

Premorbid personality and cognitive function impact on schizophrenia

Daniels Samburskis MD, Lubova Renemane PhD

Individuals with schizophrenia can experience family and social adjustment difficulties as well as significant barriers to independent living, with cognitive difficulties being one of the pivotal features of this mental health disorder. This article examines a decade of data for a sample of individuals living with schizophrenia and argues that comprehensive assessment of personality and cognitive function in the initial stage of disease should inform management and treatment to enable improved patient life outcomes.

The onset and aetiology of schizophrenia are associated with multiple factors such as delayed milestones, parental age, social situation, genetic factors, comorbidities, migration, personality and cognitive capacity.^{1,2} The mechanism through which schizophrenia develops is still unclear. There is evidence to suggest a genetic predisposition in the development of schizophrenia.^{3,4,5} The importance of premorbid personality, performance and functioning in schizophrenia is well described in the literature.^{6,7,8,9}

Individuals with schizophrenia can experience family and social adjustment difficulties as well as significant barriers to independent living.¹⁰ Cognitive difficulties are one of the pivotal features of schizophrenia.^{11,12,13} The aim of the study was to explore the relationships between sociodemographic factors, personality traits and cognitive functions at schizophrenia onset and social adaptation during the course of the illness.

Materials and methods

Study design

This was a retrospective cohort study conducted at the Riga Center of Psychiatry and Addiction Disorders (RCPAD) in 2016. The RCPAD is a central psychiatric clinic in Latvia (440 beds).¹⁴ The collection of data and their analysis were divided into two steps: baseline (A2006) and interview (A2016).

Firstly, we analysed all consecutive inpatient medical records for patients who received a primary diagnosis of schizophrenia during their first admission to

RCPAD from January 2006 to December 2006 using the RCPAD discharge register. The sociodemographic and psychological testing (Minnesota Multiphasic Personality Inventory (MMPI), Schulte table, visual memory and 10-word recall test) data for participants were obtained from medical records.

In the second part of the study, the same patients were interviewed in 2016. The contact details, location of the participants and ongoing outpatient or inpatient treatment were collected from the RCPAD database after 10 years of schizophrenia. The patients completed the Sheehan Disability Scale (SDS) and the patient data protocol. All patients received a complete description of the study and agreed to participate by written consent.

The inclusion criteria were: no previous psychiatric history; first hospitalisation; confirmed diagnosis of schizophrenia (F20.XX) as per the International Classification of Diseases and Related Health Problems 10 (ICD-10);¹⁹ completed psychological assessment during the first hospitalisation, and informed consent for follow-up assessment.

The exclusion criteria for potential study participants were: substance abuse; significant medical or neurological illness; poor reliability of the MMPI (validity scales), and an absence of follow-up contact after 10 years of disease.

The study was conducted in accordance with the Declaration of Helsinki and approved by the RCPAD and the Research Ethics Committee at Riga Stradins University with the protocol number 21/30.04.2015.

Data collection and assessment

Patient data protocol in A2006 included data about gender, age at onset of schizophrenia symptoms, occupation, mean amount of monthly income, marital status, education, number of children and accommodation at the moment of first hospitalisation.

The MMPI is one of the most frequently used tools for adult psychological assessment to establish a profile of personality. The MMPI has 567 items and 10 clinical scales: hypochondriasis (Hs); depression (D); hysteria (Hy); psychopathic deviate (Pd); masculinity/femininity (MF); paranoia (Pa); psychasthenia (Pt); schizophrenia (Sc); hypomania (Ma); social introversion (Si).¹⁶

Cognitive functions were evaluated by means of Schulte table, visual memory and 10 words recall tests. Schulte table is a visual test that assesses attention capacity and ability to change it. The test is performed by reading numbers or letters in a specific order and time displayed in a table of 5x5. The results were interpreted with standardised criteria and were available as a summary only suggesting the presence or absence of lowered cognition.¹⁷ The 10-word recall test is performed by memorising 10 words and recalling them in an hour. The results are scored according to the number of recalled words (0–10).¹⁸ The visual memory test is performed by recalling 30 images viewed during the assessment after one minute. The results are estimated in percentages and the best result makes up 100%.¹⁹

Patient data protocol in A2016 consisted of participant's age, occupation, monthly income, marital status, education, number of children. Data on number of hospitalisations between A2006 and A2016, duration of each admission, number of admissions against their will, number of admission with police assistance and course of schizophrenia according to ICD-10 were collected from the medical records.

SDS is a brief self-report tool and it has five items.²⁰ The first three items assess the quality of work/school, social life and family life/home responsibilities and are scored on a 10-point visual analogue scale from 0 to 10. The sum of these three items measure global functional impairment ranging from 0 (unimpaired) to 30 (highly impaired). The last two items assess the number of days lost and unproductive days over one week. The collected data were used to estimate each participant's level of disability due to mental disorder.

Statistical analysis

Descriptive and analytical statistics were used to analyse the data. The interval data were analysed with the Shapiro-Wilk test that revealed unequal data distribution. The mean values were changed to medians (Me) with the interquartile range (IQR) in brackets. Spearman's Rho test was used to correlate the interval data. Before that, the data related to education, work, marital status, accommodation and income were ordered in increasing value. The Wilcoxon test was used to analyse the data dynamics between 2006 and 2016. Chi-square and Fisher's tests were used for categorical and nominal data analysis. Sheehan Disability Scale's sensitivity was tested with Receiver Operating Characteristic

Table 1. Comparison of the sociodemographic data of patients with schizophrenia during 10-year period, since the first hospitalisation in a psychiatric hospital (n=31)

| Gender: male/female | n=11/20 (35.5%/64.5%) | | | |
|-----------------------------|-----------------------|------|----------------|------|
| | 2006 | | 2016 | |
| Median age (years) | 28 (IQR=37–21) | | 38 (IQR=48–33) | |
| Education | n | % | n | % |
| Special needs education | 1 | 3.2 | 1 | 3.2 |
| Primary | 6 | 19.4 | 5 | 16.1 |
| Secondary | 11 | 35.5 | 11 | 35.5 |
| Post-secondary non-tertiary | 6 | 19.4 | 6 | 19.4 |
| Higher | 7 | 22.5 | 8 | 25.8 |
| Marital status | n | % | n | % |
| Single | 19 | 61.2 | 15 | 48.4 |
| Divorced | 3 | 9.7 | 4 | 12.9 |
| Widowed | 3 | 9.7 | 2 | 6.4 |
| Married, lives separately | 3 | 9.7 | 3 | 9.7 |
| Lives with partner | 3 | 9.7 | 6 | 19.4 |
| Married | 0 | 0 | 1 | 3.2 |
| Employment | n | % | n | % |
| Unemployed | 11 | 35.5 | 20 | 64.5 |
| Volunteer | 1 | 3.2 | 0 | 0 |
| Part-time job | 2 | 6.4 | 3 | 9.7 |
| Employed | 16 | 51.6 | 7 | 22.6 |
| Other | 1 | 3.2 | 1 | 3.2 |
| Accommodation | n | % | n | % |
| Homeless shelter | 0 | 0 | 3 | 9.7 |
| Nursing homes | 0 | 0 | 2 | 6.4 |
| Group homes | 0 | 0 | 1 | 3.2 |
| With parents | 10 | 32.2 | 6 | 19.4 |
| With other relatives | 3 | 9.7 | 6 | 19.4 |
| Alone | 9 | 29.1 | 7 | 22.6 |
| With spouse | 7 | 22.6 | 5 | 16.1 |
| Other | 2 | 6.4 | 1 | 3.2 |

Table 2. Correlations between sociodemographic data and functional impairment in 2006

| 2006 | Education | Marital status | Work | Accommodation | Source of income |
|--------------------------------|------------|----------------|------------|---------------|------------------|
| SDS work/school | $r=0.274$ | $r=-0.266$ | $r=-0.072$ | $r=-0.134$ | $r=-0.022$ |
| | $p=0.135$ | $p=0.149$ | $p=0.702$ | $p=0.474$ | $p=0.909$ |
| SDS social | $r=-0.021$ | $r=-0.091$ | $r=-0.276$ | $r=-0.128$ | $r=-0.349$ |
| | $p=0.911$ | $p=0.628$ | $p=0.133$ | $p=0.492$ | $p=0.064$ |
| SDS family | $r=0.162$ | $r=0.108$ | $r=-0.265$ | $r=0.027$ | $r=-0.235$ |
| | $p=0.394$ | $p=0.57$ | $p=0.157$ | $p=0.887$ | $p=0.306$ |
| SDS days lost | $r=0.051$ | $r=-0.334$ | $r=-0.418$ | $r=-0.396$ | $r=-0.107$ |
| | $p=0.791$ | $p=0.077$ | $p=0.024$ | $p=0.034$ | $p=0.567$ |
| SDS unproductive | $r=-0.174$ | $r=-0.436$ | $r=-0.292$ | $r=-0.294$ | $r=-0.076$ |
| | $p=0.451$ | $p=0.048$ | $p=0.199$ | $p=0.196$ | $p=0.686$ |
| SDS global function impairment | $r=0.274$ | $r=-0.266$ | $r=-0.072$ | $r=-0.134$ | $r=-0.022$ |
| | $p=0.135$ | $p=0.149$ | $p=0.702$ | $p=0.474$ | $p=0.909$ |

Abbreviation: SDS: Sheehan Disability Scale

Table 3. Correlations between sociodemographic data and functional impairment in 2016

| 2006 | Education | Marital status | Work | Accommodation | Source of income |
|--------------------------------|------------|----------------|------------|---------------|------------------|
| SDS Work/school | $r=0.227$ | $r=-0.348$ | $r=-0.116$ | $r=-0.173$ | $r=-0.495$ |
| | $p=0.218$ | $p=0.055$ | $p=0.533$ | $p=0.352$ | $p=0.005$ |
| SDS social | $r=-0.039$ | $r=-0.231$ | $r=-0.041$ | $r=-0.016$ | $r=0.113$ |
| | $p=0.835$ | $p=0.211$ | $p=0.825$ | $p=0.931$ | $p=0.551$ |
| SDS family | $r=0.11$ | $r=-0.329$ | $r=-0.383$ | $r=-0.272$ | $r=-0.393$ |
| | $p=0.563$ | $p=0.076$ | $p=0.036$ | $p=0.146$ | $p=0.047$ |
| SDS days lost | $r=0.059$ | $r=-0.004$ | $r=-0.079$ | $r=-0.181$ | $r=-0.181$ |
| | $p=0.758$ | $p=0.984$ | $p=0.679$ | $p=0.338$ | $p=0.338$ |
| SDS unproductive | $r=0.046$ | $r=-0.265$ | $r=-0.262$ | $r=-0.155$ | $r=-0.155$ |
| | $p=0.824$ | $p=0.19$ | $p=0.197$ | $p=0.448$ | $p=0.448$ |
| SDS global function impairment | $r=0.227$ | $r=-0.348$ | $r=-0.116$ | $r=-0.173$ | $r=-0.495$ |
| | $p=0.218$ | $p=0.055$ | $p=0.533$ | $p=0.352$ | $p=0.005$ |

Abbreviation: SDS: Sheehan Disability Scale

(ROC) curve analysis. Microsoft Excel 2016 and SPSSv22 were used for data analysis.

Results

Altogether 62 consecutive cases of patients admitted to RCPAD between January 2006 and December 2006 were analysed. From those only 39 had completed psychological assessment. In two cases MMPI validity scales were too high and those patients were excluded from the research group. After exclusion there were 37 research participants. It was not possible to contact four of them and two refused to give their consent for participation in the research. The comparisons of the sociodemographic data are presented in Table 1.

The average number of hospitalisations during the 10-year catamnesis was 4 (IQR=7–2). The average duration of hospitalisation was 30 days (IQR=39–22).

Twenty-six per cent of participants ($n=7$) scored 60% in the 10-word recall test – that was the mode score among the study population. Sixty-five per cent of participants from the study group ($n=20$) had lowered cognition by Schulte table score and 75% of them scored in the top percentile on the Sc scale by MMPI. The Sc scale scores were in the top percentile in 67.2% ($n=21$) of participants, Pd scale in 32.2% ($n=10$) and Hy scale in 25.5% ($n=8$). The visual memory test suggest a cognitive decline in 60% of participants.

Tables 2 and 3 present correlations between sociodemographic data and functional impairment. There was a positive correlation between global function impairment and source of income in 2006 ($r=-0.433$; $p=0.050$) and work in 2016 ($r=-0.402$; $p=0.027$). Therefore, the participants with higher SDS score had a tendency towards lower ratings in the source of income during the time of their first hospitalisation and they tended to be unemployed at the time of interview in 2016.

There was also a significant negative correlation between SDS social life subscale's score and the source of income in 2006 ($r=-0.436$; $p=0.048$), but it had a significant low strength negative correlation with level of education in 2016 ($r=-0.348$; $p=0.055$). A lower level of education was observed for the participants with a higher SDS social life scale score. The visual memory test score was correlated with level of education in 2006 ($p=0.001$) and 2016 ($p<0.001$).

Participants were divided into two subgroups regarding the acquired scores in the first part of the

SDS that either exceeded (SDS-4) or were lower than 5 points (SDS-5). When the SDS-5 subgroup was studied separately, a negative correlation with level of education ($p=0.005$) and work in 2016 ($p=0.047$) was found.

No correlations were found for Sc scale scoring of MMPI. The Hy scale had a weak positive correlation ($p=0.033$; $r=0.067$) with SDS work subscale. SDS work subscale had a medium strength positive correlation with the Hy scale ($p=0.002$) in the SDS-5 work subscale group.

In the analysis of the participants with the highest Pd score, there was a negative correlation between SDS global function impairment and work in 2006 ($p=0.065$) and 2016 ($p=0.040$). There was a strong negative correlation between SDS lost days subscale and source of income in 2016 in the same group. Marital status in 2016 had a negative correlation with SDS work subscale ($p=0.006$), SDS communication subscale ($p=0.003$) and SDS days lost subscales ($p=0.017$). The highest Pd scale had a positive correlation with relationship status ($r=0.546$), work ($r=0.544$) and accommodation ($r=0.512$) in 2006 and a positive correlation with marital status ($r=0.375$), work ($r=0.561$), accommodation ($r=0.361$) and source of income ($r=0.431$) in 2016. No correlations were found between the SDS score and the 10-word recall test ($r=0.031$), the visual recall test ($r=0.091$; $p=0.625$) and the Schulte table test ($r=0.023$; $p=0.901$).

Discussion

There is established consensus that early detection and intervention for the first episode of schizophrenia is an effective way to establish a prognosis and improve social adjustment.^{21,22} Detection of individuals at risk of poor social outcome require knowledge of their sociodemographic, clinical, functional, cognitive and neurobiological characteristics, and use of assessment tools can be helpful to evaluate prognosis and to make an appropriate intervention plan.²³ In our study participants with a lower scoring in employment, education and marital status at the first episode of schizophrenia demonstrated poorer social functioning ratings after 10 years. Chan *et al.* evaluated a sample of $n=148$ individuals with schizophrenia using several psychometric scales and concluded that higher educational level and longer period of employment during the initial three years of schizophrenia spectrum disorder predict recovery.²⁴

In research by Majuri *et al.* disability pensions of 111 (79%) persons in schizophrenia group were

still running after 50 years follow-up.²⁵ Our results also suggest a trend of socioeconomic adaptation difficulties in schizophrenia group as there was an increase in the number of the unemployed, an increase in the number of the handicapped and an increase in those who live in the social care institutions that underline the necessity of early detection and intervention of patients with a first episode of schizophrenia.

Several studies have demonstrated a potential for using MMPI-2 for elucidating the aetiopathogenesis and detection of schizophrenia and formulation of prognosis.^{26,27} The majority of our sample had an elevated scoring of Sc scale by MMPI-2 at the first episode of schizophrenia, therefore it could potentially be used as an early detection and diagnostic tool.⁸ Sc and Hy personality characteristics of patients in the premorbid phase of schizophrenia lead to worsening of social functioning after 10 years. These findings suggest a possibility for using the MMPI-2 as a prognostic tool.

Poor cognitive functioning at the premorbid phase and the first episode of schizophrenia seems to be linked with global functional impairment and poor outcome.^{28,29} More than a half of the patients from our study presented with impairment of cognition during the first episode of schizophrenia.

However, we did not find that poor cognitive functioning in the first episode of schizophrenia had an impact on social adaptation after 10 years of schizophrenia. This finding is in agreement with previous data reported by Galderisi *et al.*³⁰ The authors did not find the direct connection between changes in cognition and real-life functioning in schizophrenia patients. However, the meta-analysis conducted by Halverson *et al.* demonstrated associations between cognition and functional outcomes of the patients with schizophrenia and recommended applying cognitive testing for evaluation of functional outcome in schizophrenia.³¹

There are several limitations to this study. It was not possible to learn the exact duration of untreated psychosis due to the lack of data collected during initial admission to psychiatric hospital and the difficulty for study participants to remember 10-year-old events. It is possible to notice heterogeneity in the research population, such as personality, professional and social differences of individuals with schizophrenia during the first episode. Another limitation is a relatively small sample number. We expected a higher number of participants, but due to the exclusion criteria one third were excluded.

Conclusions

Our study suggests that in the study population social indicators such as working capacity, employment, level of earnings and housing conditions have worsened during 10 years of schizophrenia. Factors such as a lower rating in employment, education and marital status at the start of the illness, were associated with poorer social functioning after 10 years. The social functioning of patients with schizophrenia seems to be affected by premorbid personality traits. Patients with evidence of schizoid and hysterical personality traits in premorbid phase of schizophrenia had a worse level of social functioning than patients with premorbid psychopathic personality traits. Our findings suggest that the decline in cognitive functions such as memory and attention at the initial stage of schizophrenia do not significantly affect further social functioning over the 10-year period of the disorder. An understanding of prognostic risk factors can be helpful in clinical practice.

A major implication of this study is the argument for a comprehensive assessment of personality and cognitive function in the initial stage of disease that can help to plan management and treatment accordingly. The routine social outcome measures could improve the complex interaction of clinical and social factors and may help to develop better patient-centred treatment and rehabilitation plans.

Dr Samburskis is a Psychiatrist at Riga Center of Psychiatry and Addiction Disorders, Riga, Latvia and Professor Renemane is Assistant Professor at Department of Psychiatry and Addiction, Riga Stradins University, Latvia.

Declaration of interests

No conflicts of interest were declared.

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