

Learning and Memory Function of Alcohol Dependent Patients and Normal Controls: A Comparative Study

Rohit Ranjan¹, Manglesh Kumar Manglam²

¹Department of Psychology, Lovely Professional University, Punjab, India

²Department of Psychological Sciences, Central University of South Bihar, Gaya, India

Corresponding Author: Manglesh Kumar Manglam

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ABSTRACT

Background: Alcoholism is a worldwide public health issue. The third leading cause of death globally is alcohol dependent. Numerous research conducted on patients with alcohol dependent have revealed deficits in cognitive abilities, including attention, information processing, learning, memory, and executive function.

Aim: The aim of the study was to investigate the relationship between learning and memory of alcohol dependent patients.

Materials and Methods: The sample comprised 40 alcohol-dependent patients, aged 18 to 50, who were chosen by the purposive sampling technique, and 40 healthy normal controls, who were matched for age and education with the alcohol-dependent group and had a General Health Questionnaire-12 score of less than three. After obtaining an informed consent, the details of socio-demographic information were taken. The Alcohol dependence scale and Rey Auditory Verbal Learning test was administered. The study was approved by ethical committee of the University.

Results and conclusion: Alcohol dependent patients showed deficit in immediate recall, delayed recall and recognition. The recognition score was positively correlated with family history of alcohol dependent.

Keywords: Alcohol dependent, Learning, Memory

INTRODUCTION

Alcohol dependence is a worldwide public health problem. Alcohol dependence is related to maladaptive behaviour that results in the persistent, compulsive, and uncontrolled use of alcohol. Alcohol dependence is the third leading cause of death worldwide (Hall, 2012). There was a strong correlation between the degree of alcoholism and family history. There was a substantial inverse relationship between harshness and age at the beginning of start. According to Johnson et al. (2010), the impact of family history on the rate at which problem drinking developed did not achieve

statistical significance for those with an early age of onset.

Singh et al. (2008) employed the PGI Battery of Brain Dysfunction on a sample of thirty male alcoholics. In comparison to the non-alcoholic group, the alcoholic group's mean dysfunctional rating score was shown to be considerably higher across all factors. The fact that the alcoholic group did poorly on measures of IQ and memory further supports the theory that prolonged alcohol consumption worsened cognitive decline.

Pitel et al. (2009) state that memory, executive functioning, and visuospatial skills are only a few of the cognitive

processes that are negatively impacted by excessive alcohol use.

Alcoholic patients showed impaired executive functions combined with below-normal performance on both free and delayed recall (Noel et al., 2012).

A sample of 21 alcohol-dependent patients, 12 alcohol-dependent patients with affective illness, and nine healthy controls were included in a study conducted by Lee et al. (2015). The outcomes demonstrated that the group with mood disorders and alcohol dependence had worse visual learning and memory.

Alcohol-dependent patients had poor conceptual ability than their first-degree relatives or normal controls. Alcohol-dependent patients demonstrated significant impairment of abstract ability, error utilization and persuading goal-directed behaviour (Jha & Sinha, 2015).

A study conducted by Verdejo-Garcia et al. (2019) reported that people with substance use disorders have moderate impairment in memory, attention, and executive functions.

Vijay et al. (2023) conducted an observational, analytical case-control study using a sample of thirty alcohol-dependent patients who had stabilised and twenty-five healthy controls. The findings demonstrated substantial cognitive deficits in alcohol-dependent people, primarily in the areas of working memory, high impulsivity, and executive functions.

Sullivan et al. (2002) found mild to moderate impairment of executive functions, visual spatial abilities, and the presence of balance disorders in their study of the cognitive functioning of alcohol-dependent subjects. Meanwhile, other studies (Oscar-Berman and Marinkovic, 2003) note that declarative memory, language skills, and primary perceptual and motor abilities are retained, and others (Kopera et al., 2012; Le Berre et al., 2014; Sullivan et al., 2000a) report deficits in spatial learning, short-term memory, and the inhibitory control of reactions and decision-making.

MATERIALS & METHODS

Aim: The aim of the present study was to investigate the relationship between learning and memory of alcohol dependence patients.

Objective:

To find the learning and memory functions in patients with alcohol dependent patients as compared to normal healthy controls.

Hypothesis:

There would be significant difference in learning and memory functions in patients with alcohol dependent as compared to the normal healthy controls.

Sample:

The sample for the study was selected from Disha Dee-addiction center an NGO situated at Phulwari Shariph (Patna). The sample consisted of 40 male alcohol dependent patients as per the diagnostic criteria of research (DCR) of the International Classification of Diseases (ICD-10), aged between 18 and 50 years, with a minimum educational qualification of at least the 6th standard, selected by purposive sampling technique, and 40 normal healthy controls selected from the general population matched for age and education status to the alcohol dependent patients and General Health Questionnaire (GHQ-12) scores less than three.

Tools:

Socio-demographic and Clinical Data Sheet:

To capture demographic and clinical variables including age, education, marital status, occupation, mode of onset, age of started alcohol intake, duration of alcohol intake, family history of substance intake and types of alcohol intake, a socio-demographic and clinical data sheet was created especially for the current study.

Rey Auditory Verbal Learning Test (RAVLT):

Rey Auditory Verbal Learning Test (RAVLT): The Rey Auditory Verbal

Learning Test is a brief, easily administered paper and pencil test that assesses immediate memory span, new learning, susceptibility to interference, and recognition memory. The original version was developed by Rey (1964). The Rey Auditory Verbal Learning Test (Schmidt, 1966), adapted for different cultures by WHO (Maj et al., 1994), was adapted to suit conditions in India. Over a one-year period, the test-retest reliability has been found to be 0.55 (Snow et al., 1988). Reliability is found to be low when a different version of the test is used (Crawford et al., 1989).

General Health Questionnaire-12:

General Health Questionnaire-12 was developed by Goldberg and William in 1988. The purpose of administered this scale to normal controls is to rule out any mental illness. The General Health Questionnaire has 12 items; the GHQ-12 is a condensed form of the questionnaire with a cut-off score of three or higher. Because it takes less time, the shortened version is a more effective screening tool.

PROCEDURE:

Patients and normal controls giving informed consent were selected on the basis of inclusion/exclusion criteria (after administering GHQ-12 to the normal controls).

In the first contact, the patient's clinical history and sociodemographic details were assessed. After that, the Rey Auditory Verbal Learning Test was administered. The normal control group would also be assessed with a similar test for the study. The study was approved by the ethical committee of the university.

STATISTICAL ANALYSIS:

The statistics package for social sciences (SPSS) version 20 for Windows was used to analyse the data that had been gathered. For continuous variables, the mean and SD were computed using descriptive statistics. A t-test for independent samples was employed to compare the continuous variable. The level of significance was kept at $p < 0.05$.

RESULTS

Table 1: Socio demographic characteristics of alcohol dependent patients and normal healthy controls (N= 40)

Variables		Normal healthy controls N(40)	Alcohol dependent patients N (40)	
Marital status	Married	25 (62.50)	17 (42.5)	
	Unmarried	14 (35.0)	23 (57.5)	
	Others	1 (2.5)	0 (0)	
Occupation	Employed 24 (60)	24 (60)	20 (50)	
	Unemployed	16 (40)	20 (50)	
Types of family	Joint 34 (85)	34 (85)	26 (65)	
	Nuclear 6 (15)	6 (15)	14 (35)	
Variable	Alcohol dependent (N= 40) mean \pm SD	Normal healthy controls (N= 40) Mean \pm SD	t (df=78)	p
Age in years	31.60 \pm 9.276	31.08 \pm 8.639	.262	.644
Education	12.55 \pm 3.537	13 \pm 2.828	.682	.471

Out of 40 normal healthy control 25 (62.5%) percent were married; 14 (35.0%) were unmarried and 1 (2.5%) percent divorced. Out of 40 alcohol-dependent patients 17 (42.5%) percent were married and 23 (57.5%) were unmarried. Out of 40 normal healthy control 24 (60%) were employed and 16 (40%) were unemployed, and in the patient population 20 (50%) were employed and 20 (50%) were unemployed. Out of 40 normal healthy control 34 (85%)

were joint family and 6 (15%) were nuclear family, and in the patient population 26 (65%) were joint family and 14 (35%) were nuclear family. The mean and SD of age of alcohol dependent patients was found to be 31.60 ± 9.276 years and normal healthy control was found to be 31.08 ± 8.639 years. Mean and SD of education of alcohol dependent patients was found to be 12.55 ± 3.537 years and normal healthy control was found to be 13 ± 2.828 years. There was no

statistically significant difference between groups in terms of age and education. the alcohol dependent and normal control

Table 2: Alcohol intake related parameters of alcohol dependent patients (N= 40)

Variable	Mean ±SD	
Started age of alcohol intake (in years)	20.98 ± 6.85	
Duration of alcohol intake (in years)	10.58 ± 7.50	
Minimum amount of alcohol intake (in ml)	253.75 ± 145.20	
Maximum amount of alcohol intake (in ml)	445.50 ± 251.96	
Variables	n (%)	
Family history of mental illness	Yes	4 (10)
	No	36 (90)
Alcohol dependent in family	Yes	17 (42.5)
	No	23 (57.5)
Types of alcohol intake	Foreigner	34 (85)
	Others	6 (15)

The mean and SD of started age of alcohol intake was found to be 20.98 ± 6.85years. The mean and SD of duration of alcohol intake was found to be 10.58 ± 7.50 years, Mean and SD of minimum amount of alcohol intake was found to be 253.75 ± 145.20 ml and maximum amount of alcohol

intake was found to be 445.50 ± 251.96 ml per day. Out of 40 patients 4 (10%) had family history of mental illness, 17 (42.5%) had alcohol dependent in the family. Out of forty 34 (85.5 %) patients had taken a foreign brand of alcohol and 6 (15%) had taken all types of alcohol.

Table 3: Comparison of RAVLT performance between alcohol dependent patients and normal healthy controls (N= 40)

RAVLT	Alcohol dependent patients	Normal healthy controls	t (df=78)	Level of significance
	Mean & SD	Mean & SD		
RAVLT list A- trial 1	5.53 ± 1.76	6.78 ± 1.67	3.249**	.002
RAVLT list A- trial 2	7.05 ± 1.93	8.25 ± 1.41	3.171**	.002
RAVLT list A- trial 3	8.23 ± 2.52	9.15 ± 1.79	1.889*	.063
RAVLT list A- trial 4	8.4 ± 2.54	9.50 ± 1.88	2.201*	.031
RAVLT list A- trial 5	9.18 ± 2.60	10.18 ± 1.73	2.022*	.047
Total score of list A	37.55 ± 9.4	43.95 ± 7.5	3.365**	.001
List B-immediate recall	4.65 ± 1.87	6.18 ± .931	4.608***	<.001
List A- delayed recall	7.37 ± 2.57	8.65 ± .2225	2.415*	.018
Recognition list- A	11.35 ± 3.017	14.45 ± .815	6.273***	<.001

*p<.05 level (2-tailed) **p<.01 level (2-tailed), ***p<.001level (2-tailed), RAVLT: Rey Auditory Verbal Learning Test

Patient group had significant lower score in RAVLT list A trial- 1 (t=3.49, df= 78, p<.01), RAVLT list A- trial 2 (t= 3.171, df=78, p< .01), RAVLT list A- trial 3 (t=1.88, df=78, p<.05), RAVLT list A- trial 4 (t= 2.201, df= 78 , p<.05), RAVLT list A- trial 5 (t= 2.022, df= 78, p<.05), total score of list A (t= 3.365, df= 78, P<.001), RAVLT list B immediate recall (t= 4.608, df= 78, p<.001), RAVLT list A delayed recall (t= 2.415, df= 78, p<.05), RAVLT Recognition of list A (t= 6.273, df= 78, p<.001).

DISCUSSION

The aim of the study was to investigate the relation between learning and memory functions of alcohol dependence patients. The mean and SD of age in years of alcohol dependent patient were found to be (31.60±9.27). The mean and SD of age in the year of normal healthy control were found to be 31.00 ± 8.68. The mean and SD of education in the year of alcohol-

dependent patient were found to be 12.55 ± 3.54 years. The mean and SD of education for normal healthy control were found to be 13 ± 2.83 years. Other researchers concurred with the findings (Jha and Sinha, 2015). Normal control and alcohol-dependent patients with educational attainment of at least the 6th standard were selected. Numerous investigations corroborate these conclusions (Neol et al., 2012; Jha and Sinha, 2015). The mean age at which people began drinking alcohol was 20.98 ± 6.85 years. A similar age of starting alcohol intake was noted in a study by Lee et al. (2015). The duration of alcohol intake in the patients' population was found to be 10.58 ± 7.50 years. Almost similar results were noted in a study by Jha and Sinha (2015).

The Rey Auditory Verbal Learning Test (RAVLT) was used in this study to assess memory and learning. When alcohol-dependent patients and normal, healthy controls were compared for learning and memory performance on the RAVLT test, it was found that alcohol-dependent patients showed a deficit in immediate recall. Immediate memory is the ability to remember a small amount of information over a few seconds. When the delayed recall scores of alcohol-dependent patients and normal, healthy controls were compared, the alcohol-dependent patient scored the lowest. Delayed recall is the ability to remember something after a period of rest or distraction ranging anywhere from minutes to days.

When the results of learning and memory recognition were compared between alcohol-dependent patients and normal healthy controls, it was found that alcohol dependent patients had the low score in recognition. The capacity to identify previously encountered persons, objects, or events is known as recognition. This shows that the alcohol-dependent patients had a significant difference from healthy control of learning and memory. Our capacity to encode, store, retain, and then recall and retrieve previously stored information and

experiences is known as memory. The results are consistent with the majority of research (Noel et al., 2012; Verdejo-Garcia et al., 2019; Vijay et al., 2023) that have found widespread impairment in nearly every domain of learning and memory function, i.e. recognition, delayed recall, and immediate recall.

CONCLUSION

Learning and memory impairments were evident in the alcohol-dependent patients. Patients with alcohol dependence were found to have impairments in recognition delayed recall, and immediate recall. Our study's shortcomings include a small sample size and no representation of female participants.

Declaration by Authors

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