



**ORIGINAL RESEARCH PAPER**

**Psychiatry**

**COMPARATIVE ASSESSMENT OF EXECUTIVE FUNCTION, VISUAL LEARNING AND COGNITIVE FLEXIBILITY AMONG INDIVIDUALS WITH ALCOHOL DEPENDENCE SYNDROME AND NON-ALCOHOLICS**

**KEY WORDS:**

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**ABSTRACT**

**INTRODUCTION:** Alcohol generally considered as a central nervous system depressant, in large doses it functions like general anaesthetic. It impairs the executive function, visual and cognitive flexibility to a greater extent  
**OBJECTIVE:** To compare the executive function, visual learning and cognitive flexibility among individuals with alcohol dependence syndrome with non alcoholics.  
**METHODOLOGY:** Based on the inclusion and exclusion criteria, 60 subjects were chosen. Out of whom 30 were control group and 30 were experimental group. Neuropsychological test batteries including Rey Osterrieth complex figure test (ROCF), The Trail Making Test (TMT) and Stroop colour test were conducted. Alcohol Use Disorder Identification Test and Severity of Alcohol Dependence Questionnaire (SADQ) were also used.  
**RESULTS:** Alcohol dependent individuals significantly represented poor executive function, visual learning and cognitive flexibility when compared with non alcoholic counter parts.  
**CONCLUSION:** Meticulous testing reveals early signs of impairment of executive functions and other parameters in alcohol dependence individuals, which may not be evident in day to day life. Hence they have been given suitable advice to abstain from alcohol to prevent further worsening of symptoms with the best outlook for reversal in the course of time.

**INTRODUCTION**

India is one of the fastest growing alcohol markets in the world. Rapid increase in urban population, sizable middle class population with rising spending power, and a sound economy are certain significant reasons behind increase in consumption of alcohol in India. Many of the impulsive suicidal attempts occurred in intoxicated state, otherwise they will not attempt for trivial problems. (Simon et al, 2005, Meir et al, 2005). Alcohol affects the attendance in occupational setup due to hangover, withdrawal effects and associated complications. It affects the occupational well being of the person. Alcohol is the main harbinger of the quarrels in road sides and in domestic violence. Many of the crimes occurs under the influence of alcohol. Thus alcohol affects the mental, physical and social integrity of an individual. (Rafael et al, 2011, Christopher et al, 1998, Karen et al, 2012)

Alcohol intake impairs the executive function to a greater extent. Executive function is the ability to maintain an appropriate mental set in order to fulfil a future goal. The components of executive function are planning, filtering competing information, maintain a goal and excluding other irrelevant things from the goal. Many times executive function discussed under the heading of intelligence quotient, but actually they are partially overlapping separate entities, because, in lesions of frontal lobe executive function is affected much, but intelligence quotient is relatively stable (Glass et al, 2009, Gary et al 2012). Along with executive function, visual learning and cognitive flexibility is also affected. Thus the present study was conducted to assess the same.

**METHODS AND MATERIALS**

**SELECTION OF THE LOCALE AND SAMPLES**

The study is conducted in Department of psychiatry, Government Rajaji hospital, Madurai. The institutional ethical committee approval was obtained prior to the conduct of the study. The patient was chosen from inpatients who were admitted in deaddiction unit of Dept of psychiatry. Controls were recruited from the non alcoholic relatives of the patients in deaddiction ward and medicine ward. Based on the inclusion and exclusion criteria 30 cases and 30 controls were chosen. The purpose of the study was explained to the

participants in regional language. Oral as well as written consent was obtained before the conduct of the study.

**CONDUCT OF NEUROPSYCHOLOGICAL TEST BATTERY:**

Neuropsychological assessment was carried out to assess the extent of impairment in particular skill and to attempt to determine the area of the brain which is impaired. A core part of neuropsychological assessment is the administration of neuropsychological tests for the formal assessment of cognitive function. It is essential that neuropsychological assessment also include an evaluation of the person's mental status. The following tests were administered for all the subjects.

**1. REY OSTERRIETH COMPLEX FIGURE TEST (ROCF)**

A complex figure task was developed by Andre Rey (1941; most recently translated by Corwin & Bylsma, 1993b) to examine both perceptual processing and visual memory in brain-damaged individuals. Paul alexander Osterrieth (1944; translated by Corwin and Bylsma, 1993b) standardized Rey's procedure and provided a numerical scoring system based on the presence or absence of structural elements in the individual's reproduction of the figure. The Rey-Osterrieth Complex Figure Test remains a central test in the practice of neuropsychology (Lezak, 1995). AsBoone (2000) notes, the ROCF has become one of the most commonly used neuropsychological tests in both clinical and research paradigms, and it is referenced in over 200 publications.

**2. THE TRAIL MAKING TEST (TMT)**

The Trail Making Test (TMT) is one of the most popular neuropsychological tests and is included in most test batteries. The TMT provides information on visual search, speed of processing, scanning, mental flexibility, and executive functions.

The Trail Making Test consists of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the patient should draw lines to connect the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letter (A – L); as in Part A, the patient draws lines to connect the circles in an ascending pattern, but with the added task of alternating between the numbers and letters.

**3. STROOP COLOURTEST**

The Stroop task is included in many neuropsychological batteries as a measure of selective attention. This brief five minute test is applicable for those between the ages of 15 and 90. It assesses cognitive processing and provides valuable diagnostic information on brain dysfunction, cognition, and psychopathology. This test measures the ease with which a perceptual set can be shifted both to conjoin changing demands and by suppress a habitual response in favor of an unusual one. The pre frontal areas are essential for response inhibition.

**SCORING, INTERPRETATION AND STATISTICAL ANALYSIS**

The above neuropsychological tests were administered, scoring done according to the standard procedure as per the manual. The scores thus obtained were tabulated, analyzed and interpreted. SPSS 20 is used for statistical analysis. Correlation analysis was used to correlate various test findings and alcohol related parameters.

**RESULTS AND DISCUSSION**

**TABLE - I MEAN SCORE OF REY OSTERRIETH COMPLEX FIGURE COMPLETION TEST**

| Variables            | Alcohol dependence | Non alcoholics | p value |
|----------------------|--------------------|----------------|---------|
| Rey copy             | 35.06±1.57         | 34.83±1.60     | 0.594   |
| Rey Immediate recall | 26.50±5.54         | 29.63±4.06     | 0.024*  |
| Rey delayed recall   | 26.60±6.45         | 29.30±4.40     | 0.063   |

\*Significant at 5% level; \*\* significant at 1% level

The table depicts that the mean score of Rey Osterrieth complex figure completion test. Alcohol dependent group scored 35.06, 26.50 and 26.60 in Rey copy, immediate recall and delayed recall respectively; while the non - alcohol group scored 34.83, 29.63 and 29.30 in Rey copy, immediate recall and Delayed recall respectively. There is a significant difference between two groups in immediate recall phase.

**TABLE - II MEAN TIME TAKEN TO COMPLETE TRIAL MAKING TEST**

| Variables | Alcohol Dependence | Non Alcoholics | p Value  |
|-----------|--------------------|----------------|----------|
| Trail A   | 61.00±26.38        | 52.73±19.57    | 0.149    |
| Trail B   | 107.80±39.60       | 63.20±15.79    | 0.0001** |

\*Significant at 5% level; \*\*significant at 1% level

Trail making A and B were administered to obtain scores on information processing speed, visual scanning, working memory and executive functioning. The mean time taken to complete trial A were 61 and 52.72 seconds while trial B were 107.80 and 63.20 second by alcohol dependent and non - alcohol dependent group respectively. There is significant difference between two group at 1% level in performance of trail B test.

**TABLE - III MEAN SCORE OF STROOP TEST RESULTS**

| Variable | Alcohol dependence | Non alcoholics | p value |
|----------|--------------------|----------------|---------|
| Stroop 1 | 83.33±19.30        | 92.90±10.08    | 0.023*  |
| Stroop 2 | 48.50±11.71        | 51.80±9.63     | 0.191   |
| Stroop 3 | 29.43±9.65         | 37.23±13.05    | 0.021*  |

\* Significant at 5% level; \*\* significant at 1% level

Stroop test 1, 2 and 3 were administered to both alcohol and non - alcohol dependent group. The mean score were 83.33, 48.50 and 29.43 in alcohol dependent group in Stroop 1, 2 and 3 while it was 92.90, 51.80 and 37.23 in non-alcohol group. There is significant difference in Stroop I and III results at 5% level.

**TABLE IV CORRELATION BETWEEN DAILY INTAKE, QUANTITY OF ALCOHOL, SADQ, AUDIT SCORE, TOBACCO USE AND VARIOUS NEUROPSYCHOLOGICAL TESTS**

|                    | Rey Ostreich Copy | Rey Ostreich Immediate Recall | Rey Ostreich Delayed Recall | Trial A         | Trial B         |
|--------------------|-------------------|-------------------------------|-----------------------------|-----------------|-----------------|
| Daily Intake       | -0.098<br>0.607   | 0.070<br>0.712                | 0.0003<br>0.999             | 0.206<br>0.274  | -0.090<br>0.636 |
| Quantity (alcohol) | 0.041<br>0.830    | 0.286<br>0.125                | 0.240<br>0.202              | 0.084<br>0.660  | -0.208<br>0.270 |
| Sadq Score         | -0.422*<br>0.020  | 0.222<br>0.239                | 0.305<br>0.101              | 0.030<br>0.875  | -0.083<br>0.664 |
| Audit Score        | -0.301<br>0.106   | 0.193<br>0.306                | 0.337<br>0.068              | -0.107<br>0.575 | 0.049<br>0.797  |
| Tobacco Use        | -0.128<br>0.500   | -0.017<br>0.929               | 0.100<br>0.600              | -0.043<br>0.822 | -0.023<br>0.904 |

After screening with AUDIT score, SADQ was applied. Scores categorized and compared with test results. Karthikeyan and Ithayamalar, 2018 reported that around 50, 22 and 23 per cent of the subjects were found to be mild, moderate and severe alcohol dependent respectively. An attempt was made to derive correlation between various alcohol related parameter like duration of alcohol intake, daily intake, audit score, SADQ score and various neuropsychological tests. Significant correlation was found between SADQ score and Rey ostreich copy phase. There existed an inverse correlation between SADQ and the ROC. That is whenever there is an increase in score of the SADQ, there is poor performance in the test. Significant negative correlation between daily alcohol intake and Stroop III test was observed.

**CONCLUSION**

Meticulous testing reveals early signs of impairment of executive functions and other parameters in alcohol dependence individuals, which may not be evident in day to day life. Hence they have been given suitable advice to abstain from alcohol to prevent further worsening of symptoms with the best outlook for reversal in the course of time.

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