

ORIGINAL ARTICLE

**FACTORS AFFECTING EXECUTIVE FUNCTIONS IN  
PATIENTS RECOVERED FROM ACUTE AND  
TRANSIENT PSYCHOTIC DISORDER**

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**Abstract**

**Objectives:** Executive function is an important cognitive function affected in many psychiatric disorders but limited data is available regarding its course in patients recovered from acute and transient psychotic disorder. The aim of this study was to assess the executive function of recovered patients of acute and transient psychotic disorder and to evaluate different factors affecting the executive function of patients recovered from acute and transient psychotic disorder. **Method:** This was a non-invasive, one point, comparative study where the executive function was assessed after clinical recovery from acute and transient psychotic disorder. The patients were divided into two groups (poor and fair) on the basis of their executive performance. Retrograde analyses of different factors affecting executive performance were carried out. **Results:** A total of 28 patients had undergone assessment on Wisconsin Card Sorting Test (WCST) out of which 13 patients had poor and 15 patients had fair executive performance. The fair executive performance group had shorter duration of psychosis, male preponderance and more years of education. **Conclusion:** Average duration of psychosis seems to be a reliable predictor of better or poor executive functioning. *ASEAN Journal of Psychiatry, Vol. 15 (2): July – December 2014: 196-204.*

**Keywords:** Acute and Transient Psychotic Disorder, Executive Function, WCST, Average Duration of Psychosis

**Introduction**

Non-affective, transient psychotic disorders of acute to sudden onset are classically described as “Acute and Transient Psychotic Disorder (ATPD)” in International Classification of Diseases, 10<sup>th</sup> edition, 1993 [1]. The Diagnostic and Statistical Manual – 4<sup>th</sup> edition, text revision of American Psychiatric Association (DSM-IV-TR) mentions it as “brief psychotic disorder” [2]. Like any other psychiatric illness (may it be schizophrenia or bipolar affective disorder or obsessive compulsive disorder or attention deficit hyperkinetic disorder) [3 - 13], cognitive

dysfunction occurs during the illness course of acute and transient psychotic disorder. The ICD-10 diagnostic criteria for acute and transient psychotic disorder also mentions symptoms suggesting cognitive distortion which are – *perplexity, misidentification, emotional turmoil, impairment of attention & concentration, disorganized thinking process leading to incomprehensible or incoherent speech* [1]. Existing evidences state – acute and transient psychotic disorder usually recovers completely [14]. A question arises spontaneously: *Does cognitive deficits persist after recovery from acute and transient psychotic disorder?* There is scarcity of

literature regarding cognitive dysfunction in recovered patients of acute and transient psychotic disorder. Executive functions include managing body movement (motor function), emotions, focused attention, motivation, and other thinking functions such as decision-making, judgment, abstract reasoning, planning and completing tasks, working memory, and meeting goals [15 -17]. It is commonly affected in various psychiatric disorders.

The Card-sorting tests are frequently used to assess executive functioning. These tests assess the subject's ability to attain, to maintain, and to shift cognitive set. Executive skills are most important in dealing with novel or complex situations [18 - 19]. Physiologically, executive function is linked to the cortical-sub cortical circuits and frontal lobes which can be assessed by Wisconsin Card Sorting Test [18 - 20]. In our previous study on assessment of neurocognitive functions in recovered patients of acute psychosis, we found that the patients show varied performance in the neurocognitive functions [21]. That was a two point assessment of neurocognitive functions following recovery from acute psychosis. There might be some attributing factors which resulted in differential improvement of neurocognitive functions including the executive functions. Hence it was planned to analyze different factors that might have attributed to poor or fair executive performance on Wisconsin Card Sorting Test.

## **Methods**

This study was aimed at assessing the executive functions and analyzing different factors attributing to impairment in executive functions in recovered patients of acute and transient psychotic disorder. This was a non-invasive one point study where the executive functions were assessed after clinical recovery from acute and transient psychotic disorder. The tools used for assessment were - Semi structured Proforma for socio- demographic and clinical details, Standard Progressive Matrices (SPM) for IQ assessment, Computer based Neuro-cognitive Test – WCST for assessment of executive function, International Classification of Diseases – 10 – Diagnostic

Criteria for Clinical Research, 1993 (ICD-10, DCR, 1993) for making diagnosis of acute and transient psychotic disorder and Brief Psychiatric Rating Scale (BPRS) for assessing the psychopathology. Patients diagnosed to be suffering from acute and transient psychotic disorder (as per ICD – 10 – DCR,1993) fulfilling selection criteria, were recruited from the outpatient department of Psychiatry, King George's Medical University, Lucknow (India) between "September 2009" to "July 2010". Patients diagnosed to be suffering from acute and transient psychotic disorder (as per ICD – 10 – DCR, 1993) with minimum 8 years duration of formal education and age between 18 to 55 years were included in the study after obtaining informed consent. Those patients with - history of any other psychiatric illness in the past, medical illnesses that were likely to cause cognitive impairment and intellectual disability were excluded from the study.

As the assessment of executive function was done on computer based WCST, patients with physical problems which would render study measure difficult or impossible to administer or interpret e.g. blindness, hearing impairment were excluded from the study.

Both newly registered as well as follow up patients were recruited in the study. Patients were prescribed appropriate psychotropic medications. During follow up visits, patients were also assessed by clinical interview and on Brief Psychiatric Rating Scale (BPRS). Patient's clinical recovery was also correlated with the scores of different items of BPRS which denote for psychotic manifestations (i.e: conceptual disorganization, mannerisms & posturing, suspiciousness, hallucinatory behavior, motor retardation, unusual thought content and blunted affect).

After at least seven consecutive, psychotic symptom free days (in this study, the working definition of recovery was – seven consecutive days psychotic symptom free interval), the patients were subjected to cognitive assessment on a mutually convenient day. During the follow up visits, patients were assessed clinically and if they were found to be recovered completely from psychotic symptoms were assessed by Standard Progressive Matrices for IQ. Those having IQ

of more than 70 were assessed on computer based WCST. Patients were asked to remain drug free on the day WCST was to be administered. On the basis of executive performances on WCST, the patients were divided into two groups (group with fair performance and poor performance respectively). Both the groups were compared on different demographic variables & other illness related factors, which were likely to affect the executive functions, and were analyzed. For statistical analysis, chi-square test and student's t – tests were applied using the statistical software SPSS (16.0 version).

### Results

A total of 180 patients were screened out of which 118 patients were excluded and the major reason for exclusion was not satisfying the education criteria. From the group of 62 included patients, assessment was possible on 28 patients because of reasons like withdrawal of consent, or missing the follow up visits.

Majority of patients were below the age of 25 years with an average of  $11.79 \pm 2.15$  years of education. In the sample population, males and females were equal in number. Majority of sample population belong to middle socioeconomic strata of rural background with high rate of unemployment. All the sample populations were Hindu, majority were

unmarried and belong to nuclear family. The patient's intelligence was assessed on SPM and majority were having intelligence level of grade – III or above.

The illness was acute in onset (54%) and without any obvious stressor (71%) in majority of the patients. The average duration of the episode of acute psychosis was  $6.61 \pm 1.83$  weeks and assessment of executive function on WCST was done after  $10.64 \pm 6.73$  weeks following recovery from the illness. The sample was divided into two groups: (i) group with fair executive function, and (ii) group with poor executive function.

On distribution, six was the median of “number of categories completed” in WCST, hence it was considered as the demarcating mark for fair and poor executive function. Patients who had completed less than six categories in the WCST, were considered having poor cognitive function and rest of the patients (who had completed at least six categories or above) were considered as having fair cognitive function. There were 15 patients in the group with fair executive function and 13 patients in the group with poor executive function. When the “Group with fair executive function” was compared with the “Group with poor executive function”, there was significant difference in all parameters of WCST and most of the differences were extremely significant (Table 1).

**Table 1. Comparison of findings of Wisconsin Card Sorting Test (WCST) between the “Group with fair executive function” and the “Group with poor executive function”**

Parameters (mean $\pm$ standard deviation)	Group with fair executive function [n=15]	Group with poor executive function [n=13]	Test of significance (unpaired t test)
Trials administered	$95.53 \pm 12.78$	$128.00 \pm 0$	-
Percentage (%) of total no of errors	$21.13 \pm 3.92$	$39.23 \pm 13.90$	$p < 0.0001, t=4.839, df=26$
Percentage (%) of preservative responses	$10.00 \pm 1.60$	$27.85 \pm 14.06$	$p < 0.0001, t=4.895, df=26$
Percentage (%) of perseverative errors	$9.73 \pm 1.39$	$22.85 \pm 10.58$	$p < 0.0001, t=4.769, df=26$

Percentage (%) of non-perseverative errors	11.20±4.24	16.54±8.03	p=0.0336, t=2.244, df=26
Percentage (%) of conceptual level responses	73.86±5.50	47.92±19.71	p< 0.0001, t=4.895, df=26
Categories completed	6.00±0	3.00±1.47	-
Trials to complete 1 <sup>st</sup> category	14.40±4.22	36.31±34.42	p=0.0213, t=2.451, df=26

In the “Group with fair executive function”, there was male preponderance (53%), majority were educated more than 10 years (67%), unemployed (87%), unmarried (53%), belonging to middle socio-economic status (67%), nuclear family (67%) of rural background (60%). Majority (89%) of patients

had intelligence of grade III or above with average BPRS score of 20.27±2.09. The average duration of the psychotic episode being 5.8±1.32 weeks and assessment of executive function was done after an average of 10.53±6.25 weeks (Table 2 & 3).

**Table 2. Comparison of demographic variables**

Variables	All patients (n=28)	Group with fair executive function (n=15)	Group with poor executive function (n=13)	Tests of significance
<b>Age (Years)</b>				
18-25 Years	23 (82%)	12 (80%)	11 (85%)	$\chi^2=0.1011$ , P=0.7505, df=1
>25 Years	5 (18%)	3 (20%)	2 (15%)	
Mean age (in years)	22.39±3.80	23.33±4.53	21.31±2.50	P=0.1652, t=1.428, df=26
<b>Education (Years)</b>				
Up to 10 Years	12 (43%)	5 (33%)	7 (54%)	$\chi^2=0.5056$ , p=0.4771, df=1
>10 Years	16 (57%)	10 (67%)	6 (46%)	
Mean education (in years)	11.79±2.15	11.87±2.23	11.69±2.14	P=0.8299, t=0.2170, df=26
<b>Gender</b>				
Male	14 (50%)	8 (53%)	6 (46%)	$\chi^2=0.1436$ , p=0.7047, df=1
Female	14 (50%)	7 (47%)	7 (54%)	
<b>Socio economic status</b>				
Lower	10 (36%)	5 (33%)	5 (39%)	$\chi^2=0.07977$ , p=0.7776, df=1
Middle	18 (64%)	10 (67%)	8 (61%)	
<b>Employment status</b>				
Unemployed	22 (79%)	13 (87%)	9 (69%)	$\chi^2=0.4351$ , p=0.5095, df=1
Employed	6 (21%)	2 (13%)	4 (31%)	
<b>Domicile</b>				
Rural	19 (68%)	9 (60%)	10 (77%)	$\chi^2=0.3031$ , p=0.5819, df=1
Urban	9 (32%)	6 (40%)	3 (23%)	

Marital status				
Unmarried	18 (64%)	8 (53%)	10 (77%)	$\chi^2 = 0.8169$ , df=1, p=0.3661
Married	10 (36%)	7 (47%)	3 (23%)	
Religion				
Hindu	28 (100%)	15 (100%)	13 (100%)	-
Non-Hindu	0 (0%)	0 (0%)	0 (0%)	
Family structure				
Joint	5 (18%)	5 (33%)	0 (0%)	$\chi^2=3.248$ , p=0.0715, df=1
Nuclear	23 (82%)	10 (67%)	13 (100%)	

In the “Group with poor executive function”, there was female preponderance (54%), majority were educated up to 10 years (54%), unemployed (69%), unmarried (77%), belonging to middle socio-economic status (61%), nuclear family (100%) of rural background (77%). All patients had intelligence of grade III or above with average BPRS score of 20.08±1.71. The average duration of the psychotic episode being

7.54±1.94 weeks and assessment of executive function was done after an average of 10.77±7.51 weeks (table 2 & 3). On comparison of clinical subtypes of Acute and transient psychotic disorder between the “Group with fair executive function” and “Group with poor executive function”, no statistically significant difference was found (table 4).

**Table 3. Comparison between other illness related parameters**

Parameters	All Patients (n=28)	Group with fair executive function (n=15)	Group with poor executive function (n=13)	Test of significance
<b>Intelligence</b>				
Grade - I	0 (0%)	0 (0%)	0 (0%)	$\chi^2=1.197$ , p=0.2740, df=1 [Grade-I +II vs Grade-III+IV]
Grade - II	3 (11%)	3 (20%)	0 (0%)	
Grade - III	10 (36%)	5 (33%)	5 (38%)	
Grade - IV	15 (53%)	7 (47%)	8 (62%)	
<b>BPRS score</b>				
Mean ±S.D	20.18±1.89	20.27±2.09	20.08±1.71	p= 0.7964, t=0.2606, df=26
Average duration of psychosis (in weeks)	6.61±1.83	5.8±1.32	7.54±1.94	<b>p=0.0093, t=2.807, df=26</b>
Average duration between recovery and assessment (in weeks)	10.64±6.73	10.53±6.25	10.77±7.51	p=0.9272, t=0.09232, df=26
<b>Onset</b>				
Acute	15 (54%)	7 (47%)	8 (62%)	$\chi^2=0.1657$ , p=0.6840, df=1
Sudden	13 (46%)	8 (53%)	5 (38%)	
<b>Stressor</b>				
Present	8 (29%)	4 (27%)	4 (30%)	$\chi^2=0.05744$ , p=0.8106, df=1
Absent	20 (71%)	11 (73%)	9 (70%)	

**Table 4. Clinical subtypes of acute and transient psychotic disorder in groups with fair & poor executive function**

Clinical subtype of acute psychosis (As per ICD-10, DCR, 1993)	Group with fair executive function (n=15)	Group with poor executive function (n=13)	Test of significance
F23.0 (Acute polymorphic psychotic disorder without symptoms of schizophrenia)	2	2	$\chi^2=0.4308$ , $p= 0.5116$ , $df=1$ (comparison of F23.8 with other clinical subtypes of acute and transient psychotic disorder)
F23.2 (Acute schizophrenia-like psychotic disorder)	3	0	
F23.8 (Other acute and transient psychotic disorders)	10	11	

## Discussion

Executive function is an important cognitive function which is largely regulated by the frontal lobe of the brain [22]. Cognition, especially executive functioning, is affected in various psychiatric illnesses. There is scarcity of literature regarding status of executive function in patients of acute and transient psychotic disorder, particularly in patients following recovery from illness. This is possibly because, acute and transient psychotic disorder is commonly prevalent in developing countries [14] and the facility to assess the executive function is not available in most settings of developing countries. Hence this study was planned to assess the executive function in recovered patients of acute and transient psychotic disorder and to analyze different factors that affect the executive function.

In the present study, out of 180 screened patients 118 patients were excluded, majority being not satisfying the education criterion (which was set as minimum 8 years of formal education), so that the patient could understand the computerized form of the test. Other causes of exclusion were “past history of psychiatric illness”, “not meeting the age criteria”, “positive family history of psychiatric illness”, “substance abuse” and “significant medical illness”. Due to drop outs or consent withdrawal or incomplete recovery by the time of termination of study complete assessment was possible in 28 out of 62 patients. These 28 patients formed sample of the study.

The executive function of 28 patients was assessed after clinical recovery from acute and transient psychotic disorder. There is no well accepted definition of recovery in acute and transient psychotic disorder as it is a transient psychotic illness which usually subsides between 1 to 3 months (1 month for clinical subtype - Acute polymorphic psychotic disorder with symptoms of schizophrenia [F23.1] and Acute schizophrenia-like psychotic disorder [F23.2] and 3 months for the remaining clinical subtypes of acute and transient psychotic disorder) [1]. As per the working definition of the study, clinically recovered patient should remain psychotic symptom free for seven consecutive days which should be clinically replicated from different items of BPRS denoting the psychotic symptoms (i.e: conceptual disorganization, mannerisms & posturing, suspiciousness, hallucinatory behavior, motor retardation, unusual thought content and blunted affect).

The sample group with fair executive function was compared with those having poor executive function on different parameters of WCST. The difference was extremely significant ( $p < 0.0001$ ) in WCST parameters like - % of total no of errors, % of perseverative responses, % of perseverative errors and % of conceptual level responses. The group with fair executive function had completed an average of  $6.00 \pm 0$  categories where as the group with poor executive function had completed an average of  $3.00 \pm 1.47$  categories. Similarly number of trials administered by the poor executive

function group ( $128.00 \pm 0$ ) outnumbered the fair executive function group ( $95.53 \pm 12.78$ ).

As there was significant difference between two groups, there must be some factors that were likely to favor recovery of executive function in the group with fair executive function and some factors causing hindrance in recovery of the same in the group with poor executive function.

The demographic variables were compared and analyzed. The differences in age, gender, years of education, socio-economic status, employment status, domicile, marital status, family structure, level of intelligence were not significant. The group with fair executive function had more patients (67%) with more than 10 years of education in comparison to the poor executive function group where there were more patients (54%) with 10 or less years of education. Similarly the fair executive function group had more patients of urban background (40%) in comparison to poor executive function group patients (23%). One possible reason could be that the urban population had more accessibility to health care services than the rural population which might have resulted in early diagnosis and treatment attributing to get better cognitive outcome.

The fair executive function group had more married patients (47%) in comparison to the poor executive function group (23%). 33% patients in the fair executive function group belonged to joint family whereas none of the patients in the poor executive function group belonged to joint family. The psychosocial support system was stronger in the joint family and in married people, which might be one of the possible reasons for better cognitive recovery.

The group with fair executive function in comparison to that with poor executive function had higher levels of intelligence (grade I and III). Though the difference was not significant, having a higher level of intelligence was more likely associated with better executive functioning.

Analysis of illness factors showed no significant difference between the mode of onset and association of stressor between the

two groups but the group with fair executive function had more illnesses with sudden onset (53%) as compared to the other group (38%). There was no significant difference in the "BPRS scores" and "average duration between recovery & assessment of executive function". The BPRS scores in both the groups were just above 20 (minimum possible BPRS score is 18) which were due to very mild anxiety or somatic complaints.

The average duration of the psychotic episode in the group with fair executive function was  $5.8 \pm 1.32$  weeks which were significantly lower than the group with poor executive function, where the average duration of the psychotic episode was  $7.54 \pm 1.94$  weeks. So it can be concluded that longer duration of psychosis has a greater impact on the brain and hence resulting in poorer executive functioning. The duration of psychotic episode was the only parameter which significantly differed between the two groups. After extensive web search, to the best of our knowledge, there is no study available in this particular area. The findings of this study cannot be generalized due to limitations like small sample size, drug effects were not nullified and pre-morbid executive functioning of the patients were not known. However this study opens a lot of scope for further research in this area.

## **Conclusion**

Acute transient psychotic disorder is not uncommon diagnosis in clinical practice. Research evidences favor complete clinical recovery and good outcome. The recovery of cognitive domains including executive functions also improve parallel however there may occur individual variations, i.e. few patients improve significantly and others may lag behind. Our study gives a preliminary idea about different possible factors that might be responsible for the differential improvement in executive function. Average duration of psychosis seems to be a reliable predictor of better or poor executive functioning, which is the most significant finding of the study. An extensive research is required in this domain in the near future.

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