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Comparison of Alcohol Attentional Bias and Alcohol Craving Among Alcohol Abusers and Non-Abusers

Alkol Kullanım Bozukluğu Olan ve Olmayan Kişilerde Alkol Dikkat Yanlılığı ve Alkol Aşermesinin Karşılaştırılması

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ABSTRACT

The aim of this research is to investigate implicit cognitive process underlying alcohol craving and relationship between alcohol attentional bias and alcohol craving by using visual probe task. Current study examined whether alcohol abusers show attentional bias toward alcohol related task compared with non- abusers and causal relationship between alcohol attentional bias and alcohol craving. Firstly, participants were divided two groups (non abusers- abusers) and they were completed alcohol craving scale to determinate their alcohol craving level. Then, participants alcohol attentional bias was investigated using the visual probe task. In this task, images (alcohol-related and neutral) were presented for 500 ms on a computer screen. After that, probe (*, asterisk) was presented. Participants were asked to decide the place of the probe place by using keyboard keys within 1500 ms. Participants reaction time and number of correct and incorrect answers during the test. According to results, alcohol abuser group's reaction times were faster than non-abuser when probe was associated with alcohol picture but not in neutral trials. These results suggested that, alcohol abusers showed significantly greater attentional bias to alcohol related pictures than non- abusers. From this point, investigation of alcohol attentional bias might be important component of alcohol dependence in terms of the alcohol relapse risk and determination of the alcohol craving.

Keywords: Attentional bias, alcohol, visual probe task, craving

ÖZ

Bu araştırmanın amacı, aşermenin altında yatan örtük bilişsel süreçleri nokta arama testi kullanarak araştırmak ve dikkat yanlılığının aşerme ile olan ilişkisine dair kanıtlar sunmaktır. Çalışmada sağlıklı kişiler ve alkol kullanım bozukluğu tanısı almış kişiler arasında alkolle ilintili uyaranlara ilişkin dikkat yanlılığının varlığı ve bu yanlılık ile alkol aşerme seviyesi arasındaki ilişki incelenmiştir. Öncelikle çalışmaya katılmayı kabul eden gönüllü katılımcılar alkol kullanım bozukluğu olan ve olmayan kişiler olarak iki gruba ayrılmıştır. Katılımcıların aşerme seviyesini belirlemek amaçlı her iki gruba da alkol aşerme ölçeği uygulanmıştır. Sonrasında kişilerin alkol dikkat yanlılığı nokta arama testi aracılığı ile ölçülmüştür. Bu testte alkolle ilişkili ve ilişkisiz resimler bir arada 500 ms süre boyunca sunulmuştur. Ardından işaret (*, asteriks) belirmiştir. Gönüllülerden gördükleri işaretin ne tarafta olduğunu 1500 ms içinde belirlemeleri istenmiştir. Test boyunca katılımcıların göreve verdikleri tepki süreleri ve doğru- yanlış cevap sayıları kaydedilmiştir. Elde edilen bulgulara göre alkol kullanım bozukluğu olan kişiler alkolle ilişkili resimlerin eşleştiği denemelerde sağlıklı kişilere nazaran daha hızlı cevap verdiği;, alkolle ilişkisiz olan uyaranların bulunduğu denemelerde ise farklılaşma olmadığı bulunmuştur. Bu bulgular, alkol kullanım bozukluğu olan kişilerde sağlıklı kişilere nazaran alkol içerikli uyaranlara ilişkin bir dikkat yanlılığı olduğunu göstermiştir. Bu yönüyle bağımlılıkta alkol dikkat yanlılığının incelenmesi alkol kullanımının devam riskini ve aşerme seviyesini belirlemede yordayıcı bir etmen olarak kullanılabilir.

Anahtar sözcükler: Dikkat yanlılığı, alkol, nokta arama testi, aşerme

Introduction

Addiction has long been studied under the headings of controlled/ explicit cognitive processes and rational decision making disorders. This approach is based on the idea that people's approach to hedonic behavior while they tends to avoid anhedonic behavior (Field and Cox 2007). This approach falls short of explaining the paradox of continuing the addictive substance despite its harm, even though people know its advantages and disadvantages. It is observed that human behavior, at least partially, goes beyond controlled processes and tends to seek and use substances with the effect of automatic/implicit processes.

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This shows that implicit cognitive processes are also an important issue that needs to be studied in the field of addiction (Stacy and Wiers 2010). Studies conducted with people whı were diagnosed with alcohol use disorder have found that people are generally unaware of the decision processes that trigger their drinking behaviors and show unconscious drinking behavior (Wiers et al. 2002, Fardardi and Cox 2006, Wiers et al. 2016).

Implicit/automatic response to a motivational stimulus is not independent of attention processes (Fadardi and Cox 2006). Research on motivational processes has shown that individuals' possession of a specific goal affects cognitive processes such as attention, thought, and memory in a goal-oriented direction (Klinger 1996). More specifically, being committed to a goal makes a person more reactive and sensitive to situations that aim (Klinger and Cox 2004). Thus, people prioritize cognitive-processing the stimulus that is important for their motivation, and this is called "attentional bias" (Stacy and Wiers 2010).

Attentional bias is a cognitive process that affects a person's mood and behavioral control (Fadardi and Cox 2006). Regular substance use and/or addiction have been associated with excessive reaction to substance-related stimulus (Robinson and Berridge 1993). In other words, it can be said that addicted people are more sensitive to the substance which they are addicted to than other stimuli and they are faster to direct their attention to this substance. For example, Field and Cox said in their 2008 paper that if people with alcohol use disorders are exposed to stimuli such as the smell and appearance of alcohol-related stimuli, people have physiological arousal and an increased desire to drink alcohol. Increased responsiveness and arousal is a cognitive process that occurs due to attentional bias (Robinson and Berridge 2008). Investigation of the attentional bias towards addictive substances has been an issue that needs to be taken into consideration in clarifying the continuation of substance use and the underlying causes of craving.

It seems that attentional bias in addiction is investigated with various cognitive paradigms (Stroop-test, Visual Probe Test, Approach - Avoidance Test, etc.). In the Stroop test, people who developed addiction to the addictive substance (alcohol, nicotine, heroin, etc.) named the ink colors of the substance-related words more slowly than neutral words, while no such effect was seen in the group that was not addicted to these substances (Cox et al. 2002, Waters et al. 2003, Marissen et al. 2006).

Researchers investigated attentional bias with the visual probe test (MacLeod et al. 1986), which is claimed to measure implicit cognition better than the Stroop test. In this test, participants are presented with two images at the same time, meaningful in terms of motivation (related to alcohol/substance for addiction) and neutral through a computer-based stimulus presentation program. Immediately afterwards, participants are asked to specify the location of the asterix (*) or point (.), which is presented selectively on the side of one of the two images, by using the keyboard's keys. Meanwhile, the correct number of answers and reaction times of the participants are recorded by the computer. There are many alcohol/substance attentional bias studies using the visual probe test. As a result of these researches, the reaction time of the addicted group to the task (locating the point) matching the addictive substance was observed faster than the healthy group; no such difference has been observed in response time to the task matching the neutral stimulus (MacLeod and Mathews 1988, Ehrman et al. 2002, Bradley et al. 2004, Cox et al. 2006, Field et al. 2006). In addition, the research using an eye-tracking device along with the point search test found that nicotine-addicted people looked at cigarette-related stimuli for a longer time; and people who were not addicted looked at neutral stimuli for longer (Mogg 2003). These studies show that information in the region where attention is drawn by highly motivated stimuli is processed faster.

As mentioned above, in addition to the visual probe test, the Approach-Avoidance Test is also widely used in cognitive bias measurements (Rinck and Becker 2007). Studies with the approach-avoidance test were also found to be successful in measuring alcohol/substance attention bias by supporting the results of studies with the visual probe test (Field et al. 2006, Bradley et al. 2008, Wiers et al. 2013). For example, according to the results of studies with people with alcohol/substance use disorders, the group with cannabis addiction (Cox et al. 2002, Cousijn et al. 2011), smoking addiction (Bradley et al. 2008, Watson et al. 2013, Wiers et al. 2013), alcohol dependence (Palfai 2003, Wiers et al. 2009, 2010) and food addiction (Havermans 2001, Nederkoorn 2010, Veenstra et al. 2011) have been found to be difficult removal their attention to stimulus which is important terms of their motivation (alcohol-substance or food) as compared to the healthy group. On the other hand, in neutral stimuli, no difference was observed between the responses of the two groups. These results show that people tend to approach automatically instead of avoiding the stimulus that is important for motivation, and that approach avoidance bias may play an important role in addictive behavior, just like attentional bias.

In addition, researchers have shown that alcohol/substance attentional bias and craving are positively correlated (Waters et al. 2003, Field et al. 2006). As the person's desire for the addictive substance increases, so does the attentional bias towards the substance. As a matter of fact, it is known that resumption of alcohol/substance use in people with high attentional bias occurs clinically and relapse occurs faster (Cox et al. 2002, Waters et al. 2003, Marissen et al. 2006, Field and Cox 2008). Many studies have assessed the level of craving with the various questionnaire. Cognitive tests measured alcohol/substance attentional bias and its relationship between craving. For example, the relationship between craving and attentional bias in cigarette addicts (Zack et al. 2001, Mogg and Bradley 2002, Mogg et al. 2005), the relationship between craving and attentional bias in alcohol addicts (Sayette et al. 1993, Field et al. 2004, Field and Eastwood 2005, Field et al. 2007), the relationship between craving and attentional bias in cocaine users (Rosse et al. 1993, Franken et al. 2000, Copersino et al. 2004) and the association of craving and attentional bias in cannabis users (Field et al. 2004, Field and Eastwood 2005) were strongly positively correlated. However, some research has not found an association between craving and

attentional bias (Lubman et al. 2000, Wertz and Sayette 2001, Ehrman et al. 2002, Field et al. 2006).

The conflicting results led researchers to investigate the underlying cognitive causes of cravings more thoroughly. Using manipulation methods that are thought to increase craving (such as deprivation, exposure to substances), the relationship between craving and attentional bias has been examined. For example, many studies have been conducted examining the change in alcohol attentional bias using manipulation methods that increase craving in heavy alcohol consumers. In these studies, people with heavy alcohol consumption were exposed to visual cues about alcohol by using a visual probe test. As a result of the researches, it was observed that both alcohol attentional biases and alcohol cravings increased in heavy drinkers (Cox et al. 1999, 2003, Duka and Townshend 2004, Schoenmakers et al. 2008, Schulze 1999).

Every piece of evidence presented about the effect of implicit cognition on addiction has an important place in understanding the nature of craving and relapse. As a result of this evidence, these cognitive tests, which have been used in attentional bias research in recent years, have been investigated to have the anti-relapse effect of a new intervention method called Alcohol Cognitive Bias Modification (Fadardi and Cox 2009, Schoenmakers et al. 2010, Clerkin et al. 2016). Therefore, the tests used in attentional bias studies and the use of these tests as an accurate measurement tool are of great importance in understanding the nature of addiction. It is particularly important that the stimuli in the tests used to investigate cognitive processes are selected in accordance with the goal of the research (Onie et al. 2020). Due to the fact that the stimuli used in alcohol studies vary from culture to culture, cognitive tests cannot be used in a standardized manner in all countries. In this study, the standardization of alcoholic and non-alcoholic stimulants suitable for Turkish culture was made and adapted to the visual probe test. As far as is known, there is no cognitive bias test that can be used in alcohol attentional bias researches adapted to Turkish culture and proven to provide results in parallel with the literature. The main purpose of the study is to prove that the visual probe test, which does not have an international stimulus standard due to cultural effect, can be used on the Turkish sample. Similar to studies conducted to date, it has been predicted that alcoholic stimuli will increase alcohol attentional bias in people with alcohol use disorder more than in healthy volunteer individuals, and that there will be a positive relationship between participants' level of alcohol attentioaln bias and alcohol craving level.

Method

Sample

The sample of research was composed of healthy volunteer (HV) randomly selected from Ege University and İzmir Katip Çelebi University Atatürk Training and Research Hospital personnel between the ages of 18-50; The second group was composed with alcohol use disorder (AUD) people who were between the ages of 18-50 and who applied to Ege University Substance Abuse Polyclinic with alcohol use problems. The study was conducted by Ege University Medical Research Ethics Committee on 20.08.2020 with the permission of the ethics committee numbered 20-8.1R/44. Participation in the experiments is entirely voluntary, and those who want to participate in the experiment are informed by the researcher. All participants who agreed to participate in the experiment responded to the demographic information form after signing an informed consent form.

There was no difference between the two groups in terms of their demographic characteristics (age, gender, education level). The sample size was determined by previous research. Totally, 101 people participated in the research; 11 people were excluded because of the error rate was over 10% (Jia et al. 2009). In total, 90 (45 HV, 45 AUD) participants data were analyzed. Only male individuals were included in resarch in order to avoid the sex as a confounding factors.

For participation criteria were determined for the group diagnosed with alcohol use disorder. These criteria are (1) meets the DSM-5 (APA 2013) alcohol use disorder criteria within one year prior to hospital admission, (2) primary diagnosis of alcohol use disorder, (3) maximum 50 years of age or younger, and (4) being male. For HV group participation criteria are (1) not having pathological alcohol use, (2) 50 years of age or younger, and (3) being male. The exclusion criteria for both groups are (1) having any visual problem, (2) a history of neurological disorders, (3) a diagnosis of bipolar disorder or psychotic disorder, (4) non-remission depression, anxiety disorder, or obsessive-compulsive disorder.

Research Design

To investigate the alcohol attentional bias difference between the HV and AUD groups, alcoholic and non- alcoholic beverages stimuli were manipulated as within- subject factors. Also, participant reaction time and accuracy were recorded. Group and trial type were independent variables; reaction time and accuracy were determinated dependent variables.

Measures

Alcohol Use Disorders Identification Test (AUDIT)

AUDIT (Alcohol Use Disorders Identification Test) developed to determine the harm caused by alcohol and it was applied by the interviewer (Saunders et al. 1993). Scale consist 10 questions; It is used to determine drinking habits, alcohol consumption and alcohol-related problems. The validity and reliability study of the Turkish version of the scale was conducted with 51 patients who were treated as inpatients and diagnosed with alcohol use disorder at Bakırköy Mental Health and Nervous Diseases Training and Research Hospital (Saatçioğlu et al. 2002).

Penn Alcohol Craving Scale (PACS)

PACS (Penn Alcohol Craving Scale) is a 5-point likert-type scale used to assess craving in people who diagnosed with alcohol use disorder (Flannery et al. 1999). The questionnaire is a self-report form that assesses the amount of craving in the last week. The

validity and reliability study of the Turkish version of the scale was conducted with 122 patients who were treated as inpatients and diagnosed with alcohol use disorder at Bakırköy Mental Health and Nervous Diseases Training and Research Hospital. The findings of the study showed that the Turkish version of PACS could be used to measure to asses craving level in individuals with alcohol use disorder (Evren et al. 2008).

Visual Probe Test

In the study, visual probe test was used to measure alcohol attentional bias. The visual probe test was chosen because it measures implicit cognition by separating it from explicit cognitive processes better than tests that are also frequently used, such as Stroop (Starzomska 2017). The stimulants are made up of pictures of alcoholic and non-alcoholic beverages (whiskey, beer, wine, raki, water, cola, soft drinks, coffee). A total of 16 non-alcoholic and 16 alcoholic beverage pictures were presented to the participants as 120 trials by matching each other. Asterix (*) has been designated as the task probe.

The experiment was conducted in a room with a computer, which did not transmit sound. The participant sat 60 cm away from the computer screen and then the practical phase was carried out under the guidance of the researcher before the actual experiment. During the practice phase, feedback was given for each answer like "you answered correctly, you answered incorrectly or you did not answer". A total of 16 practice trials were conducted. All participants who agreed to participate in the study have successfully completed the practical phase. Then the participant was left alone in the room and the real experiment was started.

Before the data collection phase was initiated, participants were asked to have their fingers on the right and left arrow keys of the keyboard and ready to press the keys at any time. After a detailed explanation of what was expected from the test (deciding on the place of the asterix) experiment was started (Figure-1). First of all, 500 ms. or 1000 ms. blank screen was presented. After that fixation "+" was shown with a duration of 100 ms so that participants can fix their eyes at the center point of the screen. Alcoholic and non-alcoholic stimulant pairs randomly presented during 500 ms. the aim of influencing the implicit cognition of the participants. Immediately after that, the task of finding out where the asterix is "*" on the screen (alcohol-related/non-alcohol-related side) was presented during 1500 ms. Each participant completed a total of 136 trials, including 120 experimental stages and 16 practical stages. The experiment, lasted a total of 25 minutes. Care has been taken to ensure that the research is not physically or mentally disturbing. Data and information about the participants are stored anonymously.

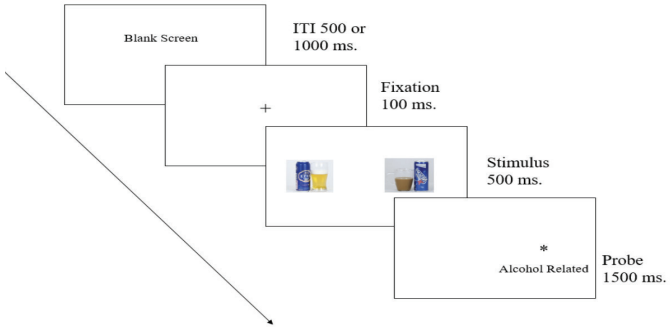

Figure-1: The trial sequence of experiment

Statistical Analysis

In the visual probe test experiment, it was examined whether the types of alcoholic and non-alcoholic beverages presented created a differentiation between the HV and AUD groups in terms of the mean of reaction time and the number of correct answers were given. For this, 2 (group: HV and AUD) x 2 (trial type: alcohol-related and non-alcohol related) mixed ANOVA analysis was applied. Finally, correlation coefficient analysis was performed between PACS craving scale scores and reaction times of people with and without alcohol use disorder to determine whether there was a relationship between craving and attentional bias.

Results

Totally 90 participants (HV:45, AUD: 45) participated in study. Sociodemographic results and group comparision were shown in Table-1. All participants were male and mean age were 38.22 (±8.24); [HV= 39.4 (±7.65); AUD= 37.02 (±8.83)], $t(88) = 1.38$, $p > 0.05$. There is no education time difference between groups $t(88) = 0.23$, $p > 0.05$; [HV =11.82 (±3.28); AUD=12.00 (±4.11)]. HV groups avarege AUDIT score was 5.40 (±2.26) while AUD group was 31.40 (±5.18), $t(88) = 36.76$, $p < 0.05$. 66% of HV group was married and 33.3% of AUD group was married; 4.3% of HV group was divorced and 20% of AUD group was divorced and 25.5% of HV group and 46.7% of AUD group were single, $\chi^2 (1) = 19.30$, $p < 0.05$. Finally, 51.1% of HV group was smoker and 82.2% of AUD group was non smoker $\chi^2 (1) = 11.09$, $p < 0.05$.

Results showed the main effect of item type on reaction time was statistically significant, [$F(1,88) = 4.29$, $p < .05$, $\eta^2 = .06$]. Figure 2 showed that, reaction time of alcohol related stimuli ($M = 537.63$, $SE = 9.45$) was more speed than non- alcohol related stimuli ($M = 542.07$, $SE = 9.48$). However this reaction time difference was very small and its significant level was $p = .04$. On the other hand, the results indicated that, the main effect of group was not statistically significant [$F(1,88) = 3.67$, $p > .05$]. That means, AUD and HV group reaction time was observed same.

Also, there was significant interaction effect between trial type (alcohol related and non- alcohol related) and group (AUD and HV) [$F(1,88) = 9.65$, $p < .05$, $\eta^2 = .09$]. As a follow-up test, simple effect analysis showed that, there was significant difference in alcohol related condition between groups [$F(1,88) = 5.11$, $MD = 42.70$, $SE = 18.89$, $p < .05$]; On the other hand there was not observed statistically significant difference in non- alcohol related condition between two groups [$F(1,88) = 2.40$, $MD = 29.36$, $SE = 18.97$, $p > .05$]. As seen in Figure 3, trial type effect on speed of reaction time was observed much more in alcohol related condition between AUD ($M = 516.28$, $SE = 13.36$) than HV ($M = 558.97$, $SE = 13.36$). Neverthless, reaction time difference

Table-1: Means (SDs or percentage) for demographic and clinical characteristics per group			
	Group		
Variables	**Healthy N = 45**	**AUD N = 45**	**χ^2/ t (p)**
Age	39.42 (7.65)	37.02 (8.83)	1.38 (0.17)
AUDIT skore	5.40 (2.26)	31.40 (5.18)	36.76 (0.00)
Education time	11.82 (3.28)	12 (4.11)	0.23 (0.82)
Married	33 (%70.2)	15 (%33.3)	19.30 (0.00)
Divorce	2 (%4.3)	9 (%20)	
Single	12(%25.5)	21 (%46.7)	
Smoker	24 (%51.1)	37 (%82.2)	11.09 (0.00)
Non- smoker	23 (%48.9)	8 (%18.8)	

*AUDIT: Alcohol Use Disorders Identification Test
*AUD: Alcohol Use Disorders

Figure-2: Mean (with 95% CI) reaction time of the participants in trial type

between AUD (*M* = 527.93, *SE* = 13.41) and HV (*M* = 556.75, *SE* = 13.41) was observed same for non- alcohol condition.

2 (trial type: alcohol related and non- alcohol related) x 2 (group: AUD and HV) repeated measures factorial ANOVA was conducted to investigate whether error rate was influenced by trial type depend on group. The same analysis procedure was applied with reaction time analysis and error rate results were parallel with reaction time results. The results indicated that the main effect of trial type on error rate was statistically non-significant [$F(1,118) = 0.21$, $p > .05$]. Also, the main effect of group on error rate was not statistically significant [$F(1,118) = 3.09$, $p > .05$]. The interaction between item type and proportion congruency was also statistically significant, [$F(1,118) = 5.46$, $p < .05$, $\eta^2 = .04$]. Follow-up test was performed to compare trial type between groups. Simple effect analysis showed that, there was a significant difference between group depend for non- alcohol related trials [$F(1,118) = 6.04$, *MD* = 2.08, *SE* = 0.84, $p < .05$]; while there was non- significant difference between group for alcohol related trials [$F(1,118) = 0,47$, *MD* = 0,54, *SE* = 0.49, $p > .05$]. As seen in Figure 4, AUD group non- alcohol related number of error rate (*M* = 2.24, *SE* = 0.54) was higher than HV group non- alcohol related number of error rate (*M* =0.16, *SE* = 0.65). However, for alcohol related stimuli number of error rate was observed same in both AUD group (*M* = 1.62, *SE* = 0.50) and HV group (*M* = 1.08, *SE* = 0.60).

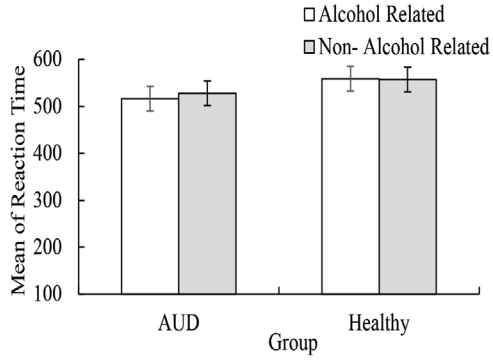

Figure-3: Mean (with 95% CI) reaction time of the participants in different groups by trial type

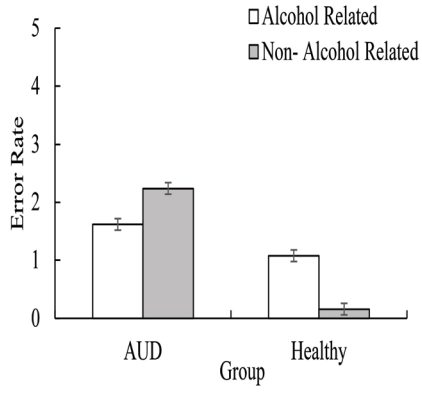

Figure- 4: Mean (with 95% CI) error rate of the participants in different groups by trial type

Finally, pearson correlation coefficient analysis was performed to investigate relationship between alcohol attentional bias and PACS score. For correlation analysis, every participant alcohol related reaction time and non- alcohol related reaction time difference was calculated. The difference of reaction times was called alcohol attentinal bias. After this calculation, participant's PACS score and bias score correlation was analyzed. According to results, there was a negative correlation between PACS score and alcohol related reaction time speed r = -.25, p < .05. That means while PACS score rised, participant's reaction time to the alcohol related stimuli was shorter.

Discussion

In this study, the effect of alcohol attentional bias on cognitive process and the relationship between alcohol craving and alcohol craving were examined by using the visual probe test. The study involved two groups; healthy volunteers (HV) and volunteers who had been diagnosed with alcohol use disorder (AUD). The alcohol use levels of the participants were measured by the AUDIT test and the alcohol craving levels were measured by the PACS test. Alcohol attentional bias was measured by recording reaction time with the alcohol version of the visual probe test. The research results help to identify the underlying cognitive processes and causes of alcohol abuse.

First, the study was successful in identifying the attentional process of people with HV and AUD. The visual probe test prepared in accordance with the Turkish sample is seen as possible to determine the level of alcohol attentional bias in participants with AUD. Studies using the visual probe test have also shown that after detox treatment, people who still have high attentional bias toward alcohol have lower treatment success and shorter relapse times (Cox et al. 1999, 2002, Duka and Townshend 2004). This result suggests that the visual probe test, if desired, can be used as a predictive tool in people with alcohol use disorders.

Findings of the study showed that participants with AUD paid more attention to alcoholic stimuli than HV group and responded more quickly to tasks that matched alcoholic stimuli. Results supports our assumption and the findings of previous studies. In studies investigating alcohol attentional bias, it was seen that people who were cognitively and motivationally more sensitive to alcohol and who thought more about alcohol had more alcohol attentional biases (Cox et al. 1999, Duka and Townshend 2004). The fact that the our results are in parallel with the literature and it shows that the alcohol attentional bias test adapted to Turkish culture is working well.

Another goal of our research was to examine the relationship between alcohol attentional bias and craving. Although the results shows there is a significant positive correlation between these two variables, this relationship was found to be low level. In previous studies, results of the relationship between craving level and attentional bias have mostly been found to be highly positively correlated (Field et al. 2004, 2005). The low level of our finding may be due to the fact that the recruitment of participants is not homogeneous enough, and this creates a limitation. As far as is known, the motivation of people to quit alcohol in the group diagnosed with alcohol use disorder, whether there is anti-craving use or not (Cox et al. 1999, 2002) can affect attentional bias. In the researches to be carried out in this field, alcohol attentional bias should be investigated by considering these variables.

The most important limitation of the research is the use of anti-craving and antidepressants in the group with the diagnosis of AUD. Since the drugs could not be interrupted during the long-term treatment, the use of drugs could not be determined as an exclusion criterion and this situation constituted as a limitation. In order to balance the effect of anti-craving and antidepressant use as much as possible, attention was paid to the fact that, participants with alcohol use disorders in the study were people who used similar drugs.

Conclusion

In the study, the alcohol attentional biases of people with and without alcohol use disorder were compared using the visual probe test. The results showed that people with alcohol use disorders reacted significantly faster alcohol related stimuli. These findings show that attentional bias has an important place in addiction and that implicit cognition in addiction is an issue that needs to be investigated. Current findings have identified ideal alcoholic and non-alcoholic stimuli for alcohol attentional bias research. Finally, future studies on alcohol attentional bias should also determine the motivation of people with alcohol use disorder to quit alcohol as a variable.

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