The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 11, Issue 1, January- March, 2023
DIP: 18.01.239.20231101, DOI: 10.25215/1101.239
https://www.ijip.in

Research Paper

Neuropsychological Deficits in Schizophrenia Patients

Raj Kishore Ram[1], Jai Prakash[2]*

ABSTRACT

Background: Schizophrenic patients have been determined a variety of neuropsychological deficits such as inability to pay proper attention, impaired information processing, inability to recall information and respond to information quickly, inability to think critically, problems of the plan and organized, inability to solve a simple problem and make a decision, impaired speech and language, etc. **Aim:** The present study has been undertaken to determine the effects of age on neuropsychological deficits in schizophrenia patients. **Method:** The sample consists of 100 schizophrenia patients and 100 normal control subjects, age range from 20 to 50n years based on a purposive sampling technique. Bender Gestalt Test-II (BGT-II) and Comprehensive Trail Making Test (CTMT) were used to determine neuropsychological deficits in schizophrenia patients. **Result:** The age of schizophrenia patients determined neuropsychological deficits in comparison to normal control subjects on BGT-II and CTMT. Schizophrenia patients performed poorly to copy the design and also took more time to copy of design on Bender Gestalt Test-II as compared to normal control subjects. Similar trends have been found in recall of design on BGT-II, schizophrenia patients have been performed impaired on perception tests and also performed slowing motor function. Schizophrenia patients have taken more time and committed more errors as compared to normal control subjects in trail 1, trail 2, trail 3, trail 4 and also trail 5 on CTMT.

Keywords: *Neuropsychological Deficits, Schizophrenia, BGT-II, CTMT*

Schizophrenia is a unique and severe mental disorder in any psychological disorder. In Schizophrenia patients, the most common characteristics of neuropsychological deficits (Bloom et al., 1995) such as problems in sensory processing and information processing, impaired perception, inability to think properly, difficulty in focusing or paying attention and concentration (Palmer et al., 1997) and working memory, difficulty in expressing thoughts and formulate ideas, disorganized thinking, difficulty in understanding information, difficulty in integrating thoughts, feelings and behavior, impaired memory, problem of remember and recall information, difficulty in organize and solve problems, problem in respond to information quickly, problem in visual scanning, disorganized speech and language, impaired executive functioning, impaired decision making, impaired motor functioning, poverty of speech, etc. (Choudhury et al. 2009, Dalal et al., 2010; Carter et al. 2010, Hill et al. 2013, Shen et al. 2014, Ragland et al. 2015, Bhattacharya, 2015; Aich et al, 2016, García-Laredo 2018, McCleery et al 2019).

[1] Assistant Professor of Psychology, Marwari College, Ranchi (under R. U. Ranchi)
[2] Additional Professor, Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS), Kanke, Ranchi (Jharkhand)
*Corresponding Author

Received: November 15, 2022; March 21, 2023; Accepted: March 31, 2023

MATERIALS AND METHOD

Sample

In the present study, the sample comprises 100 schizophrenia patients and 100 normal controls with age ranges between 20-50 years. Only male subjects were taken as samples. Schizophrenia patients were selected from different wards of Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS), Kanke, Ranchi, Jharkhand diagnosed with schizophrenia according to ICD–10 DCR criteria and normal controls were selected from different localities of Jharkhand state by using purposive sampling technique.

Materials

A self-prepared performa mainly designed for this study was used for socio-demographic and clinical details of the subjects. GHQ-12 developed by Goldberg and Miller (1979) was administered as a screening tool for the normal control subjects. BPRS developed by Overall et al (1962) was used to screen the severity of psychopathology in schizophrenia patients. BGT was first developed by child neuropsychiatrist Bender in 1938. The test is used to assess "visual-motor maturity", to screen for developmental disorders, or to assess neurological function or brain damage. BGT- II was given by Brannigan et al. (2003) is measures visual-motor integration skills in children and adults from 4 to 85 years and above age. CTMT (Reynolds, 2002) is designed to be used in neuropsychological assessment to detect the effects of brain defects and deficits. More specific purposes include the detection of frontal lobe deficits, problems with psychomotor speed, visual search and sequencing, attention, and impairments in set-shifting. The original trail-making instrument, the Trail Making Test, Part A, and B, was developed in 1938 by Partington as a measure of divided attention (Partington et al., 1949).

Procedure

All the participants included in the present study were interviewed after having informed consent and then a self-prepared semi-structured socio-demographic and clinical data sheet was used. Then GHQ-12 was administered as a screening tool for normal controls, cutoff point 2 signifies the sound mental health of an individual. Participants scoring more than 2 on GHQ were screened out. BPRS was used as a screening tool for schizophrenia patients. BGT-II, and CTMT were administered on schizophrenia patients and normal control subjects individually to evaluate neuropsychological impairment. Mean, SD and t-test have been computed by using SPSS 16.00.

RESULT AND DISCUSSION

It is observable from Table- 1 on BGT-II, schizophrenia patients aged between 20-30 years have performed poorly in a copy of the design as compared to normal control subjects and the difference between the two groups have been found significant statistically (Age Range= 20-30 years: Schiz; M=24.90±12.59, Normals; M=65.06±6.23, F=59.39, $p<0.01$), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=27.24±12.84, Normals; M=58.08±12.95, F=59.39, $p<0.01$) and schizophrenia patients aged between 41-50 years (Schiz; M=25.47±13.02, Normals; M=56.25±17.73, F=59.39, $p<0.01$). Patients with schizophrenia aged between 20-30 years took more time to copy of design in comparison to normal control subjects and differences between the two groups have been found to be significant statistically (Schiz; M=8.85±1.34, Normals; M=5.00±0.00, F=98.57, $p<0.01$), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=9.31±1.69, Normals; M=4.59±0.89, F=98.57, $p<0.01$) and schizophrenia patients aged between 41-50 years (Schiz; M=8.52±1.50, Normals; M=5.28±1.04, F=98.57, $p<0.01$).

Performance of recall on BGT-II, Schizophrenia patients aged between 20-30 years have also performed poorly in recall of design as compared to normal control subjects and the difference between the two groups has been found to be significant statistically (Age Range= 20-30 years: Schiz; M=31.75±3.79, Normals; M=41.80±16.18, F=8.06, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=32.27±5.28, Normals; M=42.64±12.91, F=8.06, p<0.01) and schizophrenia patients aged between 41-50 years (Schiz; M=33.63±6.40, Normals; M=38.85±14.16, F=8.06, p>0.05). Patients with schizophrenia aged between 20-30 years took more time to recall of design in comparison to normal control subjects and differences between the two groups have been found to be significant statistically (Schiz; M=7.50±1.73, Normals; M=4.06±1.03, F=73.83, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=8.01±1.32, Normals; M=4.49±0.73, F=73.83, p<0.01) and schizophrenia patients aged between 41-50 years (Schiz; M=7.57±1.57, Normals; M=4.92±1.18, F=73.83, p<0.01).

Table-1: Neuropsychological Functions in the group of Schizophrenia Patients and Normal Control Subjects on Bender Gestalt Test-II (BGT-II)

Subjects / Variables	Age Range	Schiz Patients (N=100)		Normal Controls (N=100)		df	F-Value
		M	SD	M	SD		
Copy of Design	20-30	24.90	12.59	65.06	6.23	WG-5 BG-194	59.39**
	31-40	27.24	12.84	58.08	12.95		
	41-50	25.47	13.02	56.25	17.73		
Time Taken	20-30	8.85	1.34	5.00	0.00	WG-5 BG-194	98.57**
	31-40	9.31	1.69	4.59	0.89		
	41-50	8.52	1.50	5.28	1.04		
Recall of Design	20-30	31.75	3.79	41.80	16.18	WG-5 BG-194	8.06**
	31-40	32.27	5.28	42.64	12.91		
	41-50	33.63	6.40	38.85	14.16		
Time Taken	20-30	7.50	1.73	4.06	1.03	WG-5 BG-194	73.83**
	31-40	8.01	1.32	4.49	0.73		
	41-50	7.57	1.57	4.92	1.18		
Performance on Perception Test	20-30	1.15	0.36	3.73	0.45	WG-5 BG-194	258.83**
	31-40	1.24	0.43	3.66	0.60		
	41-50	1.47	0.51	3.85	0.35		
Performance on Motor Test	20-30	1.15	0.36	3.80	0.41	WG-5 BG-194	469.61**
	31-40	1.09	0.30	3.68	0.46		
	41-50	1.15	0.37	3.85	0.35		

**= Significant at 0.01, WG=Within Groups, BG=Between Groups

Performance of perception test and motor test on BGT-II, Patients with schizophrenia aged between 20-30 years have impaired perceptual functions as compared to normal control subjects and the difference between the two groups has been found to be significant statistically (Age Range= 20-30 years: Schiz; M=1.15±0.36, Normals; M=3.73±0.45, F=258.83, p<0.01), similar trends have been noticed in schizophrenia patients aged between 31-40 years (Schiz; M=1.24±0.43, Normals; M=3.66±0.35, F=258.83, p<0.01) and schizophrenia patients aged between 41-50 years (Schiz; M=1.47±0.51, Normals; M=3.85±0.35, F=258.83, p<0.01). In the motor test, schizophrenia patients aged between 20-30 years also have been observed slowing motor functions in comparison to normal control subjects and the difference between the two groups have been found to be significant statistically (Age Range= 20-30 years: Schiz; M=1.15±0.36, Normals; M=3.80±0.41,

F=469.61, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=1.09±0.30, Normals; M=3.68±0.46, F=469.61, p<0.01) and schizophrenia patients aged between 41-50 years (Schiz; M=1.15±0.37, Normals; M=3.85±0.35, F=469.61, p<0.01). It has been observed that schizophrenia has consistent deficits in visual processing (Butler et al., 2008). Findings of perceptual deficit in schizophrenia include contrast detection, gestalt processing, motion perception, and eye-movement control. Psychomotor slowing (PS) is a cluster of symptoms that were already recognized in schizophrenia (Morrens et al., 2008).The findings of the present study consistent with the findings of Punekar et al. 2006, Uhlhaas et al. 2007, Kaneko 2018, García-Laredo 2018.

Table- 2 projects the neuropsychological function in the group of schizophrenia patients and normal control subjects on the Comprehensive Trail Making Test (CTMT). In the trail-1, schizophrenia patients aged between 20-30 years performed poorly (Schiz; M=18.95±1.84, Normals; M=24.40±5.06, F=27.79, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=18.85±1.57, Normals; M=25.15±4.29, F=27.79, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=18.84±1.57, Normals; M=23.14±4.91, F=27.79, p<0.01). Patients with schizophrenia aged between 20-30 years have committed more errors as compared to normal control subjects (Schiz; M=1.25±0.55, Normals; M=0.20±0.41, F=13.51, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=0.88±0.77, Normals; M=0.24±0.50, F=13.51, p<0.01) and also schizophrenia patientsaged between 41-50 years (Schiz; M=0.84±0.60, Normals; M=0.35±0.55, F=13.51, p<0.01).

In the trail-2, schizophrenia patients aged between 20-30 years have been performed poorly (Schiz; M=19.85±3.29, Normals; M=25.80±7.31, F=24.11, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=20.00±3.49, Normals; M=29.38±6.23, F=24.11, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=20.26±3.72, Normals; M=26.35±7.26, F=24.11, p<0.01). Patients with schizophrenia aged between 20-30 years have been committed more errors as compared to normal control subjects (Schiz; M=1.10±0.78, Normals; M=0.46±0.51, F=15.25, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=1.19±0.65, Normals; M=0.29±0.49, F=15.25, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=0.78±0.78, Normals; M=0.42±0.63, F=15.25, p>0.05).

Table 2: Neuropsychological Functions in the group of Schizophrenia Patients and Normal Control Subjects on Comprehensive Trail Making Test (CTMT)

Variables \ Subjects		Age Range	Schiz Patients (N=100)		Normal Controls (N=100)		Df	F-Value
			M	SD	M	SD		
Trail 1	Time Taken	20-30	18.95	1.84	24.40	5.06	WG-5 BG-194	27.79**
		31-40	18.85	1.57	25.15	4.29		
		41-50	18.84	1.57	23.14	4.91		
	Error	20-30	1.25	0.55	0.20	0.41	WG-5 BG-194	13.51**
		31-40	0.88	0.77	0.24	0.50		
		41-50	0.84	0.60	0.35	0.55		
Trail 2	Time Taken	20-30	19.85	3.29	25.80	7.31	WG-5 BG-194	24.11**
		31-40	20.00	3.49	29.38	6.23		
		41-50	20.26	3.72	26.35	7.26		
	Error	20-30	1.10	0.78	0.46	0.51	WG-5	15.25**

Variables \ Subjects		Age Range	Schiz Patients (N=100)		Normal Controls (N=100)		Df	F-Value
			M	SD	M	SD		
		31-40	1.19	0.65	0.29	0.49	BG-194	
		41-50	0.78	0.78	0.42	0.63		
Trail 3	Time Taken	20-30	19.10	1.88	28.60	8.73	WG-5 BG-194	27.45**
		31-40	19.13	2.05	30.36	8.48		
		41-50	19.36	2.54	28.78	9.29		
	Error	20-30	1.10	0.85	0.40	0.73	WG-5 BG-194	20.38**
		31-40	1.00	0.70	0.17	0.38		
		41-50	1.36	0.68	0.25	0.51		
Trail 4	Time Taken	20-30	19.50	2.01	26.66	7.35	WG-5 BG-194	21.90**
		31-40	19.24	2.69	28.45	7.39		
		41-50	20.26	3.54	26.60	7.54		
	Error	20-30	1.10	0.85	0.40	0.63	WG-5 BG-194	13.53**
		31-40	1.11	0.75	0.26	0.51		
		41-50	1.10	0.73	0.46	0.57		
Trail 5	Time Taken	20-30	22.70	5.59	32.80	4.79	WG-5 BG-194	46.89**
		31-40	21.03	4.56	32.21	4.70		
		41-50	20.26	4.10	29.39	5.67		
	Error	20-30	0.85	0.48	0.40	0.73	WG-5 BG-194	18.11**
		31-40	1.14	0.81	0.21	0.49		
		41-50	1.05	0.84	0.14	0.35		

**= Significant at 0.01, WG=Within Groups, BG=Between Groups

In the trail-3, patients with schizophrenia aged between 20-30 years have been performed poorly (Schiz; M=19.10±1.88, Normals; M=28.60±8.73, F=27.45, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=19.13±2.05, Normals; M=30.36±8.48, F=27.45, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=19.36±2.54, Normals; M=28.78±9.29, F=27.45, p<0.01). Schizophrenia patients aged between 20-30 years have been committed more errors as compared to normal control subjects (Schiz; M=1.10±0.85, Normals; M=0.40±0.73, F=20.38, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=1.00±0.70, Normals; M=0.17±0.38, F=20.38, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=1.36±0.68, Normals; M=0.25±0.51, F=20.38, p<0.01).

In the trail-4, patients with schizophrenia aged between 20-30 years have been performed poorly (Schiz; M=19.50±2.01, Normals; M=26.66±7.35, F=21.90, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=19.24±2.69, Normals; M=28.45±7.39, F=21.90, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=20.26±3.54, Normals; M=26.60±7.54, F=21.90, p<0.01). Schizophrenia patients aged between 20-30 years have been committed more errors as compared to normal control subjects (Schiz; M=1.10±0.85, Normals; M=0.40±0.63, F=13.53, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=1.11±0.75, Normals; M=0.26±0.51, F=13.53, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=1.10±0.73, Normals; M=0.46±0.57, F=13.53, p<0.01).

In the trail-5, patients with schizophrenia aged between 20-30 years have been performed poorly (Schiz; M=22.70±5.59, Normals; M=32.80±4.79, F=46.89, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=21.03±4.56, Normals; M=32.21±4.70, F=46.89, p<0.01) and also schizophrenia patients aged between 41-

50 years (Schiz; M=20.26±4.10, Normals; M=29.39±5.67, F=46.89, p<0.01). Schizophrenia patients aged between 20-30 years have been committed more errors as compared to normal control subjects (Schiz; M=0.85±0.48, Normals; M=0.40±0.73, F=18.11, p<0.01), similar trends have been seen in schizophrenia patients aged between 31-40 years (Schiz; M=1.14±0.81, Normals; M=0.21±0.49, F=18.11, p<0.01) and also schizophrenia patients aged between 41-50 years (Schiz; M=1.05±0.84, Normals; M=0.14±0.35, F=18.11, p<0.01). The findings of the present study are consistent with the findings of other researchers, they have also found that schizophrenia has difficulty with attention, concentration, executive functions, psychomotor coordination, and mental processing (Boeker et al., 2006; Das et al., 2007). Sustained attention is the central dysfunction in schizophrenia (Bhatia et al., 2009) to memory which is found to be impaired consistently across most of the studies (Kerns et al., 2008; Bhatia et al., 2009; Leeson et al., 2010, Dalal et al., 2010; Ram et al., 2015; Bhattacharya, 2015, Aich et al. 2016, Tripathi et al. 2018, Kaneko 2018, García-Laredo 2018, McCleery et al. 2019, Liss at al. 2019, Zanelli et al, 2019).

CONCLUSION

Results reflect that patients with schizophrenia have neuropsychological deficits in comparison to normal control subjects. Schizophrenia patients performed poorly to copy the design and also took more time to copy of design on Bender Gestalt Test-II as compared to normal control subjects. Similar trends have been found in recall of design on BGT-II, schizophrenia patients have been performed impaired on perception tests and also performed slowing motor function. Schizophrenia patients have taken more time and committed more errors as compared to normal control subjects in trail 1, trail 2, trail 3, trail 4 and also trail 5 on the Comprehensive Trail Making Test.

REFERENCES

Aich, T. K., Mahato, A. and Subedi, S. (2016). Cognitive Impairment in Schizophrenia: Current Perspective. *Journal of Psychiatrists' Association of Nepal*, 5 (1). 5-13.

Bhatia, T., Garg, K., Geile, M. P., Nimgaonkar, V. L. and Deshpande, S. N. (2009). Executive functions and cognitive deficits in schizophrenia: Comparisons between probands, parents and controls in India. *Journal of Post Graduate Medicine*, 55 (1), 3-7.

Bhattacharya, K. (2015) Cognitive Function in Schizophrenia: A Review. *Journal of Psychiatry*, 18(1), 14-78.

Bloom, F. E., Kupfer, D. J., Goldberg, T. E. and Gold J. M. (1995). Neurocognitive functioning in patients with schizophrenia. *In:* Bloom FE, Kupfer DJ, *editors.* Psychopharmacology: The Fourth Generation of Progress. New York, NY*:* Raven Press, 1245-1257.

Boeker, H., Kleiser, M., Lehman, D., Jaenke, L., Bogerts, B. and Northoff, G. (2006). Executive dysfunction, self, and ego pathology in schizophrenia: an exploratory study of neuropsychology and personality. *Comprehensive Psychiatry*, 47 (1), 7-19.

Brannigan, G. G. and Decker, S. L. (2003). Bender Visual-Motor Gestalt Test, Second Edition. Itasca, IL: Revised Publishing.

Carter, C. S., Lesh, T. A., Niendam, T. A. and Minzenberg, M. J. (2010). Cognitive Control Deficits in Schizophrenia: Mechanisms and Meaning. *Neuropschopharmachology*, 36, 316-338.

Choudhury, S., Khess, C., Bhattacharyya, R., Sanyal, D. (2009). Insight in schizophrenia and its association with executive functions. *Indian Journal of Psychological Medicine,* 31, 71-6.

Dalal, P. K. and Sivakumar, T. (2010) Cognitive psychiatry in India. *Indian Journal of Psychiatry*, 52 (Suppl1), 128–135.

Das, R. K., Moore, B. P., Nayak, A. and Patel, R. R. (2007). Relationship of cognitive function in patients with schizophrenia in remission to disability: a cross- sectional study in an Indian sample. *Annals of General Psychiatry*, 6-19.

García-Laredo, E. (2018). Cognitive Impairment in Schizophrenia: Description and Cognitive Familiar Endophenotypes. A Review of the Literature. *IntechOpen*, DOI: 10.5772/intechopen.78948

Goldberg and Miller (1979). Mannual of the General Health Questionnaire, London, Oxford University Press.

Heaton, R. K. (1981). Wisconsin Card Sorting Manual. Odessa, Florida: Psychological Assessment Resources, Inc.

Hill, S. K., Reilly, J. L., Keefe, R. S. E., Gold, J. M., Bishop, J. R., Gershon, E. S., Tamminga, C. A., Pearlson, G. D., Keshavan, M. S. and Sweeney, J. A. (2013). Neuropsychological Impairments in Schizophrenia and Psychotic Bipolar Disorder: Findings from the Bipolar-Schizophrenia Network on Intermediate Phenotypes (B-SNIP) Study. *American Journal of Psychiatry,* 170, 1275-1284.

Kaneko, K. (2018). Negative Symptoms and Cognitive Impairments in Schizophrenia: Two Key Symptoms Negatively Influencing Social Functioning. *Yonago Acta Medica*, 61(2): 91–102.

Kerns, J. G., Nuechterlein, K. H., Braver, T. S. and Barch, D. M. (2008). Executive functioning component mechanisms and schizophrenia. *Biological Psychiatry*, 64(1), 26-33.

Leeson, V. C., Barnes, T. R. E., Harrison, M., Matheson, E., Harrison, I., Mutsatsa, S. H., Ron, M. A. and Joyce, E. M. (2010). The Relationship Between IQ, Memory, Executive Function, and Processing Speed in Recent-Onset Psychosis: 1-Year Stability and Clinical Outcome. *Schizophrenia Bulletin*, 36(2), 400-409.

Liss, A., Kolbjørn K. Brønnick, K. K., Johannessen, J. O., Joa, I., Kroken, R. A., Johnsen, Rettenbacher, E., Fathian, F. and Loberg, E. M. (2019). Cognitive Profile in Ultra High Risk for Psychosis and Schizophrenia: A Comparison Using Coordinated Norms, *Frontiers in Psychiatry*, https://doi.org/10.3389/fpsyt.2019.00695

McCleery, A. and Nuechterlein, K. H. (2019). Cognitive impairment in psychotic illness: prevalence, profile of impairment, developmental course, and treatment considerations. *Dialogues in Clinical Neuroscience*, 21(3):239-248

Morrens, M., Hulstijn, W. and Sabbe, B. (2008). Psychomotor Slowing in Schizophrenia. *Schizophrenia Bulletin*, 33(4), 1038–1053.

Overall, J. E. and Gorham, D. R. (1962). The brief psychiatric rating scale (BPRS-16). *Psychological Rehabilitation*, 10, 799-812.

Palmer, B. W., Heaton, R. K., Paulsen, J. S., Kuck, J., Braff, D., Harris, M. J., Zisook, S. and Jeste, D. V. (1997). Is it possible to be schizophrenic yet neuropsychologically normal? *Neuropsychology*, 11, 437-446.

Partington, J. E. and Leiter, R. G. (1949). Partington's Pathway Test. *The Psychological Service Center Bulletin*, 1, 9-20.

Punekar, J. N. *and* Kelkar, R. S. (2006). Psychomotor performance and Cognitive Abilities in Chronic Schizophrenia. *The Indian Journal of Occupational Therapy, 37(1).*

Ragland, J. D., Ranganath, C., Harms, M. P., Barch, D. M., Gold, J. M., Layher, E., Lesh, T. A., MacDonald III, A. W., Niendam, T. A., Phillips, J., Silverstein, S. M., Yonelinas, A. P. and Carter, C. S. (2015). Functional and Neuroanatomic Specificity of Episodic Memory Dysfunction in Schizophrenia: A Functional Magnetic Resonance

Imaging Study of the Relational and Item-Specific Encoding Task. *JAMA Psychiatry,* 72(9), 909-916.

Ram, R. K. and Prakash, J. (2015). Neuropsychological Deficits in Schizophrenia Patients. *Journal of Contemporary Psychological Research (Online),* 2 (3).

Reynolds, C. R. (2002). *Comprehensive Trail Making Test: Examiner's manual.* Austin, Texas: PRO-E.

Shen, C., Popescu, F. C., Hahn, E., Ta, T. T. M., Dettling, M. and Neuhaus, A. H. (2014). Neurocognitive Pattern Analysis Reveals Classificatory Hierarchy of Attention Deficits in Schizophrenia. *Schizophrenia Bulletin, 40 (4), 878-885.*

Tripathi, A., Kar, S. K. and Shukla, R. (2018). Cognitive Deficits in Schizophrenia: Understanding the Biological Correlates and Remediation Strategies. *Clinical Psychopharmacol Neuroscience*. 2018 Feb; 16(1): 7–17.

Uhlhaas, P. J. and Mishara, A. L. (2007). Perceptual Anomalies in Schizophrenia: Integrating Phenomenology and Cognitive Neuroscience, *Schizophrenia Bulletin, 33 (1),* 142-156.

Zanelli J, Mollon J, Sandin S, Morgan C, Dazzan P, Pilecka I, Reis Marques T, David AS, Morgan K, Fearon P, Doody GA, Jones PB, Murray RM, Reichenberg A. (2019) Cognitive Change in Schizophrenia and Other Psychoses in the Decade Following the First Episode. *Americal Journal of Psychiatry*, https://doi: 10.1176/appi.ajp.2019.18091088.

Acknowledgement

The investigator wishes to convey heartfelt gratitude to all of the experts, participants, supporters, and previous researchers who contributed directly and indirectly to this study.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Ram R.K & Prakash J. (2023). Neuropsychological Deficits in Schizophrenia Patients. *International Journal of Indian Psychology, 11(1),* 2334-2341. DIP:18.01.239.20231101, DOI:10.25215/1101.239