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Attentional biases for alcohol-Stroop test in patients with alcohol dependence

Abstract

Background: Alcohol abuse is an enormous social problem, both in terms of its acute behaviourally impairing effects on the drinker and in terms of the long-term health problems that occur as a function of prolonged excessive use. Recently, there has been a burgeoning interest in associations between the rewarding effects of alcohol and alcohol-related cues, and consequently the degree to which such cues could serve to promote alcohol abuse. Magnitude of attentional bias is associated with relapse in alcohol dependent individuals and that retraining of attentional bias (away from alcohol cues) can have a positive impact on treatment outcome. Keeping this in view, the aim of the present study is to investigate presence of such attentional biases in patients with alcohol dependence. **Methodology:** A sample of 30 patients with alcohol dependence and 30 healthy controls matched on age and education was taken, for which purposive sampling was done. A modified Stroop test, an index of attentional bias or distraction was administered and their performance was compared to controls. **Results:** Results indicated that the alcohol group had significantly lower score on colour Stroop ($p<0.01$) and alcohol colour word Stroop ($p<0.05$) than normal controls. **Implication:** Gaining a better understanding of the mechanisms through which attentional bias might operate to promote alcohol consumption behaviour could have potentially significant contributions to the understanding of alcohol use disorders, including implications for treatment.

Keywords: Reward. Cues. Distraction. Colour. Word.

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INTRODUCTION

The attentional bias involves the tendency to pay attention to some things while concurrently ignoring others. It has its impact on the perception as well as decision making of the individual. In recent years there has been a burgeoning interest in associations between the rewarding effects of alcohol and alcohol-related cues, and consequently the degree to which selective attention directed toward such cues could serve to promote alcohol abuse. Attentional bias is believed to reflect increased incentive motivational value of alcohol and alcohol-related cues as these cues elicit same responses as actual drinking does and if drinking does not take place patient face withdrawal features. Also, attentional bias is considered to be a clinically pertinent factor contributing to relapse as these cues are processed more efficiently by patients with alcohol dependence.[1,2]

Theoretical accounts of the role of attentional bias in substance abuse rely heavily on the incentive sensitisation theory of Robinson and Berridge.[3,4] The theory is based on evidence that drugs of abuse have the ability to produce long-lasting changes in the organisation of brain systems, including those normally involved in the process of incentive motivation and reward (i.e. "wanting" for more drugs). Such neuro-adaptations cause these systems to become hypersensitive to drug administration, and this is said to be a critical process in addiction. Schema-based theories of addiction suggest that drug using behaviours tend to be automatic, difficult to impede in the presence of triggering stimuli, and may occur in the absence of awareness.[5] Both of these theories highlight the ability of drug-related stimuli to capture attention and support the idea that attentional biases play an important part in drug dependence.

Attentional bias towards drug-related cues can be measured with a range of paradigms. Indirect procedures like the modified visual dot probe task[6] or the addiction-Stroop task[7] have assets to study attentional resources of the brain. Individuals whose focus of attention are towards drug-related cues can easily be distracted by such cues when conducting a primary task due to less available cognitive capacity. Research regarding such an attentional bias (i.e. a preferential focus of attention towards alcohol stimuli) has produced a wealth of evidence suggesting a pronounced attentional bias towards alcohol-related cues in heavy and problematic drinkers. Additionally, initial evidence suggests that magnitude of attentional bias is associated with relapse in alcohol-dependent individuals. However, the zestful implications of the study and dearth of such studies inspire an investigation to be carried out with respect to attentional biases in patients with alcohol dependence. Gaining a better understanding of the mechanisms through which attentional bias might operate to encourage alcohol consumption behaviour could have potentially significant contributions to the understanding of alcohol use disorders, including implications for treatment, e.g. retraining of attentional bias (away from alcohol cues) can have a positive impact on treatment outcome. Hence, present study was designed with the aim to study the attentional biases for alcohol-related stimuli in patients with alcohol dependence.

METHODOLOGY

The present study was conducted at the State Drug Dependence and Treatment Centre of Institute of Mental Health, University of Health Sciences, Rohtak, Haryana, India. In the present study, purposive sampling method was used and a sample size of 30 patients with the diagnosis of mental and behavioural disorder due to use of alcohol, currently using the substance (active dependence)[8] and 30 normal controls matched on age and education and satisfying the inclusion and exclusion criterion were taken. All patients were male and mean age of patients were 33.16±6.83 years matched with healthy controls whereas mean years of education of alcohol group were 11.86±2.54 years.

All the patients were included in the study after successful detoxifications. Whereas, patient with serious physical problem and complicated withdrawal (seizure, delirium) and organic brain disorder and with a history of harmful use or dependence on any other substance (except nicotine and caffeine) were excluded.

Tools for assessment

Sociodemographic and clinical datasheet

Self-made semi-structured sociodemographic and clinical datasheet was used in the present study. It includes various sociodemographic variables like age in years, educational qualification, occupation, marital status, religion, income, and residence, and clinical variables like types of substance, age of onset, pattern of intake, duration of dependence, family history of substance dependence, and treatment history.

General Health Questionnaire 12 (GHQ 12)

The 12-item questionnaire[9] was used to see the general health and to screen out any psychiatric morbidity in healthy controls. It is a self-administered screening test which is sensitive to the presence of psychiatric disorders in individuals presenting in primary care settings and non-psychiatric clinical settings. The validity of the scale is 0.80.

Attentional bias by the addiction-Stroop test

Attentional bias toward alcohol-related words were assessed by using the addiction-Stroop test.[7] For this purpose, three words related with alcohol in Hindi were selected on the basis of significance of these words in order to grab attention. These words were selected out of ten words allied with alcohol-related stimuli. For the final selection, these words were rated by ten mental health professionals, who had no history of taking alcohol, harmful use or dependence (occasionally or regularly) on a five points Likert scale. Finally, three words on the basis of higher rating in terms of representativeness of alcohol were used in the present study. Hence, attentional biases were measured by these words in which patients were instructed to read the word page as quickly as they can in 45 seconds. Similarly, scores on colour page and colour word based on three words written in Hindi (*daru*, *sharab*, and beer) was obtained. In the colour word page, subject had to read the colour by which the word was written and not the word as such.

Procedure

Thirty patients with diagnosis of alcohol dependence syndrome as per ICD-10 (DCR) criteria,[8] and fulfilling the inclusion criteria were taken for the study. At first, informed consent was taken from each patient and healthy control that was investigated for present study. Necessary sociodemographic and clinical information was collected by using structured sociodemographic sheet. After that, all the patients were assessed on the addiction-Stroop test. Similarly, 30 healthy controls were selected after screening on GHQ-12 and matched on age and education.

Data interpretation

The obtained data were subjected to a number of statistical analyses pertinent to aim of the study. The analyses included one sample Kolmogorov-Smirnov test to see the normality of data. As the data found to be normally distributed, further independent sample-t test was used. To see the correlation between domains of Stroop test and clinical variables, Pearson r was used.

RESULTS

Table 1 shows difference between alcohol group and control group on alcohol-Stroop test (independent sample t-test). Results indicate that when different domains of alcohol-Stroop were compared, it was found that alcohol group had significantly lower score on colour Stroop ($p<0.01$) and alcohol colour word Stroop ($p<0.05$) than healthy controls. Whereas, there was no statistically significant difference on word score between patients with alcohol dependence and control group.

Table 2 shows correlation between various clinical variables and Stroop test (Pearson r). When age of onset, age of regular use, amount of daily intake, and duration of use were correlated with alcohol-Stroop test, it was found that there was significant positive correlation (0.518; $p<0.05$) between alcohol colour word and age of onset. This means that lower the age of onset of alcohol dependence higher the attentional biases towards alcohol colour word.

On the other hand, there was significant negative correlation between alcohol colour word and amount of daily intake (-0.650; $p<0.01$). It shows that patients who drink heavily or more have less score on alcohol colour word which means that heavy drinkers have more attentional biases towards alcohol colour word.

DISCUSSION

The main aim of the present study was to assess the attentional biases in patients with alcohol dependence. For this purpose to assess attentional biases, alcohol-Stoop test was especially designed.

Our results indicate that when different domains of alcohol-Stroop were compared, it was found that alcohol group had significantly lower score on colour Stroop and alcohol colour word Stroop than healthy controls. Whereas, there was no statistically significant difference on word score between patients with alcohol dependence and control group. This indicates that alcohol-related words were creating interference in patients with alcohol dependence. This substantiates that patients with alcohol dependence have attentional biases towards alcohol-related words. Therefore, the results of the present study are consistent with literature showing interference for alcohol-related words.[10,11] Townshend and Duka[12] also investigated attentional bias associated with alcohol cues, reporting "an attentional bias towards the alcohol-related stimuli when compared to the occasional social drinkers". Our findings support the incentive model of craving,[13] which posits that a stimulus regularly associated with alcohol consumption, provokes similar physiological and psychological responses as actual drinking. If drinking does not take place, craving occurs to promote seeking behaviour in order to appreciate the positive aspects of alcohol as a positive reinforcement or reward.[14] As a consequence, alcohol is perceived as increasingly rewarding and more attractive, and the craving for alcohol rises. Through the process of conditioning, cues related to alcohol become linked with the effects of alcohol and hence, can have the same features as alcohol. Consequently, alcohol-related cues become increasingly more attractive.

Table 1: Difference between alcohol group and control group on alcohol-Stroop test (independent sample t-test)

Variable	Alcohol dependence N=30	Healthy control N=30	df	t-value
	Mean±SD	Mean±SD		
Alcohol word	68±13	76±19	58	1.42
Colour	41±15	58.8±21.9		2.963**
Alcohol colour word	31±8.6	40.5±14		2.496*

*p<0.05 level, **p<0.01 level, df=degree of freedom, SD=standard deviation

Table 2: Correlation between various clinical variables and Stroop test (Pearson r; N=30)

Variable	Age of onset	Age of regular use	Amount of daily intake	Duration of substance use
Alcohol word	-0.265	-0.381	-0.307	-0.250
Colour	-0.206	-0.109	-0.190	-0.003
Alcohol colour word	0.518*	0.038	-0.650**	-0.362

*p<0.05 level, **p<0.01 level

On correlating different clinical variables (age of onset, age of regular use, amount of daily intake, and duration of use) with alcohol-Stroop test, it was found that there was significant positive correlation between alcohol colour word and age of onset. This means that higher the age of onset of alcohol use, higher the interference score on alcohol-Stroop test. Hence, on the basis of above finding one can extrapolate that if patient started drinking alcohol later in their life he will have less interference (attentional bias) for alcohol-related words as compared to patients who started drinking alcohol earlier in their life. Our finding also revealed that onset at early age is strongly related with more attentional bias for alcohol-related cues which could be a prognostic factor.[15]

On the other hand, there was significant negative correlation between alcohol colour word and amount of daily intake. Which further indicates that patients who drink heavily have more attentional biases towards alcohol-related words. The cognitive disadvantage arising out of increased alcohol consumption could probably explain the difficulty in processing words. Our results are also consistent with the literature,[16] that heavy drinkers have greater attentional bias than light drinkers.

Limitations

The results of present study cannot be generalised as sample size was small. Secondly, no other neuro-cognitive measure was used. In the present study, Stroop test was used as a measure of assessing attentional bias. Inclusion of other measures like visual probe stimuli test and event-related potentials (ERP) could have provided better insight upon mechanism of attentional bias. Finally, a study can be carried out to compare different substances and difference in their attentional bias.

Conclusion

On the basis of results of present study, it can be concluded that patients with alcohol dependence had significantly lower score on alcohol colour word Stroop than healthy controls. This indicates that alcohol-related words were creating interference in patients with alcohol dependence. This substantiates that patients with alcohol dependence have attentional biases towards alcohol-related words.

Gaining a better understanding of the mechanisms through which attentional bias might operate to encourage

alcohol consumption behaviour could have potentially significant contributions to the understanding of alcohol use disorders, which further includes implications for treatment. For example, retraining of attentional bias (away from alcohol cues) can have a positive impact on treatment outcome and prevention of relapse.

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