

## **Long Distance Continuum Computerized Cognitive Training in Schizophrenic Patients with a High Level of Functioning. Therapeutic Advantages**

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**Abstract:** *Schizophrenia is a condition of chronically evolving cognitive invalidation. The average debut for the paranoid form is the third decade of life, affecting the social and family evolution through deficiencies in the mnesic prosexic area and that of thinking. For young schizophrenic patients, in their first psychotic episodes, the association between psychotropic medication and cognitive computerized training reduces the post process defect. A pilot group of 10 schizophrenic patients (aged 25 to 30), of both genders, accompanied by a family member, committed to the Sapunari Psychiatric Hospital or an average time of 10 days, were taught to utilize a set of computerized cognitive tests. The computerized cognitive training was initiated as soon as the second day of treatment, immediately after the medication started working on the scale of behavioral disorganization. The cognitive training aimed at developing: attention (with a direct focus on concentration, stability, selectivity and distributive action), memory (retention and evoking, in the spatial realm versus verbal information) and thinking (superior cognition, organizing, sequencing, planning, operational control).*

*After being released, the patients continued their training practice (long distance) under the supervision of the family member present at the hospital. The results were sent in on a weekly basis to the specialist and the psychologist who monitored the case, tracing the detailed evolution of each component of the mnesic – prosexic area for a whole year. In some cases (3), visual contact was maintained (via Internet).*

*Results: In what the patient is concerned, we noticed that the cognitive markers analyzed were maintained and improved, that the adapting and social functioning, the family cohesion finely increased. From the psychiatric medical unit point of view, the direct and indirect costs of hospitalization per patient decreased, the inpatient care period was kept to a minimum (10 days), the further follow up being done outpatient, therefore we managed to obtain a better supervision of the patient in time.*

**Keywords:** *schizophrenia, computerized cognitive training, cognitive deterioration prevention.*

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### **1. DESCRIPTION OF THE PATIENTS ISSUES INCLUDED IN THE STUDY**

The cognitive symptoms in schizophrenia are subtle and are often detected only through the running of neuro-physiological test. These include:

- Low “executive functions” (the ability to absorb and interpret information and to take decisions based on them is reduced)
- Inability to sustain attention
- Problems concerning “working memory” (referring to the ability to memorize recently absorbed information and to utilize it correctly).

The cognitive deficiency often interfered with the patient’s ability to lead a normal life and to benefit from it. This can generate major emotional stress which is significantly emphasized in schizophrenia, affecting up to 75% of patients. Also, it is well known that medical treatment, in the form of classic neuroleptics and even that of modern atypical anti psychotics, is not efficient in these cases. (Andresen, 1998).

The study started from evaluating a number of 10 patients from the point of view of cognitive deficiency. A quantification of cognitive deficiency on specific areas (short term or midterm memory, attention, execution) was initially assessed by applying a battery of computerized tests; these results were related to gender, age, case history, clinical form and quality of remission, etc. For each quantified schizophrenic patient a cognitive training was initiated on their minor deficit area for a period of ten days (this period initially corresponding to that of the hospitalization), then on areas of gradually higher deficit, in a period of eight weeks. Thus, it was stated that eight weeks was the limit from which the short term or midterm specific training would bring a decrease in the deficit degree per cognitive area. The determining was set by weekly cognitive retesting. This threshold, correlated with the other factors investigated for each specific patient, have led to the prediction of their social and or workforce reinsertion degree.

It started from the premise that through cognitive stimulating and training we would obtain an improvement of the psychic capacities we had in mind, which would have significant positive impact on day to day functionality of patients diagnosed with schizophrenia, and, implicitly, on the quality of their lives, as well as that of their families. This research is of interest, from a practical, medical and social point of view (leading to decreased social support costs for schizophrenic patients with cognitive disabilities, creating a standard of care that could be implemented nationally), as from a scientific perspective.

The evaluation for determining the specific steps and, then, the cognitive training for the improvement of at least one area of cognition was done simultaneously with specific treatment in the Sapunari Psychiatric Hospital. From the point of view of the personnel in the institution involved in the treatment of the schizophrenic patient, the degree of interest and the desire to act grew inside the therapeutic psychiatrist – psychologist team by involving the latter also in the patient's active recovery phase (well-known that at the time being, in many psychiatric hospitals, the psychologist's role is limited to testing the patient and some support counseling).

Although the project was limited for a small number of patients (10 schizophrenics), it's development would have multiple valence, on a social level (due to costs and care), as on a workforce market level, by increasing the reintegration possibilities for the person involved and their family. Extending such a study nationally would allow the creation of standardized and materialized treatment protocols, improved and adapted to the schizophrenic patient.

This study, centered on cognitive deficient schizophrenic patients, meant:

- Selecting and putting together a modern battery of computerized test to detect cognitive deficiency, globally and on each cognitive function (process) individually.
- Establishing some correlations between these indicators of cognitive deterioration, evidenced through complex psychiatric and psychological testing and different parameters of tracking the condition (age of debut, moment of evolution, clinical form, the quality of inter episodic remission, quality of life).
- Putting together a battery of computerized programs focused on cognitive recovery. The training was designed specifically for each psychic function (process) individually (concentrated attention, distributive attention, short term and long term memory training, realization of the absurd), also complex starting from simple exercises as that of daily chores (training for doing grocery, learning to handle money) , to higher difficulty chores chosen by the therapist in conformity with the patient's highest level of professional training prior to the debut of the schizophrenic process.

The cognitive training had the goal of reducing the cognitive deficiency lower than that of the time he was first evaluated and improving his day to day functionality, with an impact on the quality of life. The therapeutic team set their goal on following the cognitive deficit for eight weeks into the evolution of the condition, bearing in mind the possible side effects of the medical treatment (especially the classic one) and the predominantly depressive psychological reactions secondary to the awareness of the seriousness of the diagnosis. The basic concept is that of utilizing/ training the patient's remaining cognitive potential = cognitive stimulation.

Description of psychopathological manifestation in schizophrenia.

Schizophrenia is a serious psychic condition, with decompensation in the psychotic register, of a long evolution, continual, episodic with the main characteristic of personality rift. Etymologically, the term

“schizophrenia” is translated through the dissociation, the fracturing of the mind, from “schizein”, which in Greek means “to break” and “frein” which means “mind, spirit”.

Schizophrenia is defined by hallucinations, delirium, disorganized thinking and behavior. The people with schizophrenia isolate themselves from others and their activities, withdrawing in an inner world of psychosis. This condition has a long history of stigma. The people with schizophrenia are often rejected by society (they lose their jobs and find it difficult to get hired again, have serious family conflicts, end up on the street and may commit criminal acts). (Barbato, 1996) We are talking about a chronic disorder that requires treatment for a lifetime. In what the studies have shown, statistics point out that this condition is quite frequent, affecting approximately 1% of the world’s population. Many acute cases are not clearly differentiated unless after a couple of years of suffering, when the negative symptoms grow more obvious. As it can be noticed, going further out, this disorder does not limit to affecting the psychic, but it also considerably deteriorates the social, family and professional aspects of those suffering.

The damage of cognitive function in schizophrenia was observed early in the beginning of the condition (there are studies that consider it a disorder premorbid to the occurrence of psychotic symptoms = neuro-developing disorder). It was proven that there is a partial improvement under treatment, but not sufficient, given the constant progression of the deficit. (Fuller Torrey, 2006)

Schizophrenia is a condition of heterogenous etiology, which implies cognitive, sensory and behavioral disorders. The pathology of the schizophrenic patient is very complex and requires multidimensional approach in diagnosis and therapy. Most forms (types) of schizophrenia evolve with cognitive disorders of varied profile. The alteration of the cognitive component in schizophrenia represents one of the difficult parts of the assessment. The identification of these disturbances requires a specific therapeutic approach, aiming besides the basic condition’s therapy, the use of specific investigating means of neuropsychological type as well as neurocognitive recovery in patients. The enormous complexity of this pathology centres the permanent attention of studies from the fields of neuropsychology and neuroscience. Currently, these patients bring together behavioral disorders and cognitive disorders. (Green, 1996)

We are focusing in this current study on the alogy, the ideo affective “impoverishment”, anergy and inattention, both social and in testing of the mental status. The causes of these disorders are multifactorial are directly linked with the type of schizophrenia, the length of an episode, the age of debut, the pursued medication and the quality of the interepisodic remission. The identification of these cognitive and behavioral problems, followed by adequate intervention in an as early as possible stage, ensures the improvement of the schizophrenic patient’s quality of life. (Green, 1996)

Internationally there is a current and continual development of the problematic concerning cognitive disorders in schizophrenic patients, associated with the presence of the condition itself ( IE. : the case of personality, memory, language disorders and attention concentration, stability and selectivity or motor skills damage) , as well as associated with the classic neuroleptics medical treatment, which currently translates into sometimes significant cognitive damage. (Andreasen, 1998)

## **2. RESULTS FOUND FOR THE 10 PATIENTS GROUP**

- The cognitive deficit represents a fundamental aspect of the condition, given the proof that the 10 patients have shown cognitive deficiency before the debut of psychotic symptoms and other clinical signs.
- Stage I relatives of the patients on study show a similar cognitive deficit pattern, even in the absence of psychotic symptoms (suggesting the link between certain cognitive deficiencies and genetic vulnerability in schizophrenia).
- On a level of certain cognitive functions, the deficiencies remain more or less unchanged, in the acute phase of the condition (psychotic episode), as well as in remission. Also, the correlations between the severity of the psychotic symptomatology and cognitive performance are very low or nonexistent, cognitive performance being more likely tied to negative symptomatology. We observe a pattern of cognitive deterioration, specific to schizophrenia, different from that of other pathologies like: dementia, depression, bipolar disorder, deterioration on which anti psychotic medication has an extremely limited effect. This fact suggests that anti psychotic medication works in neural systems different from those that produce cognitive deficiencies.

- All 10 investigated patients have shown disorders at the level of their prosexic function, as well as their superior cognitive function, that of analysis, synthesis, operationalisation, planning, sequencing, control through reversed afferentation. The results are consistent with specialty literature, which states that cognitive deficiencies are common in schizophrenia, the number of affected patients being estimated at 90% for at least one cognitive field and 75% for at least two.
- Cognitive deficit affects daily functioning and quality of life, confirmed for all 10 patients followed.
- Cognitive performance can be improved by medical and/ or neuropsychological treatment.

The psychological set of tests utilized in cognitive training followed:

- \_ the combining or discriminating capacity ( analysis versus synthesis)
- \_ creative faculty
- \_ critical spirit
- \_ reason
- \_ imagination
- \_ sensoriality
- \_ the power to assure ideational representation
- \_ the practical dimension
- \_ reason (as deductive faculty)
- \_ stage of conceptual memory developing

The manner of evaluating the 10 patients enrolled in this study implied an experimental and logical-mathematical aspect, in which the patients were tested to see to which extent they possess intelligence abilities to match the mental age at which the “psychic operators” function ( all selected patients have had a high level of cognitive functioning reached prior their psychic disorder debuted). For a better, more eloquent portrayal of the cognitive deficit in schizophrenia, certain notions which express if “mental operators” are active were selected from mathematics. (Gold, 2004)

In the investigated group we noticed a process of destructing intelligence, which (more or less) follows the opposite “rules” of its construction and development in childhood and adolescence. Intelligence is destructed differently in schizophrenia from other psychic disorders (dementia, emotional conditions, delirious disorders, organic pathology), intelligence being reported differently in diverse pathologies, in relation to: thinking, emotions, originality, division, reason. In the case of the patients we have studied, the underlined aspects refer to the patients incapacity to use:

- \_ their thinking faculty
- \_ their capacity to know and understand
- \_ their speed and extension of thinking
- \_ their dynamism
- \_ their good organizing skills (proportion, harmonization, comparison, synthesis, abstraction)
- \_ their capacity to verify
- \_ the power to assemble and disassemble / compose and decompose
- \_ their inclination for consonance
- \_ their critical spirit.

The conclusions of the study referring to the 10 patients diagnosed with schizophrenia and their ability to function or not with these “mental operator”:

Comparison. For the schizophrenic patient’s mind, it becomes difficult to insert in their reasoning the criterion on which the psychic operation of comparison is performed, because the subject meets with difficulty the possibility of choosing/ capturing the princeps criterion. The difficulties arise from the

patient's incapacity to understand the concept of "temporarily elimination", so that afterwards the "annulled" measure to be brought back in the foreground. (Henry, 2002)

The false hypothesis. For it to be activated on a mental level it requires operation over the possible, discerning between the yes/no, black/white, true/false, possible/impossible alternatives. Equally, the possibility to operate the other way around arises too, from the end to the beginning, by steps, sequences, "step by step" judgments. The presence of the possibility of comparison is also necessary, so that the patient be might able to make judgments about what changes must be made in the assumption, with the goal of these leading to eventual resolving of the situation.

The observation of the reversed path, when the base is the prosexic function, attention being the princeps requisite over which the observation of the reversed dimension must take place. A smaller but significant contribution, is brought by memory, through the ability to recall the steps in reverse. In terms of thinking, the operations involved are: sequencing, planning, anticipation and retroactive control, through unique or multiple feedback. The patient must succeed in mentally rising to the idea that reversibility does not cancel the constancy of the phenomenon, that it is only its mirroring, reflection that can only complete the overall vision of a certain phenomenon.

The observation of duration and movement. The time and space dimensions are psychic constrictions to which the human being reaches in his first year of life, once the course of delay is set. The possibility to apprehend past, present and future is built in parallel with that of perceiving duration, as a finite measure/ quantity. The perception of time, as the notion of duration, are built during childhood and are completely different depending on the biological age, mental age as well as the psychic pathology. Around the age of eight, the child discovers the possibility to enjoy time as finite. There is an entire psychopathology of time and many situations tied to the impossibility of understanding it are due to the incapacity to perceive correctly and exactly its flow and temporality, in a heraclitian meaning.

The concept of space is easier to grasp mentally. Still, at time, space can be anxiogenic, leading from the perception of a "too big" or "too small" psychic, extended to infinity or the subjective unit, as each patient can represent it. To 7 out of 10 patients in the facing study, the perception of time seems to be intrinsically represented, mechanically memorizing dates and figures and presenting a selective undifferentiated hypermnesia for certain dates, facts and events deliriously traumatic integrated.

The observation of the reduction to the absurd. Through approaching this "mental operator" we wanted to identify the measure in which the studied schizophrenic patient's intelligence (for which the highest level of functioning reached before the psychic condition was graduating from high school) can still operate with:

- \_ the psychic meaning of what we call statement (ideational unit)
- \_ the possibility to compare the judgment of a true or false statement by probing reality
- \_ the principle of no contradiction = when a statement is not simultaneously true and false
- \_ the occurrence of operational groups, which allow for conceptualization and coordination of concepts. The detachment from objects and the manipulation of their immediate representations, replacing objects with statements/ sentences, transitive inferences allow the formation of notions of: conjunction or disjunction, negation, implication ("if ... then..."), as a step towards building hypothesis and equivalency ("if and only if...") .

The method of the reduction to the absurd is a type of logical reasoning, which involves following certain rules, so that the truth would not be lost. (Weinberger, 1997).

The conclusions of this study underline the fact that intelligence starts to express itself as a system that permanently lowers its own entropy level. The "mental operators" of comparison and false hypothesis, interfering with induction and deduction, are differently "affected" in all 10 patients, but the "collapse" of the intellect is significant.

### **3. CONCLUSIONS**

The facing study complies with MATRICS Programme, by the initiative of NIMH (National Institute of Mental Health) – United States, from the desire to stimulate the development of new treatments for cognitive degradation in schizophrenia. (Green, 2004).

Therefore, the course of action in this research aimed to identify the cognitive functions on which we must focus our attention, the cognitive fields that have risen as the most relevant in the disfunctionality of the schizophrenic patients, being:

- \_ Working memory
- \_ Attention/ Vigilance
- \_ Learning and verbal memory
- \_ Learning and visual memory
- \_ Reasoning and problem solving
- \_ Noticing similarities and differences
- \_ Noticing the absurd
- \_ The possibility to simultaneously execute complex duties
- \_ Processing speed (reaction time)
- \_ Social cognition

The research had a general objective of achieving a model of complex interdisciplinary psychiatric, psychological and neuropsychological treatment, thus ensuring the avoidance or minimising the schizophrenic patient's handicap, improving the quality of his life, touching that of his family and social environment. This way, the quality and efficiency of the medical act increases significantly, improving the pharmacological clinical methods. (Richard, 2007) The future development of such initiatives lowers the incidence and prevalence of cognitive disorders, through early screening of the deficit and neuropsychological recovery, which leads to lowering social and medical costs tied to this severe and invalidating condition. The immediate impact is on a faster social integration of the schizophrenic patient, on the boost of his self esteem, on the confidence in the possibility of a normal life, on lowering the levels of associated anxiety and/ or depression.

#### **4. PERSPECTIVES FOR FUTURE RESEARCH**

For the time being, bearing in mind the cognitive damage this condition entails, numerous schizophrenic patients are medically retired, having a lowered capacity for work. This has the following consequences: state budget cost for pensions, lowered level of living and personal in satisfaction. Schizophrenia therefore reduces significantly the patient's quality of life, even more so when to that are added social rejection and discrimination. Sustained programs for neurocognitive recovery could offer these people support in improving their cognitive abilities, in capitalizing their latent potential, in increasing their social integration and capacity for work, making it easier for their eventual professional reinsertion. Studies in the field show, unanimously, that professional activity and high social functioning correlates with a high level of satisfaction towards life in the case of these patients.

Although a higher cognitive functioning (at a memory, thinking or attention level) correlates with an objectively higher quality of life for the schizophrenic patients, subjectively, the patients with a higher level of neurocognitive capacities are not more satisfied with their lives, on the contrary, This apparent paradox is explained in the specialty literature through the impact that stigma has on those of higher cognitive levels, because they can perceive and better understand social rejection.

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