusted < 0.01, sensitivity level α=1%). As well, the subscale of positive symptoms detected statistically significant differences between al the lots studied (adjusted $p < 0.01$, sensitivity level α=1%), the group of patients associating the obsessive-compulsive symptoms to the psychotic one obtaining intermediate scores, making themselves noticed from this point of view, compared to their opponents with pure schizophrenia.

At the analysis of the PANSS scores of negative symptoms, were obtained significant differences between patients with schizophrenia and those with OCD (adjusted $p < 0.01$, sensitivity level α=1%) and

between the lot of obsessive-compulsive and the comorbid one (adjusted $p < 0.01$, sensitivity level $\alpha=1\%$). However, there were no statistically significant differences between the 2 lots of schizophrenics ($p>0.5$, sensitivity level $\alpha=5\%$). As well, the PANSS score for general symptoms individualizes the group of schizophrenic patients associating OCD, compared to the other groups, placing them on a lower position, in terms of severity, compared to pure schizophrenics (adjusted $p < 0.01$, sensitivity level $\alpha=1\%$). There were no correlations between the scores obtained on the Y-BOCS scale and the total PANSS score ($r=0.265$; $p=0.106$). The analysis of clinical variables is shown in Table 2

If in part A of the TMT test there were no significant differences between the 3 lots, the analysis of the part B of the TMT test showed interesting data. The best scores were obtained by the patients in the lot with schizophrenia associated with OCD (average= 97.76; D.S. = 28.98), followed closely by those in the lot with OCD (average= 104.11; D.S. = 49.07) and at great distance by those with pure schizophrenia (average= 153; D.S. = 67.23). The results of the sampling without replacement procedure of the 3 samples showed statistically significant differences both between the lots of patients with schizophrenia and those with OCD (adjusted $p=0.0018$), as well as between the lots of patients with schizophrenia and those from the comorbid lot (adjusted $p=0.0122$). There were no statistically significant differences between the patients with OCD and those with schizophrenia associating OCD. However, the results obtained in part A and B were not correlated with the educational level of the patients, being, therefore, independent from their educational level.

In the Stroop test, the part of word reading and namely that of colours, the values of adjusted p, obtained by permutation, differentiated, from the statistical point of view, the lot of schizophrenics of those with OCD ($p=0.0094$, namely $p < 0.01$) and the lot of schizophrenics from the comorbid one ($p=0.005$, namely $p < 0.05$). There were no statistically significant differences between the lot with OCD and the comorbid one ($p>0.05$). And the results obtained at these Stroop subtests were positively correlated with the educational level of the patients ($r=0.554$; $p < 0.0001$, namely $r=0.399$; $p=0.0010$). The analysis of the colour/written words reading test statistically differentiated the patients with OCD from those with pure schizophrenia, the lot of patients with schizophrenia associated with OCD obtained relatively intermediate scores, slightly below those obtained by obsessive-compulsive patients, but much better than those of their opponents without OCD. Positive correlations were registered between the scores obtained at this subtest and the educational level of the patients in this study ($r=0.309$; $p=0.0127$). However, the lots did not differentiate by the means of T interference scores which was below the normally predicted level, certifying the fact that the psychopathologic disorder, regardless its classification, imprints the ability to inhibit the answer, consequence of a diminished cognitive flexibility.

The statistical analysis of the RAVLT test-Romanian version showed statistically significant differences especially between the lots of patients with pure schizophrenia and those with OCD. Thus regarding the sum of trials, there were statistically significant differences between the lots of schizophrenics without OCD associated and the lot of OCD (adjusted $p < 0.01$, sensitivity level $\alpha = 1\%$, namely adjusted $p < 0.05$, sensitivity level $\alpha = 5\%$). There were no differences between the 2 lots of schizophrenic patients ($p>0.05$, sensitivity level $\alpha=5\%$). Regarding the learning ratio, the analysis of the unidirectional variant (One-Way ANOVA) found differences between the lots of patients taken into the study, and the permutation procedure of the 3 samples statistically differentiated the lot with schizophrenia from the one with OCD (adjusted $p < 0.01$, sensitivity level $\alpha=1\%$). Again, patients with schizophrenia made themselves notices as having the lowest learning rate in this RAVLT variant, while the patients with schizophrenia and OCD had scores located between the patients with OCD and those with schizophrenia, but without there being significant differences. Both the results obtained from the sum of the trials, as well as those for the learning rate were positively correlated with the educational level of the patients taken into the study ($r=0.489$; $p < 0.0001$, namely $r=0.337$; $p=0.0063$). The analysis of the variables given by the curve of the doubles and the curve of mistakes did not found any significant differences between the 3 samples, the values being close in all lots ($p>0.05$, at the ANOVA test, for the curve of the doubles and $p>0.05$, at the Kruskal-Wallis test for the curves of mistakes). The results of the variable curve of the mistakes was negatively correlated with the educational level of the patients from the research trial ($r=-0.295$; $p=0.017$). The analysis of the volume of correct recognitions, shows again the lot with schizophrenia as having significantly lower scores than the patients with OCD ($p=0.0033$), while the lot of patients with schizophrenia and OCD had intermediated results. The results recorded at this subtest were positively correlated with the educational level **of the patients in the trial** ($r=0.469$; $p < 0.0001$). The analysis of the variable **volume of wrong recognitions** showed statistically significant differences between the 3 lots, but these do not have a clinical significance (the medians of the 3 lots of study are equal to zero). The results of the neuropsychological tests are summarized in table 3.

No psychological variable could be correlated with the total Y-BOCS scores, but there were correlations between certain psychological variables and the total PANSS score. Thus, the scores obtained at the Stroop test of word reading was negatively correlated with the total PANSS score ($r= -0.511$; $p < 0.0001$), as well as the scores obtained at the tests of colour reading and colour-words reading ($r= -0.485$; $p < 0.0001$, namely $r=-0.397$; $p=0.0011$). There were no correlations between the T interference score at the Stroop test and

the total PANSS scores. Negative correlations were established between the total PANSS scores and the variables Rey the sum of the trials, the learning rate and the volume of correct recognitions ($r= -0.722$; $p < 0.0001$, namely $r= -0.465$; $p=0.0001$, namely $r= -0.530$; $p < 0.0001$), while the scores for the volume of wrong recognitions was positively correlated with the total PANSS score ($r=0.290$; $p=0.0198$). There were no correlations between the Rey variables the curve of the doubles or the curve of mistakes with the total PANSS scores. Also, were positively correlated the scores obtained at the two subtests of the TMT tests with the total PANSS scores ($r= 0.389$; $p=0.0014$, in part A, namely $r= 0.458$; $p=0.0001$, for part B).

In the attempt of finding a model classifying the patients either in the group of schizophrenia, either in the one of OCD, either in the comorbid one, we used the linear discriminant analysis to determine which variables may discriminate between 2 or several classes, in order to generate a classification model to be able to predict the affiliation of a future subject to a certain group.

We used as parameters for the two discriminant functions the variables which were significant in the analysis type ANOVA: the place of birth, the educational level, the history of family diseases, the total PANSS score, the GAF score, the PANSS score of positive symptoms, the PANSS score of negative symptoms, the PANSS score of general symptoms, the STROOP score of words, the TMT B, REY sum of trials, REY learning rate. For the analysis were used the first two terms of the discriminant, the variability ratio being explained in proportion of 0.7838 (78.38%) by the discriminant 1(LD1) and in proportion of 0.2162 (21.62%) by the linear discriminant 2(LD2). The model classified correctly a proportion of 0.9375 (93.75%) of the patients. For validation we used "Leave-one-out cross validation" – LOOCV (a procedure using for training n – 1 of the patients (n = total number of patients) and the patient left aside for validation and then repeats the procedure for n times). The classification at cross-validation was correct in proportion of 0.8440 (84.40%) as shown in table 4, and the result can be viewed graphically in Figure 1.

IV. Discussions

Our study aimed at establishing the neuropsychological profile of young patients diagnosed with schizophrenia and OCD, as well as the impact of obsessive-compulsive symptoms on their cognitive functionality in the early stage of the diseases, by comparing them with a group of subjects with schizophrenia and another one with OCD. Regarding these objectives, we have issued the hypothesis that the patients diagnosed both with schizophrenia, as well as with OCD show less severe deficits in certain neurocognitive areas and that the neurocognitive performance does not depend on the severity of OCD. Generally, the results obtained from our research supported these hypothesis, since the patients with schizophrenia and OCD tended to display higher neuropsychological scores, most of them being statistically significant, compared to the patients with pure schizophrenia (TMT B, Stoop subtest words and Stroop subtest colours). No correlation was found between the neurocognitive results and the severity of the obsessive-compulsive symptoms measured with the Y-BOCS scale. Even more, the patients with schizophrenia and OCD showed a slightly better performance at the TMT B neuropsychological test, compared to the group with OCD and a similar performance on some of the Stroop subtests (Stroop words, Stroop colours, Stroop colours-words).

4.1. OCD in the early stage of schizophrenia

Unlike some of the previous studies which found an earlier onset of the schizophrenia (Fenton and McGlashan 1986, Berman et al., 1995), a higher use of medical service (Fenton and McGlashan 1986; Berman et al., 1995; Samuel et al, 1993) and a higher number of hospitalizations (Fenton and McGlashan, 1986; Berman et al., 1995, Hwang et al., 2000), our study found similarities regarding the onset age of the psychotic symptoms, the duration of the not treated diseases, the duration of the disease so far or the number of hospitalizations in the 2 lots of schizophrenics. Thus, the evolution of the disease in the first two years as of the onset of the schizophrenia seems to be relatively similar in the 2 lots, independently from the presence of the OCD symptoms. And the current psychotic relapse influences, from the point of view of the negative signs and maybe of the global functioning, in the same degree the patients with schizophrenia, regardless of the presence or absence of the associated of obsessive-compulsive symptoms, contrary to a study where patients diagnosed both with cu schizophrenia, as well as with OCD had higher functionality scores and less negative symptoms than those diagnosed only with schizophrenia (Tibbo et al, 2000).

Contrary to certain studies (Eisen and Rasmussen, 1993; Sevincok et al., 2006, Gűleç et al, 2008, Zink et al, 2014), but according to the study of Poyurovsky et al., 1999, our research showed that the patients with schizophrenia also associating OCD are much better educated than their opponents without OCD, probably due to a better preservation of the cognitive function, at least in this early phase of schizophrenia. This is, probably, the reason why the, occupational level of the patients with schizophrenia and OCD is different from the one of pure schizophrenics, being much closer to the occupational level of patients with OCD. Another explanation for the better educational level is the mostly urban origin of the patients with schizophrenia and OCD and, therefore, the easier access to educational and occupational resources. The reactive, acute onset of schizophrenia

in patients also associating OCD, in nearly half of cases, representing a favourable prognostic factor in the evolution of schizophrenia, may also explain the significantly higher educational level performed by the patients with schizophrenia and OCD versus those with pure schizophrenia.

The patients from the comorbid group showed significant differences regarding the onset age of the two disorders, the onset of the OCS being, in average, at 12.82 years (DS=4.99), while the psychotic one being recorded at the age of 19,11 years (DS= 2.54). It is still to be researched the influence of an earlier presence of the OCS in schizophrenia. It is possible that its presence exercises an influence on the physiopathology of schizophrenia, leading to an acute method of expression, at the onset, of the schizophrenia. However, the underlying mechanisms are not known at the present and further studies are needed to define them.

An important discovery of our study was that the patients with schizophrenia and OCD have an increased family aggregation, especially for disorders in the affective spectrum, but also psychotic and obsessive-compulsive, proving a high heritability for the comorbid diseases presented, unlike their opponents without OCD who have family history of affective disorders in a much lesser extent.

Although it is well-known the fact that patients developing obsessive-compulsive symptoms have a higher degree of anxiety, sometimes even of depression, which may negatively influence the performance at cognitive tests, in the lots studies, these parameters being equally distributed between the 3 samples of patients, we believe that they do any favour, from the point of view of the results at the neuropsychological tests, none of the categories of patients. Therefore, from this point of view, the anxiety and depression were able to function as controlled variables.

In terms of the clinical profile, we notices, in full agreement with the results of other studies (Byerly et al, 2005; Poyurovsky et al, 2006; Rajkumar et al, 2008) the fact that the amplitude of the total psychotic symptoms is significantly lower than in the case of schizophrenics associating OCD, than in their opponents without OCD, and this is not correlated to the amplitude of the obsessive-compulsive symptoms. Although the schizophrenics with OCD have significantly lower scores for positive and general symptoms, we did not find, in the two lots of schizophrenics, differences regarding the severity of the negative symptoms, contrary to other studies (Poyurovsky, 1999; Fabisch et al, 1997; Nechmad et al, 2003; de Haan et al., 2013; Schirmbeck et al., 2013a). Contrary to most studies finding that the schizophrenics with cu obsessive-compulsive symptoms were associated with the lower global social, economic and vocational functioning (Poyurovsky et al., 2001; Lisaker et al., 2004; Fenton et al., 1986; Berman et al., 1995; Tibbo et al, 2000), even in the early phase of disease (deHaan et al, 2013), our study does not prove any differences of significant global functioning between schizophrenics with our without OCD, agreeing to the study of Rajkumar et al. din 2008 and suggestive that the obsessive-compulsive symptoms would have a protective effect on the preservation of the global functionality (Poyurovsky, 1999; Üçok et al, 2011; deHaan et al, 2005).

These patients with schizophrenia and OCD had, however, a better level of the insight on the psychosis than pure schizophrenics and approximately fair on the associated obsessive-compulsive disorder, which seems to be a favourable prognostic factor on the evolution of schizophrenia, at least on the short and medium term, especially in terms of adherence to treatment.

The insight on the obsessive-compulsive symptoms is examined in a few studies and the results are inconclusive. While a study (Matsunaga et al., 2002) reports that most patients have a poor or absent insight, 2 other studies (Poyurovsky et al., 2007; Faragian et al., 2008) report that most of them have a good or fair insight on the obsessive-compulsive symptoms, indicating that the presence of OCD does not substantially modifies the global consciousness of the disease.

In our study, because the insight on the OC symptoms is lower than in patients from the comorbid patients compared to the patient in the lot with OCD, it is possible that this result be due to the coexistence of another psychiatric existence, namely schizophrenics. Also, the insight on the obsessionality and/o compulsions was positively correlated with the total PANSS score And because the patients taken into this study were in a severe phase of psychotic disease, it is possible that the severity of the image of schizophrenia imprint negatively on the degree of insight on the obsessive-compulsive psychopathology in these patients. Of course, it also matters the moment when evaluating this insight, because in the severe phase, the weak insight is a common feature in schizophrenia.

4.2. The impact of associating OCD on the cognition in the early stage of schizophrenia

The reasons why the results of the studies on the role of the role obsessive-compulsive symptoms on the cognitive function in schizophrenia are inconsistent, taking into account the heterogeneity of the clinical samples and the applied neuropsychological test, the reduced size of the samples or the fact that, often, only 1 - 2 specific cognitive areas were assessed at the same sample. Moreover, it is unclear if the cognitive deficits reported to the comorbid sample are set in time, since the longitudinal studies are nearly non-existent. Lysaker et al. (2009) analyzes prospectively the cognitive function in patients with schizophrenia and OCD /obsessive-compulsive symptoms and report that the presence of deficits in the area of inhibition of the executive function

was correlated to a higher and prospective level of the obsessive-compulsive symptoms self-reported in patients with schizophrenia.

Schirmbeck et al. (2013b) find that obsessive-compulsive symptoms are associated, in schizophrenia, with specific cognitive deficits – visual-spatial perception, visual memory, executive functioning and the cognitive flexibility – and persistent in time, which were positively correlated with the severity of the obsessive-compulsive symptoms and which are cognitive areas typically affected in the obsessive-compulsive disorder. By these results, they argument a superposition, at least partial, of the neurobiological mechanisms of the two diseases: schizophrenics and the obsessive-compulsive disorder.

Unlike these studies, in our transversal research we did not find correlations with a statistical significance between the level of severity of the obsessive-compulsive symptoms and the cognitive deficits measured in patients with schizophrenia or OCD. In turn, the schizophrenic patients also showing associated OCD, they had performances related to the visual and motor processing, work memory, as well as the cognitive flexibility, significantly better than their opponents without OCD and equivalent to the patients with OCD, both at the TMT B test, as well as at part of the STROOP tests, several times beyond those predicted according to the age and educational level. However, the interference scores were generally small, some of them beyond 40, suggestive for the presence of a disorder with origin in the left-sided pre-frontal area. It seems that the ability to read depends on a good development of the phonologic processing in the early schooling and a good development of the orthographic processing in the upper schooling, depending on the differentiated maturity of the responsible cerebral substrates. (McNorgan et al, 2011).

Golden (1975) suggests that the Stroop test is correlated with creativity, because it asks the subject to develop new cognitive strategies, fast and proper, to cope with common stimuli. The author suggests that the Stroop test has the creativity advantage on the rest of the tests, that it does not need any higher verbal skills, nor a better manual dexterity, nor any particular cultural background or special experience. Because the Stroop, test tests the ability to select relevant information from the environment of an individual in a flexible manner, Golden (1975) says that, the more the performance in this test is better, the more the individual may adapt better to new circumstances and generically, work better. In full agreement with this author, we believe that the Stroop test may be a useful measure of the assessment of the improvement caused by the pharmacologic and psychotherapeutically treatment, of those cases who modify their rigid, defensive behaviour, towards one which is more open, flexible, according to the requirements of reality.

In schizophrenics associating OCD we found, in addition, a higher capacity to memorize words (verbal learning memory), according to other research (Purcell et al., 1998; Kuelz et al., 2004), as well as a better recognition memory, although without reaching the statistical meaning threshold. The obsessive effort to memorize may be associated with better scores regarding the learning capacity in patients who are in the early stage of schizophrenia.

The results of our study lead to the idea that the presence of obsessive-compulsive symptoms in the early stages of schizophrenia provides a protection level against the priming of cognitive deficits specific schizophrenia. And the results of the neuropsychological tests deny the fact that this association of disorders would imply a cumulus of deficits in cognitive areas specific to each of them. It seems that this association, at least from the perspective of the cognitive results shown and the early stage of schizophrenia, it represents more than a simple comorbidity, the specific neuropsychic deficits in the presence of obsessive-compulsive symptoms, being more likely a specific cluster of symptoms in schizophrenia which may imprint on it a special evolution.

Implications and future directions

Taking into account the high prevalence of OCD in schizophrenia, our results have important clinical implications On the one side, it is imperiously necessary the screening of the obsessive-compulsive symptoms in the presence of any form of schizophrenia and in any period thereof, either at the onset, acute or in remission. On the other hand, the evaluation in the dynamics of the cognitive resources of patients with schizophrenia associated with OCD may provide useful Informations on the evolution and the prognostic of schizophrenia, given that cognitive deficits intensify as the disease progresses. Also, the assessment of the insight on the psychotic and obsessive-compulsive symptoms are helpful, given the fact that poorer insight into OC symptoms in schizophrenia may also pose a challenge in the management since poor insight may predict poorer treatment response to traditional methods of treatment (Ravi Kishore et al., 2004). In early stage of illness, under OC symptoms cognitive protection, the major implication of better insight would be in the selection of treatment for these patients as present insight is associated with better outcome. From the clinical perspective, the modification in dynamics of the neuropsychological scores may be useful in both in monitoring the progression of the schizophrenia, as well as to identify the patients with OCD who have and increased risk to develop schizophrenia or to identify the patients with the chronic disease more severe, be it schizophrenia or OCD or the obsessive-compulsive phenotype of schizophrenia.

The clarification of the neurobiological status of the schizophrenic patients associating obsessive-compulsive symptoms/OCD may determine the modification of the current therapeutic strategies in this group of patients.

Strengths

We included a third group of patients, those with OCD, according to certain neuropsychological studies performed so far (Borkowska et al, 2003;. Tumkaya et al, 2009;. Devi et al, 2015) and we assessed and controlled the anxiety level, as well as the effects of depression, which any act as intricate variable on the neuropsychological performance (Patel et al, 2010; Frias et al, 2014). The subjects in both psychotic groups were similar in terms of duration of the schizophrenia until the entry into the research trial and of duration of the not treated psychosis, among other factors. We highlight the fact that both variables exercise a notable effect on the cognitive development (Gaynor et al 2009; Lewandowski et al, 2011). And taking into account their potential of intricate variables, we believe that the result of our study show a good internal validity.

Limitations

The results of the study must be taken into consideration in the context of several limitations. Firstly, the transversal design of the study does not allow us to assess the effect of OCD on the evolution of schizophrenia. Secondly, the small size of the size increased the risk of recruiting errors and provided, sometimes, contradicting results, statistically, upon the localization of the differences between the groups. To increase the power of discriminating analysis must be performed studies on samples of patients, preliminary quantified from the statistical point of view. Thirdly, the inclusion only of those patients who were in the acute phase, most of them hospitalized, limits the generalization of results. Because only one evaluator examined all the patients, although the evaluator was very well trained, the reliability of the results could not be determined, which influences the methodological rigour.

V. Conclusions

Although the cognitive deficits are central symptoms in schizophrenia, with a much earlier onset than other disease symptoms, the emergence of the obsessive-compulsive symptoms seems to be a beneficial factor in the early evolution of the disease, the result being the fact that these patients are kept for a longer period of time in the area of educational and academic training. Although it is not different from the classic phenomenology encountered in OCD, obsessive-compulsive symptoms may represent defence means in front of a clinical and not organized of schizophrenia.

The neuropsychological assessment by using standardized neurocognitive tests, aimed at a well-known psychological substrate, may be a method to assess the contribution of various cerebral areas involved in the schizophrenics with obsessive-compulsive symptoms.

Although the evolution of schizophrenia in the apparently comorbid cases in relatively similar, no effort to preserve the cognitive function must be avoided, for recovery and motivational training, for prevention by combined means, psychopharmacological and psychotherapeutically, of the negative hypertimic emergences in these patients. Showing a high educational performance, these patients might benefit from special programs of social and occupational insertion.

Future research is necessary to evaluate the subadjacent neurobiology of this schizophrenia associated with OCD for a better understanding of the impact of obsessive-compulsive symptoms on the evolutionary course of schizophrenia. Also, future research must take into consideration larger lots of patients longitudinally assessed the specific clinical, neurologic, cognitive and imagistic pattern of the schizophrenia associated with OCD and to be able to mention and to foresee the decisive molecular therapeutic conduct.

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Table 1 – Demographic and medical history features in schizophrenia with/without OCD

	Schizophrenia (n = 26) n/average (D.S.)	**OCD (n = 21) n/average (D.S.)**	**Schizophrenia + OCD (n = 17) n/average (D.S.)**	**Statistics**	**Freedom degrees**	**P Values**	**P Values after correction (Bonferroni or permutation of samples)**
Gender (M/F)	5/21	12/9	8/9	X^2=	2	0.022	
Place of birth (U/R)	13/13	19/2	15/2	X^2=	2	0.002	
Familyantecedents (first degree relatives)							
affective	5	18	6	$X^{2=}$	2	< 0.0001	
schizophrenia	8	1	13	$X^{2=}$	2	< 0.0001	
OCD Spectrum	2	8	9	$X^{2=}$	2	0.004	
Number of hospitalizations	4.07 (2.81)	1.33 (0.73)	4.05 (3.34)	χ^2=24.5636	2	< 0.0001	0.0010[a] 0.0038[b]
Duration of disease at study entry, months	44.76 (23.65)	87.90 (53.07)	58.00 (33.30)	χ^2=8.8198	2	0.0122	0.0006[a] 0.0487[b]
Duration of the disease not treated, months	12.84 (16.19)	63.90 (53.11)	12.52 (8.37)	χ^2=16.0254	2	0.0003	< 0.0001[a] < 0.0001[b]
Age at the first treatment	20.15 (2.12)	20.66(1.82)	19.70 (2.56)	F=0.94	2	0.3972[ANOVA]	
Age at the first hospitalization	20.26 (2.23)	21.47(2.35)	19.82 (2.62)	F=2.55	2	0.0861[ANOVA]	
Onset age of the psychotic disorder	19.57 (2.46)		19.11 (2.54)	t=0.5852	35.4804	0.5621[ANOVA]	
Onset age of the obsessive-compulsive disorder		14.90(5.01)	12.81(4.99)	t=1.2750	36.4524	0.2104[ANOVA]	
Marital status							
Married	4	2	2	χ^2=1.02	2	0.6015	
Consensual relation –	2	6	3				
Single	20	13	10				
Divorced	0	0	2				
Widower	0	0	0				
Educational Level							
Unschooled	0	0	0	χ^2=12.46	2	0.0020	0.003[a] 0.014[c]
Primary school	2	0	0				
Middle school	4	0	2				
High school	18	11	8				
Faculty	2	10	5				
Post-Graduate	0/26 (0)	0	2				
Occupational							

level							
Pupil	0	0	0	χ^2=12.01	2	0.0025	0.0030[a]
Student	3	5	0				
Employed	3	9	4				
Unemployed	10	6	10				
Retired	1	0	0				
Handicap	9	1	3				

OCD, obsessive-compulsive disorder; D.S, standard deviation; a, $p < 0.01$ schizophrenia versus OCD; b, $p < 0.05$ OCD versus schizophrenia + OCD; c, $p < 0.05$ schizophrenia + OCD versus schizophrenia.

Table 2 – Psychopathological variables in patients with schizophrenia with / without OCD

	Schizophrenia (n = 26) n/media (D.S.)	**OCD (n = 21) n/average (D.S.)**	**Schizophrenia + OCD (n = 17) n/average (D.S.)**	**Statistics**	**Freedm degrees**	**P values**	**P values after correctionnferroni, Scheffe or permutation of samples)**
PANSS Total	96.42 (12.60)	50.76(11.71)	80.58 (15.72)	F=69.96	2	< 0.0001[ANOVA]	< 0.0001[a] < 0.0001[b] 0.0007[c]
PANSS positive	26.57 (4.47)	10.19 (4.17)	19.88 (5.94)	χ^2=41.4948	2	< 0.0001	< 0.0001[a] < 0.0001[b] 0.0003[c]
PANSS negative	23.15 (5.25)	10.90 (4.34)	20.64 (6.63)	χ^2=31.5451	2	< 0.0001	< 0.0001[a] < 0.0001[b]
PANSS general	46.30 (7.87)	29.09 (5.29)	39.94 (7.18)	F=35.98	2	< 0.0001	< 0.0001[a] < 0.0001[b] 0.0137[c]
Y-BOCS Total		21.14 (5.80)	23.11(6.06)	T=-1.02	33.721	0.3162	
HAMA Total	17.61 (8.20)	18.71 (6.22)	19.88 (8.95)	F=0.44	2	0.6489[ANOVA]	
HAMD Total	17.19 (8.12)	15.33 (5.77)	15.88 (7.15)	F=0.42	2	0.6600[ANOVA]	
GAFS	34.57 (9.41)	55.95 (11.79)	41.88 (10.90)	χ^2=25.67	2	0.00000267	-40.53 to -14.00[a,d] 3.41 to 32.29[b,d]
				T=-2.2655	2	0.03068	-13.88 la -0.72[c,d]

OCD, obsessive-compulsive disorder; PANSS, Positive and Negative Syndrome Scale; Y-BOCS, Yale-Brown Obsessive-Compulsive Scale; HAM-A, Hamilton Anxiety Scale; HAM-D, Hamilton Depression Rating Scale; GAFS, Global Assessment of Functioning Scale; D.S, standard deviation; a, $p < 0.01$ schizophrenia versus OCD; b, $p < 0.05$ OCD versus schizophrenia + OCD; c, $p < 0.05$ schizophrenia + OCD versus schizophrenia.d, IC95% for the difference of arithmetic means rank.

Table 3 – Neuropsychological variables in patients with schizophrenia with / without OCD

	Schizophrenia (n = 26) n/media (D.S.)	**OCD (n = 21) n/average (D.S.)**	**Schizophrenia + OCD (n = 17) n/average (D.S.)**	**Statistics**	**Freedom degrees**	**P Values**	**P values after correction (Bonferroni or permutation of samples)**
TMT A (seconds)	67.69 (46.96)	44.57 (21.93)	54.35 (16.33)	χ^2=5.4262	2	0.0663	
TMT B (seconds)	153.00 (67.23)	104.11 (49.07)	96.76 (28.98)	χ^2=7.6480	2	0.0011	0.0018[a] 0.0122[c]
Stroop words	87.11 (11.67)	97.76 (11.27)	99.41 (13.44)	F=6.99	2	0.0019[ANOVA]	0.0094[a] 0.0050[c]
Stroop colours	51.88 (13.68)	66.33 (14.92)	64.88 (14.82)	χ^2=10.9343	2	0.0042	0.0031[a] 0.0140[c]
Stroop colours/words	29.61 (8.59)	38.52 (14.67)	36.05 (8.22)	χ^2=7.9758	2	0.0185	0.0162[a]
Stroop interference	48.23 (6.17)	48.90 (10.76)	47.00 (7.02)	χ^2=0.7077	2	0.7020	
RAVLT sum of tests	31.11 (7.42)	45.95 (10.74)	36.76 (10.77)	F=14.13	2	< 0.0001[ANOVA]	< 0.0001[a] 0.0129[b]
RAVLT learning rate	5.23 (4.24)	13.09 (8.80)	9.41 (7.26)	F=7.76	2	0.0010	0.0029[a]
RAVLT curve	4.03 (2.64)	4.61	4.47 (3.74)	F=0.20	2	0.8208	

of doubles		(3.61)					
RAVLT curve of mistakes	0.50 (0.76)	0.42 (0.67)	0.64 (1.05)	χ^2=0.1361	2	0.9342	
RAVLT volume of recognitions correct	11.19 (3.26)	13.95 (1.43)	12.00 (3.33)	χ^2=8.9500	2	0.0114	0.0033[a]
RAVLT volume of wrong recognitions	0.19(0.49)	0.04 (0.21)	0.52 (0.87)	χ^2=6.3966	2	0.0408	

OCD, obsessive-compulsive disorder; TMT A, Trail Making Test part A; TMT B, Trial Making Test part B; RAVLT, Rey Auditory Verbal Learning Test; D.S, standard deviation; a, $p < 0.01$ schizophrenia versus OCD; b, $p < 0.05$ OCD versus schizophrenia + OCD; c, $p < 0.05$ schizophrenia + OCD versus schizophrenia.

Table 4 –LDA classification model of schizophrenic subjects with/without OCD

Group			Classification per lots			Total
			1	2	3	
Just training	Number	1	20	1	0	21
		2	1	15	1	17
		3	0	1	25	26
	Percent	1	95.2	4.8	.0	100.0
		2	5.9	88.2	5.9	100.0
		3	.0	3.8	96.2	100.0
Cross-validation	Number	1	17	4	0	21
		2	2	12	3	17
		3	0	1	25	26
	Percent	1	81.0	19.0	.0	100.0
		2	11.8	70.6	17.6	100.0
		3	.0	3.8	96.2	100.0

Lot 1: OCD, obsessive-compulsive disorder; Lot 2: schizophrenia + OCD, schizophrenia + obsessive-compulsive disorder; Lot 3: schizophrenia

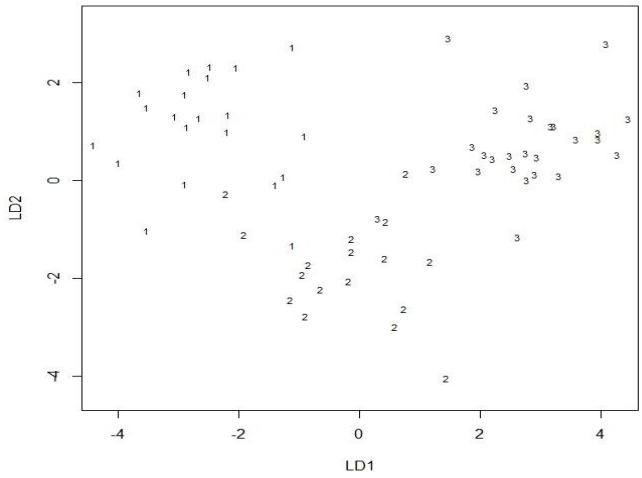

Fig.1 LDA results in schizophrenia with/ without OCD sample

LDA – Linear discriminant Analysis
LD1 – discriminant 1
LD2 – discriminant 2
1 - OCD
2 - Schizophrenia + OCD
3- Schizophrenia