Poonam Shodh Rachna(ISSN 2456-5563)
(A Multidisciplinary, Peer Reviewed and Refereed Research Journal)
Vol. 3,Issue.V, May 2024, PSR-2405037

Evaluating and comparing neuropsychological strengths and areas of enhancement in individuals diagnosed with schizophrenia and those considered normal.

Nandan Kumar Thakur, Assistant Professor Suresh Gyan Vihar University
Jaipur, Rajasthan, E-Mail: nandan13rinpas@gmail.com
Dr. Jai Prakash, Ranchi Institute Of Neuro–Psychiatry &
Allied Sciences (RIINPAS), Email: drjaiprakashrinpas@rediffmail.com
[Additional Professor, RINPAS, Kanke, Ranchi]
Hemant Kashyap, Ph.D. Clinical Psychology Research Scholar,
Mizoram University, Email: hhhemant01@gmail.com

Abstract:
Schizophrenia is a multifaceted mental disorder characterized by disruptions in cognition, perception, emotions, and behavior, often accompanied by neuropsychological deficits. This cross-sectional study aimed to assess and compare these deficits between patients with schizophrenia and normal controls. Purposive sampling was used to recruit 20 participants with schizophrenia and 20 normal control subjects. The AIIMS Comprehensive Neuropsychological Battery in Hindi (Adult Form) was administered, with each assessment lasting approximately 50-60 minutes per participant. The results revealed significant differences between schizophrenia patients and normal subjects ($U = 102.50$, $Z = 2.64$, $P < 0.01$). These findings contribute to our understanding of neuropsychological impairments in schizophrenia patients compared to normal controls, encompassing various cognitive domains such as attention, memory, executive function, and processing speed. Deficiencies in sustained attention, working memory, verbal learning, and cognitive flexibility were observed in schizophrenia patients. Moreover, deficits in social cognition, including theory of mind and emotion processing, were prevalent, with implications for clinical interventions and mental health promotion.

INTRODUCTION:

Neuropsychology seeks to understand the relationship between the brain and behavior, that is, it attempts to explain the way in which the activity of the brain is expressed in observable behavior. Neuropsychology is the science of the relationship between brain function and behavior (Kolb, 2000). Cognitive psychology deals with how people perceive, learn, remember and think about information (Sternberg, 1999). What mechanisms are responsible for human thinking, learning, and emotion, how do these mechanisms operate, and what are the effects of changes in brain states upon human behavior? There are a variety of ways in which neuropsychologists conduct their investigations into such questions, but the central theme of each is that to understand human behavior. Neuropsychology is often divided into two main areas: clinical neuropsychology and experimental neuropsychology. The distinction is principally between clinical studies, on brain-injured subjects, and experimental studies, on normal subjects, although the methods of investigation also differ. The division between the two is not absolutely clear-cut but it helps to form an initial classification of the kinds of work in which neuropsychologists is involved.

Concept of Schizophrenia

The schizophrenic disorders are characterized in general by fundamental and characteristic distortions of thinking and perception, and by inappropriate or blunted affect. Clear consciousness and intellectual capacity are usually maintained, although certain cognitive deficits may evolve in the course of time. The disturbance involves the most basic functions that give the normal person a feeling of individuality, uniqueness, and self-direction. The most intimate thoughts, feelings, and acts are often felt to be known to or shared by others, and explanatory delusions may develop, to the effect that natural or supernatural forces are at work to influence the afflicted individual's thoughts and actions in ways that are often bizarre. The individual may see himself or herself as the pivot of all that happens. Hallucinations, especially auditory, are common and may comment on the individual's behaviour or thoughts. Perception is frequently disturbed in other ways colours or sounds may seem unduly vivid or altered in quality, and irrelevant features of ordinary things may appear more important than the whole object or situation. Perplexity is also common early on and frequently leads to a belief that everyday situations possess a special, usually sinister, meaning intended uniquely for the individual. In the characteristic schizophrenic disturbance of thinking, peripheral and irrelevant features of a total concept, which are inhibited in normal directed mental activity, are brought to the fore and utilized in place of those that are relevant and appropriate to the situation. Thus thinking becomes vague, elliptical, and obscure, and its expression in speech

sometimes incomprehensible. Breaks and interpolations in the train of thought are frequent, and thoughts may seem to be withdrawn by some outside agency.

According to ICD-10 diagnostic guideline of Schizophrenia:

Although no strictly pathognomonic symptoms can be identified, for practical purposes it is useful to divide the above symptoms into groups that have special importance for the diagnosis and often occur together, such as:

a) Thought echo, thought insertion or withdrawal, and thought broadcasting;
b) Delusions of control, influence, or passivity, clearly referred to body or limb movements or specific thoughts, actions, or sensations; delusional perception;
c) Hallucinatory voices giving a running commentary on the patient's behaviour, or discussing the patient among themselves, or other types of hallucinatory voices coming from some part of the body;
d) Persistent delusions of other kinds that are culturally inappropriate and completely impossible, such as religious or political identity, or superhuman powers and abilities (e.g. being able to control the weather, or being in communication with aliens from another world);
e) Persistent hallucinations in any modality, when accompanied either by fleeting or half-formed delusions without clear affective content, or by persistent over-valued ideas, or when occurring every day for weeks or months on end;
f) Breaks or interpolations in the train of thought, resulting in incoherence or irrelevant speech, or neologisms;
g) Catatonic behaviour, such as excitement, posturing, or waxy flexibility, negativism, mutism, and stupor;
h) "Negative" symptoms such as marked apathy, paucity of speech, and blunting or incongruity of emotional responses, usually resulting in social withdrawal and lowering of social performance; it must be clear that these are not due to depression or to neuroleptic medication;
i) A significant and consistent change in the overall quality of some aspects of personal behaviour, manifest as loss of interest, aimlessness, idleness, a self-absorbed attitude, and social withdrawal;

The normal requirement for a diagnosis of schizophrenia is that a minimum of one very clear symptom (usually two or more if less clear-cut) belonging to any one of the groups listed as (a) to (d) above, or symptoms from at least two of the groups referred to as (e) to (h), should have been clearly present for most of the time during a period of 1 month or more. Conditions meeting such symptomatic requirements but of duration less than 1 month (whether treated or not) should be diagnosed in the first instance as acute schizophrenia-like psychotic disorder (F23.2) and reclassified as schizophrenia if the symptoms persist for longer periods. Symptom (i) in the above list applies only to the diagnosis of Simple Schizophrenia (F20.6), and duration of at least one year is required.

Neuropsychological Aspect of Schizophrenia

Schizophrenia has been considered a disorder involving neuropsychological deficits from its earliest description. Emil Kraeplin, the first to distinguish schizophrenia (dementia praecox) from other form of serious mental illness, held a strongly neurobiological conceptualization of this disorder. He described it as a disorder of attention and eventually coined the term “Dementia praecox” to describe the deteriorating course of illness which resembled an organic dementia in some patients (kraeplin, 1919). Kraeplin (1919) noted that the disease attacks preference the frontal areas of the brain, the central convolutions, and the temporal lobe, and this distribution would un a certain measure agree with our present views about the site of the psychic mechanisms which are principally injured by this disease (Palmer et al. 2009). Kraepelin also characterized dementia praecox as a dysfunction in what would today be labeled “executive functions,” particularly in regard to deficits of “volition” or “will” (Palmer et al. 2009)

Schizophrenia is associated with a generalized defect of face processing, both in terms of familiarity and emotional expression, attributable to deficient processing at sensory (P1) and perceptual (N170) stages. These patients appear to have difficulty in encoding the structure of a face and thereby do not evaluate correctly familiarity and emotion (Caharel et al. 2007).

Many explanations have been put forth to explain deficits in face processing. The hypothesis, that deficit is the consequence of a more generalized face recognition problem (Kerr & Neale, 1993; Salem et al., 1996), has often been supported by findings that subjects with schizophrenia are deficient in the discriminating the age of faces (Schneider et al., 1995; Kolher et al., 2000; Baudouin et al., 2002) and recognizing the familiarity and identification of faces (Archer et al., 1994; Salem et al., 1996; Baudouin et al., 2002; Hooker & Park, 2002). Moreover, schizophrenia is associated with deficiencies in the arrangement of internal facial traits (Archer et al., 1994), as patients show poor exploration of such features measured by eye movements for neutral faces (Phillips & David, 1995; Williams et al., 1999) and for faces expressing various emotions (Streit et al., 1997; Loughland et al., 2002). These authors speculate that initial perceptual stages are affected, for example at the level of strategies necessary for handling the visuospatial aspect of faces. In another but related line of inquiry, Grusser et al. (1990) postulated that configural processing is affected in this disease, in particular the analysis of spatial relations existing between facial features, essential for face recognition. Other authors indicate that schizophrenia is associated with deficits in earlier sensory stages of processing (Butler et al., 2001; Foxe et al., 2001; Leitman et al., 2005; Louchart-de la Chapelle et al., 2005). There is evidence that abnormal processing at the sensory level contributes to higher-level cognitive defects, including processing the emotional attributes of faces

(Mandal et al., 1998; Edwards et al., 2002; Kim et al., 2005; Leitman et al., 2005). Another premise is that problems in face recognition are secondary to deficits in selective attention (Addington & Addington, 1998; Kolher et al., 2000; Baudouin et al., 2002).

Few studies have examined mechanisms of face processing in schizophrenia. Streit et al. (2001) observed reduced ERP amplitudes between 180 and 250 ms in patients with schizophrenia relative to controls in affect recognition, concordant with the hypothesis that a deficit occurs at the level where perception meets initial stages of cognition. An et al. (2003) reported a reduced P3 component in patients with schizophrenia only for faces with negative emotions. Moreover, Herrmann et al. (2004) found a diminished N170 component for faces but not for objects. This finding suggested a dysfunction of early stage visual processing of faces in patients with schizophrenia. Caharel et al. (2007) found that the schizophrenic group was less accurate than controls in the face processing, especially for unknown faces and those expressing negative emotions such as disgust. P1 and N170 amplitudes were lower and P1, N170, P250 amplitudes were of slower onset in patients with schizophrenia. N170 and P250 amplitudes were modulated by familiarity and face expression in a different manner in patients than controls.

A few studies have focused on schizophrenia and audiovisual speech perception (Campanella & Belin, 2007). An integration deficit in schizophrenic patients has been demonstrated by behavioural and neuroimaging studies, which suggests that abnormalities in the integration of auditory and visual language inputs could underlie many core psychotic features, such as hallucinations (Surguladze et al., 2001). Perceptual confusion might arise because of the normal propensity of visual speech perception to evoke auditory percepts; this is an issue that should be investigated. Schizophrenic patients have been shown to have great difficulty in processing facial expressions (Mandal et al., 1998) and emotional voices (Ross et al., 2001). Accordingly, emotional face–voice interactions have also been shown to be impaired, suggesting that such a deficit might increase susceptibility to certain paranoid and hallucinatory symptoms (Surguladze et al., 2006).

Patients with schizophrenia demonstrate abnormalities in early visual encoding of facial features that precedes the ERP response typically associated with facial affect recognition. This suggests that affect recognition deficits, at least for happy and sad discrimination, are secondary to faulty structural encoding of faces (Borde et al. (1996) attributed deficits in emotion recognition deficits to right hemisphere dysfunction. Pandey and Nizamie (1998) found increased spectral power density of delta and theta bands associated with decreased emotions. However, increased power in the Beta band was associated with decreased surprise, fear and increased anger and disgust. Increased alpha activity was associated with increased happiness, sadness and disgust. They also found that negative symptoms were inversely associated with negatively aroused emotions and positive symptoms were inversely related to positive emotions.

It has previously been found that schizophrenic patients have a particular difficulty in recognizing their own faces (Platek and Gallup, 2002). Kircher et al., (2001) support the notion of a specific self-face processing dysfunction in schizophrenia and related it to altered self-awareness. However, visual search for self-face is more efficient than for famous faces and self-face recognition is spared in schizophrenia (Lee et al., 2007). These findings suggest that impaired self processing in schizophrenia may be task-dependent rather than omnipresent.

Trivedi et al. (2007) conducted on the Cognitive functions in stable schizophrenia & euthymic state of bipolar disorder and found that impairment in attention or immediate memory can interfere with almost every facet of human life and cognitive deficits can serve as the end phenotype markers for schizophrenia. Further, in the study suggested cognitive dysfunctions as a possible explanation for the poorer functional outcome of patients with schizophrenia.

Sheffield et al. (2014) assessed the interrelationships among tasks from the MATRICS and CNTRACS batteries, to determine the degree to which tasks from each battery capture unique variance in cognitive dysfunction in schizophrenia, and to determine the ability of tasks from each battery to predict functional outcome. Subjects were 104 schizophrenia patients and 132 healthy control subjects recruited as part of the CNTRACS initiative. These findings suggest that there exists both shared and specific variance across cognitive tasks related to cognitive and functional impairments in schizophrenia and that measures derived from cognitive neuroscience can predict functional capacity and status in schizophrenia.

Hoff et al. (1999) conducted the study on a neuropsychological study of early onset schizophrenia. In this study measure of motor ability, perceptual motor and pure motor speed, receptive and expressive speech, and overall cognition function, and inversely related to severity of negative symptoms; that is, earlier age of onset was associated with worse cognitive performance and an increase in negative symptoms. This study demonstrates that an early age of onset in schizophrenic illness is associated with impairment on tasks which involved motor and language abilities, functions linked to the frontal, temporal, and subcortical regions of the brain. This association is not due to the effects of medication, negative symptoms, or duration of illness.

Gooding et al. (2004) Conducted the study on nonverbal working memory deficits in schizophrenia patients. The purpose of this study was to evaluate the domain specificity of nonverbal working memory impairment in schizophrenia patients. Results indicate that using visual stimuli that can be considered prototypical of object vision, namely, faces we observed that schizophrenia patients perform poorly on working memory tasks that are based on the identity and features of the stimulus (i.e., object-based working memory tasks) as well as on a working memory task based on the spatial location of the stimulus. We observed significant associations between global ratings of negative symptoms and working memory performance.

OBJECTIVE OF THE STUDY

- To assess and compare the neuropsychological deficits among patients with schizophrenia and Normal.

STATEMENT OF PROBLEM

- The problem which has been taken to investigations is "A Comparative study of Neuropsychological Deficits among Patients with Schizophrenia and Normal Control Subjects".

HYPOTHESIS

- There will be no significant difference in neuropsychological deficits between patients with schizophrenia and Normal Control Subjects.

RESEARCH METHODOLOGY

STUDY DESIGN:

It was a hospital based cross sectional study among patients of Schizophrenia and Normal Control Subjects.

VENUE OF THE STUDY:

This study has been conducted at the Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS) Kanke, Ranchi.

SAMPLE SIZE:

The sample is consisted of 40 participants, among which 20 patients were of schizophrenia and 20 normal control subjects.

SAMPLING METHOD:

Participants have been selected by using the purposive sampling method.

INCLUSION AND EXCLUSION CRITERION:

Inclusion criteria for patients with Schizophrenia

- ⇨ Patients with diagnosis of schizophrenia according to ICD-10 DCR.
- ⇨ Male patients with the age range 20-45 years.
- ⇨ Duration of illness of at least two years.
- ⇨ Education at least primary level and are able to comprehend the instructions.
- ⇨ Patient who gave consent form.
- ⇨ Patients with right handedness.
- ⇨ Patients who were cooperative.

Exclusion criteria for Schizophrenia

- ⇨ History suggestive of Mental Retardation.
- ⇨ History suggestive of head injury.
- ⇨ Any significant physical illness.
- ⇨ Patients with any co-morbid psychiatric disorder.

Inclusion criteria for Normal Control Subjects

- ⇨ Subjects with no any psychiatric according to ICD-10 DCR.
- ⇨ Male subjects with the age range 20-45 years.
- ⇨ Education at least primary level and are able to comprehend the instructions.
- ⇨ Subjects who will give consent form.
- ⇨ Subjects with right handedness.
- ⇨ Subjects who are cooperative.

Exclusion criteria for Normal Control Subjects

- ⇨ History suggestive of head injury.
- ⇨ History suggestive of Mental Retardation.
- ⇨ Any significant physical illness.
- ⇨ Subjects with any co-morbid psychiatric disorder.
- ⇨ Subjects with the age range less than 20 above 45 years.
- ⇨ Subjects who are not cooperative.

TOOLS FOR ASSESSMENT

The following tools have been administered in the study

- ⇨ Socio- Demographic and Clinical Data Sheet (Self prepared).
- ⇨ Brief Psychiatric Rating Scale.
- ⇨ AIIMS Comprehensive Neuropsychological Battery in Hindi (Adult Form).

DESCRIPTION OF THE TOOLS

- ⇨ **Socio- Demographic and Clinical Data Sheet**

  It is a semi- structured Performa especially designed for the study. It contains information about the socio-demographic variables like age, sex, marital status, education, occupation, domicile and monthly family income of the subjects. It also includes the following information about diagnosis, course of illness, duration of illness, and any history of significant head injury, seizure, mental retardation and any other significant physical or psychiatric illness.

- ⇨ **Brief Psychiatric Rating Scale (Overall & Gorham, 1963)**
- ⇨ The Brief Psychiatric Rating Scale (BPRS), developed by Overall and Gorham in 1963, comprises 18 rating constituents representing primary factors from the Inpatients Multidimensional Psychiatric Scale. It assesses a broad range of psychopathology, providing severity ratings from "not present" to "extremely severe" based on clinical experience. Widely used due to its alignment with clinical thinking, it offers flexibility for various conditions and yields a comprehensive psychopathology profile.

- ⇨ **General Health Questionnaire-12 (GHQ-12)**

The General Health Questionnaire (GHQ), first formulated by Goldberg and William in 1988, is a self-administered screening test for psychiatric disorders. GHQ-12, among its versions, is sensitive in primary healthcare and non-psychiatric clinical settings. It assesses normal activities and distressing experiences. Widely used, it screens psychopathology in healthy control subjects. Validity: 0.78; Reliability: 0.90.

AIIMS Comprehensive Neuropsychological Battery in Hindi (Adult Form)

The AIIMS Comprehensive Neuropsychological Battery (ACNB) in Hindi, introduced by Gupta et al. in 2000, offers a valuable tool for clinical and research purposes in neuropsychology. It effectively identifies and lateralizes brain dysfunction, providing an alternative to traditional assessments. With a short administration time of 2-3 hours, it measures a wide range of behaviors, facilitating refined statistical analysis for both clinical and theoretical investigations.The 160 items in Hindi of the test are spread over 10 primary (basic) scales which are as follow:

Scale	Total	Items sequence of items
Motor scale	35	1 to 35
Tactile scale	19	36 to 54
Visual scale	8	55 to 62
Receptive speech	19	63 to 81
Expressive speech	17	82 to 98
Reading scale	10	99 to 107
Writing scale	13	108 to 121
Arithmetic scale	13	122 to 134
Memory scale	12	135 to 146
Intellectual process scale	14	147 to 160

From out of these basic content scales, the following three other scales are derived:

Scale	Total items	Sequence of items
Pathognomonic scale	7	17, 35, 38, 37, 41, 45, 160
Left Hemisphere scale	26	1, 3, 5, 7, 9, 11, 15, 17, 21, 37,
		45, 47, 49, 51, 53, 96, 97,
		127, 135, 139, 140, 148,

		150, 154, 155, 158.
Right Hemisphere scale	26	2, 4, 8, 10, 12, 14, 18, 20, 22,
		38, 46, 48, 50, 52, 54, 55, 57,
		61, 137, 138, 141, 144, 145,
		146, 160.

The AIIMS Comprehensive Neuropsychological Battery (ACNB) consists of 14 clinical scales, including 10 primary and 4 secondary scales. Each item is rated on a 5-point scale from 0 to 4, assessing brain performance. Test-retest reliability is high (average: 0.896), indicating stability over time. Inter-rater reliability is excellent (range: 0.981 to 1.00), showing minimal examiner variance. Internal-consistency reliability (Cronbach's alpha) ranges from 0.791 to 0.986. The battery's construct and concurrent validity are well-established. Additionally, 8 lobe (localizing) scales help localize neuropsychological dysfunctions using the same items.

PROCEDURE

In this study 40 participants who were meeting inclusion and exclusion criterion were selected for the study through purposive sampling method. Out of 40 participants 20 patients were with schizophrenia. For the selection of schizophrenic patients Brief Psychiatric Rating Scale was administered on individuals and after screening were finally 20 participants were selected for the study and 20 were normal control subjects. And normal control group were selected from different locality of Ranchi district. For the selection of normal control group GHQ-12 was administered on individuals and after screening were finally 20 participants selected for the study. After selection, detailed socio-demographic data was collected from all selected participants by using socio-demographic and clinical sheet. Then the assessment of selected samples was done by AIIMS Comprehensive Neuropsychological Battery in Hindi (Adult Form) test and Comprehensive test to test different facets of attention. Participants assessed for the study who gave informed consent for the study.

ANALYSIS:

The statistical analysis was done by help of the statistical package for social science-20 (SPSS-20). Mann Whitney U Test and Chi-square (χ^2) was used for the analysis of data.

Table 1: Shows age variable of persons with schizophrenia and normal control subjects:

Socio-demographic Variables	Schizophrenia (N=20)		Normal Control Subjects (N = 20)		χ^2	df
	Mean ± SD	Mean Rank	Mean ± SD	Mean Rank		
Age (in years)	34.30 ± 4.97	33.45	32.90 ± 5.02	27.45	1.19 NS	2

NS (Not Significant)

Table -1 shows that age range of patients with schizophrenia was 20-45 years, mean = 34.30, standard deviation (SD) =4.97 and mean rank=33.45. Age range of normal control group was 20-45 years mean = 32.90, standard deviation = 5.02 and mean rank=27.45. The result of χ^2 value was found 1.19 indicates that there is no significant difference between persons with schizophrenia and normal control subjects in terms of their age (χ^2=1.19, P>0.05).

Table 2: Socio-Demographic Details of Schizophrenia and Normal Control Subjects:

Socio-Demographic Variables		Schizophrenia (N=20)	Normal Control Subjects (N = 20)	χ2	df
		n (%)	n (%)		
Education	Primary	4 (20.0)	2 (10.0)	3.65 NS	6
	Metric	6 (30.0)	6 (30.0)		
	Intermediate	7 (35.0)	5 (25.0)		
	Graduation & above	3 (15.0)	7 (35.0)		
Marital status	Single	6 (30.0)	9 (45.0)	4.28 NS	2
	Married	14 (70.0)	11 (55.0)		
	Employed	5 (25.0)	6 (30.0)		4

Occupation	Unemployed	3 (15.0)	8 (40.0)	4.91 NS	
	Self work	12 (60.0)	6 (30.0)		
Monthly Family Income	Low	13(65.0)	10 (50.0)	0.99 NS	4
	Middle	5 (25.0)	7 (35.0)		
	Upper	2 (10.0)	3 (15.0)		
Domicile	Rural	15 (75.0)	7 (35.0)	7.17 NS	4
	Urban	3 (15.0)	8 (40.0)		
	Semi Urban	2 (10.0)	5 (25.0)		

NS (Not Significant)

Table-2 showing that the comparison of the socio-demographic profile of persons with schizophrenia and normal control subjects. Education has been observed that 20% patient with schizophrenia, and 10% normal control subjects were educated up to below primary; 30% patient with schizophrenia and 30% normal control subjects were educated up to metric; 35% patient with schizophrenia and 25% normal control subjects were educated up to intermediate and 15% patient with schizophrenia and 35% normal control subjects were educated up to graduation and above. Which shows no significance difference among the patient with schizophrenia and normal control subjects (χ^2=3.65, P>0.05).

The result shows that 30% patients with schizophrenia and 45% normal control group were unmarried and 70% patients with schizophrenia and 55% normal control group were married which is showing no significant difference among patients with schizophrenia and normal control subjects with respect to their marital status (χ^2=4.28, P>0.05).

The result shows that 25% patients with schizophrenia and 30% normal control group were employed and 15% patients with schizophrenia and 40% normal control group were unemployed and 60% patients with schizophrenia and 30% normal control group were self work which is showing no significant difference among patient with schizophrenia and normal control subjects with respect to their occupational status (χ^2=4.91, P>0.05).

The result shows that 75% patients with schizophrenia and 35% normal control group were from rural area and 15% patients with schizophrenia and 40% normal control group were from urban area and 10% patients with schizophrenia and 25% normal control group were from semi urban area which is showing no significant difference among patients with schizophrenia and normal control subjects with respect to their area status (χ^2=7.17, P>0.05).

The result shows that 65% patients with schizophrenia and 50% normal control group were from lower monthly family income and 25% patients with schizophrenia and 35% normal control group were from middle monthly family income and 10% patients with schizophrenia and 15% normal control group were from upper monthly family income area which is showing no significant difference among patients with schizophrenia and normal control subjects with respect to their monthly family income (χ^2=0.99, P>0.05).

Table 3: Showing course of illness variable of patients with schizophrenia:

Socio-demographic Variables		Schizophrenia (N=20)	χ2	df
		n (%)		
Course of Illness	Continuous	12 (60.0)	0.44 NS	1
	Episodic	8 (40.0)		

The result shows that 60% patients with schizophrenia were from continuous course of illness and 40% patients with schizophrenia, were from episodic course of illness which is showing no significant difference between patients with schizophrenia with respect to their course of illness (χ^2 = 0.44, P > 0.05).

Table 4: Comparison of T scores of Clinical Scales of AIIMS Comprehensive Neuropsychological Battery among Patient of Schizophrenia and Normal Subject:

CLINICAL SCALES	Schizophrenia (N=20)			Normal Control Subject (N=20)			Mann-Whitney U	Z
	Mean ± SD	Mean Rank	Sum of Rank	Mean ± SD	Mean Rank	Sum of Rank		
T - Score (Motor Scale)	97.70 ± 29.22	25.38	507.50	72.60 ± 9.23	15.62	312.50	102.50	2.64**

T - Score (Tactile Scale) #	56.40 ± 15.63	25.48	515.50	41.50 ± 2.23	15.22	304.50	94.50	3.52**
T - Score (Visual Scale) #	45.65 ± 11.15	24.90	498.00	37.70 ± 2.15	16.10	322.00	112.00	2.93**
T - Score (Expressive Speech Scale)	80.05 ± 36.72	24.48	489.50	60.60 ± 14.76	16.52	330.50	120.50	2.16*
T - Score (Reading Scale) #	103.10 ± 41.22	25.70	514.00	66.60 ± 18.85	15.30	306.00	96.00	2.85**
T - Score (Writing Scale) #	70.45 ± 25.65	25.60	512.00	48.10 ± 14.01	15.40	308.00	98.00	2.87**
T - Score (Arithmetic Scale) #	68.10 ± 15.20	24.72	494.50	57.15 ± 10.90	16.28	325.50	115.50	2.29*
T - Score (Memory Scale)	58.20 ± 11.34	25.98	519.50	48.00 ± 9.28	15.02	300.50	90.50	2.96**
T - Score (Intellectual Process Scale)#	54.60 ± 12.27	26.12	522.50	42.40 ± 7.89	14.88	297.50	97.50	3.07**
T - Score (Total Battery)	634.25 ± 144.70	25.92	518.50	474.65 ± 53.15	15.08	301.50	91.50	2.93**

* Significant at the 0.05 level.

** Significant at the 0.01 level.

Table-6 shows that the comparison of mean, SD, mean rank and sum of rank score of all the clinical scale of AIIMS Comprehensive Neuropsychological Battery of persons with schizophrenia and normal subjects.

To see the difference between patients with schizophrenia and normal subjects group Mann Whitney U Test was calculated. The Expected T score of the schizophrenia in Motor Scale obtained mean = 97.70, SD = 29.22, mean rank = 25.38 and sum of rank = 507.50 and obtained expected score of normal subjects in Motor Scale obtained mean = 72.60, SD = 9.23, mean rank = 15.62 and sum of rank = 312.50. The result revealed that there is significant difference between patients with schizophrenia and normal subjects ($U = 102.50$, $Z = 2.64$, $P < 0.01$). Result further shows that the Expected T Score of the schizophrenia in Tactile Scale obtained mean = 56.40, SD = 15.63, mean rank = 25.48 and sum of rank = 515.50. However obtained expected score of normal subjects in Tactile Scale obtained mean = 41.50, SD = 2.23, mean rank = 15.22 and sum of rank = 304.50. This result is showing that there is significant difference between patients with schizophrenia and normal subjects ($U = 94.50$, $Z = 3.52$, $P < 0.01$).

Result indicates the Expected T Score of the schizophrenia in Visual Scale obtained mean = 45.65, SD = 11.15, mean rank = 24.90 and sum of rank = 498.00. However Expected Score of normal subject in Visual Scale obtained mean = 37.70, SD = 2.15, mean rank = 16.10 and sum of rank = 322.00. This result is showing that there is significant difference between patients with schizophrenia and normal subjects ($U = 112.00$, $Z = 2.93$, $P < 0.01$).

Result indicates the Expected T Score of the schizophrenia in Expressive Speech scale obtained mean = 80.05, SD = 36.72, mean rank = 24.48 and sum of rank = 489.50. However expected score of normal subject in Expressive Speech Scale obtained mean = 60.60, SD = 14.76, mean rank = 16.52 and sum of rank = 330.50. This result is showing that there is significant difference between patients with schizophrenia and normal subjects ($U = 120.50$, $Z = 2.16$, $P < 0.05$).

Result indicates the Expected T Score of the schizophrenia in Reading Scale obtained mean = 103.10, SD = 41.22, mean rank = 25.70 and sum of rank = 514.00. However expected score of normal subjects in Reading Scale obtained mean = 66.60, SD = 18.85, mean rank = 15.30 and sum of rank = 306.00. This result is showing that there is significant difference between patients with schizophrenia and normal subjects ($U = 96.00$, $Z = 2.85$, $P < 0.01$).

Result indicates the Expected T Score of the schizophrenia in Writing Scale obtained mean = 70.45, SD = 25.65, mean rank = 25.60 and sum of rank = 512.00. However expected score of normal subjects in Writing Scale obtained mean = 48.10, SD = 14.01, mean rank = 15.40 and sum of rank = 308.00. This result is showing that there is significant difference between patients with schizophrenia and normal subjects ($U = 98.00$, $Z = 2.87$, $P < 0.01$).

Result indicates the Expected T Score of the schizophrenia in Arithmetic Scale obtained mean = 68.10, SD = 15.20, mean rank = 24.72 and sum of rank = 494.50. However expected score of normal subjects in Arithmetic Scale obtained mean = 57.15, SD = 10.90, mean rank = 16.28 and sum of rank = 325.50. This result is showing that there is significant difference between patients with schizophrenia and normal subjects ($U = 115.50$, $Z = 2.29$, $P < 0.05$).

Result indicates the Expected T Score of the schizophrenia in Memory Scale obtained mean = 58.20, SD = 11.34, mean rank = 25.98 and sum of rank = 519.50. However expected score of normal subjects in Memory Scale obtained mean = 48.00, SD = 9.28, mean rank = 15.02

and sum of rank = 300.50. This result is showing that there is significant difference between patients with schizophrenia and normal subjects (U = 90.50, Z = 2.96, P < 0.01). Result indicates the Expected T Score of the schizophrenia in Intellectual Process Scale obtained mean = 54.60, SD = 12.27, mean rank = 26.12 and sum of rank = 522.50. However expected score of normal subject in Intellectual Process Scale obtained mean = 42.40, SD = 7.89, mean rank = 14.88 and sum of rank = 297.50. This result is showing that there is significant difference between patients with schizophrenia and normal subjects (U = 97.50, Z = 3.07, P < 0.01).

Result indicates the Expected T Score of the schizophrenia in total battery scale obtained mean = 634.25, SD = 144.70, mean rank = 25.92 and sum of rank = 518.50. However expected score of normal control subjects in total battery scale obtained mean = 474.65, SD = 53.15, mean rank = 15.08 and sum of rank = 301.50. This result is showing that there is significant difference between patients with schizophrenia and normal subjects (U = 91.50, Z = 2.93, P < 0.01).

Table 8: Frequency of Abnormal Performance [i.e. T score > Expected T score] on the Clinical Scales of AIIMS Neuropsychological Battery among Schizophrenia and Normal Subjects

Abnormal Performance [i.e. T score > Expected T score] on Clinical Scales	Schizophrenia (N =20)	Normal Control Subjects (N = 20)	χ2 df=2
	n (%)	n (%)	
Motor Scale	1 6(80)	3 (15)	19.79**
Tactile Scale	10 (50)	0 (0)	13.33**
Visual Scale	4 (20)	0 (0)	0.122NS
Expressive Speech Scale	12 (60)	4 (20)	0.022*
Reading Scale	15 (75)	3 (15)	16.55**
Writing Scale	12 (60)	2 (10)	12.48**
Arithmetic Scale	13 (65)	4(20)	8.97*
Memory Scale	5 (25)	0 (0)	4.61NS
Intellectual Process Scale	11 (55)	2 (10)	9.23*

NS- Not Significant
*- Significant at 0.05 level
**- Significant at 0.01 level

Table 8 shows the frequency of abnormal performance on the clinical scales of AIIMS neuropsychological battery among schizophrenia and normal subjects. A significantly higher schizophrenia patient have neuropsychological deficits found in most of the scales of AIIMS Neuropsychological Battery except Visual Scale and Memory Scale. Motor Scale ($\chi2 = 19.79$; $p < 0.01$), tactile scale ($\chi2 = 13.33$ $p < 0.01$), Visual Scale ($\chi2 = 0.122$ $p > 0.01$), Expressive Speech Scale ($\chi2 = 0.022$; $p < 0.05$), Reading Scale ($\chi2 = 16.55$; $p < 0.01$), Writing Scale ($\chi2 = 12.48$., p.01), Arithmetic Scale ($\chi2 = 8.97$; $p < 0.05$), Memory Scale ($\chi2 = 4.61$; $p > 0.01$), Intellectual Process Scale ($\chi2 = 9.23$ $p < 0.05$). However there are two scales in which no significant difference was found among these group such as Visual & Memory ($\chi2 = 0.122$ $p > 0.01$ & $\chi2 = 4.61$; $p > 0.01$).

CONCLUSION:

A cross-sectional study conducted at RINPAS, Ranchi, compared neuropsychological deficits in 20 male schizophrenia patients (20-45 years) and 20 male normal controls (20-45 years). Schizophrenia patients exhibited significant deficits across all AIIMS battery scales compared to controls. Findings align with previous studies indicating impaired cognitive functions in schizophrenia. Results emphasize the importance of neuropsychological assessments for treatment planning and estimating functional abilities in schizophrenia spectrum disorders.

RECOMMENDATION:

Clinical implication

A comprehensive assessment of neuropsychological functioning has always been desirable because neuropsychological dysfunctions are mentioned to have impact on rehabilitation and overall treatment outcome in patients with schizophrenia. Neuropsychological assessment also provides both general and specific information about current levels of cognitive performance. An average or composite score across multiple ability areas provides an overall index of how well a person functions cognitively at the current time This study gives comprehensive details of neuropsychological dysfunctions in these two groups on the basis of results obtained after assessment of them with the AIIMS comprehensive neuropsychological battery in Hindi (Adult Form; Gupta et al., 2000). The findings may also be helpful in planning of day today functioning for their rehabilitation in community.

Limitation and future direction of the study

- This was a time bound-study, sample size was small; in future similar research study can be conducted with larger sample size to generalize the obtained result.
- The receptive speech scale of AIIMS comprehensive neuropsychological Battery is not used because of the T Score of receptive speech are not given in the manual.
- There were only right handed participants selected in the study, and this further limits the generalization of the findings.
- In future study the homogeneity of the data could be maintained in relation to various socio-demographic and cultural variables.
- In future study to augment the scientific worth of the measures and findings, present research work can be replicated involving larger sample size with involvement of participants of both genders.
- In future study the AIIMS comprehensive neuropsychological battery should also be used to assess changes in neuropsychological functions in such populations in longitudinal studies.

References

- Addington, J., Addington, D. (1998). Facial affect recognition and information processing in schizophrenia and bipolar disorder. Schizophrenia Research, 32, 171–181.
- An, S.K., Lee, S.J., et al. (2003). Reduced P3 amplitudes by negative facial emotional photographs in schizophrenia. Schizophrenia Research, 64(23),125–135.
- Archer, J., Hay, D. C., & Young, A. W. (1994). Movement, face processing and schizophrenia: evidence of a differential deficit in expression analysis. *British Journal of Clinical Psychology*, *33*(4), 517-528.
- Baudouin, J. Y., Martin, F., Tiberghien, G., Verlut, I., & Franck, N. (2002). Selective attention to facial emotion and identity in schizophrenia. *Neuropsychologia*, *40*(5), 503-511.
- Borde, M., Roy, A., Davis, E.,Davis, R.(1996).Right hemisphere function in normals, affective disorder and schizophrenia. Indian Journal of Psychiatry,38,225–30.
- Butler, P.D., Schechter, I., Zemon,V., Schwartz, S.G., Greenstein,V.C., Gordon, J., Schroeder, C.E., Javitt, D.C. (2001). Dysfunction of early-stage visual processing in schizophrenia. American Journal of Psychiatry 158, 1126–1133.
- Caharel, S., Bernard, C., Thibaut, F., Haouzir, S., Di Maggio-Clozel, C., Allio, G., ... & Rebaï, M. (2007). The effects of familiarity and emotional expression on face processing examined by ERPs in patients with schizophrenia. *Schizophrenia research*, *95*(1), 186-196.
- Campanella, S., Belin, P. (2007). Integrating face and voice in person Perception. Trends in Cognitive Sciences, 11(12), 535-543.
- Edwards, J., Jackson, H.J., Pattison, P.E. (2002). Emotion recognition via facial expression and affective prosody in schizophrenia, a methodological review. Clinical Psychology Review, 22(6),789-832.
- Foxe, J.J., Doniger, G.M., Javitt, D.C. (2001). Early visual processing deficits in schizophrenia, impaired PI generation revealed by highdensity electrical mapping. NeuroReport ,12, 3815–3820.
- Gooding, D. C., & Tallent, K. A. (2004). Nonverbal working memory deficits in schizophrenia patients: evidence of a supramodal executive processing deficit. *Schizophrenia research*, *68*(2), 189-201.
- Grusser, O.J., Kirchhoff, N., Naumann, A., 1990. Brain mechanisms for recognition of face, facial expression and gestures, neuropsychological and electroencephalographic studies in normals, brain-lesioned patients and schizophrenics. Journal of Nervous and Mental Diseases, 67, 165–193.
- Herrmann, M.J., Ellgring, H., Fallgatter, A.J. (2004). Early-stage face processing dysfunction in patients with schizophrenia. American Journal of Psychiatry, 161 (5), 915–917.
- Hoff, A. L., Harris, D., Faustman, O. W., Beal, M., DeVilliers, D., Mone R.D., James. (1996). A neuropsychological study of early onset schizophrenia Original Research Article *Schizophrenia Research*, Volume 20, Issues 1–2, Pages 21-28.
- Hooker, C., & Park, S. (2002). Emotion processing and its relationship to social functioning in schizophrenia patients. *Psychiatry research*, *112*(1), 41-50.
- Kerr, S. L., & Neale, J. M. (1993). Emotion perception in schizophrenia: specific deficit or further evidence of generalized poor performance?. *Journal of abnormal psychology*, *102*(2), 312.
- Kim, D., Zemon, V., Sapersteina, A., Butler, P.D., Javitt, D.C. (2005). Dysfunction of early-stage visual processing in schizophrenia, harmonic analysis. Schizophrenia Research 76, 55–65.

- Kircher, T.T., Senior, C., Phillips, M.L., Rabe-Hesketh, S., Benson, P.J., Bullmore, E.T., et al. (2001). Recognizing one's own face. Cognition, 78, 1–15.
- Köhler, C.G., Bilker, W., Hagendoorn, M., Gur, R.E., Gur, R.C. (2000). Emotion recognition deficit in schizophrenia, association with symptomatology and cognition. Biological Psychiatry, 48, 127–136.
- Kolb, B., Gibb, R., & Gorny, G. (2000). Cortical plasticity and the development of behavior after early frontal cortical injury. *Developmental neuropsychology*, *18*(3), 423-444.
- Kraepelin, E. (1971). *Dementia praecox and paraphrenia*. Krieger Publishing Company.
- Leitman, D.I., Foxe, J.J., Butler, P.D., Saperstein, A., Revhiem, N., Javitt, D.C. (2005). Sensory contributions to impaired prosodic processing in schizophrenia. Biological Psychiatry, 58, 56–61.
- Loughland, C.M.,Williams, L.M., Gordon, E. (2002). Visual scan paths to positive and negative facial emotions in an outpatient schizophrenia sample. Schizophrenia Research 55, 159–170.
- Louchart-de la Chapelle, S., Nkam, I., Houy, E., Belmont, A., Ménard, J.F., Roussignol, A.C., Siwek, O., Mezerai, M., Guillermou, M., Fouldrin, G., Levillain, D., Dolfus, S., Campion, D., Thibaut, O., F.(2005). A concordance study of three electrophysiological measures in schizophrenia. American Journal of Psychiatry 162, 466–474.
- Mandal, M.K., Pandey, R., Prasad, A.B. (1998). Facial expressions of emotions and schizophrenia, a review. Schizophrenia Bulletin, 24,399–412.
- Phillips, M.L., Williams, L., Senior, C., et al. (1999). A differential neural response to threatening and non-threatening negative facial expressions in paranoid and non-paranoid schizophrenics. Psychiatry Research 92 (1), 11–31.
- Phillips, M.L., David, A.S. (1995). Facial processing in schizophrenia and delusional misidentification, cognitive neuropsychiatric approaches. Schizophrenia Research, 17, 109–114.
- Palmer, B.W., Dawes, S.E., and Heaton, R.K. (2009). What do we know About *Neuropsychology Review*, 19, 365-384.
- Pandey, A.K., Nizamie, S.H. (1998). Recognition of facial expression of emotion in Schizophrenia and its QEEG correlates. Unpublished M.Phil. Dissertation. Ranchi, Ranchi University.
- Platek, S., Gallup, G., (2002). Self-face recognition is affected by schizotypal personality traits. Schizophrenia Research, 57, 81.
- Ross, E.D. et al. (2001). Affective-prosodic deficits in schizophrenia, comparison to patients with brain damage and relation to schizophrenic symptoms. Journal of Neurology Neurosurgery Psychiatry, 70, 597–604.
- Sternberg, R. J. (1999). The theory of successful intelligence. *Review of General psychology*, *3*(4), 292.
- Salem, N., Wegher, B., Mena, P., & Uauy, R. (1996). Arachidonic and docosahexaenoic acids are biosynthesized from their 18-carbon precursors in human infants. *Proceedings of the National Academy of Sciences*, *93*(1), 49-54.
- Schneider, F., Gur, R. C., Gur, R. E., & Shtasel, D. L. (1995). Emotional processing in schizophrenia: neurobehavioral probes in relation to psychopathology. *Schizophrenia research*, *17*(1), 67-75.
- Sheffield, J. M., Gold, J. M., Strauss, M. E., Carter, C. S., MacDonald III, A. W., Ragland, J. D., ... &Barch, D. M. (2014). Common and specific cognitive deficits in schizophrenia: relationships to function. *Cognitive, Affective, & Behavioral Neuroscience*, *14*(1), 161-174.
- Streit, M., Wölwer, W., Gaebel, W. (1997). Facial-affect recognition and visual scanning behaviour in the course of schizophrenia. Schizophrenia Research 24, 311–317.
- Streit, M., Wolwer, W., Brinkmeyer, J., et al. (2001). EEG-correlates of facial affect recognition and categorisation of blurred faces in schizophrenic patients and healthy volunteers. Schizophrenia Research, 49 (1–2), 145–155.
- Surguladze, S.A. et al. (2001) Audio-visual speech perception in schizophrenia, an fMRI study. Psychiatry Research Neuroimaging, 106, 1–14.
- Trivedi, J. K., Goel, D., Sharma, S., Singh, A. P., Sinha, P. K., &Tandon, R. (2007). Cognitive functions in stable schizophrenia & euthymic state of bipolar disorder. *Indian journal of medical research*, *126*(5), 433.
- Williams, L.M., Loughland, C.M., Gordon, E., Davidson, D. (1999). Visual scanpaths in schizophrenia, is there a deficit in face recognition. Schizophrenia Research 40, 189–199.