# Medical Science

**Authors' Affiliation:**
[1]Junior Resident, Department of Psychiatry, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences (Deemed to be University), Sawangi, Wardha, Maharashtra, India; Email: patilswar7@gmail.com
[2]Professor and Head, Department of Psychiatry, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences (Deemed to be University), Sawangi, Wardha, Maharashtra, India; Email: dr.p.s.patil2012@gmail.com
[3]Assistant Professor, Department of Psychiatry, Chhindwara Institute of Medical Sciences, Chhindwara, Madhya Pradesh, India; Email id: tt315745@gmail.com
[4]Former Assistant Professor, Department of Psychiatry, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences (Deemed to be University), Sawangi, Wardha, Maharashtra, India; and current Assistant Professor, Department of Psychiatry, Government Medical College, Akola, Maharashtra, India; Email: ajinkyaghogaremd@gmail.com

[*]**Corresponding Author**
Junior Resident, Department of Psychiatry, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences (Deemed to be University), Sawangi, Wardha, Maharashtra, India;
Email: patilswar7@gmail.com

# Comparison of cognitive dysfunctions in individuals with Schizophrenia and Mood Disorders: A cross-sectional observational study from Central Rural India

**Swaroopa Lunge Patil**[1*], **Pradeep Shriram Patil**[2], **Tushar Subhash Talhan**[3], **Ajinkya Sureshrao Ghogare**[4]

## ABSTRACT

*Introduction:* Schizophrenia and mood disorders are the chronic debilitating psychiatric disorders having profound personal, social, occupational, and cognitive impairments. Cognitive impairments can hinder treatment seeking behavior leading to chronic and relapsing course of schizophrenia as well as mood disorders. *Aim:* To assess and compare the profiles of cognitive impairment among individuals with schizophrenia and mood disorders. *Material and methods:* Present study was conducted at tertiary care teaching hospital from central rural India over a period of two years as a part of postgraduate dissertation in Psychiatry. Cognitive impairment was assessed by using PGI brain dysfunction battery which consisted of five tests such as Bhatia's short battery of performance intelligence, Verbal adult intelligence test, PGI memory scale, Bender visual-motor gestalt test, and the Nahor-Benson test for perceptual acuity. *Results:* On comparing Group A (schizophrenia) and Group B (mood disorders), we found that Bender Gestalt and Nahor-Benson tests had statistically significant difference between Group A and Group B (p <0.05) and such difference was found to be higher in Group B (mood disorders). While comparing Group A and Group B, we found that total dysfunctional rating score (DRS) had statistically non-significant difference between Group A and Group B (p <0.05). *Conclusion:* Some cognitive domains appear to be more affected than others with diverse presentation among the individuals suffering from schizophrenia and mood disorders. Early diagnosis of and effective coping with the cognitive impairments may reduce the burden of both disorders and prevent further complications such as treatment dropouts or treatment denial.

**Keywords:** Cognitive dysfunctions, Schizophrenia, Bipolar disorder, Depression, Comparison

# 1. INTRODUCTION

Schizophrenia is the long-standing incapacitating psychiatric disorder characterized by the persistent and severe psychotic symptoms, cognitive impairment, and profound psychosocial deterioration (Tamminga, 2017; Shukla et al., 2022). An Indian study found that the prevalence of schizophrenia was 0.3% (Sagar et al., 2020). The prevalence of cognitive impairment in individuals with schizophrenia was found to be in a range of 61% to 78% (García-Laredo, 2018; Green, 2006). Earlier a term "Dementia praecox" was in use for the schizophrenia. Now it has been evident that the cognitive impairment is one of the cardinal presentations of the schizophrenia (García-Laredo, 2018). Cognitive deficits have been found in those with the first episode of schizophrenia (Mohamed et al., 1999; Albus et al., 1996), longstanding or chronic schizophrenia (Reichenberg, 2010), during the remission phase of schizophrenia (Nuechterlein et al., 1992), and in antipsychotics naïve individuals (Torrey, 2002; Keefe et al., 2006). It has been evident that the cognitive impairment in individuals with schizophrenia not only hampers the activities related to daily living but it also hampers an ability to solve the problems related to social context (Sitzer et al., 2008; Green et al., 2000). The most common cognitive deficit in individuals with schizophrenia was found to be executive dysfunctions (García-Laredo, 2018).

Meta-analysis showed that among individuals with schizophrenia the cognitive domains such as episodic memory and speed of processing were impaired prominently (Schaefer et al., 2013). Cognitive impairment is the core feature of schizophrenia symptomatology and cognitive deficits range from the moderate to severe levels. Various cognitive domains such as working or short term memory, verbal learning, attention, and the executive functions are impaired among individuals suffering from schizophrenia (Bowie & Harvey, 2006). Poor retention of the verbally acquired information and poor learning are the hallmark of the cognitive impairment in individuals diagnosed with schizophrenia (Bowie & Harvey, 2006). Usually cognitive impairment tends to emerge before the positive symptoms of schizophrenia (Cornblatt & Erlenmeyer-Kimling, 1985; Davidson et al., 1999).

As per the International Classification of Diseases – Tenth Edition (ICD–10), mood or affective disorders comprised of bipolar affective disorder which consists of manic and depressive episodes, and depressive disorder which consists of mild, moderate, and severe depressive episodes (WHO, 1993). The lifetime prevalence of bipolar affective disorders is around 2.4% (Merikangas et al., 2011) and it is one of the most disabling psychiatric disorders across the globe. About 40 to 60% individuals with bipolar disorder show impairment of neurocognitive functions (Solé et al., 2017). Various cognitive domains such as executive function, attention, declarative memory, and visual memory were found to be impaired among the individuals suffering from the bipolar affective disorder when compared with the normal controls (Bora et al., 2010).

Many studies found that these cognitive dysfunctions among the individuals with bipolar affective disorder were state independent i.e., they were found to be prevalent across all the phases of bipolar affective disorder (Sanches et al., 2015; Bora et al., 2009; Lopes & Fernandes, 2012; Zubieta et al., 2001; Glahn et al., 2007; Martínez-Arán et al., 2004). A study found that individuals with manic phase of bipolar affective disorder displayed impaired verbal fluency, cognitive skills, and verbal memory compared to the individuals with depressive as well as remission phases of the disorder (Dixon et al., 2004). The same study also found that executive cognitive deficits were more common among the individuals with manic phase of bipolar affective disorder. The same study conclude that individuals with manic phase had more cognitive impairment than those with depressive and remission phase, and it was related with the presence of formal thought disorder among the individuals with manic phase (Dixon et al., 2004).

The global prevalence of depressive disorder ranges in between 3.2% and 4.7% (WHO, 2017; Moussavi et al., 2007). Among individuals with depressive disorder, various cognitive domains such as executive functions, attention, processing speed, and memory were found to be impaired (Perini et al., 2019). Such cognitive impairments have been found to be persistent even during the remission phase of the depressive disorder. In accordance with a study, cognitive dysfunction's prevalence was 85% to 94% during the frank depressive episode, while it was found to be in a range of 39% to 44% during the remission phase of the depressive disorder (Conradi et al., 2011).

**Rationale of the study**

On reviewing the literature, it was found that there was paucity of data from central rural India regarding an assessment and comparison of cognitive profile among individuals suffering from major psychiatric disorders like schizophrenia and mood disorders. Assessment and comparison of cognitive impairments among individuals with the schizophrenia and the mood disorders can be done with administration psychological tools standardized for Indian Population. Early detection and the management of cognitive dysfunctions may improve the outcome among the individuals suffering from schizophrenia and mood disorders. With this view we planned the present research work.

**Objective of present study**

Present study was carried out with an objective of assessment of cognitive dysfunctions in patients with schizophrenia and mood disorders, and to compare both the groups to see whether the cognitive dysfunction varies between them.

**Research Question**

Did cognitive profile of individuals with mood disorders and schizophrenia differ from each other? - reflected the research question of this study.

## 2. MATERIALS AND METHODS

**Type of the study**

This study was cross-sectional hospital based observational study.

**Study setting and relevant time period**

This study was carried out at outpatient and inpatient departments of Psychiatry of a rural teaching hospital from central rural India from October 15, 2019 till October 14, 2021. Before initiation of present study an approval was taken from Institutional Ethics Committee with letter number [DMIMS (DU)/IEC/Sept-2019/8347] dated October 03, 2019.

**Inclusion Criteria applied for the study**

Eligibility criteria for this study considered were the individuals belonging to an age group of 18 to 70 years who were clinically diagnosed with schizophrenia and mood disorders by using the diagnostic criteria from International Classification of Diseases – 10th Edition (ICD – 10) (WHO, 1993) and those who had basic level of education and knowledge of Hindi and English, with more than or equal to 8 years of schooling in these languages. Individuals with BPRS-18 item scores of 18 to <53 were incorporated in this study after taking written informed consents. Exclusion criteria consisted of unwilling, acutely ill or uncooperative individuals, individuals with the history of developmental delay or any associated major organic brain pathology, individuals who had diabetes mellitus, dyslipidemia, or hypertension at the time of entry into the study, individuals who had past history of traumatic injury to the head, and the individuals who received recent electro-convulsive therapy during a 6 months period prior to conduction of the present study.

**Assessment tools**

Individuals diagnosed with the mood disorders and the schizophrenia as per the ICD-10 diagnostic criteria were given clinical data sheet which included demographic data details like name, age, gender, educational qualifications, domicile background, and duration of the psychiatric disorders as well as the duration of treatment. Those individuals were then screened using BPRS-18 item scale (Overall et al., 1967) and those belonging to mildly – moderately ill with the scores ranging from 18 onwards to less than 53 were then administered the PGI Brain Dysfunction Battery (Pershad & Verma, 1990). It includes 5 different tests of brain functioning as following (Pershad & Verma, 1990):

1) *Bhatia's Short Battery of the Performance Intelligence*: It consists of 2 sub-tests which are Kohs Block design test and Alexander Pass Along test. Kohs Block design test has 10 cards of design along with 16 cubes. After demonstrating how to make the design from cards, individuals are subsequently asked to do it on their own. Alexander Pass Along test has 8 cards of design, 4 boxes and rectangle blocks. In this test, the coloured boxes and rectangle blocks are arranged reversely which the subject has to arrange according to the design of the card. In this the Dysfunctional Rating Score (DRS) is obtained by Performance Quotient (PQ) which is a mean of scores of both tests. The value of P/K x100 is also obtained which is a ratio of Test Quotient (TQ) of Pass Along test and Kohs Block design test multiplied by 100.

2) *Verbal Adult Intelligence Test*: It encompasses 4 subtests of Information (consisting of 33 items graded as 1 point each), Digit Span (similar to attention and concentration subtests of PGI memory scale), Arithmetic (consisting of 15 items graded as 1 point each) and Comprehension (consisting of 18 items graded as 0, 1, 2 points each). Individual TQ is obtained from each subtest and mean of all four TQs gives the Verbal Quotient (VQ).

3) *PGI Memory Scale*: Verbal and non-verbal components of memory are measured with 10 sub-units which are recent memory, remote memory, attention, mental balance, immediate recall, delayed recall, visual retention, recognition properties of psychometric, retention of dissimilar pairs, and retention of similar pairs.

4) *Bender Visual-Motor Gestalt Test*:  It is one of perceptual-motor test. It illustrates about reception of sensory information, its interpretation, and organization at central nervous system level. Nine cards are given in which the person has to duplicate the design and the scoring is given according to the various characteristics like perseveration, rotation, concretism, separation of lines, added angles, overlap, distortion, embellishments, partial rotation, omission, abbreviation, absence of erasure, separation, points of contact, and closure.

5) *Nahor Benson test of the Perceptual Acuity*: This is also one of perceptual-motor test consisting of 8 cards of which five have design and the other three have instructions to be followed. This gives information about parieto-occipital functioning and spatial relation understanding.

   DRS were acquired for every test and then were compared. All these tests yield globally the rates of dysfunction of cognition based on nineteen test variables which gives estimation of well validated psychological concepts of memory, intelligence, and perceptual acuity or Gestalt formation.

**Sample size calculation**

To calculate the population size for present study, we applied the formula of sample size calculation for the cross-sectional study design and the formula was $n = 4pq/L^2$, where n is sample size, p is the prevalence of cognitive impairment, q is 100 – p, and L is allowable error which is 20% of the p (Wankhade et al., 2021; Shaikh et al., 2021). Based on the previous study finding (Solé et al., 2017), we took p = 46%. Hence, at p = 46%, 20% allowable margin of error, and 95% confidence interval, the required sample size was 117.39, which was rounded to 120. Out of those 120, 60 individuals belonged to Group A (i.e. Schizophrenia group) and another 60 individuals belonged to Group B (i.e. Mood disorders group). Out of 60 individuals from Group B, 30 had bipolar affective disorder and another 30 had unipolar depression.

**Statistical interpretation**

Data were gathered and analyzed by using SPSS (version 22) for windows. The unpaired t test was used for comparison of the results among the study population. Level of statistical significance was set at $p \leq 0.05$.
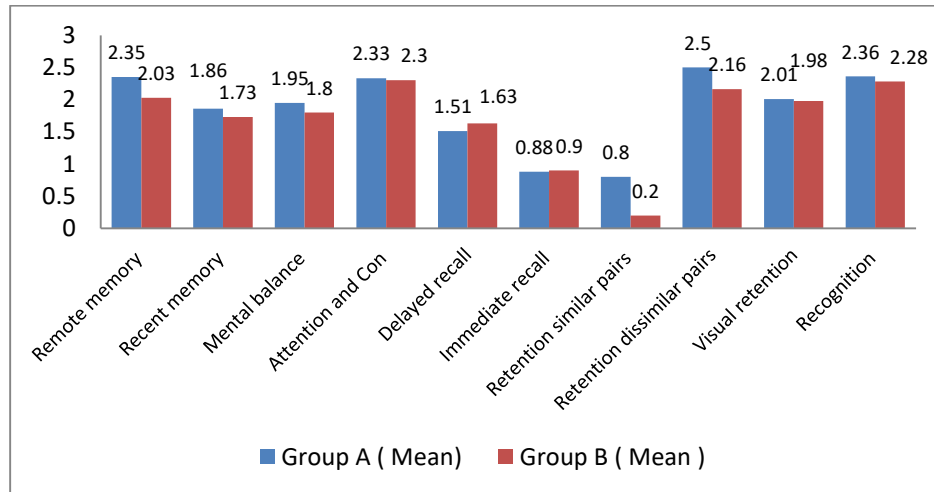
## 3. RESULTS

**PGI memory scale scores for comparing the cognitive impairments among Group A and Group B**

Table 1 and graph 1 showed that while comparing the DRS of PGI Memory Scale in Group A and B, we found remote memory, mental balance, delayed recall, and retention of similar pairs had statistically significant difference between Group A and Group B ($p < 0.05$). Out of those cognitive features, remote memory, mental balance, and retention of similar pairs were found to be more impaired in Group A, whereas delayed recall was found to be more impaired in Group B. While comparing both the groups, we found that recent memory, attention and concentration, immediate recall, retention of dissimilar pairs, visual retention, and recognition had non-significant difference among both groups ($p > 0.05$), but however those cognitive domains were largely hindered in Group A except for the immediate recall which was more impaired in Group B.

**Table 1** Comparison of the DRS of PGI Memory Scale among both the groups A and B

| | Group A (Mean+SD) | Group B (Mean+SD) | P value (Unpaired t test) | Result |
|---|---|---|---|---|
| Remote memory | 2.35+0.56 | 2.03+0.21 | 0.044 | Significant |
| Recent memory | 1.86+0.76 | 1.73+0.50 | 0.76 | Non-significant |
| Mental balance | 1.95+0.21 | 1.80+0.25 | 0.049 | Significant |
| Attention and Concentration | 2.33+0.86 | 2.30+0.75 | 0.81 | Non-significant |
| Delayed recall | 1.51+0.32 | 1.63+0.41 | 0.042 | Significant |
| Immediate recall | 0.88+0.11 | 0.90+0.09 | 0.49 | Non-significant |
| Retention of similar pairs | 0.8+0.07 | 0.2+0.24 | 0.0065 | Significant |
| Retention of dissimilar pairs | 2.5+0.52 | 2.16+0.21 | 0.61 | Non-significant |
| Visual retention | 2.01+0.6 | 1.98+0.74 | 0.97 | Non-significant |
| Recognition | 2.36+0.76 | 2.28+0.20 | 0.34 | Non-significant |

**Graph 1** Comparison of means of Dysfunctional Rating Score (DRS) of PGI Memory Scale
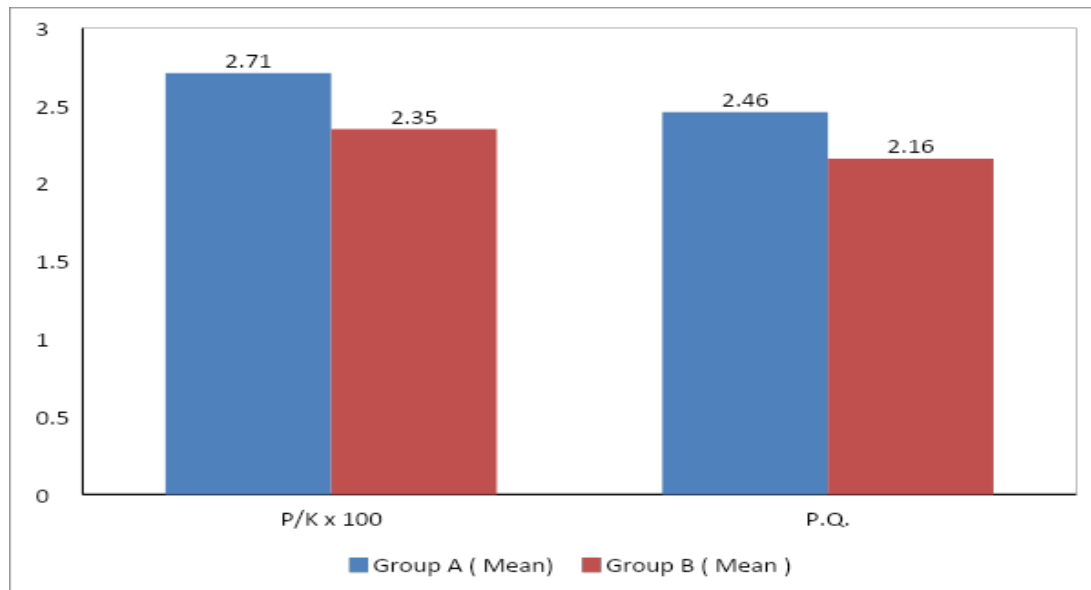
**Battery of Performance tests of Intelligence for comparing the cognitive impairments among Group A and Group B**

Table 2 and graph 2 showed that in these tests of intelligence, p value from unpaired t test revealed significant differences among two groups with lesser P/K x 100 and performance quotient among individuals in Group B.

**Table 2** Comparison of the DRS of Battery of Performance tests of Intelligence

|  | Group A (Mean+SD) | Group B ( Mean+SD ) | P value (Unpaired T test) | Results |
|---|---|---|---|---|
| P/K x 100 | 2.71+0.88 | 2.35+0.32 | 0.0071 | Significant |
| Performance Quotient | 2.46+0.71 | 2.16+0.38 | 0.042 | Significant |

(P/K x 100 – Ratio of test quotient of Pass along test and Kohs-block-design test x100)
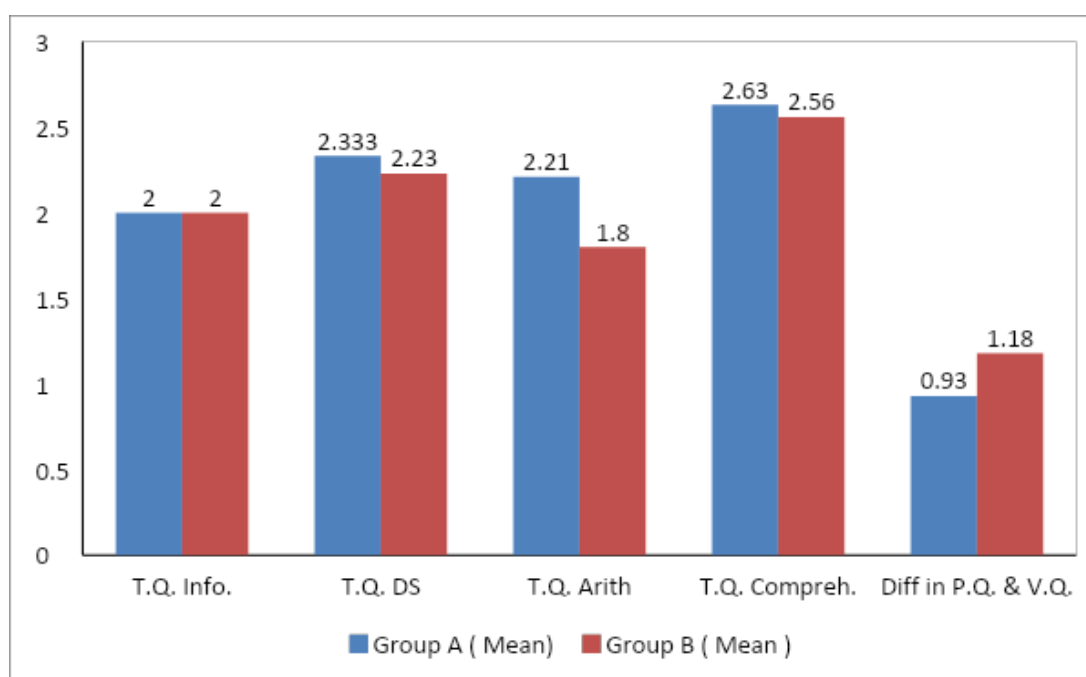


**Graph 2** Comparison of means of Dysfunctional Rating Scores of Battery of Performance tests of Intelligence

**Comparison of Cognitive functions by using verbal adult intelligence scale**

Table 3 and graph 3 showed that the significant difference existed between the two groups in regards of test quotient for arithmetic (more impaired in Group A) and difference in performance and verbal quotients (more impaired in Group B).

**Table 3** Comparison of Dysfunctional Rating Scores of verbal adult intelligence scale

|  | Group A (Mean±SD) | Group B ( Mean±SD) | P value (Unpaired t test) | Results |
|---|---|---|---|---|
| Test Quotient for Information | 2 | 2 | -- | -- |
| Test Quotient for Digit Span | 2.333±0.76 | 2.23±0.41 | 0.61 | Non-significant |
| Test Quotient for Arithmetic | 2.21±0.55 | 1.80±0.75 | 0.0082 | Significant |
| Test Quotient for Comprehension | 2.63±0.12 | 2.56±0.19 | 0.72 | Non-significant |
| Difference in Performance Quotient & Verbal Quotient | 0.93±0.2 | 1.18±0.6 | 0.0035 | Significant |



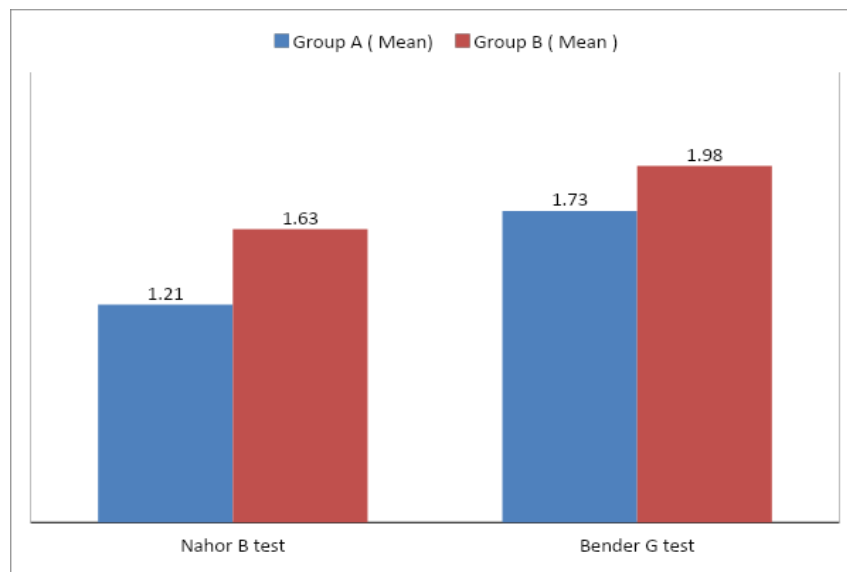**Graph 3** Comparison of Dysfunctional Rating Scores of verbal adult intelligence scale

**Comparison of Cognitive functions by using the Percepto-motor functioning tests analysis**

Table 4 and figure 4 showed that on comparing the both groups, we found that Bender Gestalt as well as Nahor Benson tests had significant statistical differences among Group A and Group B (p <0.05) and those features were found higher in Group B.

**Table 4** Dysfunctional Rating Scores of Percepto-motor functioning analysis

|  | Group A (Mean±SD) | Group B ( Mean±SD ) | P value (Unpaired t test) | Results |
|---|---|---|---|---|
| Nahor Benson test | 1.21±0.81 | 1.63±0.32 | 0.0022 | Significant |
| Bender Gestalt test | 1.73±0.55 | 1.98±0.11 | 0.036 | Significant |

**Graph 4** Comparison of mean of Dysfunctional Rating Scores of Percepto-motor functioning

**Comparing the cognitive domains by using the Total Dysfunctional Rating Score**
Table 5 showed that while comparing Groups A and B, we found that total DRS had statistically non-significant difference between the two groups (P <0.05).

**Table 5** Total Dysfunctional Rating Score (DRS) analysis

|  | Group A (Mean±SD) | Group B ( Mean±SD ) | P value (Unpaired T test) | Results |
|---|---|---|---|---|
| Total DRS | 36.81+7.8 | 34.95+5.65 | 0.61 | Non-significant |

## 4. DISCUSSION

In our study, data collected from the patients were coded and further tabulated. Group A included individuals with schizophrenia, while Group B included individuals with mood disorders. In our study, mean age of group A was 37.40 years while of group B was 41.51 years. Talreja et al., (2013) found that mean age of individuals with schizophrenia was 33.96±9.894 years, as schizophrenia is an illness of young age in comparison to mood disorders. Okewole et al., (2014) found that mean age of individuals with mood disorders and schizophrenia were 37.2 ±11.9 and 40.3±11.8 years respectively (t = 1.298, p = 0.197, df = 98). Gender wise no statistically significant difference was seen in the number of individuals in both groups of the present study. Group A had 31 males and 29 females, while Group B contained 34 males and 26 females. A study noticed that out of 100 individuals with schizophrenia, 54 males and 46 females were assessed for the cognitive impairment (Talreja et al., 2013). Okewole et al., (2014) found significant differences with respect to gender and occupational status.

In our study, maximum patients from Group A were from rural area, while in group B patients were almost equally from rural as well as urban area. In our study, mean duration of illness in Group A was 11.66 years while in case of Group B it was 11.78 years, whereas mean duration of treatment in Group A was 8.96 years while in the Group B it was 9.23 years. In a study conducted by Talreja et al., (2013), mean duration of schizophrenia was 58.52 months ± 37.93, whereas the mean duration of the treatment was 45.30 ± 33.4 months. In the study conducted by Okewole et al., (2014), mean duration of schizophrenia and mood disorders were 10.2 ± 8.2 and 7.1 ± 8.7 years respectively, with no significant difference (t = 1.773, df = 98, p = 0.079).

In our study in group A, 34 individuals had family history of mental disorder, while in group B only 28 individuals had such family history. While comparing both A and B groups, we found that BPRS scores, remote memory, mental balance, delayed recall, and retention of similar pairs had statistically significant difference (p<0.05) and those features were found more impaired in Group A (schizophrenia group). While comparing both A and B groups, the recent memory, attention and concentration, immediate recall, recognition, visual retention, and retention of dissimilar pairs had statistically non-significant differences between both the groups (p>0.05), however those cognitive domains were found more impaired in Group A. On comparing both the groups A and B, we found that Nahor Benson and Bender Gestalt tests had statistically significant difference between the both groups (p<0.05) and

those features found to be higher in Group B. While comparing both groups, we found that total DRS had statistically non-significant difference across the groups A and B.

Okewole et al., (2014) reported that the individuals with negative or the mixed schizophrenia syndrome might have severe cognitive dysfunction. Same study concludes that poor verbal performance among people with schizophrenia may be related with the left handedness, severe illness and poor performance. Only a fewer studies comparing the cognitive profiles of bipolar affective disorder and schizophrenia used functional definition of the euthymia. Available literature has shown the proof that the traces of manic residue or depressive symptoms may be causing mental retardation seen in euthymic patients (Yatham et al., 2010; Elshahawi et al., 2011).

In our study, individuals with schizophrenia had a more severe mental disability that included a few domains which include deficits in high performance, memory, IQ, and perceptuo-motor function. This was in line with the broad body of literature available in the area, indicating that most of the individuals suffering from schizophrenia had significant cognitive impairment in high-performance settings, attention, IQ, and oral memory (Austin et al., 2001; Waltz & Gold, 2016). The number of studies on dementia in bipolar affective disorder is very small compared to that in schizophrenic individuals, but many studies on euthymic individuals did satisfactorily demonstrated impairment in high-performance, speech, memory, and on-going attention (Elshahawi et al., 2011; López-Jaramillo et al., 2010; Torres et al., 2010). In this study, individuals with a diagnosis of bipolar affective disorder had a disability that included a wide range of the cognitive domains such as deficits observed in the memory, percepto-motor function and IQ.

In this study, individuals with schizophrenia had more severe cognitive problems than those with mood disorders. Available literature had also shown that although the cognitive profiles were similar between the individuals with bipolar disorder and schizophrenia, the severity of cognitive problems were higher among the individuals suffering from schizophrenia (Seidman et al., 2002; Martínez-Arán et al., 2002). Green et al., (2000) observed that cognition was a good predictor of the functional prognosis of the bipolar 1 disorder and schizophrenia. In this study, we assessed and differentiate between the profiles of cognitive impairments among the individuals with mood disorders and schizophrenia. It has been observed that such comparison between the two diseases groups was difficult secondary to the different illness related characteristics as well as the treatment regimens (Trivedi, 2006).

### Limitations

This study was cross-sectional hospital based study; hence there existed a limitation regarding the generalizability of results found. A longitudinal follow-up study would be required to explore more in this area. Large sample size would be needed to establish comparative differences in these psychiatric disorders based on cognitive functions. No comment was given on the impacts of psychiatric medications on cognitive impairment.

## 5. CONCLUSION

In our study, we did comparison between the individuals with mood disorders and schizophrenia. We found that individuals with schizophrenia had more cognitive impairment in terms of performed tests of intelligence, attention, memory, and perceptuo-motor function. These findings have highly significant implications for etiology and management of such type of mental disorders. This can be further addressed with early diagnosis and effective treatment which may lower the burden of both psychiatric disorders and prevent further complications.

### Author contributions

Swaroopa LungePatil: Concepts, design, definition of intellectual content, literature search, data acquisition, data analysis, manuscript editing, manuscript review, guarantor.
Pradeep Shriram Patil & Tushar Subhash Talhan: Concepts, design, definition of intellectual content, literature search, data analysis, manuscript editing, manuscript review, guarantor.
Ajinkya Sureshrao Ghogare: Concepts, design, definition of intellectual content, literature search, manuscript editing, manuscript review, guarantor.

**Conflicts of interest**

The authors declare that there are no conflicts of interests.

**Data and materials availability**

All data associated with this study are present in the paper.

## REFERENCES AND NOTES

1. Albus M, Hubmann W, Ehrenberg C, Forcht U, Mohr F, Sobizack N, Wahlheim C, Hecht S. Neuropsychological impairment in first-episode and chronic schizophrenic patients. Eur Arch Psychiatry Clin Neurosci 1996; 246: 249-55. doi: 10.1007/BF02190276

2. Austin MP, Mitchell P, Goodwin GM. Cognitive deficits in depression: possible implications for functional neuropathology. Br J Psychiatry 2001; 178: 200-6. doi: 10.1192/bjp.178.3.200

3. Bora E, Yucel M, Pantelis C. Cognitive endophenotypes of bipolar disorder: a meta-analysis of neuropsychological deficits in euthymic patients and their first-degree relatives. J Affect Disord 2009; 113: 1-20. doi: 10.1016/j.jad.2008.06.009

4. Bora E, Yücel M, Pantelis C. Cognitive impairment in schizophrenia and affective psychoses: implications for DSM-V criteria and beyond. Schizophr Bull 2010; 36: 36-42. doi: 10.1093/schbul/sbp094

5. Bowie CR, Harvey PD. Cognitive deficits and functional outcome in schizophrenia. Neuropsychiatr Dis Treat 2006; 2: 531-6. doi: 10.2147/nedt.2006.2.4.531

6. Conradi HJ, Ormel J, de Jonge P. Presence of individual (residual) symptoms during depressive episodes and periods of remission: a 3-year prospective study. Psychol Med 2011; 41: 1165-74. doi: 10.1017/S0033291710001911

7. Cornblatt BA, Erlenmeyer-Kimling L. Global attentional deviance as a marker of risk for schizophrenia: specificity and predictive validity. J Abnorm Psychol 1985; 94: 470–86. doi: 10.1037//0021-843x.94.4.470

8. Davidson M, Reichenberg A, Rabinowitz J, Weiser M, Kaplan Z, Mark M. Behavioral and intellectual markers for schizophrenia in apparently healthy male adolescents. Am J Psychiatry 1999; 156: 1328-35. doi: 10.1176/ajp.156.9.1328

9. Dixon T, Kravariti E, Frith C, Murray RM, McGuire PK. Effect of symptoms on executive function in bipolar illness. Psychol Med 2004; 34: 811-21. doi: 10.1017/s0033291703001570

10. Elshahawi HH, Essawi H, Rabie MA, Mansour M, Beshry ZA, Mansour AN. Cognitive functions among euthymic bipolar I patients after a single manic episode versus recurrent episodes. J Affect Disord 2011; 130: 180-91. doi: 10.1016/j.jad.2010.10.027

11. García-Laredo E. Cognitive Impairment in Schizophrenia: Description and Cognitive Familiar Endophenotypes. A Review of the Literature. In: Irtelli, F. editor. Psychosis - Biopsychosocial and Relational Perspectives [Internet]. London: Intech Open; 2018 [cited 2022 Mar 26]. Available from: https://www.intechopen.com/chapters/62504 doi: 10.5772/intechopen.78948

12. Glahn DC, Bearden CE, Barguil M, Barrett J, Reichenberg A, Bowden CL, Soares JC, Velligan DI. The neurocognitive signature of psychotic bipolar disorder. Biol Psychiatry 2007; 62: 910-6. doi: 10.1016/j.biopsych.2007.02.001

13. Green MF, Kern RS, Braff DL, Mintz J. Neurocognitive deficits and functional outcome in schizophrenia: are we measuring the "right stuff"? Schizophr Bull 2000; 26: 119-36. doi: 10.1093/oxfordjournals.schbul.a033430

14. Green MF. Cognitive impairment and functional outcome in schizophrenia and bipolar disorder. J Clin Psychiat 2006; 67: e12.

15. Keefe RS, Bilder RM, Harvey PD, Davis SM, Palmer BW, Gold JM, Meltzer HY, Green MF, Miller DD, Canive JM, Adler LW, Manschreck TC, Swartz M, Rosenheck R, Perkins DO, Walker TM, Stroup TS, McEvoy JP, Lieberman JA. Baseline neurocognitive deficits in the CATIE schizophrenia trial. Neuropsycho pharmacol 2006; 31: 2033-46. doi: 10.1038/sj.npp.1301072

16. Lopes R, Fernandes L. Bipolar disorder: clinical perspectives and implications with cognitive dysfunction and dementia. Depress Res Treat 2012; 275957. doi: 10.1155/2012/275957

17. López-Jaramillo C, Lopera-Vásquez J, Gallo A, Ospina-Duque J, Bell V, Torrent C, Martínez-Arán A, Vieta E. Effects of recurrence on the cognitive performance of patients with bipolar I disorder: implications for relapse prevention and treatment adherence. Bipolar Disord 2010; 12: 557-67. doi: 10.1111/j.1399-5618.2010.00835.x

18. Martínez-Arán A, Penadés R, Vieta E, Colom F, Reinares M, Benabarre A, Salamero M, Gastó C. Executive function in patients with remitted bipolar disorder and schizophrenia and its relationship with functional outcome. Psychother Psychosom 2002; 71: 39-46. doi: 10.1159/000049342

19. Martínez-Arán A, Vieta E, Colom F, Torrent C, Sánchez-Moreno J, Reinares M, Benabarre A, Goikolea JM, Brugué E, Daban C, Salamero M. Cognitive impairment in euthymic bipolar patients: implications for clinical and functional outcome. Bipolar Disord 2004; 6: 224-32. doi: 10.1111/j.1399-5618.2004.00111.x

20. Merikangas KR, Jin R, He JP, Kessler RC, Lee S, Sampson NA, Viana MC, Andrade LH, Hu C, Karam EG, Ladea M, Medina-Mora ME, Ono Y, Posada-Villa J, Sagar R, Wells JE, Zarkov Z. Prevalence and correlates of bipolar spectrum disorder in the world mental health survey initiative. Arch Gen Psychiatry 2011; 68: 241-51. doi: 10.1001/archgenpsychiatry.2011.12

21. Mohamed S, Paulsen JS, O'Leary D, Arndt S, Andreasen N. Generalized cognitive deficits in schizophrenia. Arch General Psychiat 1999; 56: 749-54. doi: 10.1001/archpsyc.56.8.749

22. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet 2007; 370: 851-8. doi: 10.1016/S0140-6736(07)61415-9

23. Nuechterlein KH, Dawson ME, Gitlin M, Ventura J, Goldstein MJ, Snyder KS, Yee CM, Mintz J. Developmental Processes in Schizophrenic Disorders: longitudinal studies of vulnerability and stress. Schizophr Bull 1992; 18: 387-425. doi: 10.1093/schbul/18.3.387
Okewole AO, Adewuya AO, Makanjuola ROA. Cognitive functioning among patients with schizophrenia in a Nigerian hospital: a comparison with mood disorder. Schizophr Res Cogn 2014; 1, 155-9. doi: 10.1016/j.scog.2014.08.003

24. Overall JE, Hollister LE, Pichot P. Major psychiatric disorders: A four-dimensional model. Arch Gen Psychiatry 1967; 16: 146-51. doi: 10.1001/archpsyc.1967.01730200014003

25. Perini G, Cotta Ramusino M, Sinforiani E, Bernini S, Petrachi R, Costa A. Cognitive impairment in depression: recent advances and novel treatments. Neuropsychiatr Dis Treat 2019; 15: 1249-58. doi: 10.2147/NDT.S199746

26. Pershad D, Verma SK. Hand-book of PGI battery of brain dysfunction (PGI-BBD). National Psychological Corporation; 1990.

27. Reichenberg A. The assessment of neuropsychological functioning in schizophrenia. Dialogues Clin Neurosci 2010; 12: 383-92. doi: 10.31887/DCNS.2010.12.3/areichenberg

28. Sagar R, Dandona R, Gururaj G, Dhaliwal RS, Singh A, Ferrari A, Dua T, Ganguli A, Varghese M, Chakma JK, Kumar GA, Shaji KS, Ambekar A, Rangaswamy T, Vijaykumar L, Agarwal V, Krishkutty RP, Bhatia R, Charlson F, Chowdahry N, Erskine HE, Glenn SD, Krish V, Herrera AM, Mutreja P, Odell CM, Pal PK, Prakash S, Santomauro D, Shukla DK, Singh R, Singh RK, Thakur JS, TheKeePurakkal AS, Varghese CM, Reddy KS, Swaminathan S, Whiteford H, Bekedam HJ, Murray CJ, Vos T, Dandona L. India State-Level Disease Burden Initiative Mental Disorders Collaborators. The burden of mental disorders across the states of India: the Global Burden of Disease Study 1990-2017. Lancet Psychiatr 2020; 7: 148-61. doi: 10.1016/S2215-0366(19)30475-4

29. Sanches M, Bauer IE, Galvez JF, Zunta-Soares GB, Soares JC. The management of cognitive impairment in bipolar disorder: current status and perspectives. Am J Ther 2015; 22: 477-86. doi: 10.1097/MJT.0000000000000120

30. Schaefer J, Giangrande E, Weinberger DR, Dickinson D. The global cognitive impairment in schizophrenia: consistent over decades and around the world. Schizophr Res 2013; 150: 42-50. doi: 10.1016/j.schres.2013.07.009

31. Seidman LJ, Kremen WS, Koren D, Faraone SV, Goldstein JM, Tsuang MT. A comparative profile analysis of neuropsychological functioning in patients with schizophrenia and bipolar psychoses. Schizophr Res 2002; 53: 31-44. doi: 10.1016/s0920-9964(01)00162-1

32. Shaikh RA, Ghogare AS, Prasad P, Deshmukh S. A Cross-sectional Study of Antipsychotic Drugs Induced Sexual Dysfunction among Married Males with Remitted Schizophrenia Attending Tertiary Health Care Centre from Central India. J Clin of Diagn Res 2021; 15: VC01-VC07. doi: 10.7860/JCDR/2021/46625/14608

33. Shukla RS, Ghogare AS, Patil PS. Relationship between the caregiver burden and the resilience among primary caregivers of individuals suffering from schizophrenia attending tertiary care rural hospital from central India: A cross-sectional observational study. Medical Science 2022; 26: ms56e2005. doi: 10.54905/disssi/v26i120/ms56e2005

34. Sitzer DI, Twamley EW, Patterson TL, Jeste DV. Multivariate predictors of social skills performance in middle-aged and older out-patients with schizophrenia spectrum disorders. Psychol Med 2008; 38: 755-63. doi: 10.1017/S0033291707001304

35. Solé B, Jiménez E, Torrent C, Reinares M, Bonnin CDM, Torres I, Varo C, Grande I, Valls E, Salagre E, Sanchez-Moreno J, Martinez-Aran A, Carvalho AF, Vieta E. Cognitive Impairment in Bipolar Disorder: Treatment and Prevention Strategies. Int J Neuropsycho pharmacol 2017; 20: 670-80. doi: 10.1093/ijnp/pyx032

36. Talreja BT, Shah S, Kataria L. Cognitive function in schizophrenia and its association with socio-demographics factors. Ind Psychiatry J 2013; 22: 47-53. doi 10.4103/0972-6748.123619

37. Tamminga CA. Introduction and overview. In: Sadock BJ, Sadock VA, Ruiz P, editor. Comprehensive Textbook of Psychiatry, 10th ed. Philadelphia: Wolters Kluwer; 2017; Pp.3613-17.

38. Torres IJ, DeFreitas VG, DeFreitas CM, Kauer-Sant'Anna M, Bond DJ, Honer WG, Lam RW, Yatham LN. Neurocognitive functioning in patients with bipolar I disorder recently recovered from a first manic episode. J Clin Psychiatry 2010; 71: 1234-42. doi: 10.4088/JCP.08m04997yel

39. Torrey EF. Studies of individuals with schizophrenia never treated with antipsychotic medications: a review. Schizophr Res 2002; 58: 101-15. doi: 10.1016/s0920-9964(02)00381-x

40. Trivedi JK. Cognitive deficits in psychiatric disorders: Current status. Indian J Psychiatry 2006; 48: 10-20. doi: 10.4103/0019-5545.31613

41. Waltz JA, Gold JM. Motivational Deficits in Schizophrenia and the Representation of Expected Value. Curr Top Behav Neurosci 2016; 27: 375-410. doi: 10.1007/7854_2015_385

42. Wankhade SH, Bele AW, Jain D, Ghogare AS, Qureshi MI, Phansopkar P, Singh NC. A cross-sectional study of effect of stress and anxiety on neck pain among undergraduate physiotherapy and nursing students of a rural health sciences University from Maharashtra, India. Medical Science 2021; 25: 2222-32

43. WHO. Depression and Other Common Mental Disorders: Global Health Estimates. Geneva: World Health Organization; 2017; Licence: CC BY-NC-SA 3.0 IGO.

44. World Health Organization (WHO). The ICD-10 Classification of Mental and Behavioural Disorders. Genève, Switzerland: World Health Organization. 1993

45. Yatham LN, Torres IJ, Malhi GS, Frangou S, Glahn DC, Bearden CE, Burdick KE, Martínez-Arán A, Dittmann S, Goldberg JF, Ozerdem A, Aydemir O, Chengappa KN. The International Society for Bipolar Disorders-Battery for Assessment of Neurocognition (ISBD-BANC). Bipolar Disord 2010; 12: 351-63. doi: 10.1111/j.1399-5618.2010.00830.x

46. Zubieta JK, Huguelet P, Lajiness-O'Neill R, Giordani BJ. Cognitive function in euthymic bipolar I disorder. Psychiatry Res 2001; 102: 9-20. doi: 10.1016/s0165-1781(01)00242-6