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Relationship Between Attention Bias and the Prognosis of Male Patients with Alcohol Dependence

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Abstract: *Background*: long term drinking in alcohol dependent patients seriously affects their physical and mental health. Abstinence treatment is very important, but there is no appropriate prediction method for the effect of abstinence in the past. *Objective*: In this study, we investigated word-cue attentional bias among male patients with alcohol dependence and its correlation with relapse after abstinence. *Methods*: Fifty male patients with alcohol dependence (ADs) and 50 male health controls (HCs) completed the Chinese version of the emotional Stroop task to assess attentional bias. The participants were evaluated at the beginning of the task using the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS). *Results*: The reaction times of ADs for neutral, negative, and alcohol-related words were significantly higher than those of HCs. The error index of ADs for neutral and negative words is worse than that of HCs. The period of maintained abstinence among ADs was positively correlated with the reaction time to negative words and the error index for negative and alcohol-related words. Linear regression showed the error index of alcohol-related words to be an import factor in terms of relapse. *Conclusion*: The number of errors in alcohol-related attentional bias cue words may be a predictor of the effect of abstinence.

Keywords: Alcohol Drinking, Alcoholism, Attentional Bias, Stroop Test

1. Introduction

Alcohol abuse leads to a series of serious health and social problems. Research has indicated that an estimated 4.9% of the world's adult population (240 million people) suffers from alcohol use disorder (7.8% of men and 1.5% of women), with alcohol causing an estimated 257 disability-adjusted life years lost per 100,000 population [1]. Studies have revealed long-standing heavy alcohol abuse leads to disproportionate loss of cerebral white matter and impairments in executive function [2]. These lesions ultimately lead to the cognitive decline.

Janssen et al. [3] they found that certain measures of alcohol-related attentional bias predicted later alcohol use in young adolescents. Excessive drinking sensitizes alcohol abusers' attentional responsiveness to alcohol-related stimuli [4, 5]. Increasing evidence has shown that AD have significant attentional bias to alcohol [6-10] and that attentional bias may play a crucial role in the formation of AD and the return to drinking after abstinence. Even though AD has been the focus of multiple studies, there are many aspects of the condition, such as the relationship between attention bias and abstinence of AD, that remain unclear. The purpose of this study was to explore the correlation between attention bias and the prognosis of AD.

2. Materials and Methods

2.1. Grouping

This study included 50 male AD and 50 healthy controls. AD were recruited from Anhui Mental Health Center. The inclusion criteria were as follows: (1) patients satisfied the diagnostic criteria for AD specified in the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10); (2) treatment time of hospitalization was within 5-15 days without withdrawal symptoms following the experiment (AD hospitalized for abstinence); and (3) the mini-mental state examination (MMSE) score was larger than 26 points. The exclusion criteria were as follows: (1) any organic brain disease shown on computed tomography (CT) scans; (2) neuropsychiatric disorders or other diseases that may cause cognitive impairment; or (3) drug dependence history (except tobacco). 50 healthy men were recruited as controls from the community in Hefei, China. Patient demographics are presented in Table 1. All participants were right-handed. This study was approved by the Ethical Committee of Hefei Center for Disease Control and Prevention and Anhui Mental Health Center. All procedures were conducted in accordance with the guidelines put forth in the Declaration of Helsinki, and written informed consent was obtained from all participants.

2.2. Test Methods

2.2.1. Assessment Tools

The assessment tools included the (1) Mini-Mental State Examination (MMSE); (2) Self-Rating Anxiety Scale (SAS); (3) Self-Rating Depression Scale (SDS); (4) Michigan Alcohol Use Questionnaire (MAST); and (5) telephone interviews. All the discharged AD were contacted monthly to record the time of abstinence after quitting the use of alcohol.

2.2.2. Attention Bias Test

We used the Stroop paradigm to present participants with Chinese words in four different colours. Numbers 1-4 were used to represent red, yellow, blue, and green, respectively. The test was divided into two stages with 30 words presented in each stage, including neutral words (i.e., desk, cabinet, wooden bed), negative words (i.e., death, funeral, loneliness), and clue words related to alcohol (i.e., good wine, beer, rice wine). The three types of words were alternately and randomly displayed on a computer screen. All tests were conducted in a quiet environment. Participants were seated 50 cm from the screen and asked to press the number key corresponding to the colour of the characters immediately after seeing the stimulus word. The computer automatically recorded the reaction time and the number of mistakes each participant made.

2.3. Statistical Analysis

All data were analysed using SPSS 13.0 (SPSS Inc., Chicago, USA). Differences and correlations between groups were analysed using the student t-test and chi-square test. The Pearson correlation coefficient was used to evaluate the extent to which variables were linearly related. P-values of less than 0.05 were considered statistically significant.

3. Results

3.1. Demographics and Alcohol Consumption Data of AD and HC Groups

As shown in Table 1, the AD and control groups did not differ significantly in age (t=5.542, P=0.589), years of education (t=1.537, P=0.127), marital status (X^2=4.016 P=0.134), professional situation (X^2=0.421, P=0.517), or family history of alcohol consumption (X^2=0.543, P=0.461). In the AD group, the age of starting drinking, duration of alcohol consumption (years), age of addiction, duration of addiction (years), and duration of abstinence (months) were shown in Table 1. The AD abstinence time of this group was 2-8 months.

Table 1. *Demographics and history of alcohol.*

	AD group (n=50)	Control group (n=50)
Age (year)	41.14±6.37	40.46±6.17
Years of education (year)	10.70±2.50	10.02±1.88
Marital status		
Married	36	44
Unmarried	12	5
Divorced	2	1
Profession		
Mental work	14	17
Manual labor	36	33
Family history of drinking	5	3
Start drinking age	20.74±5.11	-
Alcohol duration (year)	16.26±6.46	-
Addiction age	34.42±5.04	-
Addiction Duration (year)	6.52±4.75	-
Abstinence Time (month)	5.36±3.06	-

3.2. Comparison of Psychology Scale Scores

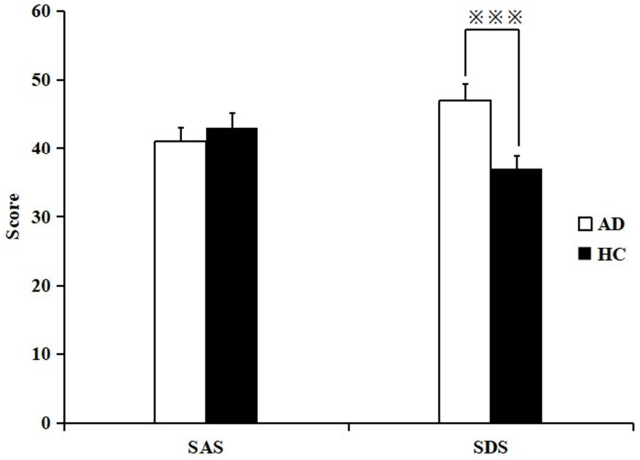

Figure 1. *Data are expressed as means ± standard error of the mean (SEM), ※※※<0.001 Attention bias comparison.*

As shown in Figure 1, SDS scores in the AD group were significantly higher than those in the HC group (47.25±12.84 vs. 38.37±5.78, P<0.001). The SAS scores did not differ

significantly between the AD and HC groups. The mean MAST score in the AD group was 21.86±7.72.

As shown in Figures 2 and 3, the response time for neutral, negative, and cue words differed significantly between the AD sand HC groups (P<0.001). The error indexes for neutral and negative words also differed significantly between the two groups (all P≤0.001). However, the error index for cue words did not differ significantly.

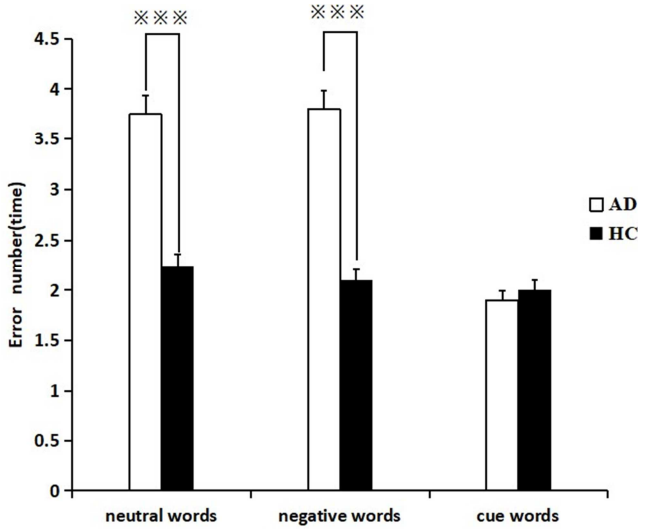

Figure 2. *Data are expressed as means ± standard error of the mean (SEM), ※※※≤0.001.*

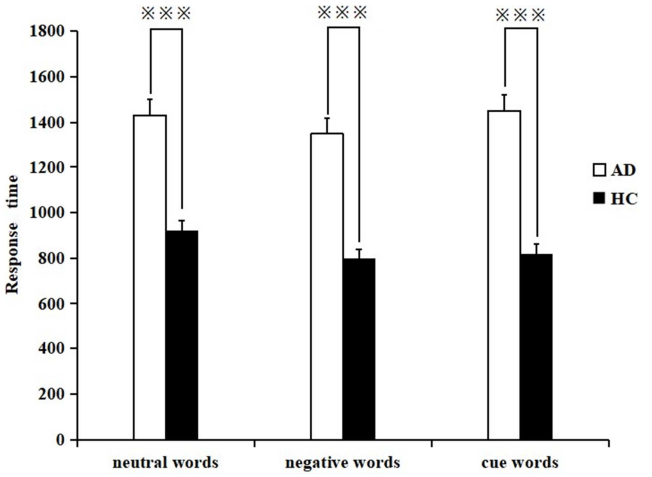

Figure 3. *Data are expressed as means ± standard error of the mean (SEM), ※※※<0.001.*

3.3. Correlation Between Abstinence Time After Hospital Discharge and Attention Bias

As shown in Table 2, the time of abstinence of AD after hospital discharge was positively correlated with the response time for negative words. The time of abstinence after hospital discharge was also positively correlated with the error indexes for negative and cue words.

Table 2. *Correlation between the abstinence time of AD after hospital discharge and attention bias.*

Spearman coefficient	neutral words		negative words		cue words	
	response time	error number	response time	error number	response time	error number
r value	0.069	0.268	0.408	0.431	0.244	0.563
P value	0.635	0.160	0.003	0.002	0.087	0.000

3.4. Correlation Between Duration of Abstinence After Discharge and Drinking Behavior and Mood

As shown in Table 3, the withdrawal time of AD after discharge had no significant correlation with the age of starting drinking, duration of drinking, age of addiction, duration of addiction, SAS, SDS, and MAST.

Table 3. *Correlation between duration of abstinence and drinking behavior and mood after abstinence treatment.*

Spearman Coefficient	Start drinking age	Alcohol duration	Addiction age	Addiction Duration	SAS	SDS	MAST
r value	-0.190	0.150	-0.198	0.092	-0.077	-0.078	0.009
P value	0.187	0.299	0.169	0.525	0.595	0.591	0.950

3.5. Multivariate Regression Analysis of the Influencing Factors of Attentional Bias of Alcohol Cue Words in AD Group

In order to further explore the effect of each influencing factor on attentional bias, the time of continuous abstinence after discharge was taken as the dependent variable, the reaction time of negative words and the number of errors between negative words and cue words were taken as the independent variables for multivariate regression analysis (PIN=0.05, POUT=0.1). Only the number of errors in cue words was selected (table 4).

Table 4. *Multivariate regression analysis of attention bias in AD.*

Variable	Regression coefficients (B)	Standard error (SE)	Standard regression (β)	*T* value	*P* value
response time of negative words	0.005	0.002	0.481	1.840	0.073
the error number of negative words	0.181	0.217	0.134	0.831	0.411
the error number of cue words	0.848	0.262	0.420	3.233	0.002

4. Discussion

AD introduces a series of social problems and threatens public health. In recent years, studies on the relationship between attentional bias and drinking in AD has attracted extensive attention. Fadardi et al. [4] found that the dependent drinkers have greater alcohol attentional bias, and excessive drinking sensitizes alcohol abusers' attentional responsiveness to alcohol-related stimuli. Furthermore, Field et al. [11] found that Among young individuals who were light drinkers, attention bias was positively associated with the subjective desire for alcohol and weekly alcohol consumption. Adams et al. [12] Studies have shown that participants who received a moderate dose of alcohol (0.40 g/kg) were faster to respond to alcohol-related stimuli compared to participants receiving a low dose of alcohol or placebo. It is necessary to study the prognosis of alcohol-dependent patients and to improve their attentional bias to alcohol [13, 14].

We demonstrated that the response times for neutral, negative, and cue words in the AD group were significantly prolonged. These results indicate slow to respond or executive dysfunction in AD, This is consistent with previous studies [2]. We also found significant differences in the error indexes for neutral and negative words between the two groups, but not in the error index for cue words. This indicates that AD can focus their attention on the alcohol-related information and reduce the number of experimental errors. Less attention is paid to other aspects; therefore, the number of errors is significantly higher. Excessive attention to alcohol-related information and lack of attention to other aspects may be an important psychological mechanism for AD difficulties in abstinence and reduced social function. In alcohol dependents with depression, a memory bias for alcohol-related material was found, suggesting that this group may be more pre-occupied with alcohol than patients without such co-morbidity [15]. Our study showed higher degree of depression in the AD group than in the HC group, which indicates that depressed mood is common among AD, and depressed mood may be a important factors for continued drinking. However, there was no significant correlation between the time of abstinence after hospital discharge and degree of depression in our study, the effect of depressed mood on after hospital repeat drinking may be uncertain.

AD has obvious attentional bias to alcohol, and poor attention to things other than alcohol, showing sluggish reaction and poor executive function. However, it has not been reported that the degree of attentional bias to alcohol can predict the time to alcohol withdrawal in AD. We want to find out the relationship between attentional bias and the duration of abstinence, and whether attentional bias can be used to predict the duration of abstinence, We found that the abstinence duration of AD after discharge was not significantly correlated with the age of starting drinking, duration of drinking, age of addiction, duration of addiction, anxiety, depression, and MAST scores, which we were pleasantly surprised to find that the time of abstinence after hospital discharge was positively correlated with the response time for negative words and the error indexes for negative words and cue words. This shows the less attention paid to negative information and alcohol clue words, the longer the abstinence time. Our results of Multiple regression analysis suggest that among the indicators of attentional bias, only the number of errors in alcohol cue words is an important factor affecting the duration of abstinence. The number of errors in alcohol cue words may be an important indicator for predicting the duration of abstinence.

In conclusion, male AD patients do have attention bias towards alcohol, which this characteristic may be related to the impairment of executive function, excessive dependence on alcohol and difficulty in abstinence, therefore It may also related to the occurrence, development and prognosis of AD, and the index of attention bias may be used as a predictor of AD prognosis. Our findings may provide a theoretical basis for the development of treatment methods for abstinence; Establish a training system to reduce AD's focus on alcohol, increase the time of physical activity training and social interaction not related to alcohol, and increase education regarding the negative effects of long-term drinking on the body. During the training, the attention bias and the number of errors in alcohol cues can be checked to test the effect of the training, the training techniques of reduce attentional bias to alcohol and prolong the duration of abstinence, as well as the application of attentional bias techniques to predict the duration of abstinence are worthy of further study.

Conflict of Interest

There is no conflict of interest between the authors.

Research Ethics

This study was approved by the Ethical Committee of Hefei Center for Disease Control and Prevention and Anhui Mental Health Center. All procedures were conducted in accordance with the guidelines put forth in the Declaration of Helsinki, and written informed consent was obtained from all participants.

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