

THE EFFECTS OF ALCOHOL AND CANNABIS ON NEUROCOGNITIVE FUNCTIONS

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ABSTRACT

Clinical evidence observed that the long-term use of cannabis may lead to cognitive impairment in the higher cognitive functions. Additionally, research has revealed the presence of neurocognitive deficits in chronic heavy alcohol users. The present study aimed to compare the deficit in executive function and memory in patients with alcohol and cannabis dependence syndrome. Method: The present study is a cross-sectional design conducted at Shree Guru Gobind Singh Tricentenary (SGT) Hospital, Gurugram, Haryana. 30 patients with alcohol dependence and another 30 patients with cannabis dependence were selected using the purposive sampling method. To measure memory and executive function, the Wisconsin Card Sorting Test, the Stroop Colour Word Test, and the PGI Memory Scale were administered to all 60 participants. Results: There is a significant difference in attention and concentration, non-perseverative errors and percent non-perseverative errors and Stroop word between cannabis and alcohol dependence patients. Conclusion: The present study confirms the pivotal role of executive function deficit in patients with alcohol and cannabis dependence syndrome.

Keywords: alcohol, cannabis, stroop, WCST, memory scale, executive function.

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INTRODUCTION

Clinical evidence indicates that the long-term use of cannabis may produce cognitive impairment in the higher cognitive functions of memory, attention, and organization, as well as in the integration of complex information (Sadock, et al., 2015). Previous studies have reported cognitive deficits in

alcohol dependence patients, which include short-term memory deficits (Knight & Longmore 1994) and executive function deficits (Noel et al. 2001). Tamm et al. (2013) examined 42 cannabis users and reported that individuals who began using cannabis regularly before age 16 may have poorer

executive functioning than users who began later. Indlekofer et al. (2009) examined the cognitive functioning of 284 participants with alcohol and cannabis. Participants were administered neuropsychological tests which consists of memory, executive function test (WCST and Stroop test) and observed poor executive function. Chronic heavy users of alcohol (Bsates & Bowden, 2002) have shown neurocognitive deficits in earlier research. Furthermore, studies indicate that the early-onset cannabis users exhibit poorer cognitive performance than late-onset users (Pope et al. 2001). Furthermore, there is a deficit in attention, concentration, memory and executive functions in individuals with alcohol and cannabis dependence (Solowij et al., 2011). There is a dearth of studies on adult cannabis and alcohol dependence, and to overcome the limitations of existing literature, the present study is an attempt to identify the difference in cognitive deficits between alcohol and cannabis dependence, which further contributes to a better treatment plan.

METHODOLOGY

Sample

The present study is a cross-sectional design conducted at Shree Guru Gobind Singh Tricentenary (SGT) Hospital, Gurugram, Haryana. 30 patients with alcohol dependence and another 30 patients with cannabis dependence were selected using the purposive sampling method. The present study aimed to compare the executive function and memory in patients with alcohol and cannabis dependence syndrome. With the inclusion criteria of AUDIT and CUIDT scores of 8 and above. The diagnosis of alcohol and cannabis dependence was made according to the ICD-10 DCR criteria. The study hypothesised that there will be no significant difference in executive function and memory in patients with alcohol and cannabis dependence syndrome.

Tools Used

The Alcohol Use Disorder Identification Test (AUDIT) (Saunders et al., 1993) is a 10-item screening tool developed by the World Health Organization (WHO) to assess alcohol consumption, drinking behaviours, and alcohol-related problems. The cannabis use disorder identification test (Adamson et al., 2010), CUDIT-R, is a 10-item self-report questionnaire to classify individuals with cannabis-related problems. The Wisconsin Card Sorting Test (Heaton, 1981) is a test to assess abstract reasoning ability and the ability to shift cognitive strategies in response to changing environmental contingencies. The Stroop Colour-Word Test (Golden, 2002) measures the relative speed of reading words, naming colours, and identifying the colours used to print an incongruous colour name. The stroop test has traditionally been viewed as a measure of executive functioning in response inhibition. The PGI Memory Scale (Prasad and Wig, 1977), or PGIMS, includes verbal and non-verbal material and measures remote, recent, and immediate short-term, very short-term, intermediate-term, and long-term memories.

Procedure

After getting permission from the Institutional Ethics Committee. Those patients who fulfilled the inclusion and exclusion criteria were selected for the study. Written informed consent was taken from the patient after explaining the objectives of the study. Those who scored 8 and above in AUDIT and CUDIT were administered the PGI Memory Scale, Stroop Colour Word Test and Wisconsin Card Sorting Test. Data was analysed using the Statistical Package for the Social Sciences (SPSS) version 16.0. Descriptive statistics were analysed for socio-demographic variables. To identify the difference in executive function and memory between the cannabis and alcohol groups, an independent

sample 't' test was analysed.

RESULTS

Table-1: Socio-demographic characteristics of the cannabis and alcohol dependence patients.

Variables		Cannabis dependence Mean $\pm$ SD, n(n%) n=30	Alcohol dependence Mean $\pm$ SD, n(n%) n=30
Age		28.03 $\pm$ 6.64	39.13 $\pm$ 8.92
Duration of illness		6.60 $\pm$ 3.27	15.46 $\pm$ 8.97
Age of onset		21.43 $\pm$ 5.07	23.70 $\pm$ 6.61
Marital status	Unmarried	22(73.3%)	8 (26.7%)
	Married	8 (26.7%)	22 (73.3%)
Religion	Hindu	28(93.3%)	30 (100%)
	Muslim	2(6.7%)	0 (0%)
Education	Undergraduate	19(63.3%)	17(56.7%)
	Graduate	9(30%)	9 (30.0%)
	Postgraduate	2(6.7%)	4 (13.3%)
Occupation	Employed	7(23.3%)	10 (33.3%)
	Unemployed	15(50.0%)	5 (16.7%)
	Self-employed	8(26.7%)	15 (50.0%)
SES	Lower	2(6.7%)	4 (13.3%)
	Middle	26(86.7%)	24 (80.0%)
	Upper	2(6.7%)	2 (6.7%)
Gender	Male	30(100%)	30 (100%)
Habitat	Rural	11(36.7%)	14 (46.7%)
	Urban	19(63.3%)	16 (53.3%)
Family type	Nuclear	22(73.3%)	25(83.3%)
	Joint	8(26.7%)	5 (16.7%)

Table-1: Shows the descriptive statistics of sociodemographic variables. The mean age of the alcohol group was higher than the cannabis group. The alcohol group had a longer illness duration and older onset age than the cannabis group. The groups had more unmarried patients. The cannabis group had more undergraduates than the alcohol group. Most of the alcohol and cannabis group were part of the nuclear family type. Similarly, most of the alcohol and cannabis group were from urban backgrounds.

Table-2 Comparisons of memory functions between cannabis and alcohol dependence patients.

Variable	Mean $\pm$ SD Cannabis	Mean $\pm$ SD Alcohol	t	df	p
Remote Memory	7.56 $\pm$ 0.62	7.06 $\pm$ 1.22	1.688	58	.097
Recent Memory	4.70 $\pm$ 0.53	4.33 $\pm$ 1.06	1.690	58	.096
Mental Balance	7.26 $\pm$ 1.63	6.63 $\pm$ 1.62	1.501	58	.139
Attention & Concentration	11.63 $\pm$ 4.70	7.63 $\pm$ 3.88	3.594	58	.001*
Delayed Recall	5.13 $\pm$ 1.07	4.56 $\pm$ 1.27	1.859	58	.068
Immediate Recall	8.60 $\pm$ 1.92	8.03 $\pm$ 2.18	1.065	58	.291
Retention SP	4.73 $\pm$ 0.52	4.46 $\pm$ 0.57	1.889	58	.064
Retention DP	13.26 $\pm$ 2.54	12.13 $\pm$ 3.14	1.533	58	.131
visual Retention	8.50 $\pm$ 3.11	7.13 $\pm$ 3.08	1.708	58	.093
Recognition	8.83 $\pm$ 1.36	8.26 $\pm$ 1.50	1.526	58	.133

Table-2: Shows the comparisons of memory functions between cannabis and alcohol dependence patients using an independent sample t-test. There is a significant difference between cannabis and alcohol dependence patients in attention and concentration ($p < .001$).

Table-3: Comparison of WCST scores between cannabis and alcohol dependence Patients.

Variable	Mean $\pm$ SD Cannabis	Mean $\pm$ SD Alcohol	t	df	p
Number of trials Administered	170.07 $\pm$ 16.50	123.67 $\pm$ 11.39	-1.803	58	.077
Total number correct	69.30 $\pm$ 8.77	66.63 $\pm$ 14.34	.869	58	.389
Total Number of Errors	47.60 $\pm$ 18.79	56.07 $\pm$ 18.49	-1.900	58	.062
Percent Error	40.46 $\pm$ 13.28	45.00 $\pm$ 13.10	-1.330	58	.189
Perseverative Responses	28.96 $\pm$ 14.00	32.50 $\pm$ 12.70	-1.023	58	.310
Percent Perseverative Responses	23.76 $\pm$ 9.69	25.90 $\pm$ 9.25	-.872	58	.387
Perseverative Errors	26.40 $\pm$ 12.66	30.06 $\pm$ 10.79	-1.207	58	.232
Percent Perseverative Errors	21.93 $\pm$ 8.48	23.86 $\pm$ 7.85	-.916	58	.364
Non-Perseverative Errors	20.73 $\pm$ 9.70	27.66 $\pm$ 14.00	-2.229	58	.030*
Percent non- Perseverative Errors	17.10 $\pm$ 6.89	22.03 $\pm$ 10.60	-2.136	58	.037*
Conceptual level Responses	51.46 $\pm$ 19.53	49.93 $\pm$ 19.71	.303	58	.763
Percent conceptual level responses	44.13 $\pm$ 19.30	40.93 $\pm$ 17.72	.662	58	.511
Number of categories completed	3.86 $\pm$ 2.06	3.60 $\pm$ 1.92	.518	58	.607
Trial to complete first category	37.76 $\pm$ 29.76	31.60 $\pm$ 31.00	.786	58	.435
Failure to maintain set	1.50 $\pm$ 1.54	1.80 $\pm$ 2.78	-.516	58	.608
Learning to learn	0.00 $\pm$ 7.42	1.28 $\pm$ 3.96	-.831	58	.409

Table-3: Shows the comparison of WCST scores between cannabis and alcohol dependence patients using an independent sample "t" test. There is a significant

difference between cannabis and alcohol dependence patients in non-perseverative errors and percent non-perseverative errors ($p < .05$).

Table-4: Comparison of Stroop scores between cannabis and alcohol dependence patients.

Variable	Mean $\pm$ SD Cannabis	Mean $\pm$ SD Alcohol	t	df	p
Stroop-Word	92.26 $\pm$ 19.17	82.13 $\pm$ 16.79	2.177	58	.034*
Stroop-Colour	61.80 $\pm$ 14.85	54.76 $\pm$ 15.14	1.816	58	.075
Stroop-Colour word	32.63 $\pm$ 16.76	29.56 $\pm$ 13.33	.784	58	.436

Table-4: Shows the comparison of Stroop scores between cannabis and alcohol dependence patients using an independent sample "t" test. There is a significant difference between the cannabis and alcohol dependence patients in the Stroop word ($p < .05$).

DISCUSSION

The present study reported there is a significant difference between cannabis- and alcohol-dependent patients in attention and concentration. This indicates the cannabis group showed better attention and concentration than the alcohol patients. This finding is in support of the earlier study by Loeber et al. (2009), which evaluated 15 patients with longer durations of alcohol dependence and 15 patients with shorter durations using the d2 test of attention and reported a significant difference in attention and concentration. In contrast, sustained attention, measured with continuous performance tasks, is inconsistently impaired in chronic cannabis users (Pope et al., 2001; Indlekofer et al., 2009). In a study by Solowij et al. (2002) that evaluated 51 long-term cannabis users and 51 short-term cannabis users, they reported that long-term heavy

cannabis users show impairments in memory and attention. There is a significant difference in non-perseverative errors between patients with cannabis dependence and those with alcohol dependence. Tarter (1973) examined chronic alcoholics using the WCST and found that long-term alcoholics required more trials and made more errors; they also experienced greater difficulty in abandoning previous concepts and cognitive sets.

CONCLUSION

The present study confirms the crucial role of executive function deficits in patients with alcohol and cannabis dependence syndromes. Relatively small size and excluding female participants are a few limitations of the study.

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