

## Roll of psychological intervention in treatment of cannabis users

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### ABSTRACT


**Background:** Cannabis has been found highly correlated to deterioration in executive functions. It is a type of substance which has a component known as Delta 9-THC (tetrahydrocannabinol). It is the primary psychoactive compound of cannabis. In cannabis concentration of THC has been increased more than 12% in the last 30 years, which is making this drug stronger than it used to be. **Aim:** To assess the effectiveness of cognitive behaviour therapy (CBT) and motivational enhancement therapy (MET) in persistent cannabis users. **Materials & Methods:** Sample: The sample (n=20) was selected from Sankalp drug de-addiction suited in Tarn Taran, Punjab after assessment of executive functions. The participants were further divided into four groups i.e. Gr<sub>I</sub>=CBT, Gr<sub>II</sub>=MET, Gr<sub>III</sub>=CBT+MET, and Gr<sub>IV</sub>=Control. Tools: In the present study total 5 test were used for measurement of executive function. These were; 1) Rey Osterrieth Complex Figure (ROCF), 2) Stroop Neuropsychological Screening Test (SNST) 3) Working Memory Index: -i) Number Letter Sequencing Test ii) Arithmetic Test iii) Digit Span Test from Wechsler Adult Intelligence Scale-III 4) Memory Scale from All India Institute of Medical Sciences (AIIMS) Neuropsychological Battery and 5) Wisconsin Card Sorting Test. **Results:** The analysis was done with SPSS 16.0. In the results, it has been found that before the intervention all four groups were performed equally on all tasks of executive functions. And all groups had equal deficits in the executive functions. In the post-intervention results, it has been seen that a combination of both therapies is more efficient than single therapy. **Conclusion:** Overall in most of the areas of executive functions the patient showed more improvement than the control group when a combination of both therapies was used.

**Keywords:** Cannabis, cognitive behavioural therapy, motivational enhancement therapy, executive functions, cognitive deficits

### INTRODUCTION

Cannabis is an illicit drug in India which is used more frequently in some part of the country despite being banned. Subtle deficits in learning and memory, working memory, attention and concentration have been observed in heavy users.<sup>[1-4]</sup> Some studies found significant deficits in executive functions whereas some studies found minimal or no difference between heavy users and control group.<sup>[5]</sup> The review of studies also reveal that the cognitive deficits were improved with the increase of the abstinence period but some showed that it has improved with the effect of psychological intervention.<sup>[6]</sup>

Executive function is the ability of human beings, to behave and adapt smartly and effectively in every situation either simple or complex. It requires different types of cognitive functions that make an individual different from others. It is possible only through the spread, growth or development of the human brain, mainly the prefrontal cortex. The research assessed the effects of low doses of cannabis exposure on cognitive or executive functions. Evidence of the adverse effects on the process of attention and concentration is found stronger in new cannabis users as compared to those who developed drug tolerance and dependence. Similar effects

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were observed on tasks that involved the information processing and basic building block for attention and concentration functions.<sup>[7]</sup> Studies showed the greatest deficits in EF found in persistent and heavy users of cannabis and those taken cannabis from many years.<sup>[8]</sup>

Prevalence rates for use of cannabis have been reported to high and on the increase<sup>[9]</sup> and based on review it has been found that chronic, heavy and persistent use of cannabis is a growing health concern. Research in the area of cannabis effect on cognition has generally been got less attention as compared to studies relating to other substances (e.g. cognitive deficit in alcohol, cocaine, methamphetamine & heroin). Thus the literature in this area suggests a lack of consistent and uniform evidence for cognitive deficits and its severity in cannabis users. Further, there is a need for examining the effects of psychological intervention on the improvement of cognitive deficits. Thus the present study was planned.

**Aim**

To assess and compare the effect of motivational enhancement therapy and cognitive behavioural therapy on cognitive functions among persistent cannabis users.

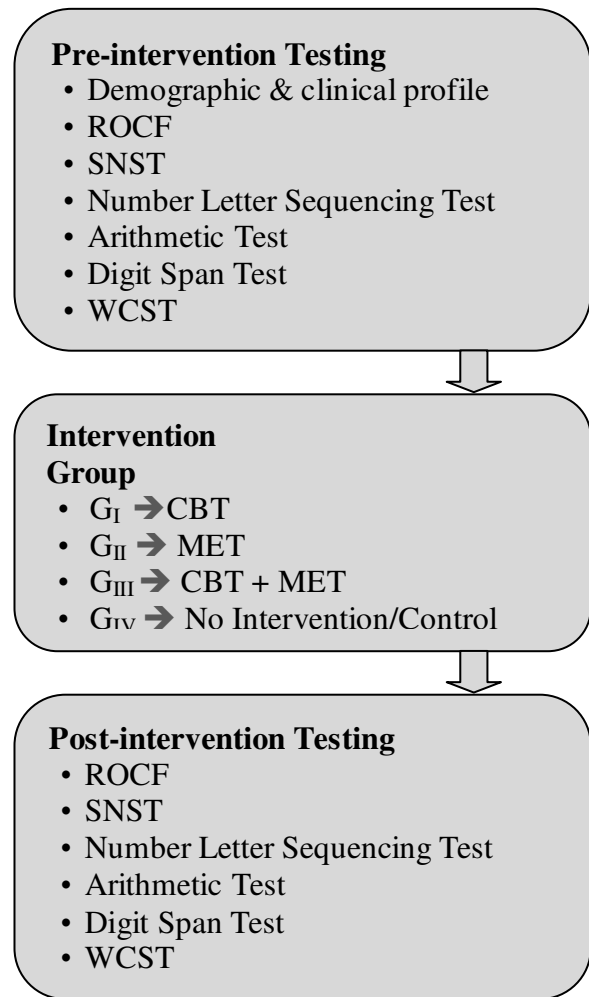
**Hypotheses:** Motivational Enhancement Therapy and Cognitive Behaviour Therapy would have an improvement in cognitive functions in persistent cannabis users.

**MATERIALS AND METHOD**

*Design:* A correlation study design was used.

*Sample:* A group of 20 participants was selected for assessment of the effectiveness of cognitive behavioural therapy and motivational enhancement therapy who had severe cognitive deficits. The sample was selected from Sanklap drug de-addiction suited in Tarn Taran, Punjab, India. The duration of the study was from October 2017 to May 2018. These were randomly assigned to four groups viz. CBT (G<sub>I</sub>), MET (G<sub>II</sub>), the combined group given both CBT and MET (G<sub>III</sub>) and the control group (G<sub>IV</sub>) where no treatment was given. There were 5 participants in each group. For the fulfilment of the purpose of the study, the snowball sampling technique was used. The layout of the design is shown in diagram 1.

**Diagram 1 Layout of the Pre-Post design**



**Inclusion Criteria:** i) Participants who have a primary diagnosis of cannabis dependence according to ICD-10 criteria by Psychiatrist, ii) Participants who have at least primary education, iii) Only male participants were selected, iv) One year of persistent use with more than 4 biddi filled with cannabis substance per day for persistent cannabis users.

**Exclusion Criteria for clinical sample:** i) Participants having primary diagnoses of psychiatric illness, ii) Presence of any major medical or neurological illness, iii) Participants having multiple substance dependence, iv) Refuse to give informed consent.

**Tools used:** The following tools were used for measuring the criterion variables.

**Socio-demographic and clinical data sheet:** Information relating to age, sex, residence, marital status, education, types of family,

occupation, the onset of substance abuse, duration of substance abuse, past psychiatric history, history of multiple substance dependence, family history of psychiatric and substance abuse were recorded in a structured interview and the investigator recorded the information.

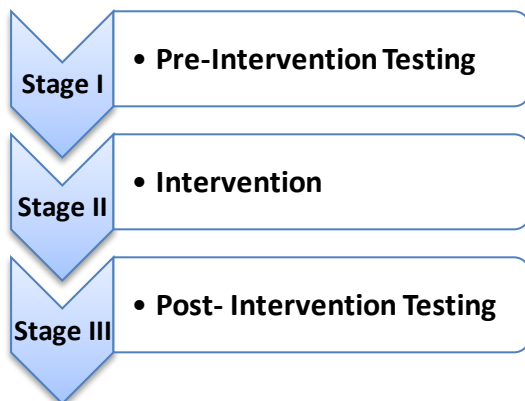
**The standard psychometric tests used were:**

1. Rey Osterrieth Complex Figure Test (ROCF) developed by Rey.<sup>[10]</sup>
2. Stroop Neuropsychological Screening Test (SNST) developed by Stroop.<sup>[11-12]</sup>
3. Working Memory Index: -1) Number Letter Sequencing Test 2) Arithmetic Test Digit Span Test from Wechsler Adult Intelligence Scale-III developed by Wechsler.<sup>[13]</sup>
4. Memory Scale from AAIMS Neuropsychological Battery developed by Gupta et al.<sup>[14]</sup>
5. Wisconsin Card Sorting Test developed (WCST) by Berg<sup>[15]</sup>

All tests are valid and had high reliability in the assessment of executive functions.

**Module of the intervention phase**

**Diagram 2 Module of the intervention phase**



The participants in the second phase of the study were randomly assigned to the four groups viz. G<sub>I</sub> (CBT), G<sub>II</sub> (MET), G<sub>III</sub> (CBT+MET), G<sub>IV</sub> (control). The severity of cognitive deficits was analyzed as per norms of all tests' respective manuals and those participants scored lowest on those dimensions they selected for the intervention group.

**1) Intervention stage:** The participants selected for the second phase of the study have given an appointment within one week for therapy. A group of 20 patients was selected

from the persistent and severe cognitive deficits and randomly assigned them in 4 groups, i.e. MET, CBT, MET+CBT, and a control group where no intervention was given who has on regular pharmacotherapy. All the cannabis users received a total of 12 sessions of psychotherapy. They received two sessions per week and the complete psychotherapy program was completed in 6 weeks.

**Module of Cognitive Behavioural Therapy:**

First of all, measure the core belief of the patient and their negative automatic thought related to substance abuse with the intense interview session. After a complete assessment, the case conceptualization was drawn which help to understand the case thoroughly. After this, in the further session, a diary was maintained by all participants in whom they record their behaviour and thoughts related to a specific situation. In another session alternate behaviour i.e. how to handle their craving and prepare not to use the substance again.

**Module of Motivational Enhancement Therapy:**

First of all, measure the level of motivation with the stage level of motivation i.e. pre-contemplation to maintenance stage with the intense interview session. After evaluation of participants during session main focus on the enhancement of their level of motivation. For this purpose, some tasks were intended to be given them to do such as pros and con or cost and benefit etc. In these tasks objectively participant was able to evaluate self and able to identify the cause of their illness and effect of substance abuse on their life.

**2) Post-Intervention stage:** After completion of Stage 1 of phase II, post-intervention psychological testing was done again. In this stage, the effectiveness of both intervention techniques either alone or combine was checked in all groups on all neuropsychological tests. A time gap of four days was maintained between the last sessions of therapy in the second stage. In the end, all participants were again examined on the selected measures individually.

**Procedure**

After formal assessment participants were assured for the confidentiality of their information as well as their comfort during the

testing and also clear them about the purpose of the study. All the participants were recruited only after their written informed consent for testing. After 'Inform Consent' from participants an interview session was conducted about the substance abuse and developed a working therapeutic alliance. After developing rapport the actual administrations of the tests were started and instructions of all tests were given them. The estimated time for the administration of tests was around 50 to 60 minutes. The psychological testing was conducted into two-phase i.e. before the intervention and after the intervention.

**Statistical analysis:** The data were analyzed using both descriptive and inferential statistical techniques mean and standard deviation were calculated. In the present study on main phase's sample (i.e. n=20) is analyzed. For the significance of the difference in the mean scores in the pre and post conditions non-parametric test i.e. Kruskal-Wallis H test followed by Tukey HSD Post hoc analysis was used. It was necessitated because in the study intervention in the form of CBT and MET were given and the pre-post mean comparison was done and the number of cases was small and assumptions of the parametric test were not fulfilled.

## RESULTS

The details of the results are shown in their respective tables. In table 1 has been revealed that the mean (SD) of the all group varied from 26.6 (5.59) to 32.4(6.58). In education, all group have more or less equal exposure to schooling. The age of onset of the substance use also approximates similar i.e. late adolescent age. In the duration of illness, the participants who were in Motivational Enhancement Therapy had more mean (SD) 9.8 (4.66), than other groups. Amount of substance also found more or less equal. Based on analysis it has been concluded that all group approximately controlled on clinical variables and demographic variables.

In table 2 it is shown that around 55% of the sample was working as a labourer and private job. In the residence, the data is approximately equally distributed. In the sample 55% were married and 40% unmarried and only 5% divorced. Most of the people belong to a nuclear family (60%) and Sikh religion (75%).

The pre-intervention scores of all the 20 participants assigned in different groups were taken on all criterion variables. The mean scores were compared for checking their significance of difference using Kruskal Wallis H test. The results are given in Table 3 and Table 4. Results revealed that the participants in all the groups scored almost similarly on all the criterion variables and the mean difference was non-significant on all variables excepting for error responses of Wisconsin Card Sorting Test (Table 4). It was decided that the error response on WCST be excluded for further analysis in the post-intervention scores.

After 12 sessions of psychological interventions, all psychological tests were readministered on all participants with equal time duration of the gap. For fulfilment of purpose i.e. find out the effectiveness of the psychological intervention in improvement of cognitive functions Kruskal Wallis H Test was applied which was followed by post hoc Tukey HSD Test.

The results revealed that on cognitive interference (Stroop Task) the H value is found (4.92, df=3), which is non-significant. In the case of colour task and colour word task also the post-intervention scores did not differ significantly. Thus there were no significant changes in cognitive interference due to CBT, MET, and CBT+MET (Table 5).

The pre and post-intervention mean scores on working and verbal memory, visual recognition, immediate visual memory, and delayed visual memory of all the participants in the CBT, MET, combine CBT and MET, and control group were compared to control (Table 6). It was found that the mean scores of all the participants in the four different groups on visual recognition task were almost similar and mean difference found to be non-significant.

On working and verbal memory, immediate visual memory and delayed visual memory all the groups differed significantly from each other. On working memory the CBT, MET, CBT+MET scored significantly higher than the control group. The CBT+MET group significantly outscored both the CBT and MET groups whereas CBT group scored higher than the MET group (Table 6).

**Table 1 Socio-demographic and clinical variables**

Variables	CBT	MET	CBT+MET	Control
	Mean (SD)*	Mean (SD)	Mean (SD)	Mean (SD)
Age in years	31.6 (5.32)	32.4 (6.58)	30.4 (8.96)	26.6 (5.59)
Education	6.6 (2.30)	7 (2.74)	7.8 (1.79)	7.8 (1.79)
Age of onset in years	20.6 (5.68)	22 (5.79)	25.8 (8.53)	21 (3.00)
Duration of Illness	6 (1.41)	9.8 (4.66)	5.2 (1.48)	5.4 (1.67)
Amount of substance	5.4 (1.14)	6.6 (0.89)	9.2 (3.03)	7.6 (2.51)

\* SD=Standard Deviation

**Table 2 Demographic variables**

Variables	Group	Frequency	Percent
Occupation	Driver	5	25
	Farmer	1	5
	Labourer	5	25
	Private Jobs	6	30
	Self-bus	2	10
	Unemployed	1	5
Residence	Rural	9	45
	Urban	11	55
Marital Status	Divorce	1	5
	Married	11	55
	Unmarried	8	40
Family Type	Joint	8	40
	Nuclear	12	60
Religion	Hindu	5	25
	Sikh	15	75

**Table 3 Cognitive interference and memory task in Pre intervention testing (df=3)**

Variables		CBT (n=5)		MET (n=5)		CBT+MET (n=5)		Control group (n=5)		H value
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Stroop Task	Colour Task	73.80	15.96	82.40	16.80	77.20	8.87	67.60	13.58	2.98 *
	Color Word task	48.40	25.38	45.40	16.04	47.60	17.08	70.60	11.70	6.24 *
Cognitive Interference		56.78	22.66	59.47	14.32	57.5	15.25	36.96	10.44	6.24*
Working Memory		16.60	4.16	15.8	2.59	22.00	6.24	16.00	4.30	4.34*
Verbal Memory		72.80	6.30	73.00	4.42	60.00	11.51	69.40	9.24	5.25*
Visual Recognition		20.60	10.36	16.4	3.36	23.80	6.14	23.8	8.64	4.39*
Immediate Visual Memory		5.60	4.34	4.20	2.17	5.80	3.56	7.80	5.76	1.23*
Delay Visual Memory		2.20	1.30	1.80	1.79	2.80	4.02	3.40	4.34	1.20*

\*=non-significant

**Table 4 Wisconsin Card Sorting Test (WCST) in Pre intervention testing**

Variables	CBT (n=5)		MET (n=5)		CBT+MET (n=5)		Control group (n=5)		H value (df=3)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Trial	128	0.00	128	0.00	128	0.00	128	0.00	0.00
Correct Responses	49	13.29	63.4	12.1	58	11.22	52.4	12.05	4.91
%Error Responses	28.8	7.05	40.4	6.66	35	2.92	30.8	6.72	8.37*
%P Responses	35.6	12.46	33	3.46	31.6	5.68	28.6	5.32	1.87
%Preservative Errors	41.4	7.92	33.8	10.13	42.4	7.64	40.4	10.92	2.54
%Non-P Errors	51.6	18.77	47	10.17	49.6	8.2	49.2	7.92	1.01
%CLR	32	7.91	37.6	4.1	36.4	1.82	30.8	6.57	5.30
NOCC	15.76	1.21	21.08	11.71	26.38	14.27	15.46	1.45	2.68
TTCFC	22.86	21.02	12.72	5.81	32.02	25.08	22.98	20.89	1.94
FTMS	63.72	34.17	33.52	41.52	19.36	33.37	19.36	33.37	2.29
LL	5.30	0.00	5.30	0.00	17.12	23.79	5.30	0.00	6.32

\*=significance level at 0.05;

Abbreviation: Conceptual Level Response=CLR, Number of Category Completed=NOCC, Total Trail in Completion of First Category=TTCFC, Failure to Maintain Mental Set=FTMS, Learning to Learn=LL

**Table 5 Post-intervention cognitive interference task (df=3)**

Variables		CBT (n=5)		MET (n=5)		CBT+MET (n=5)		Control group (n=5)		H value
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Stroop Task	Colour task	66.60	12.88	76.60	13.33	65.60	4.10	63.60	5.27	4.77 <sup>NS</sup>
	Color Word task	77.40	18.08	66.00	8.86	82.40	11.84	75.00	10.70	4.92 <sup>NS</sup>
Cognitive Interference		30.90	16.10	41.10	7.91	26.40	10.60	33.00	9.55	4.92 <sup>NS</sup>

NS=non-significant

**Table 6 Post-intervention memory task (df=3)**

Variables	CBT(n=5)		MET (n=5)		CBT+MET (n=5)		Control group (n=5)		H value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Working Memory	32.20 <sup>a</sup>	2.17	27.40 <sup>b</sup>	2.07	37.60 <sup>c</sup>	2.70	20.20 <sup>d</sup>	2.86	16.82**
Verbal Memory	46.60 <sup>a</sup>	4.77	45.00 <sup>ab</sup>	3.08	40.40 <sup>b</sup>	0.55	64.60 <sup>c</sup>	4.34	14.81**
Visual Recognition	32.40	8.05	32.00	6.16	34.00	2.83	31.60	3.05	1.96 <sup>NS</sup>
Immediate Visual Memory	25.40 <sup>a</sup>	1.52	25.60 <sup>a</sup>	2.51	30.00 <sup>b</sup>	3.67	9.80 <sup>c</sup>	3.49	14.04**
Delayed Visual Memory	25.40 <sup>a</sup>	4.16	26.20 <sup>ab</sup>	2.49	30.00 <sup>b</sup>	1.73	7.00 <sup>c</sup>	3.39	14.57**

\*=significance level at .05; \*\*=significance level at .01; NS=non-significant

Superscript a, b, c & d alphabet indicates the significance between groups. Similar alphabet indicates the non-significant, whereas dissimilar alphabet indicates the significant difference

**Table 7 Post-intervention of Wisconsin Card Sorting Test**

Variables	CBT (n=5)		MET (n=5)		CBT+MET (n=5)		Control group (n=5)		H value (df=3)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Trial	108.40 <sup>a</sup>	6.91	110.40 <sup>a</sup>	16.70	94.20 <sup>b</sup>	4.66	128.0 <sup>c</sup>	0.00	13.42**
Correct Responses	80.40 <sup>a</sup>	4.04	82.60 <sup>a</sup>	9.96	73.20 <sup>a</sup>	3.03	46.80 <sup>b</sup>	10.20	13.89**
% P Responses	45.60 <sup>a</sup>	2.97	43.60 <sup>a</sup>	7.64	34.20 <sup>b</sup>	3.90	47.80 <sup>a</sup>	4.55	10.47**
% P Errors	65.00 <sup>a</sup>	13.80	59.40 <sup>a</sup>	12.60	42.80 <sup>b</sup>	9.80	64.00 <sup>a</sup>	6.02	10.38**
% Non-P Errors	46.40	1.34	46.60	2.30	48.20	3.63	46.60	4.04	1.12
% CLR	43.40 <sup>a</sup>	0.89	43.60 <sup>a</sup>	2.19	46.40 <sup>b</sup>	0.55	37.00 <sup>c</sup>	3.39	14.53**
NOCC	42.00	0.00	42.00	0.00	42.00	0.00	31.40	14.50	6.33
TTCFC	48.40	24.20	27.26	29.18	37.52	29.69	48.40	24.20	1.80
FTMS	49.16	40.86	49.60	40.86	34.28	32.47	64.48	40.85	2.17
LL	49.64 <sup>a</sup>	22.05	59.50 <sup>b</sup>	43.50	39.04 <sup>c</sup>	28.1	9.40 <sup>d</sup>	3.85	9.56 <sup>*</sup>

\*=significance level at .05; \*\*=significance level at .01;

Superscript a, b, c & d alphabet indicates the significance between groups. Similar alphabet indicates the non-significant, whereas dissimilar alphabet indicates the significant difference.

On verbal memory test the higher the score, the poor verbal memory and the result indicate that the CBT, MET and CBT+MET groups scored significantly higher than the control group. The CBT+MET group were found to have better verbal memory than both the CBT and MET groups. The MET group however did not differ either from CBT and CBT+MET in verbal memory. Similar results were obtained in delayed visual memory (Table 6).

In case of immediate visual memory, the CBT, MET, CBT+MET scored significantly higher than the control group and the CBT+MET group scored higher than the both CBT and MET group (Table 6).

In Table 7, the results of WCST has been depicted which showed that on Non-preservative errors, number of categories completed, total trial in completion of the first category, and failure to maintain mental set there was a non-significant difference in the mean score of all the participants in all four groups.

On trial to take incomplete task all the groups were found to differ significantly (H=13, df=3, p<0.01). The post hoc comparison using Tukey HSD test revealed that the control group took significantly more number of trails to complete the task than CBT, MET, CBT+MET groups and the CBT+MET participants took the least number of trails in all the group the CBT and MET did not differ

in term of several trials taken. Similar results were obtained in case of conceptual level response (Table 7).

The correct responses on WCST are indicative of the decision-making component of executive functions. The control group participants gave significantly less number of correct responses as compared to CBT, MET, and CBT+MET groups. Whereas CBT, MET, CBT+MET did not differ in case of correct responses (Table 7).

In the case of preservative response and preservative errors, the results revealed that the control group participants displayed significantly more preservative responses and committed more preservative errors to compare to CBT, MET, and CBT+MET groups. Further, it is also clear from results that the CB+MET intervention groups participants significantly less preservative responses and committed less preservative errors as compare to both CBT and MET group which did not differ with each other. In case of learning to learn the results revealed that the mean score of participants of the control group was significantly less than participants of the other entire three groups i.e. CBT, MET, CBT+MET. The highest scores were obtained by participants of the MET group followed by CBT, and CBT+MET group. The mean scores on this variable are displayed geometrical figure (Table 7).

## DISCUSSION

The present study was conducted with the main objective to assess the psychological intervention i.e. cognitive behavioural therapy and motivational enhancement therapy in persons with cannabis dependence. In the major outcomes of the present study, it has been found that in most of the area of executive functions i.e. memory, decision making, planning etc. the psychological intervention has beneficial results as compare to only pharmacotherapy. In the review, there is no study found which depicts the effectiveness of the psychological intervention in these different areas of executive function which has been focused in the present study. If we talking about that which therapy is more effective then the results showed that most of the area of executive functions improved after combined sessions of cognitive behaviour therapy and motivational enhancement therapy.

In the review few studies which showed that there are beneficial results of psychological intervention on executive functions of persons with cannabis dependence. A recent study<sup>[16]</sup> conducted on 136 adolescents with cannabis dependence. The sample was divided into two groups i.e. CBT (N=62), and Multidimensional Family Therapy (N=74). In the result, it was found that cognitive behaviour therapy had a positive effect on abstinence period and participants also able to recover in cognitive functions. The result of this study is supported by the findings of the present study. Another study<sup>[17]</sup> found that after motivational enhancement therapy there was an improvement in recognition and taking steps, out of the three domains i.e. recognition, ambivalence and taking steps. On the other hand, there was also decrement in ambivalence stage among the experimental group but no change was seen in the control group during the study. It is concluded as MET significantly increases the desire to quit substance use. Similar results were seen in another study in which participants significantly reduced their use of cannabis at 3, 6 and 12 months of intervention and after motivational interviewing session patient able to recover from the illness and maintain the abstinence period for a longer time.<sup>[18]</sup>

In review majority of the study reported that psychological interventions (i.e. cognitive behavioural therapy, motivational enhancement therapy, contingency management, multidimensional family therapy etc.) have a significant effect in reducing the use of cannabis, maintain the abstinence period, reduce the relapse, and enhance the level of motivation to stop substance use. But in the review, not any study found related to the effectiveness of the psychological intervention in improving the cognitive/executive functions.

Overall this is the area which needs to focus on further research which is lacking. It helps not only mental health professional even for policymakers also for further management.

### Limitation

The premorbid cognitive functions of the participants were not recorded. All the participants were between 18 years to 40 years of age and therefore the result maybe not applicable to adolescents. Only male participants were taken, and therefore further research needs to be focused on identifying the effect in female users and gender difference. Large sample with a varied age range could be taken so that better generalization could be possible.

### Future Direction

Based on the present study's findings there is a need to focus on this high-risk group and develop a program for awareness about the deficit on cognitive functions. There is definitively adverse effect of cannabis on higher cognitive functions including cognitive interference, working and verbal memory, visual perception, recognition, immediate and delayed visual memory. The findings of the present study also highlight that psychological intervention is more effective in treatment at least for some cognitive functions. The present study emphasizes the combined program of psychotherapy including cognitive behavioural and motivational enhancement therapy. The present study provides a direction for mental health practitioners for charting program to improve the cognitive functions of substance users, especially cannabis users through psychological intervention.



## CONCLUSION

Cannabis is the only substance which has more psychological dependence than physical dependence. In the study, it has been seen that it has a significant effect on cognitive/executive functions. The psychological intervention has a significant effect on improvement in the executive functions. In the present study, it was also found that both therapy i.e. cognitive behavioural therapy and motivational enhancement therapy initiated in combination then the results are found more significant than if done alone. This research is not only highlighting the significant effect of cannabis use on executive functions but also focused on the importance of psychological interventions in the treatment of cannabis dependence. It also helped the mental health professional in the planning of the treatment for this high-risk group.

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**Ethical Clearance:** The proposal (ID= IGR-07-IGR-1471) was cleared by statutory bodies of the Maharshi Dayanand University, Rohtak, Haryana, India.

**Conflict of interest:** The present study was a part of research work conducted to fulfil the award of Doctorate of Philosophy Degree to the author.

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