

## Modifications of Intelligence Quotient during Pre and Post-Psychotic Period in Men with Schizophrenia

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### Abstract

**Background:** Many studies tried to find a connection between schizophrenia and intelligence, it is a vastly stigmatized chronic disease did not raise that type of questions. Either there a cognitive decline after the onset of the pathology or the changes in cognition that accompany the disease prevents the individual from manifesting one's intelligence. Even if there are certain modifications in the measured intellect it does not necessarily mean that schizophrenia is a disease that leads to inevitable dementia. It is not clear whether that decline is due to the pathological process of schizophrenia or an existent low premorbid IQ.

**Materials and Methods:** We selected 10 patients that satisfied the inclusion criteria. All of the patients were hospitalized in the IMSP Clinical Psychiatric Hospital in the men acute ward in the period between 10.11.2016 - 01.06.2017. The patients were tested 3 times during their hospitalization: 1 - 3 day, 10 - 13 day and 21 - 30 day. Patients were asked to solve Raven's Colored Progressive Matrices. After which the PANSS scale was applied for grading the positive symptoms during the psychotic and post-psychotic stages.

**Conclusion:** We concluded that people with schizophrenia, the mental activity, practical actions are preserved, the memory and attention are not affected, instead the capacity to formulate individual correct conclusions based on a personals analysis is compromised. In the acute psychotic phase, because of the thought chaos, mentism, the slowing of the ideational process etc. suffers the general capacity of manifesting an adequate amount of intelligence, but there is no insufficiency in intellect. There seems to appear an incapacity to separate the essential from unessential, or just what is considered essential in the real empiric world. So, it means there is diminished productivity of thought process with a circumstantiality tendency and not a deficit of intelligence.

**Keywords:** Schizophrenia; Intellect; Intelligence; IQ; Dementia

### Introduction

Intelligence can be generally defined as a cluster of abilities that the brain possesses. In particular, learning from experience, the adaptation to environments, as well as the selection and the shaping of them, can perhaps be considered as essential aspects of that cluster [20]. For the sake of convenience, it can also be defined as "general cognitive ability" [21]. Its importance as a construct is emphasized through the fact that it is a core concept in a number of scientific fields, such as differential psychology, behavioral genetics, as well as cognitive neuroscience [22]. There are individual differences in human intelligence, which have a major contribution to human psychology as

a whole [23] and make it one of the most accurate predictors regarding individual life outcomes, such as health, both mental and physical, occupational and educational patterns, and even mortality [2]. Indicatively, a study consisting of 33536 men and 32229 women who were participants in the 1947 Scottish Medical Survey and they were all born in the year 1936, associated childhood intelligence inversely with the entirety of major causes of death [24].

The variations that exist in the intelligence of humans have been associated with differences between their genetics. By taking advantage of the similarities in family genetics, behavioral studies have concluded that factors linked to genetics contribute to approx. 50% variation in intelligence by the age of 10, on a population level. There is a proportional increase by the end of adolescence (approx. 70%), and the numbers remain in similar heights throughout most of adult life [25]. Increased general cognitive ability or high intelligence can perhaps showcase the essential role that intelligence has in the molding of human history, as it has been attributed as being a valuable human capital for the advancement and maintenance of human society in the age of information [2].

Perhaps creativity, the construct that can be defined by usefulness and novelty [26], contributes to the influence that intelligence has to the shaping of society, as it has been consistently been correlated with it, with a common possible explanation being the similarity of the executive processes of the two [27]. The threshold hypothesis, which is prominent in studies associated with intelligence and creativity, presents the idea that above average intelligence is a necessary condition for high levels of creativity [28]. In similarly themed studies the importance of the contribution of executive cognitive functions to the performance of cognitive tasks that can be deemed as a complex is emphasized, and it is also thought to serve as a representation of a basis in regards to individual differences when it comes to intelligence [7].

Genetics is not the only factor that influences intelligence. Evidence provided from twin studies consistently indicates that there are environmental factors that substantially influence individual intelligence, though the specifics in regards to those factors and the amount of their influence are deemed as unclear [29].

It is well known that low IQ is associated with a worse outcome in schizophrenia. Whereas a higher one is associated with a more benign evolution of the disease [9]. In the previously conducted studies, the cognitive deficit is defined not by some form of dementia or a decline in score on repeated testing but a slower gain in repeated. The cognitive deficit in people with schizophrenia is expressed more in a slower score gain at repeated testing when compared to the healthy control group [14]. Thus, schizophrenia is characterized by a relative difficulty in accumulation of new cognitive abilities at a global level over time, not the loss of the already possessed intellect in general [15]. Some time ago schizophrenia was considered to be a neurodegenerative pathology resulting in the deterioration of both intelligence and intellect.

However, extensive studies have shown that all neurological changes that occur are a consequence of inadequate, outdated treatment or other factors. There is no direct evidence of toxic effect of the psychosis on brain tissue, and the occurring changes are a consequence of antipsychotic medication, alcohol, cannabis use, smoking, hypercortisolemia, and low physical activity, factors that contribute to changes in cortical and ventricular volumes. The fact that means that at least some of the consequences can be reversible [19].

Intelligence plays an important role in the evolution of schizophrenia and its manifestations. Irrefutably, previous studies had shown that people that developed schizophrenia had a low IQ score prior to the onset of the disease, compared to the healthy peers [31]. But the general level of intelligence does not interest us. The possible constancy of the IQ throughout the illness is the intriguing phenomena. That hypothesis, in our opinion, can lead to a better understanding of the pathological process, delimitations of cognitive areas affected by it and consequently better treatment and management of individual cases. In this study, we wanted to see if there are any changes in one's occurring during the pre and post-psychotic period.

### Objectives of the Study

To study the modifications, the deficits of the intelligence quotient in the psychotic and post-psychotic period in patients with Paranoid Schizophrenia.

### Materials and Methods

We selected 44 patients that satisfied the inclusion criteria. All the participants were hospitalized in Clinical Psychiatric Hospital, the wing of male acute psychosis, in the period between 10.11.2016 and 01.06.2017. The patients were tested in 3 stages during the time of the hospitalization in the department, in 1 - 3 days, 10 - 13 days and 21 - 30 days. During that period, 34 individuals were eliminated from the study for various reasons. The evaluation consisted of 10 patients who passed all 3 stages. They solved the Raven's Colored Progressive Matrices. After which the PANSS scale was applied for grading the positive symptoms during the psychotic and post-psychotic stages. The literature we used in our study is included in the reference section. We performed thorough research using scientific data basis: Pubmed, Google Academics, Medscape, Uptodate. Our keywords were: (schizophrenia, intellect, intelligence, IQ, dementia, neuropsychology, study, cognition). We included some gray literature related to intelligence and schizophrenia to provide theoretical support to the study.

#### Inclusion criteria:

1. F20.01 Paranoid schizophrenia. Acute exacerbation.
2. Age between 18 - 34 years.
3. Lack of comorbidities.
4. Presence of patient compliance.
5. The informed treatment and investigation agreement.

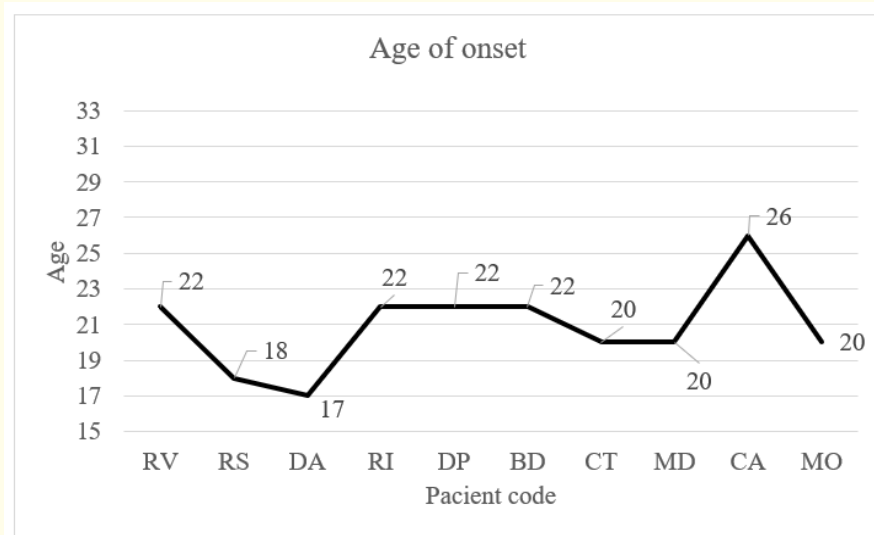
#### Exclusion criteria:

1. Lack of compliance.
2. Psychiatric comorbidities.
3. Other types of schizophrenia or a malignant course of the disease.
4. The incapacity to finish the test at any stage of the study.
5. Mechanical, random response.
6. Pronounced adverse effects of treatment.

### Results

The average age at onset (Figure 1) in our studied lot of patients is 20,9 years (S.D.  $\pm$  2,5). Data that coincide with the characteristics of paranoid schizophrenia and a study performed by Magdalena Linke., *et al.* regarding the onset of the disease in case. Her results suggested that the mean age at onset of illness was 23.1 (S.D.  $\pm$  6.2) [30]. We did not find any relevant data connecting the number of hospitalizations during lifetime, since the onset of the illness (Figure 1) and the level of intelligence, however, it has a correlation with the family and social situation, we do not possess more information it not being one of the purposes in the study.

It seems the worse are the relationships with the siblings, the higher the number of hospitalizations. The average number of hospitalizations since the onset of schizophrenia in our study is 5,1 (S.D.  $\pm$  2,9) (Figure 2). That theory seemed to show in the subject that scored maximum on all 3 times of the study (see below the results). Even though he was a part of an integral family he was unhappy with his current living situation and wished to live independently because of the "tension in the family". One subject (10%) out of 10 had a college degree education level, 2 (20%) obtained middle school diploma, 4 (40%) finished high school obtaining a diploma of baccalaureate and 3 (30%) achieved bachelor's degree in different areas of expertise.



**Figure 1:** In this figure we present the age of the first episode of schizophrenia.

Regarding the employment 3 (30%) of the studied patient was officially working at the time of the study and 7 (70%) were unemployed, although some of them engaged in unofficial labor from time to time. Those who did not wish to find jobs because they did not have the drive, motivation or desire to work, manifested higher negative symptoms scores on the PANSS scale in the post-psychotic period. Many lack the much-needed support from the close entourage.

Only 2 (20%) obtained the disability degree, the other 8 (80%) refused it continuously providing different motives: they do not want to lose their job, be stigmatized by the society, one of the reasons is the belief that the pay is not worth it, some are building their decision based on their delirious ideas and false beliefs which they act upon onto. We examined the intrafamilial relationships, knowing it as an important factor in the evolution of the disease. We collected that, 3 (30%) lived alone and independently, 4 (40%) lived with their mother, 3 (30%) lived within the integral family.

We did not find any relevant data connecting the number of hospitalizations during lifetime, since the onset of the illness (Figure 2) (average 5.1) and the level of intelligence, however, it has a correlation with the family and social situation, we do not possess more information it not being one of the purposes in the study, though it will be mentioned in the discussions. It seems the worse are the relationships with the siblings, the higher the number of hospitalizations [18].

As seen in the figure above (Table 1), 9 patients (90%) were treated during the length of their stay with: Haloperidol, 6 (60%) Levomepromazine, 9 (90%) Risperidone, 4 (40%) Clozapine, 1 (10%) Phenazepam, 4 (40%) Diazepam, 1 (10%) Amitriptyline, 3 (30%) Venlafaxine. Out of 44 individuals, 34 were eliminated from the study because they could not complete the test at some stage of the study. One of the predominant factors were the unmotivated dosages and combinations of medication. The secondary negative symptoms and the adverse effects were the main barriers. The patients were highly sedated, fatigued, exhibited mild to pronounced tremor often presenting complaints of akathisia. The combination of medication was unfortunate as well. Most of the patients received a “patterned” treatment consisting of a long period of combined classical antipsychotics that followed an abrupt change to second-generation medication. That unfortunate finding makes it difficult clinically to distinguish the true negative symptoms caused by the malfunctioning glutamate

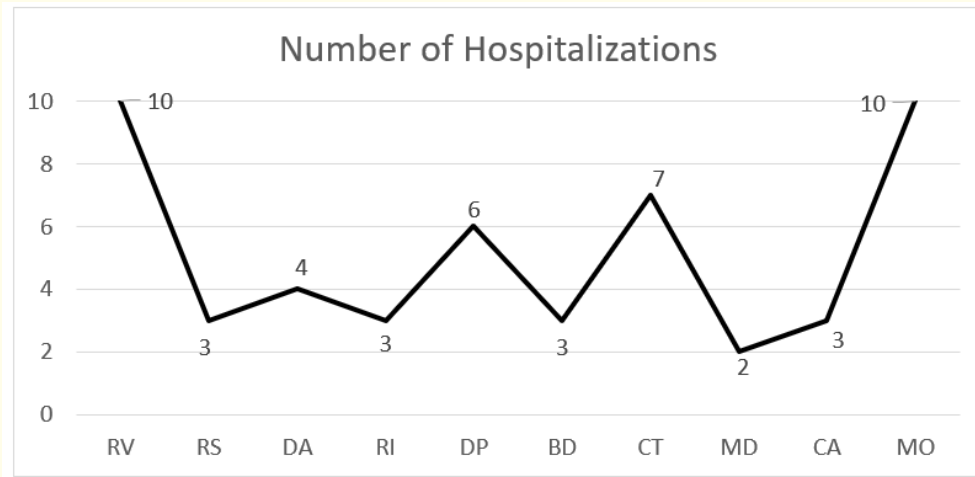


Figure 2: Here is the total number of hospitalizations of the patients enrolled in the study.

	Haloperidol	Levomepromazine	Chlorpromazine	Risperidone	Clozapine	Phenazepam	Diazepam	Amitriptyline	Venlafaxine
RV	+	+	+	+	-	-	-	-	+
RS	-	-	-	+	+	-	-	-	+
DA	+	-	+	+	-	-	+	-	-
RI	+	+	-	+	-	-	-	-	-
DP	+	-	+	+	-	-	-	-	-
BD	+	+	-	+	+	-	-	-	-
CT	+	+	+	+	-	-	-	-	-
MD	+	+	-	+	-	-	+	+	+
CA	+	+	-	+	+	-	+	-	-
MO	+	-	-	-	+	+	+	-	-
T	9	6	4	9	4	1	4	1	3

Table 1: In this table we present all the medication administered to the patients during the hospitalization).

receptors in the frontal cortex from the adverse effects caused by the medication. The dosages of the administered medication varied along the hospitalization but were not recorded by us as the detailed analysis of the liaison between medication and IQ was not our main objective, but leaves unanswered questions for the future.

Forty-four hospitalized patients fulfilled the inclusion criteria. Of these, 34 could not complete the tasks at some point of the stages so they were eliminated from the study because of the high dosage of medication, unjustified combinations of typical and atypical antipsychotics, the much-exceeded duration limit of administration of classic antipsychotics lead to excessive sedation, latency of thoughts, diminishing the attention of the patients making them unable to finish the task laid before them. Patients were constantly complaining of fatigue, somnolence, asthenia, fatigue, extrapyramidal adverse effects of the medication and akathisia. Some of the patients gave us

interpretations of the test based on their own delirious ideas, hallucinatory experiences, which they could not ignore even when asked politely to do so. These patients, being in acute psychotic state fixate on their subjective perceptions completely ignoring the empiric, real-world giving the test a “magic” interpretation making the results null. So, we remained with 10 patients who passed the tests at all the required steps.

The average results of an entire lot of the patients (Figure 3): Stage I -  $29.6 \pm 3.53$ ; Stage II -  $31.3 \pm 3.43$ ; Stage 3 -  $31.2 \pm 3.64$ . When being out of the psychotic state the patient found it easier to perform the tasks, not being distracted by ones’ psychotic experiences, there were fewer tendencies to correct his work. The interpretations gained a logical compound as seen in the slightly increasing results of the test. But in general terms, there is no grand difference in the results at hospitalization and discharge. The intelligence quota seems to oscillate insignificantly (Figure 3). We also noticed that in the intermediary period some patients displayed higher results than in the post-psychotic period, which can be attributed to the mild state of hypomania caused by the switch from conventional to atypical medication.

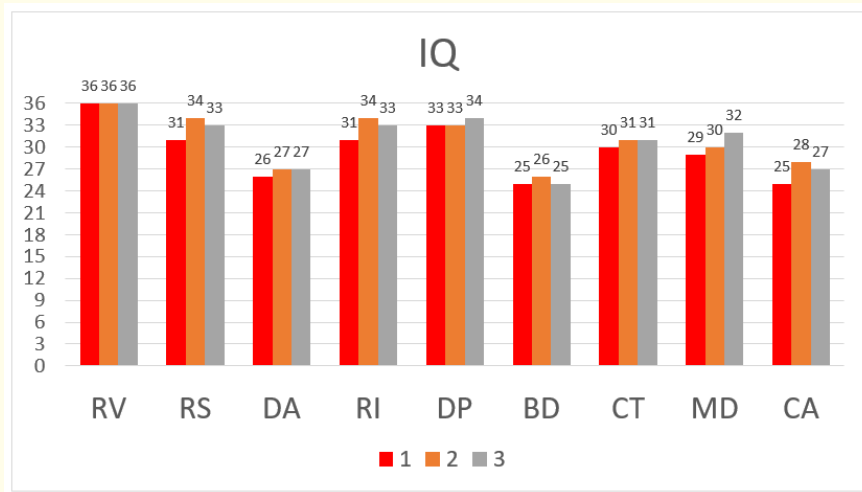


Figure 3: In this table we presented the results of the test given at 3 times. The first column is the psychotic period, second column - intermediary, last column post psychotic.

### Discussion and Conclusion

We encountered difficulties in performing the planned study. Because of the peculiar dosages, the number, quantity, quality and the combination of the antipsychotic medication which caused sedation, latency, sluggishness, and a decrease of attention and the capability to concentrate upon the given task, we had to eliminate 34 subjects from the study. Very often the patients complained of fatigue, somnolence, and asthenia and were not capable to finish the test. Some patients, during the psychotic period, offered a symbolic and delusional interpretation of the test and were fixated on the “magical” interpretation of the fragments of the progressive matrices. The intelligence bears an important role in the evolution of schizophrenia and in its manifestations.

The psychotic period, it’s characteristics, refrain upon itself the subject’s attention, rather than destroying the integrity of the learning process or the course of thinking and the taken decisions. The patient’s efforts were put into the compensation mechanisms, the constant search for support upon which is based the integrity of perception and the logic of the intellectual process. The increased tendency of the patient to circumstantiality and to correct his actions makes it more difficult to execute the cognitive process and therefore, offers it an in-

errupted form, In the post-psychotic period, we can observe an elevation of the result by 1,5. Outside the psychotic episode, they perform the tasks more easily not being distracted by their psychotic experiences, there were fewer tendencies to correct their own results. The interpretations gained o logical structure. We managed to conclude that in patients with schizophrenia, the mental activity, the practical actions are preserved, the memory and attention are not affected but instead is compromised the capability to synthesize individual, correct conclusions made after a personal analysis. In the psychotic period, because of the thought chaos, a flight of ideas, latency of thinking and other quantitative disturbances of the thought process, suffers the capacity to demonstrate an adequate level of intelligence, but there is no intellectual deterioration. There appears the inability to separate the essential essence, or simply what is considered essential in the real, empirical social world. So, it is more of particular productivity of the thinking process with a tendency towards circumstantial thinking and not an intellectual deficit. There is currently no compelling neurobiological, psychometric and clinical evidence of the decline in intelligence in schizophrenic patients. In patients, is found difficulty in manifesting intelligence and not decreasing the potential of the intellect. Mental operations and practical actions in patients with schizophrenia are preserved, but the mechanism of synthesizing correct, independent conclusions is corrupted. However, further studies and investigations are needed to elucidate and confirm the presented issue.

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