Comparative Study of Executive Dysfunction in Schizophrenia and Drug-induced Psychosis

*** Richard Eno Lawani ** Shivani Tomar**

*(PhD Research Scholar) ** (Assistant Professor),

*Department of Psychology, School of Liberal Arts,
Noida International University, Plot No.1, Sector 17A, Yamuna Expressway, Opp. F1 Track, Gautam Buddh Nagar, Greater Noida- 201308, Uttah Pradesh, India.
**Department of Psychology, School of Liberal Arts,
Noida International University, Plot No.1, Sector 17A, Yamuna Expressway, Opp. F1 Track, Gautam Buddh Nagar, Greater Noida- 201308, Uttah Pradesh, India.
Corresponding Author: Richard Eno Lawani

Abstract: Executive dysfunction is a core feature of schizophrenia and drug-induced psychosis. Executive function is an important cognitive domain crucial for an individual to achieve adaptive living. This study undertook neuropsychological assessment of executive function among Nigerian patients diagnosed with schizophrenia and drug-induced psychosis (DIP). The assessment tools employed were mini-mental status examination (MMSE), trail making test Parts A and B, fluency test and Stroop colour word test (SCWT), the executive function components assessed were working memory, inhibition, fluency and set shifting. A total of 109 participants took part in the research project. Patients diagnosed with schizophrenia (n=53, 26 females and 27 males) drug-induced psychosis (n=56, 4 females and 52 males) were recruited for the study. There were statistically significant differences between DIP patients and schizophrenia cases on all the parameters employed apart from general cognitive functioning. Utilizing regression analyses, the most significant predictors of TMT part B parameters among schizophrenia and DIP cases were with current age (t=2.48, p=0.016) and (t=3.36, p=0.001) respectively' Schizophrenia/ cases showed more executive function impairment than Drug-induced psychosis cases on the domains assessed. Hence, schizophrenics are more of a high risk population to develop executive dysfunction than drug-induced psychosis patients.

Keywords: schizophrenia; general cognitive functioning, executive dysfunction, drug-induced psychosis, neuropsychological assessment, rehabilitation, psychological intervention

INTRODUCTION

Executive function deficits have been known to occur in persons who have had severe brain injuries [1]]2] [3] and drug-induced psychosis (DIP) [4] Executive function dysfunction renders individuals unable to cope with the performance of a series of goal-motivated behavior necessary to achieve adaptive existence in an ecologically and psychologically evolving world. Such include the ability to generate thought and think flexibly, to update and manipulate information mentally, to inhibit what is undesirable or irrelevant to current goals, to self-monitor, and to plan and adjust behavior as appropriate to the current context. [5] Executive function is predominantly supported by the frontal lobe that regulates lower level processes such as perception, motor responses and thereby generating processes of self-regulation and self-directed behavior in order to perform a desired task appropriate to the current situation [5] [6] [7] Its coordinating processes make it possible to break out of undesirable habits, make decisions and evaluate risks, plan for the future, prioritize and sequence our actions, and cope with changing or novel situations [8] [6].

There is a consensus among researchers that both genetic and environmental factors can interfere with executive functioning efficacy [8] [9] [10] [11]. To regulate and guide behavior through a constantly changing environment, the human brain requires a central coordinating system. Accounting for individual differences in executive functioning in vital aspects of human health and functioning [12] [13] The executive functioning system accounts for the simultaneous operation of a number of cognitive processes in charge of goal-directed, task-oriented behaviors, self-regulation and behavior inhibition as well as planning, working memory, mental flexibility, response inhibition, impulse control, monitoring of action and many skills needed to prepare for and execute complex behaviors [15] [12]. Therefore any dysfunction of executive functioning impairs the individual's ability to analyze, plan, prioritize, schedule, initiate and complete an activity in a timely manner. Managing time and meeting deadlines then become a huge problem, notwithstanding whether one is a child, adolescent or an adult. [9].

Research evidence suggests that executive function deficits are core features of mental disorders such as schizophrenia and drug induced psychosis, due to altered neural mechanisms related to its etiology and onset. [16] DIP is a result of environmental factors, whereas schizophrenia is highly heritable and a considerable number of genetic components have been identified in the development of schizophrenia. [17] [18]. Studies have shown that biological factors contribute to these schizophrenic behaviors by disrupting neurotransmission and brain development [19, 20, 21]. And furthermore, schizophrenia can be a lifelong condition, but DIP cases need not be lifelong condition because it is treatable and curable; in schizophrenia cases, psycho education focuses on coping with demands of daily existence whereas in DIP cases emphasis should be on lifelong abstinence [22]

Drug-induced psychosis refers to a medical condition resulting from use and abuse of certain psychoactive substances which interfere with brain connectivity and functionality [23][24]. Kulhali et al [25] posit that one of the earliest reports about the effects of cannabis on mental health originated in India from the Indian Hemp Commission (1893). Nevertheless, drug-induced psychosis

resulting from use/abuse of Cannabis (Indian hemp/Igboo/Moroko), alcohol, cocaine and heroine has now assumed global proportions [23][4][26]. found that the propensity to develop psychosis is influenced by the severity of use and dependence. This position is also supported by Ham, et al]27] who claim that psychotic symptoms can be elicited in healthy human adults when exposed to drugs. Jatau et'al [4] noted that world drug report-2019 of the United Nations Office on Drugs and Crime (UNODC) estimated that 271 million (5.5%) of the global population (aged between 15 and 64 years), had used drugs in the previous year [28]. They found a prevalence of 20–40% (among students) and 20.9% (among youths) drug abuse in Nigeria. The Global Burden of disease Study 2017 reported that globally, in 2017, about 585,000 deaths were due to drug use [28]. The UNODC 2018 report titled "Drug use in Nigeria"- the first large-scale, nationwide drug use survey in Nigeria, found that one in seven (about14.2%) persons (aged 15–64 years) had used a drug in the past year . It was also found that, one in five (20%) individuals who had used drug in the past year is suffering from drug-related disorders [29][24] Butler et al [30] undertook a narrative review to determine the impact of substance use disorder pharmacotherapy on executive functioning. They found that available evidence suggest the presence of executive dysfunction in substance use disorder patients but that there was limited and conflicting evidence to support executive function improvement in dependent drug users. Duijkers J.C.L.M. et al(2016) [31] found executive dysfunction in drug induced mental disorders to be responsible for executive function impairments responsible for triggering the occurrence of mental disorders by several mechanisms such as (i) inability to maintain goals when confronted with interfering desires (for drugs or substances) that are difficult to *inhibit* and/or complicate *shifting* to more healthy goals, (ii) *inhibitory* impairment of impulsive responses, (iii) sticking attention to disorder-associated cues like substances that interfere with adequate *shifting*, (iv) impaired cognitive control (*inhibition*) and distorted future planning, (v) reduction in (emotional) stress regulation, and (vi) cognitive *in*flexibility. [32]. Impairments in these mechanisms negatively interfere with adequate impulse control and decision making, consequently also hindering proper inhibitory control that negates the initiation and sustenance of goal-directed behavior required for functional daily living [33]. Yet there exists a paucity of research focusing on executive dysfunction in drug-induced psychosis among clinical populations in Nigeria and most countries of the Global South. Hence, executive dysfunction in mental disorders especially cases of psychosis has become a global mental health concern requiring further investigation [34].

Chronic schizophrenia is defined as a chronic stage in the development of a schizophrenic illness in which there has been a clear progression from an early stage to a later stage characterized by long- term, though not necessarily irreversible, "negative" symptoms, which include. psychomotor slowing; underactivity; blunting of affect; passivity and lack of initiative; poverty of quantity or content of speech; poor nonverbal communication by facial expression, eye contact, voice modulation and posture; poor self-care and social performance. [35] Schizophrenia is a major mental illness which affects one out of every one hundred people [36]. Schizophrenia is described as a major mental disorder to give recognition to the severity of the consequences of the illness on many of the people so diagnosed. It manifests generally in the mid to late teens and presents with often uncontrollable executive dysfunctions. The disorder ranges from mild, moderate, acute to chronic in its stages of manifestation. Periods of acute schizophrenia could occur repeatedly in the course of the psychosis. Schizophrenics in an acute episode of the illness experience some variation of hallucinations, delusions, and thought disorder [36]. These are the "positive symptoms" of schizophrenia as they are in addition to the person's usual repertoire of feelings. Following an acute episode, some patients experience a remission or absence of symptoms. However, others experience a lengthy period of chronic illness characterized mostly by negative symptoms; which are subtractions from the usual repertoire of emotions, such as loss of interest and energy, loss of warmth and humour, and loss of ability to feel empathy [37]. There is an extensive research literature that identifies cognitive deficits in individuals with schizophrenia [38]. These deficits range over a broad spectrum of severity that impact on a person's functioning in daily life tasks and occupational roles. Characteristically, problems such as attention and memory disorders, problem solving difficulties, and perceptual problems are .evidence of underlying cognitive deficits [39].

Causes of schizophrenia have not been fully established, but the illness possesses multiple symptoms, courses and outcomes. And it is characterized by its episodic, heterogeneous nature. Patients with chronic symptomatology and corresponding cognitive dysfunction have significant problems coping with social demands and expectations. [13]. Similarities and differences between psychotic patients with executive functioning deficits and the traumatic brain injured are reflected throughout the literature [13]. Yet there are differences between the two populations. The brain injured has an actual identifiable lesion to their brain. Schizophrenia is a working diagnosis which suggests brain level dysfunction. However, some brain imaging studies [40] suggest the anterior hippocampus as a lesion site in the brain of schizophrenics; they also suggest the possibility that schizophrenics may have a unique brain deficit that has not yet been identified.

An approach that could address some of the confounding factors which could influence executive function performance is to examine the neuropsychological profile of patients at the chronic stage of schizophrenia. Researchers examined 72 remitted and 42 nonremitted schizophrenia patients and 119 healthy controls and found that executive function deficits are present in chronic schizophrenic patients [25]. However, a notable drawback of the study is the failure to identify and differentiate between the components of executive functioning and the higher order cognitive functions they predict. Sabhesan et al [41] examined 31 schizophrenia patients at various levels of recovery and found that the dimensions of executive functions did not show any significant relationship with age or duration of illness. However, the sample size is rather small and failure to isolate chronic cases meant that confounding factors that could influence neuropsychological test performance were ignored. In another study, Savla et al [42] conducted a study that included 145 community-dwelling individuals with schizophrenia. Executive functions were measured with the Delis-Kaplan Executive Functioning System (D-KEFS). They conducted an exploratory factor analysis (EFA) with principal axis factoring, as well as parallel analyses to examine the latent constructs underlying the D-KEFS tasks, a second EFA on weighted residuals of the D-KEFS tasks (after accounting for processing speed measured with the Digit Symbol task), and bivariate correlations to examine relationships between the D-KEFS components and relevant demographic and clinical variables, crystallized verbal knowledge, and functional capacity. The study had appreciable sample size and rigorous statistical analysis, but the absences of a control group compromised its internal reliability and imprecise number of executive functioning components

could have compromised its results. The effects of various confounding variables on executive and cognitive functioning need to be investigated further and to be controlled before a definite conclusion can be made. Additionally, extant studies have mostly been restricted to the global north - more advanced countries. However, literature, simultaneously examining executive dysfunction in both drug induced psychosis (cannabis, cocain heroin and alcohol) and chronic schizophrenia are rather scarce.

Intervention, retraining and rehabilitation

The bio-psychosocial approach to psychopathological remediation has long been accepted. Hence, D. T. Turner et al [43\ have provided a comprehensive list of psychological interventions for Psychosis as follows: (A) Befriending (B) Cognitive behavioural therapy (CBT) (C) Cognitive remediation (D) Psychoeducation (E) Social skills training (F) Supportive counseling. A brief explanation follows:

A. Befriending therapy

Befriending is basically an emotional supportive relationship in which one-to-one companionship is provided on a regular basis and has been found to be fairly efficacious [44]. Participants are assigned social support to match therapy hours provided in other conditions. Essentially, the intervention consists of friendly discussion or social activities, not directly related to symptoms, involving a supportive and empathic individual. Discussion rather focuses basically on neutral issues, including current affairs or hobbies, or other structured group activities may also be introduced. Befriending has been suggested as an efficacious intervention in reducing symptoms of psychosis [45] [46].

B. Cognitive-behavioral therapy (CBT)

Cognitive behavioral therapy for Psychosis is an evidence-based treatment technique which has been demonstrated to be effective to improve functioning in patients [47].Among the goals of CBT is increased awareness of the links between thoughts, behaviors, and feelings to achieve changes in symptoms and functioning. Therapists target the modification of dysfunctional thoughts and self-defeating behaviors that perpetuate symptoms or suffering. CBT specifically targeting psychosis has been developed primarily since the 1990s and was originally focused on coping with symptoms [48][49], whereas more recent approaches have focused on challenging maladaptive cognitions through cognitive restructuring and a formulation-based approach [50][51][52]. CBT represents the needed shift from a purely behavioural focus to an emphasis on the interaction of cognitions and behavior in psychosocial approaches to managing psychosis [53]

C. *Cognitive remediation*

Cognitive remediation has the potential reduce the burden of cognitive difficulties in psychosis and improve functioning [54] Cognitive dysfunctions have been widely implicated as influential in the development and course of psychosis and have therefore been identified as worthy treatment targets [55].
Cognitive remediation refers to those intervention techniques that target basic cognitive processes, such as working memory, attention, and executive function. This intervention is intended to improve these basic cognitive functions and may also be intended to improve various other aspects of functioning. Computer-based tasks are often the chosen method of implementing cognitive remediation [43].

D. *Psychoeducation*

Psychoeducation involves the provision of pertinent information to participants regarding their diagnosis with the aim of improving their understanding of and coping with their diagnosis [43]. Various psychoeducation methods have been developed for psychosis that go further than provision of basic information and therefore may involve development of coping strategies and role playing. A group format is often utilized, and there is often considerable diversity in what could be termed psychoeducation [43]. The increased effort of integrating families in psychoeducation is gaining momentum and worthwhile too, while isolated patient-focused interventions need further improvement and further research [56].

E. *Social skills training*

Behavioral intervention based on behavioral and social learning traditions in which participants' social functioning is targeted in order to improve their ability to perform in social situations, manage daily life tasks, and reduce social distress [43]. Importance is typically placed on verbal and nonverbal communication alongside learning appropriate perception and responses to social cues. Social skills training consists of learning activities utilizing behavioral techniques that enable persons with schizophrenia and other disabling mental disorders to acquire interpersonal disease management and independent living skills for improved functioning in their communities [57]

F. *Supportive counseling*

Unlike CBT, supportive counseling is a nondirective talking therapy that may be based on the work of Carl Rogers [58] or may simply be described in studies as a nondirective intervention in which participants have an open forum to discuss their difficulties, without being actively led or challenged by the therapist. Supportive counseling was therefore defined as an intervention in which the common factors of psychotherapy were present without the specific techniques applied in other, more directive therapies, such as CBT. The opportunity to discuss problems with an empathic therapist in a healing setting may provide relief for the patient

without any focus on acquiring new skills or challenging cognitive distortions [43]. Supportive counseling is often used as a means of comparing other interventions against the common factors of psychological interventions. [59].

The topic of investigation is 'Comparati8ve Study of Executive Dysfunction in Schizophrenia and Drug-induced Psychosis'. The purpose of the present study is the neuropsychological assessment of executive dysfunction in chronic schizophrenia and drug induced psychosis.
The following are the specific objectives for this research:
1. To examine the degenerative pattern of executive functioning in chronic schizophrenia and drug induced psychosis;
2. To explain the influence of various patient clinical and demographic characteristics on each disorder;
3. To do comparative analyses of differences in group outcomes of executive function dysfunction in drug induced psychosis and chronic schizophrenia;

Hypotheses
1. General cognitive functioning scores of patients will reflect impairment in functioning;
2. There will be differences in group outcomes in inhibition of drug-induced psychosis patients and schizophrenics;
3. There will be differences in group outcomes of working memory, fluency and set shifting deficits in drug-induced psychosis patients and schizophrenics.

METHOD
Sample
A total of 109 participants (n=30 females and n=79 males aged between 18 and 68 years were included in the study. This included a sample consisting of fifty-six Drug-induced Psychosis patients and 53 chronic schizophrenia patients selected after consent was obtained at the In-Patient and Out-Patient departments of Federal Neuropsychiatric Hospital, Benin City; Nigeria. The sample comprised five age-derived cohorts: 18–27, 28–37, 38–47, 48–57, and 58–68 years of age**.**

Instruments
Four instruments were used in this study:
1. Mini-mental state examination (MMSE) 2.Trail Making Test (TMT) 3. Fluency 4. Stroop colour word test (SCWT) See Lawani & Tomar (2022) for details.

***Procedure*:**
Cases were individuals diagnosed with chronic schizophrenia and drug-induced psychosis resulting from the use/abuse of cannabis, alcohol, cocaine or heroin and were recruited after ethical approval from the Federal Neuropsychiatric Hospital, Benin City, Nigeria Ethics Committee was received.. 109 subjects who met inclusion criteria were recruited. DIP and schizophrenic cases were personally administered the mini mental status examination (MMSE), TMT, SCWT and Fluency tasks by this researcher between the months of April, 2021 and January, 2022. Time taken to complete all parts of the test and scores were recorded. Demographic and clinical details were also recorded for all participants. See Lawani & Tomar (2022) for details of instructions to participants.

ETHICAL CONSIDERATION
Ethical clearance was by Research Ethical Committee of Federal Neuropsychiatric Hospital Benin City, Edo State, Nigeria.

Statistical Analysis
All data were evaluated on required statistical techniques with descriptive details. All statistical analyses were conducted using IBM SPSS Statistics version 20.0 (IBM, Armonk, NY, USA)

RESULTS
Table 1 Mean (M) and Standard Deviation (SD) for Study Variables with N=53 (Schizophrenia Group) and N=56 (Drug-induced Psychosis Group)

	Schizophrenia Group		***Drug-induced psychosis Group***	
Variables	**M**	**SD**	**M**	**SD**
MMSE	20.16	6.78	21.16	4.53
TMT Part A	132.52	85.32	100.14	76.92
TMT Part B	243.77	111.76	193.23	89.32
SCWT	1.60	1.88	2.19	2.03
Fluency	15.73	9.22	24.69	7.82
Age	39.41	11.12	32.78	8.97
School Years	13.61	2.03	13.13	2.30
Duration of illness	3.91	7.46	1.65	5.22

Demographics

The mean (*M)* ages and (standard deviations, *SD*) of the schizophrenia cases and drug-induced psychosis cases were *M*=39.41 (*SD=11.12*) and *M*=32.78, (*SD*=8.97) years respectively. Schizophrenics were older than DIP cases. The result showed significant difference between the mean ages of schizophrenics and drug-induced psychosis cases (t=4.33, *P<0.001*). Gender-wise distribution of the sample was 49.06% females, 50.94% males among schizophrenics, 7.1% females, 92.9% males among DIP patients. There was significantly more number of males than females among DIP patients. The mean years of education were comparable: for DIP cases 13.13 (*SD=2.03*) years, schizophrenics 13.61 (*SD=2.30*) years (Table I)

Table No. 2 Comparison of means for schizophrenics and Drug-induced psychosis total MMSE scores

	Test Value = 21.16			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
schizophrenics total mmse score	-1.190	.239	-3.0152	.7708

Table No.3 Comparison of means for schizophrenics and Drug-induced psychosis TMT A scores

	Test Value = 100.1429			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
TMT A scores of schizophrenics	2.763	.008	8.8665	55.9043

Table No.4 Comparison of means for schizophrenics and Drug-induced psychosis and Control Group TMT B scores

	Test Value = 193.2321			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
TMT B scores of schizophrenics	3.292	.002	19.7342	81.3488

Table No.5 Comparison of means for schizophrenics and Drug-induced psychosis Stroop colour word scores

	Test Value = 2.19			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
stroop word colour test score per schizophrenic participant	-2.289	.026	-1.1121	-.0732

Table No.6 Comparison of means for schizophrenics and Drug-induced psychosis total fluency sscores

	Test Value = 24.6964			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
total fluency score per schizophrenic participant	-7.074	.000	-11.5024	-6.4187

Table 7 Comparison of means for schizophrenics and Drug-induced psychosis age in years

	Test Value = 32.7857			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
age of schizophrenic participants in years	4.337	.000	3.5622	9.6966

Table No.8 Comparison of means for Drug-induced psychosis and schizophrenics years of schooling

	Test Value = 13.61			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
drug induced psychosis patients years of schooling	-1.546	.128	-1.0934	.1412

Table No.9 Comparison of means for Drug-induced psychosis and schizophrenics duration of illness in years

	Test Value = 3.91			
	t	*Sig. (2-tailed)*	*95% Confidence Interval of the Difference*	
			Lower	Upper
duration of illness in years of drug-induced pychosis patients	-3.228	.002	-3.6553	-.8550

Schizophrenics versus DIP cases:

There was no significant difference between schizophrenics and DIP cases on the MMSE tasks (t=0.78, P=0.438>0.05) [Table 2]. Schizophrenics took significantly more time (132.52±85.32) than DIP cases (103.90±78.38) (t=2.44, *P* =0.018) .[tables 1 and 3] on Part A of the TMT]. There were significant differences between DIP cases and schizophrenics on Part B of the TMT. Schizophrenia cases (243.77; SD=111.76secs) took significantly more time than DIP cases (193.23; (SD=89.32secs) (t= 3.29, *p=0.002*) [Tables 1 and 4]. Similarly, the Stroop colour word test performance of schizophrenia cases 1.60 (SD=1.88) was significantly worse than DIP cases 2.19 (SD=2.03 (t= 2.28, *p = 0.026)* [Tables 1 and 5]. For total fluency tasks (semantic fluency +polemic fluency +design fluency), schizophrenia cases performed significantly worse (15.73; SD=9.22) than DIP cases 24.69 (SD=7.82) (t= 7.07, *p<0.001*) [see Tables 1 and 6]. There were no significant differences between DIP cases, and schizophrenics on schooling years (t=1.54, *P=0.128>0.05*) [Tables 1 and 8]. There were significant differences between the duration of illness for schizophrenics *M*=3.91 (*SD=7.46*) and DIP cases *M=1.65* (*SD=5.2*) (t=3.22, *P=0.000*) [Tables 1 and 9[.

Table 10 Pearson r product moment coefficients between age and TMT B scores drug-induced psychosis patients.

		age of Drug induced psychosis patients in years	TMTB SCORE OF Drug induced psychosis patients
age of Drug induced psychosis patients in years	Pearson Correlation	1	.416**
	Sig. (2-tailed)		.001
	N	56	56
TMT B scores of Drug induced psychosis patients	Pearson Correlation	.416**	1
	Sig. (2-tailed)	.001	
	N	56	56

**. Correlation is significant at the 0.01 level (2-tailed).

Table .11 Pearson r product moment coefficients between age and TMT B scores schizophrenia patients

		age of participants in years	TMT B SCORE OF PARTICIPANTS
age of participants in years	Pearson Correlation	1	.350*
	Sig. (2-tailed)		.010
	N	53	53
TMT2 SCORE OF SCHIZOPHRENICS	Pearson Correlation	.350*	1
	Sig. (2-tailed)	.010	
	N	53	53

*. Correlation is significant at the 0.05 level (2-tailed).

A Pearson product-moment correlation was run to determine the relationship between: age and TMT B score of drug-induced psychosis patients. [Table 7] age and fluency score of drug-induced psychosis patients [Table 8] The result of the Pearson r correlation coefficients showed that: age significantly correlated with TMT B scores of drug-induced psychosis patients (r= .416, n=56, p<.01) and age significantly correlated with fluency scores of drug-induced psychosis patients (r= .379, n=56, p<.01).

Table 12: Regression analysis showing age as positive predictor of TMT B scores of drug-induced psychosis patients

Model		t	Sig.	95.0% Confidence Interval for B	
				Lower Bound	Upper Bound
1	(Constant)	1.373	.175	-26.425	141.255
	age of Drug induced psychosis patients in years	3.365	.001	1.675	6.611

a. Dependent Variable: TMT B SCORE OF Drug induced psychosis patients

Table .13 Regression analysis showing age as positive predictor of fluency scores of drug-induced psychosis patients

Model	t	Sig.	95.0% Confidence Interval for B	
			Lower Bound	Upper Bound
(Constant)	9.525	.000	28.044	42.996
age of Drug induced psychosis patients in years	-3.008	.004	-.550	-.110

a. Dependent Variable: TOTAL FLUENCY SCORE Drug induced psychosis patients

Regression analyses were performed to test for effects of different demographic variables on MMSE, TMT, SCWT, and Fluency among cases. Variables selected for analyses were age, duration of illness and school years. Analysts showed that patients' scores on Part B of the TMT were positively predicted by age, DIP (t=3.36, *p=0.001*) and schizophrenics' (t=2.48, *p*=0.016) [Table 10]; DIP patients' scores on fluency tasks were positively predicted by age and duration of illness: (t=3.00, *P=0.004*); (t=2.19, *p*=0.32).

Discussion

DIP patients have a gender distribution that is at variance with that of schizophrenia patients. Further research is required to determine what factors render females less prone to drug use disorders. There was no significant difference between schizophrenics and DIP cases on the MMSE tasks.. This result shows that schizophrenics and drug-induced psychosis patient samples are at par in general cognitive functioning. This may suggest the efficacy of the mini mental status examination as a tool for monitoring and characterizing changes in cognitive strengths and weaknesses over time in order to precisely gauge the treatment response and functional recovery status of the patients [60].. Schizophrenics took significantly more time on Parts A and B of the TMT. There were significant differences between schizophrenics and DIP cases on Part B of the TMT. As well, schizophrenia patients performed significantly poorer than DIP patients in the Stroop colour word test. These results show that both clinical cases are high on impulsivity and low on inhibitory control in agreement with earlier reports [3][20]

On the fluency tasks, schizophrenics performed statistically significantly worse than DIP cases. This result suggests that schizophrenia cases display a higher level of dysfunction in planning and organizational skills than DIP cases while their psychotic episode lasts. Further research is required to explain why DIP patients are unable to hold a job or continue schooling throughout the course of their illness whereas schizophrenia patients can still work or attend school while receiving treatment [61]. Also the findings suggest that psychopharmacological treatment of schizophrenics may need to focus more on redressing dysfunction in impulsivity/inhibitory control mechanism and dysfunction in planning and organizational brain systems. Results show that DIP is more prevalent among the younger generation than schizophrenia for the sample under investigation. Age-derived cohort analysses show that 32.1% of DIP patients fall within (18-27) years of age whereas 17.2% of schizophrenics fall within the same group. Again, 41.1% of DIP cases lie in the (28-37) year's cohort whereas 30.2% of schizophrenics fall within the same age bracket, i.e. 73.2% to 47.2%.. This may suggest that the authorities should provide more employment opportunities to the youths and review existing drug laws to include stiffer penalties for offenders [4]

Research/Clinical implications: The findings from this study tend to suggest that the MMSE and the various subtests of D-KEFS employed in this study demonstrate reasonable sensitivity in distinguishing many different types of heritable and acquired psychotic conditions. Clinicians and researchers can therefore consider administering specific parts of the D-KEFS or combination of subtests and the MMSE good choice of instruments for the assessment of executive function [62].

There are some limitations of this study. The neuropsychological measures used in our study were cross-sectional with a relatively large sample. Using a broader study sample diagnosed with substance-induced psychosis and schizophrenia will lead to more observations and a more accurate result and improve its generalization. Again, the research was performed in just one psychiatric hospital in the south-south of Nigeria. Future research may consider including psychiatric facilities from other geopolitical zones of Nigeria in order to increase validity and better generalization

ACKNOWLEDGMENT

Firstly, we acknowledge the grace and gift of life from the Almighty God and Jesus Christ, our Source and Sustainer. We owe immense gratitude to the following personalities for their constructive criticisms, suggestions, moral, spiritual and logistical support that ensured successful completion of this study: Dr Imafidon Agbonile, Medical Director, FNPH, Benin City, Nigeria; Dr Ambrose Lawani, Head Forensic Unit; Dr Afolabi Aroyewun B. Dept of Psychology, University of Lagos, Nigeria; Pastor Jeremiah Agbidi, Director of Psychiatric Nursing and Barr. F.C. Oliseh, OPD Manager of FNPH. Others include Ward Managers and Psychiatric Nurses FNPH, Benin City, Nigeria; and all participants

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

REFERENCES

1. T. Bhatia, K. Garg, M. Pogue-Heile, V. L. Nimgasonkar, and S. N. Deshpande. Executive functions and cognitive deficits in schizophrenia: Comparisons between probands, parents and controls in India. J Postgrad Med 2009;55:3-7.

2. S. Goldstein, J. A. Naglieri, D. Princiotta, and T. M. Otero. Introduction: A History of Executive Functioning as a Theoretical and Clinical Construct. (2014) in: Goldstein S., Naglieri J. (eds) Handbook of Executive Functioning. Springer, New York, NY. [Google Scholar]

3. H. R. Snyder, A. Miyake, and B.L. Hankin Advancing understanding of executive function impairments and psychopathology: bridging the gap between clinical and cognitive approaches. Front. Psychol. 6:328. doi: 10.3389/fpsyg.2015.00328.
4. A. I. Jatau, A. Sha'aban, K.A. Gulma, Z. Shitu, G. W. Khalid, A. Isa, ., … Mustapha, M. The Burden of Drug Abuse in Nigeria: A Scoping Review of Epidemiological Studies and Drug Laws. Public Health Rev 42:1603960. doi: 10.3389/phrs.2021.1603960.
5. M.B. Jurado, and M. Rosselli The elusive nature of executive functions: a review of our current understanding. Neuropsychol Rev 2007; 17 (3): 213– 233. doi:10.1007/s11065-007-9040-z. [PubMed] [Google Scholar].
6. A. Miyake, N.P. Friedman,M.J. Emerson, A.B. Witzki, A. Howerter, and T.D. Wager, The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. Cogn Psychol [Internet]. 2000;41(1):49–100. Available from: pmid:10945922 PubMed/NCBI [Google Scholar].
7. 7. C. Wray, A. Kowalski, F. Mpondo, L. Ochaeta, D. Belleza, A. DiGirolamo, et al. Executive functions form a single construct a and are associated with schooling: Evidence from three low- and middle- income countries. 2020 PLoS ONE 15(11): e0242936. https//doi.org/10.1371/journal.pone.0242936.
8. T.S. Braver, D.M. Barch, and Cohen, J. D. Cognition and control in schizophrenias: A computational model of dopamine and prefrontal function. Biological Psychiatry1999,46:312-328,.
9. S. Hosenbocus, and R. Chahal A Review of Executive Function Deficits and Pharmacological Management in Children and Adolescents J Can Acad Child Adolesc Psychiatry. 2012 Aug; 21(3): 223–229. [PubMed] [Google Scholar.
10. H.J. Ferguson, V.E.A. Brunsdon and E.E.F. Bradford The developmental trajectories of executive function from adolescence to old age. Sci Rep 11, 1382 (2021). https://doi.org/10.1038/s41598-020-80866-1.
11. C. Blair, Developmental Science and Executive Function Curr Dir Psychol Sci. 2016 Feb 1; 25(1): 3–7. doi: 10.1177/0963721415622634 PMCID: PMC4789148 NIHMSID: NIHMS741195 PMID: 26985139.
12. B Williams, J. Merson and S. hale Individual Differences, Intelligence and Behaviour Analysis *Journal of the Experimental Analysis of Behaviour 2008 Sep 80(2)* [Google Scholar].
13. G.D. Rabinovici, M.L. Stephens and K. L. Possin. Executive Dysfunction Continuum (Minneap Minn). 2015 Jun; 21(3 Behavioral Neurology and Neuropsychiatry): 646–659. doi: 10.1212/01.CON.0000466658.05156.54.
14. S. Ham, K.T. Kim, S. Chung and H. Im, Drug Abuse and Psychosis: New Insights into Drug-induced Psychosis Exp Neurobiol. 2017 Feb; 26(1): 11–24. Published online 2017 Feb 7. doi: 10.5607/en.2017.26.1.11 PMCID: PMC5326711 PMID: 28243163.
15. N.S. Narayanan, V. Prabhakaran, S.A. Bunge, K. Cristoff, E.M. Fine, and J.D. Gabrieli The role of the prefrontal cortex in the maintenance of verbal working memory: an event-related FMRI analysis. Neuropsychology. 2005;19:223-32.
16. A.D. Arafat, and M. Shoquirat Executive Functions among Substance-Induced Psychotic Patients in Jordan: A Clinical Neuropsychological Study Dirasat, Human and Social Sciences, Volume 46, No. 2, Supplement 1, 2019.
17. M. Ikeda, Y. Okahisa, B. Aleksic, *et al.* Evidence for Shared Genetic Risk Between Methamphetamine-Induced Psychosis and Schizophrenia. *Neuropsychopharmacol* **38,** 1864–1870 (2013). https://doi.org/10.1038/npp.2013.94
18. 18. S. Ham, T. K. Kim, S. Chung, and H. Im Drug Abuse and Psychosis: New Insights into Drug-induced Psychosis *Exp Neurobiol. 2017 Published online 2017 Feb 7.* doi: 10.5607/en.2017.26.1.11 [Pubmed] [Google Scholar]
19. D.T. Stuss and D.F. Benson The Frontal Lobes. New York, NY: Raven Press, 1986.
20. P. Ratiu and I.F. Talos Images in clinical medicine: The tale of Phineas Gage. New England Journal of Medicine, 2004 351(23), e21.PubMedCrossRefGoogle Scholar.

21. J. Martino, P. De Witt Hamer, F. Vergani and C. Brogna, et al. Cortex-sparing fiber dissection: an improved method for the study of white matter anatomy in the human brain Journal of Anatomy a 2011 Anatomical Society of Great Britain and Ireland 219, pp531–541.
22. 22 V. Kulhalli, M. Isaac and P. Murthy Cannabis-related psychosis: Presentation and effect of abstinence. Indian J Psychiatry [serial online] 2007 [cited 2021 May 12];49:256https://www.indianjpsychiatry.org/text.asp?2007/49/4/256/37665
23. J.Y. Jung, M. Visser, R. J. Binney and
24. M.A. L. Ralph Establishing the cognitive signature of human brain networks derived from structural and functional connectivity. *Brain Struct Funct* **223,** 4023–4038 (2018). https://doi.org/10.1007/s00429-018-1734-x
25. R.E. Lawani and S. Tomar Executive Dysfunction in Chronic Schizophrenia *International Journal of Indian Psychology* 2022 10(2) 110-130 https//www.ijip.in dip:18.01.063.20221002; doi:10.25215/1002.063
26. H. Ujike. Stimulant-induced psychosis and schizophrenia: The role of sensitization. *Curr Psychiatry Rep* **4,** 177–184 (2002). https://doi.org/10.1007/s11920-002-0024-7 [Google Scholar]
27. A. Fiorentini, L.S. Vonloteri, F. Dragogna, C. Roveraa,M. Maffini, C.M. Mauri, and C.A. Altamum. Substance-Induced Psychoses: A Critical Review of the Literature December 2011 Current Drug Abuse Reviews 4(4):228-40 DOI:10.2174/1874473711104040228 Source PubMed.
28. A.A. Beberian, A. Gadelha, N.M.Dias, T.P. Mecca, W.E. Comfort, and R.A. Bressan, Component mechanisms of executive function in schizophrenia and their contribution to functional outcomes. braz J psychiatry. 2018;00:000-000. http://dx.doi.org/10.1590/1516-4446-2018-0021.
29. 28. United Nations Office on Drugs and Crime (UNODC). (2019). World drug report 2019. Available at: https://wdr.unodc.org/wdr2019/en/exsum.html (Accessed 03 18, 2020). In Abubakar, I.J et al (2021) The Burden of Drug Abuse in Nigeria: A Scoping Review of Epidemiological Studies and Drug Laws [Google Scholar].
30. United Nations Office on Drugs and Crime, 2018). Drug use in Nigeria. Available at: https://www.unodc.org/documents/data-andanalysis/statistics/Drugs/DrugUseSurveyNigeria_2019_BOOK.pdf. [Google Scholar]
31. K. Butler, N. Sindicich and L. Burns Young people drug use and risk behaviours *researchgate.net July 2015 doi:10.13140/RG.2.1.4882.5442*
32. J.C.L.M Duijkers, W.M. Vissers, J.I.M. Egger Unraveling executive
    a. functioning in dual diagnosis. Front Psychol. 2016; 7: 979.
        i. pmid:27445939 [PubMed]
33. T. Goschke Dysfunction of decision-making and cognitive control as transdyagnostic mechanisms of mental disorders: advances and needs International Journal of Methods in Psychiatric Research VOL. 23 Isue S1 p. 41-57 2014 wiley online Library
34. N. P. Friedman and A. Miyake, The relations among inhibition and interference control functions: a latent-variable analysis. J Exp Psychol Gen 2004; 133 (1): 101– 135. doi:10.1037/0096-3445.133.1.101. [PubMed] [Google Scholar].
35. T. Rabanea-Souza, et al. Neuropsychological correlates of remission in chronic schizophrenia subjects: The role of general and task-specie executive processes. core.ac.uk 2016 [Google Scholar].
36. WHO ICD-10 Version: 2016, F20.
37. 36. R. C. Bland Psychiatry and the burden of mentak ikkness *Canadian Journal of Psychiatry 1998*
    i. *https//doi:.org/10.1177/07067437980430* [PubMed]
38. N.C. Andreason and S. Olsen Negative and positive schizophrenia: Definition and Validation *Arch Gen Psychiatry 1982* [PubMed]
39. S. Levin, D. Yurgelin,-Todd and S. Craft Contributions of clinical neuropsychology to the tudy of schizophrenia *J Abnorm Psycho.* 1989 Nov 98(4)341-56 [PubMed]
40. E. Walker and K.Tessner Schizophrenia *Perspectives on Psychologicak Science* 2008 3(1), p. 30-37 *JSTOR,* https//www,jstor.org/stable/40212225 [Google Scholar]
41. R. L. Suddath, G. W. Christison, E. F. Torrey, M. F. Casanove, and D. R. Weinberger Anatomical abnormalities in the brains of monozygotic twins discordant for schizophrenia *N Engl J Med* 1990 322(12) 789-94 doi: 10.1056/nejm19903223221201 [PubMed]
42. S. Sabhesan and S. Parthasarathy Executive functions in schizophrenia *Indian Journal of Psychiatry* 2005 vol. 47 Issue 1 p.21-26 doi: 10.4103/00195545.46069
43. 42. G. N Savla, E. W Twamley,. D. C Delis,., C. Roesch,D. Jeste, and B. Palmer, Dimensions of Executive Functioning in Schizophrenia and Their Relationship With Processing Speed Schizophrenia Bulletin, Volume 38, Issue 4, 18 June 2012, Pages 760–768, https://doi.org/10.1093/schbul/sbq149.
44. D. T. Turner, M. van der Gaag, E. Karyotaki and P .Cuijpers, Psychological Interventions for Psychosis: A Meta-Analysis of Comparative Outcome Studies *Am J Psychiatry 2014; 171:523–538)*
45. J. Siette, M. Cassidy, and S. Priebe Effectiveness of befriending interventions: A systematic review and meta-analysis April 2017 BMJ Open 7(4):e014304 DOI:10.1136/bmjopen-2016-014304
46. D. Milne, S. Wharton, I. James D. Turkington: Befriending versus CBT for schizophrenia: a convergent and divergent fidelity check. *Behav Cogn Psychother 2006; 34:25–30*
47. Y. Landa, Cognitive Behavioral Therapy for Psychosis (CBTp) An Introductory Manual for Clinicians https://www.mirecc.va.gov/visn2/docs/CBTp_Manual_VA_Yulia_Landa_2017

[Google Scholar]
48. N. Tarrier L. Yusupoff, C. Kinney, E. McCarthy, A. Gledhill, G. Haddock and J.Morris: Randomised controlled trial of intensive cognitive Am J Psychiatry 171:5, May 2014 ajp.psychiatryonline.org 535 TURNER, VAN DER GAAG, KARYOTAKI, ET AL.behaviour therapy for patients with chronic schizophrenia. BMJ 1998; 317:303–307
49. S. Lewis, N. Tarrier, G. Haddock, R.P. Bentall. Kinderman , D. Kingdon, R. Siddle, R. Drake, J. Everitt, K. Leadley, A. Benn, K.Grazebrook, C. Haley, S. Akhtar, L. Davies, S. Palmer, B. Faragher, and G. Dunn: Randomised controlled trial of cognitive-behavioural therapy in early schizophrenia: acute-phase outcomes. Br J Psychiatry Suppl 2002; 43:s91–s97
50. L.R. Valmaggia , M. van der Gaag , N. Tarrier, M. Pijnenborg, and C.J. Slooff: Cognitive-behavioural therapy for refractory psychotic symptoms of schizophrenia resistant to atypical antipsychotic medication: randomised controlled trial. Br J Psychiatry 2005;186:324–330
51. D.G. Kingdon, and D. Turkington: Cognitive Therapy of Schizophrenia (Guides to Individualized Evidence-Based Treatment). New York, Guilford Press, 2008
52. 51 J.M. Gold: Cognitive deficits as treatment targets in schizophrenia. Schizophr Res 2004; 72:21–28 [Google Scholar]
53. C. R. Rogers: Client-Centered Therapy: Its Current Practice, Implications, and Theory. Boston, Houghton Mifflin, 1951
54. B.E. Wampold: The Great Psychotherapy Debate: Models, Methods, and Findings. Mahwah, NJ, Routledge, 2001
55. R.L Hayes, W.K Halford, and F.T:Varghese Social skills trainingwith chronic schizophrenic patients: effects on negativesymptoms and community functioning. Behav Ther 1995; 26:433–449
56. G.E Hogarty, C.M Anderson, D.J Reiss, S.J Kornblith, D.P Greenwald, C.D Javna, M.J Madonia: Family psychoeducation,social skills training, and maintenance chemotherapy in the after-care treatment of schizophrenia, I: one-year effects of a controlled study on relapse and expressed emotion. Arch Gen Psychiatry 1986; 43:633–642
57. G.E Hogarty, C.M Anderson, D.J Reiss, S.J,Kornblith D.P Greenwald, R.F,Ulrich and M. Carter; Environmental-Personal Indicators in the Course of Schizophrenia (EPICS) Research Group: Family psychoeducation, social skills training, and maintenance chemotherapy in the aftercare treatment of schizophrenia, II:two-year effects of a controlled study on relapse and adjust-ment. Arch Gen Psychiatry 1991; 48:340–347
58. A. Kopelowicz, R.P. Liberman, and R. Zarate Recent Advances in Social Skills Training for Schizophrenia
59. *Schizophr Bull. 2006 Oct; 32(Suppl 1): S12–S23.*
    i. *doi: 10.1093/schbul/sbl023 PMCID:*
    ii. *PMC2632540 PMID: 16885207*
60. T.M.Lincoln K.Wilhelm and Y.Nestoriuc Effectiveness of psychoeducation for relapse, symptoms, knowledge,
61. adherence and functioning in psychotic disorders: A meta-analysis *Schizophrenia Research Volume 96, Issues 1–3,*
    a. *November 2007, Pages 232-245*
62. 59. W.P Horan, R.S Kern, K. Shokat-Fadai, M.J,Sergi J.K Wynn, and M.F Green: Social cognitive skills training in schizophrenia: an initial efficacy study of stabilized outpatients. Schizophr Res 2009; 107:47–54
63. 60. Harvey, D. H. (2012) Clinical applications of neuropsychological assessment Dialogues Clin Neurosci. 2012 Mar;
64. 14(1): 91–99. doi: 10.31887/DCNS.2012.14.1/pharvey PMCID:
    a. PMC3341654 PMID: 22577308 [Google Scholar]
65. 61. W.P Horan, R.S. Kern , C. Tripp ,G. Hellemann , J.K. Wynn , M. Bell, S.R. Marder, and M.F. Green : Efficacy and specificity of social cogni-tive skills training for outpatients with psychotic disorders. J Psychiatr Res 2011; 45:1113–1122
66. 62. Y. Chan, Validation of the Delis-Kaplan Executive Function System (D-KEFS) in participants with Traumatic Brain Injury University of Birmingham Research Archive e-theses repository online resource 16/8/2021.[Google Scholar]