RESEARCH ARTICLE

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The Role of Metacognition in the Emergence of Anger and Aggression in Patients with Alcohol Use Disorder

ABSTRACT

Objective: In this study, we aimed to investigate metacognitive functions, anger and aggression and the relationship in patients with alcohol dependence. It is to have information about which metacognitive beliefs plays a role in the emergence of anger and aggression in people with alcohol dependence.

Method: The patient group diagnosed with Alcohol Use Disorder (AUD) according to DSM-5 (n = 72) and the control group without any psychiatric diagnosis (n = 71) were included in the study. Sociodemographic data form, Alcohol Use Disorders Identification Test (AUDIT), Metacognition Questionnaire (MCQ-30), Trait Anger and Anger Expression Scale (STAXI) and Buss-Perry's Aggression Questionnaire (AQ) were used.

Results: In the AUD group, the MCQ-30 total, STAXI trait anger, anger out and anger in, and AQ total scores were found to be significantly higher than the control group ($p<0,001$, $p<0,001$, $p=0,001$, $p=0,001$ and $p<0,001$, respectively). When comparing the correlation coefficients of MCQ-30 and other scales between the groups, a difference was found between the AUD group, trait anger and physical aggression ($z=2,035$; $p=0,042$ and $z=2,120$; $p=0,034$, respectively). As a result of the regression analysis performed in our study, it was found that the need to control thoughts is the most metacognitive beliefs that predicts aggression in people with AUD($\beta=0.567$,$t(66)= 4,034$, $p<0.001$,$pr2=0.20$).

Conclusion: Metacognitive beliefs are highly affected in people with AUD and they cause more anger and aggression. The need to control thoughts plays an important role in the emergence of anger.

Keywords: Alcohol Dependence, Metacognition, Anger, Aggression.

Alkol Kullanım Bozukluğu Olan Hastalarda Öfke ve Agresyonun Ortaya Çıkışında Üstbilişin Rolü

ÖZET

Amaç: Bu çalışmada alkol bağımlılığı olan hastalarda üstbiliş işlevleri ve üstbilişin öfke ve agresyon ile ilişkisi araştırılmıştır. Alkol bağımlılığı olan hastalarda öfke ve agresyonun ortaya çıkmasında hangi üstbilişsel inançların rol oynadığı hakkında bilgi sahibi olmak amaçlanmıştır.

Gereç ve Yöntem: Çalışmaya DSM-5'e gore Alkol Kullanım Bozukluğu (AKB) tanısı alan hasta grubu (n=72) ile herhangi bir psikiyatrik tanısı olmayan kontrol grubu (n=71) dahil edildi. Sosyodemografik veri formu, Alkol Kullanım Bozuklukları Tanıma Testi (AKBTT), Üstbiliş Ölçeği (ÜBÖ-30), Sürekli Öfke ve Öfke İfade Tarzı Ölçeği (SÖ-ÖİTÖ) ve Buss-Perry Agresyon Ölçeği (AÖ) kullanılmıştır.

Bulgular: AKB grubunda ÜBÖ-30 toplam, SÖ-ÖİTÖ sürekli öfke, öfke dışa ve öfke içe ve AÖ toplam puanları kontrol grubuna göre anlamlı olarak yüksek bulundu (sırasıyla $p<0,001$, $p<0,001$, $p=0,001$, $p=0,001$ ve $p<0,001$). Gruplar arasında ÜBÖ-30 ve diğer ölçeklerin korelasyon katsayıları karşılaştırıldığında, AKB grubunda sürekli öfke ve fiziksel agresyon arasında farklılık saptanmıştır (sırasıyla $z=2,035$; $p=0,042$ ve $z=2,120$; $p=0,034$). Çalışmamızda yapılan regresyon analizi sonucunda, AKB olan kişilerde agresyonu yordayan en önemli üstbilişsel inancın düşünceleri kontrol etme ihtiyacı olduğu bulunmuştur ($\beta=0.567$,$t(66)= 4.034$, $p<0.001$,$pr2 =0.20$).

Sonuç: Üstbilişsel inançlar AKB olan kişilerde yüksek oranda etkilenir ve daha fazla öfke ve agresyona neden olur. Öfkenin ortaya çıkmasında düşünceleri kontrol etme ihtiyacının önemli bir rol oynadığı gösterilmiştir.

Anahtar Kelimeler: Alkol Bağımlılığı, Üstbiliş, Öfke, Agresyon.

INTRODUCTION

Dr. Benjamin Rush defined excessive alcohol use as a disease in the 1700s and stated his treatment as abstinence from alcohol (1). With the Diagnostic and Statistical Manual of Mental Disorders Fifth, alcohol-related disorders were no longer two separate diagnostic categories as abuse and addiction, and were gathered under the heading of Alcohol Use Disorder (AUD) (2).According to World Health Organization (WHO) data, the incidence of AUD was determined as 4.1% worldwide and 7.5% in Europe in 2014 (3). It has been reported that the age of alcohol use is reduced to 12-14 years, Common ages of initation of alcohol is between the ages of 15-22, alcohol-related problems begin between the ages of 18-25, and applications for treatment are at the ages of 40 (4). At the same time, many psychiatric disorders can coexist with AUD. 37% of individuals with AUD are co-diagnosed for any other mental disorder (5). The most common comorbidities are: Another Substance Use Disorder, Mood Disorders, Anxiety Disorders, Post Traumatic Stress Disorder, and Personality Disorders, which also have higher rates of suicide (6). In addition, it has been reported that the frequency of anger, aggression and violence is higher in those with AUD (7).

Anger is expressed as an emotional state ranging from mild discomfort to violence (8). Aggression is defined as anger, anger and hateful destructive behavior with the aim of harming others physically and mentally (9). Buss and Perry analyzed aggression in four dimensions: physical aggression, verbal aggression, anger and hostility. Physical aggression and verbal aggression reflect motor behavior, including injuring and harming others. Anger, on the other hand, includes the physiological response and preparation for aggression and is related to the emotional or affective aspect of the behavior. Hostility is related to the cognitive aspect of behavior and includes feelings of ill will and injustice (10).

It is known that 50-86% of alcohol use accompanies anger and aggression attacks (11). Studies have shown that in case of aggression that occurs with alcohol use, AUD's are more prone to cognitively provocative cues (12). As cognitive processes lead from anger and aggression, researchers have suggested that metacognitive beliefs may have a role in the emergence of anger and aggression (13).

Metacognitive beliefs express the implicit or explicit knowledge that individuals have about their own cognition and the coping strategies that affect it. Metacognition, in its shortest definition, means that one can control these processes by being aware of their thinking processes (14,15). There are five sub-categories of metacognition: Positive Beliefs, Negative Beliefs (Uncontrollability and Danger), Cognitive Confidence, Need for Control of Thoughts, and Cognitive Awareness (16).

Considering the relationship between alcohol use and metacognition, the role of metacognition in AUD has now been defined intensively. It was found that beliefs abouts to the need to control thoughts predicted alcohol use (17). It is known that positive metacognitions about alcohol use are especially important in the development of problematic alcohol use and contribute independently to drink behavior (18,19). Metacognitive beliefs may play an important role in the regulation of emotion regulation skills in those with AUD (20). Again, there is a close relationship between craving behavior and metacognition in people with AUD(21).

Metacognition is known to be associated with both AUD and anger problems, but there is no study evaluating which subdomains of metacognition elicits anger in those with AUD. The aim of this study is to investigate which area of metacognition plays a role in the emergence of anger and aggression in people with AUD.

The hypotheses of this study;

1- People with AUD have different metacognitive beliefs than healthy people.

2- People with AUD have more anger and aggression than healthy people.

3. In people with AUD, there is a relationship between metacognition and anger and aggression.

4. People with AUD differ from healthy people in the mechanisms by which aggression occurs.

MATERIAL AND METHODS

Among the patients who applied to Duzce University Faculty of Medicine, Department of Psychiatry between February 2019 and January 2020, and patients who applied to Sakarya University Training and Research Hospital, Department of Psychiatry, who were diagnosed with Alcohol Use Disorder according to DSM-V diagnostic criteria after the interview were included to the study. Patients with comorbid Substance Use Disorder or alcohol withdrawal and Delirium Tremens, and patients under the influence of alcohol or any substance were excluded. A control group was formed from patients who did not have any psychiatric diagnosis. All individuals included in the study were literate, could understand and answer the given scale appropriately, and were selected on a voluntary basis. Sociodemographic Data Form, Alcohol Use Disorders Identification Test (AUDIT), Metacognition Scale-30 (MCQ-30), Trait Anger and Anger Expression Style Scale (STAXI), Buss-Perry's Aggression Questionnaire (AQ) were filled in by all participants.

The study was concluded with a total of 143 participants, 72 in the patient group and 71 in the control group. Patient selection flow is given in figure-1. In the power analysis, it is known that the mean MCQ score in healthy individuals is 70 (22) .

In this study, the required minimum sample size was calculated as 70 in each group, under 0.80 power and 0.05 Type 1 error conditions, in order to determine the statistical significance of one standard deviation difference in terms of MCQ score in patients with AUD compared to the control group, and in this direction, it is necessary to work with a total of 140 individuals has been planned (22,23).

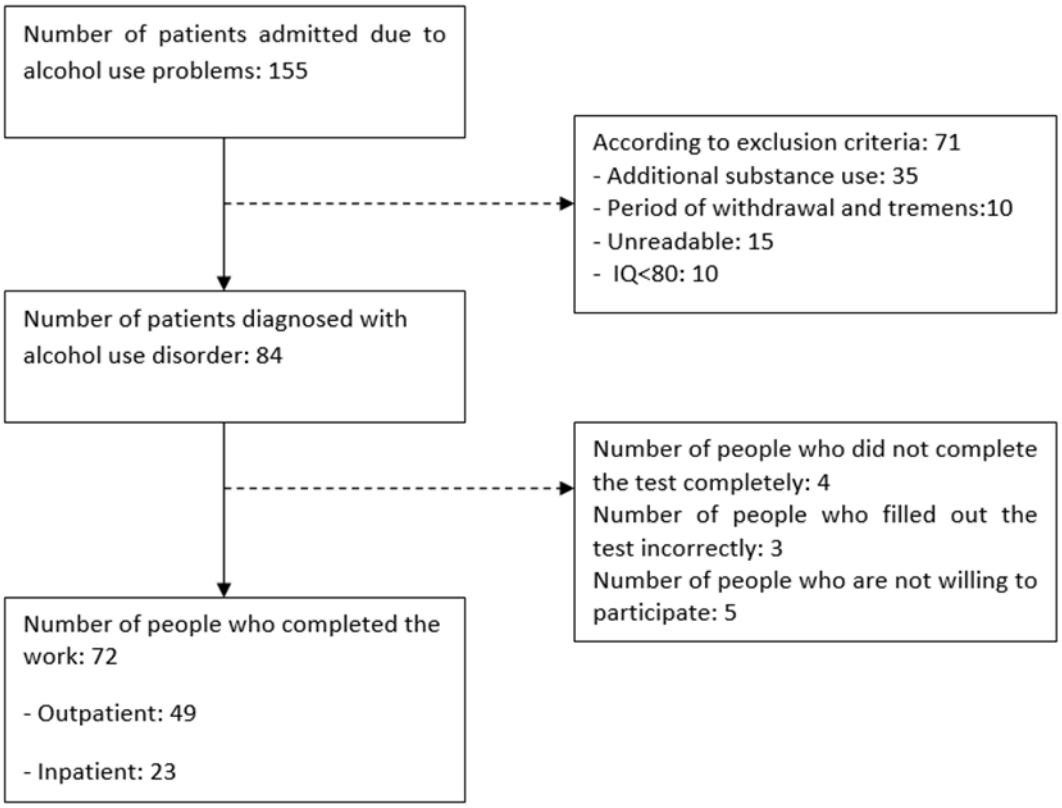

Figure 1. Flowchart for patient selection.

IRB approval for the study was proced from the Ethics Committee of Duzce University [2019/16]. All of the study procedures were in accordance with the WHO Declaration of Helsinki and local laws and regulations.

Scales

Sociodemographic Data Form: It is a form created by authors which questions participants' age, gender, marital status, education period, age at onset of alcohol use, duration of alcohol use, amount of alcohol use, additional psychiatric disease history, etc. sociodemographic characteristics.

Alcohol Use Disorders Identification Test (AUDIT): AUDIT, is developed by WHO to identify people with harmful alcohol consumption and alcohol dependence. Each question is scored on a five-point Likert scale (0-4). High scores on AUDIT were associated with alcohol dependence. Four levels of risk have been defined in WHO's AUDIT guidelines, and increased levels of risk reflect increased levels of intervention (24). The Turkish validity and reliability of AUDIT was performed by Saatçioğlu et al. in 2002 (25). The internal consistency of the scale was found to be 0.59 and 0.65 for two different interviewers.

Metacognition Questionnaire-30 (MCQ-30): The original name of the scale developed by Cartwright-Hatton and Wells is "Meta-Cognitions Questionnaire (MCQ)". Later, Wells and Cartwright-Hatton developed a short 30-item form (MCQ-30) of this scale (26). It is answered by the patient on a 4-unit Likert-type rating scale. The scores that can be obtained from the scale vary between 30 and 120, and an increase in the score indicates an increase in pathological metacognitive activity (16). The Turkish validity and reliability study of the scale was conducted by Tosun and Irak in 2008 (27). The inter-item correlation matrix of MCQ-30 is above .3, and this value indicates that the items are suitable for factor analysis. The Kaiser–Meyer–Olkin (KMO) measurement is .90 and supports the suitability of the items for factor analysis.

Trait Anger and Anger Expression Scale (STAXI): The scale developed by Spielberger, Jacobs, Russell, and Crane (1983) is a self-evaluation type scale that measures anger emotion and expression (28). The scale, which consists of 34 items and is a 4-point Likert type, includes 4 subscales: anger-in, anger-out, anger control, and trait anger. The scale evaluates trait anger and anger expression types separately. Each item is scored

between 14. Turkish adaptation was carried out by Özer (1994) (29).

Buss-Perry'sAggression Questionnaire (AQ): Developed by Buss and Durkee in 1957, the scale was revised by Buss and Perry in 1992. The aggression scale consists of 4 different sub-dimensions: physical aggression, verbal aggression, anger and hostility. Each of the questions, consisting of 29 items in total, is evaluated on a 5-point Likert type scale (10). The validity and reliability study of the AO, which was adapted into Turkish, was conducted by Evren et al. with alcohol and substance addicted patients (30).

Statistical Analysis: SPSS version 26.0 software was used for statistical analysis (SPSS Inc., Chicago IL, USA). Mean, standard deviation, number, percentage values were used for descriptive variables, and median and interquartile range values were used for data showing non-parametric distribution. Whether the numerical variables showed normal distribution or not was evaluated with the Kolmogorov-Smirnov test. Independent samples t test was used for independent groups in the comparison of two normally distributed groups, and the Mann Whitney U test was used in the comparison of the two groups in terms of normally distributed numerical variables. One-way ANOVA was used to compare more than two groups in terms of normally distributed numerical variables, and the Kruskal-Wallis test was used to compare non-normally distributed numerical variables. Correlations between normally distributed numerical variables were evaluated with Pearson correlation coefficient, and correlations between non-normally distributed numerical variables were evaluated with Spearman correlation coefficient. Regression analysis method was used to examine the relationship between the dependent variable and one or more independent variables. Statistical significance was accepted as $p < 0.05$.

RESULTS

Sociodemographic Characteristics of the Participants: The socio-demographic characteristics of the study are summarized in Table-1. While the mean age of the participants was 44.06±9.71 in the AUD group, it was 44.42±9.57 in the control group. 6 (8.3%) of 72 people in the AUD group were female, 66 (91.7%) were male, 6 (8.5%) of 71 people in the control group were female, 65 (91.5%) was male. There was no statistically significant difference between the groups in terms of age and gender (p=0.820; p=0.980, respectively). When compared in terms of marital status, the rates of being single (23.6% vs. 5.6%) and being separated (12.5% vs. 4.2%) were found to be statistically significantly higher in the AUD group compared to the control group (p=0.001). The number of siblings were significantly higher in the control group (median 4 to 3). (p=0.38)

Table 1. Comparison of the sociodemographic characteristics of the participants

		AUD (n=72)	Controls(n=71)	t,x^2	p
Age, (Mean±SD)		44.06±9.71	44.42±9.57	-.228*	0.820
Sex, n(%)	Women	6 (8.3)	6 (8.5)	.001**	0.980
	Men	66 (91.7)	65 (91.5)		
Marital status, n(%)	Married	46 (63.9)	64 (90.1)	13.889**	0.001
	Single	17 (23.6)	4 (5.6)		
	Divided	9 (12.5)	3 (4.2)		
Number of Sibling, med (min-max)		3 (1-10)	4 (1-12)	-2.091*	0.038
Smoking, n(%)		68 (94.4)	29 (40.8)	47.067**	<0.001
Substance use, n(%)		7 (9.7)	0 (0.0)	7.207**	0.013
Suicide attempt, n(%)		19 (26.4)	1 (1.4)	18.544**	<0.001
Mental disorder, n(%)		17 (23.6)	0 (0.0)	19.026**	<0.001
Psychiatric hospitalization, n(%)		27 (37.5)	0 (0.0)	32.822**	<0.001
Legal trouble, n(%)		35 (48.6)	4 (5.6)	33.290**	<0.001
Alcohol use in the family, n(%)		37 (51.4)	12 (16.9)	18.877**	<0.001
History of substance use in the family, n(%)		4 (5.6)	0 (0.0)	4.058**	0.044

*,t:independent sample t test **,x^2: chisquare test, AUD: Alcohol Use Dısorder

While the average smoking amount of 68 (94.4%) smokers in the AUD group was 36.15±18.98 packs/year, the average smoking amount of 29 smokers in the control group was 25.00±14.61 packs/year and the amount of smoking in the AUD group was found to be significantly higher than in the control group (p=0.007). Substance use in the AUD group (9.7% vs. 0.0%) was found to be significantly higher than in the control group (p=0.013).

Suicide attempt history was significantly higher in the AUD group (26.4% vs. 1.4%) compared to the control group (p<0.001).

Both psychiatric comorbid diagnosis (23.6% vs. 0.0%) and psychiatric hospitalization history (37.5% vs. 0.0%) were found to be significantly higher in the AUD group compared to the control group (p<0.001). The most common psychiatric comorbidities were Mood Disorders (n: 10), Anxiety Disorder (n: 5), Personality Disorder (n: 2).

Experiencing legal problems (48.6% vs. 5.6%) in the AUD group was significantly higher than the control group (p<0.001). Both history of familial alcohol use (51.4%; 16.9%; p<0.001) and history of family substance use (5.6%; 0.0%; p=0.044) were also significantly higher in the AUD group compared to the control group.

Comparison of AUDIT, MCQ, STAXI and AQ Scale Scores in AUD: Scale scores filled in AUD and control group are summarized in Table-2. The mean AUDIT score of the participants in the AUD group was 26.44±7.25. Positive beliefs (p=0.042), uncontrollability and danger (p<0.001), cognitive confidence (p<0.001), need to control thoughts (p<0.001) and total score (p<0.001) subscale scores of the metacognition scale in the AUD group were controlled significantly higher than the group. There was no significant difference between the groups in terms of cognitive awareness subscale scores (p=0.106). According to the scores obtained from the trait anger-anger expression style scale, trait anger (p<0.001), anger-out (p=0.001) and anger-in (p=0.001) scores were found to be significantly higher in the AUD group, while the anger control (p=0.014) scores were found in the control group.) scores were found to be significantly higher. Physical aggression (p=0.003), anger (p<0.001), hostility (p<0.001) and total (p<0.001) scores were found to be significantly higher in the AUD group compared to the scores obtained from the Buss-Perry Aggression Scale. There was no significant difference between the groups in terms of verbal aggression scores (p=0.311).

Table 2. Comparison of AUDIT, MCQ, STAXI and AQ scale scores in AUD group and control group

	AUD (n=72)	**Controls(n=71)**	**t**	**p**
	Mean±SD	**Mean±SSD**		
AUDIT	26.44±7.25	---		---
MCQ-30				
Positive Beliefs	13.88±4.90	12.28±4.38	2.050	0.042
Negative Beliefs about Uncontroll ability and Danger	15.18±4.04	12.11±3.65	4.765	<0.001
Cognitive Confidence	12.79±4.60	10.10±2.95	4.171	<0.001
Need to Control Thought	13.96±5.27	10.08±3.18	5.326	<0.001
Cognitive Self-Consciousness	15.67±4.27	14.51±4.26	1.626	0.106
Total	71.47±16.21	59.08±13.08	5.024	<0.001
STAXI				
Anger-trait	23.10±6.61	19.04±5.57	3.966	<0.001
Anger-control	20.74±5.19	22.94±5.40	-2.493	0.014
Anger-out	17.50±4.91	14.89±4.33	3.374	0.001
Anger-in	18.57±4.42	16.38±3.43	3.306	0.001
AQ				
Physical Aggression	11.58±7.66	8.27±5.33	3.009	0.003
Verbal Aggression	8.67±4.28	7.97±3.87	1.018	0.311
Anger	11.85±6.18	7.66±5.40	4.309	<0.001
Hostility	14.82±7.00	9.61±5.93	4.805	<0.001
Total	46.92±20.85	33.51±15.80	4.338	<0.001

t: independent sample t test, AUD: Alcohol Use Dısorder, AUDIT: Alcohol Use Disorders Identification Test, MCQ-30: Metacognition Questionnaire-30, STAXI: Trait Anger and Anger Expression Scale, AQ: Buss-Perry's Aggression Questionnaire

Correlations between MCQ-30, STAXI, and AQ in the AUD Group: The correlations of the scales with each other are summarized in Table-3. AUDIT score and the need to control thoughts of the MCQ-30 scale (r=0.340; p=0.003), trait anger (r=0.301; p=0.010), AQ hostility (r=0.328; p=0.005), and AQ total was observed that there was a weak positive correlation between the scores (r=0.236; p=0.046).

In the AUD group, the positive beliefs score of MCQ-30 was found to be weakly and positively correlated with STAXI anger control (r=0.289; p=0.014). In the AUD group, the uncontrollability and danger scores of the MCQ-30 were determined by the STAXI trait anger (r=0.235; p=0.047), anger-in (r=0.233; p=0.049), AQ anger (r=0.256; p=0.030) , hostility (r=0.282; p=0.016), and total score (r=0.300; p=0.010) were found to be weakly and positively correlated. Trait anger (r=0.446; p<0.001), anger-out (r=0.286; p=0.015), anger-in (r=0.413; p<0.001), anger-in of MCQ-30's cognitive confidence score in the AUD group, in STAXI scale; It was found that AQ showed weak and positive correlations with anger (r=0.308; p=0.008), hostility (r=0.384; p=0.001), total score (r=0.308; p=0.008). In the AUD group, the scores of MCQ-30's need to control thoughts were determined by the STAXI trait anger (r=0.558; p<0.001), anger-out (r=0.430; p<0.001), anger-in (r=0.476; p<0.001), AQ was moderate with physical aggression (r=0.471; p<0.001), anger (r=0.420; p<0.001), hostility (r=0.572; p<0.001), total score (r=0.553; p<0.001). In the AUD group, it was determined that the cognitive awareness score of MCQ-30 showed a weak and positive correlation with STAXI anger control (r=0.317; p=0.007).

Table 3. Examination of the correlations between MCQ-30, STAXI , and AQ in the AUD group

	MCQ-30						
	AUDIT	**Positive Beliefs**	**Negative Belief**	**Cognitive Confidence**	**Need to Control Thought**	**Cognitive Self-Consciousness**	**total**
AUDIT	1	0.112	0.046	0.097	0.340***	0.074	0.203
STAXI							
Anger-trait	0.301**	0.024	0.235*	0.446***	0.558***	0.088	0.397***
Anger-control	-0.157	0.289*	0.057	-0.089	-0.148	0.317***	0.112
Anger-out	0.088	-0.173	0.174	0.286*	0.430***	-0.145	0.174
Anger-in	0.061	-0.086	0.233*	0.413***	0.476***	-0.023	0.298**
AQ							
Physical Aggression	0.191	-0.074	0.225	0.197	0.471***	0.060	0.258*
Verbal Aggression	0.127	-0.015	0.227	0.078	0.308***	0.154	0.215
Anger	0.100	-0.068	0.256*	0.308**	0.420***	0.067	0.285*
Hostility	0.328***	0.131	0.282*	0.384***	0.572***	0.118	0.436***
Total	0.236*	-0.006	0.300**	0.308**	0.553***	0.113	0.370***

Pearson correlation test, *p<0.05;**p<0.01;***p<0.001, AUD: Alcohol Use Dısorder, AUDIT: Alcohol Use Disorders Identification Test, MCQ-30: Metacognition Questionnaire-30, STAXI: Trait Anger and Anger Expression Scale, AQ: Buss-Perry's Aggression Questionnaire

Effect of Metacognition on Aggression: Multivariate regression linear regression analysis was performed to predict the Buss-Perry's Aggression Questionnaire variable by using the subscale (Positive Beliefs, Negative Beliefs, Cognitive Confidence, Need to, Control Thought, Cognitive Self-Consciousness) variables of metacognition separately in the AUD and Control groups (table-4). As a result of the analysis, a significant regression model was obtained both in the AUD group and in the control group (F(5.66)=7.017, p<00.1;F(5.65)=2.933, p=0.02, respectively), and in the dependent variable in the AUD group. It was found that 30% of the variance (R2adjusted=0.3) was explained by the independent variables, while this rate was found to be 12% (R2adjusted=0.12) in the control group. In the AUD group, the need for control over thoughts predicted aggression positively and significantly (=0.567, t(66)= 4.034, p<0.001, pr^2=0.20). Mindfulness predicted aggression positively and significantly in the control group. (=0.,313,t(64)=2,113, p=0.038,pr^2=0.06).

Table 4. Demonstrating the effect of metacognition on aggression with multiple regression model

	Model	**Unstandardized**		**Standard**	**t**	**Sig.**	**95,0% Confidence**			
		B	**Std. Error**	**Beta**			**Lower Bound**	**Upper Bound**	**Correlation Partial**	**VIF**
AUD (n=72)	**(Constant)**	20.852	10.690		1.951	0.055	-.492	42.196		
	Positive Beliefs	-1.003	0.560	-.236	-1.789	0.078	-2.122	.116	-0.215	1.754
	Negative Beliefs	.625	0.709	.121	.881	0.382	-.792	2.041	0.108	1.906
	Cognitive Confidence	-.055	0.610	-.012	-.091	0.928	-1.272	1.162	-0.011	1.829
	Need to Control Thought	2.240	0.555	.567	4.034	<0.01	1.132	3.349	0.445	1.994
	Cognitive Self-Consciousness	-.005	0.735	-.001	-.006	0.995	-1.471	1.462	-0.001	2.283
Control (n=71)	**(Constant)**	3.524	8.825		.399	0.691	-14.101	21.149		
	Positive Beliefs	-.332	0.532	-.092	-.625	0.534	-1.395	.730	-0.077	1.728
	Negative Beliefs	-.098	0.625	-.023	-.157	0.876	-1.347	1.151	-0.019	1.663
	Cognitive Confidence	.722	0.711	.135	1.016	0.313	-.697	2.142	0.125	1.406
	Need to Control Thought	1.103	0.678	.222	1.628	0.108	-.250	2.457	0.198	1.486
	Cognitive Self-Consciousness	1.160	0.549	.313	2.113	**0.038**	0.063	2.257	0.253	1.749

DISCUSSION

AUD affects many people today and the age of alcohol use is decreasing gradually (31). People with AUD are more involved in the forensic process and experience more anger and aggression problems (7). In this study, we aimed to determine and compare metacognition in people with AUD

compared to controls and to determine the role of metacognition in the formation of aggression.

In our study, we found that metacognition in AUD differs in the sub-domains of positive beliefs, uncontrollability and danger, cognitive confidence, and the need to control thoughts. It was also found that those with AUD experienced more anger and aggression. In addition, another important result of our study is that the most important metacognitive beliefs that cause aggression in people with AUD is the need to control thoughts.

In our study, the female/male ratio of patients with AUD was found to be 1/11. Although AUD rates in women have increased recently, this rate may vary from region to country (32,33).

Moreover, smoking, additional substance use, divorce rates, additional psychiatric disorder history, suicide attempts, the rates of experiencing legal problems, and a family history of substance use were higher in the AUD group, which is consistent with the literature (34–38).

We also obtained significantly higher scores in all domains of metacognition (positive beliefs, uncontrollability and danger, cognitive confidence, and the need to control thoughts) except for cognitive awareness in people with AUD. Especially Spada suggested that metacognition plays an important role in people with AUD in his studies (39). Spada and Wells showed that alcohol use started in order to regulate negative mood in the model they proposed for AUD, and positive metacognitive beliefs about alcohol contributed to alcohol use (39). Again, negative metacognitive beliefs may play a role in alcohol use in risky situations (40). Our study was also found to be quite compatible with the literature. No difference was found in the area of cognitive awareness. This information is also compatible with the literature, and the reason why no difference was found may be that the control group also got high scores in this area (17,22).

Additionally, we found that anger and aggression were higher in the AUD group than in the control group. Being unable to cope with anger is one of the situations that can cause relapses in individuals with alcohol and substance addiction. Individuals who use alcohol and drugs can often internalize their anger or express it with an aggressive attitude. Due to the inability to control anger and not being assertive, they may be alone by experiencing deterioration in their interpersonal relationships. Loneliness and delinquency that develop because they have problems in interpersonal relationships are among the other factors that may threaten sobriety (41). In a similar study, it is observed that the trait anger level of alcohol and substance addicted patients is slightly higher than the medium level, and the mean anger-in and anger-out scores are higher than moderate (42). In our study, consistent with the literature, the fact that the trait anger, anger-out and anger-in scores were significantly higher in the AUD group compared to the control group, and the anger control scores were lower, show that the patients in this group experience anger more frequently, they experience their anger by either reflecting or suppressing it, but they have difficulty in anger control.

Aggressive behaviors and legal problems are frequently encountered in alcohol and substance addicts. Therefore, studies on aggression gain importance in this patient group. In our study, we found aggression significantly higher in the AUD group compared to the control group, while it was higher in physical aggression, anger and hostility, we did not detect any difference in verbal aggression. However, the high level of aggression in patients with AUD does not fully clarify the cause-effect relationship between addiction and aggression. It has been suggested that there may be a unidirectional relationship in the form of aggression creating a tendency for addiction or the effects of the substance used and causing aggression due to disinhibition, or a bidirectional relationship where both reinforce the other (43,44). The high level of verbal aggression in the society may have caused the absence of a significant difference.

It is seen that as the scores in the control area of metacognitive beliefs increase, AUD also increases. Again, it is seen that the need to control thoughts is positively correlated with anger and aggression. Cognitive confidence also correlates with some subscales of anger and aggression. It is seen that there is only a partial increase in the area of environmental damage of aggression as the severity of addiction increases in those with AUD. With this information, we sought an answer to the following question: Do people with AUD have metacognitive beliefs that reveal aggression?

According to multiple regression modeling, metacognition explains 30% of aggression. It was observed that the only variable that predicted aggression significantly was the belief in control of thoughts. Thought control belief alone could explain 20% of aggression. When the control group is examined, it is seen that the metacognitive belief that reveals aggression is the area of cognitive awareness. Looking at the literature, few studies have examined the relationship between metacognitive beliefs and aggression (13,45,46). We could not find a similar study in the literature on metacognitive beliefs and predicting aggression in people with AUD A longitudinal and comprehensive study on this subject also found that while metacognitive functions alone did not predict aggressive behavior, borderline and passive-aggressive personality structure and past violence history were associated. However, in this study, the sub-domains of metacognition were not evaluated separately (45). In the study examining metacognitive mental disorders and aggression, it

was thought that metacognitive functions alone do not predict aggressive behavior, but that metacognitive functions may be related to hostility arising from direct and indirect aggression (45). Salguero found that rumination predicted anger in his study of university students (46).

In people with AUD, however, there is no information about how the need to control thoughts predicts aggression. The need to control thoughts can be seen as the most important metacognitive belief of addiction-related beliefs (47). There may be several reasons for the relationship between the need for thought control and aggression in people with AUD. One of them is that people with AUD need to control their thoughts more and think that they will be punished if they cannot control them. They resort to the use of alcohol to distract from their thoughts. However, the fact that alcohol does not have this effect may cause them to drink more, not to stay away from their thoughts, and to reflect their anger towards themselves to the environment.

A second mechanism may be at the neurobiological level. It is known that serotonin plays a crucial role especially in thought control and involuntary thoughts. Serotonin mechanism is also highly impaired in people who show aggression (48,49). When this information is considered together, the irregularities related to the serotonin mechanism in people with AUD may cause the need for thought control to reveal aggression (50). Another mechanism may be via GABA, GABAergic neurons have an effect on both AUD and aggression (51,52). GABA is also involved in controlling unwanted thoughts (53). Disturbances in the GABA mechanism can also cause this situation. Therfore, it may be important for clinicians to consider drugs that act on both serotonin and GABA when working on anger management in people with AUD.

It was thought that the process of how the need to control thoughts predicts aggression in people with AUD detected in our study may be related to neurobiology and may be related to GABA and serotonin dysregulation seen in AUD, but further studies are needed to investigate this.

The limitations of our study are that it was a cross-sectional study design, additional pathologies of the patients could not be excluded, previous violence history predicting aggression and personality disorders were not evaluated. We think that its strengths are important in terms of researching which metacognitive domain reveals aggression in people with AUD and investigating the mediating role of metacognition in the emergence of aggression.

In the near future there is a need for more comprehensive studies that evaluate personality structures, violence, metacognition and psychiatric disorders that may be effective in the emergence of anger in people with AUD. In addition, it may be very interesting in studies on how interventions in different areas of metacognition change anger.

CONCLUSIONS

The use of metacognitive functions is impaired in people with AUD, there is a positive correlation between controlling thoughts in AUD and the severity of alcohol use, and cognitive therapies may be considered in the treatment. In addition, the effort to control thoughts seems to be highly responsible for aggression in people with AUD. Clinicians working on AUD and anger problems should keep in mind about the role of metacognition and should develop themselves in the field of metacognitive therapies.

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REFERENCES

1. Witkiewitz K, Litten RZ, Leggio L. Advances in the science and treatment of alcohol use disorder. Sci Adv. 2019;5(9):eaax4043.
2. American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders. 2013
3. World Health Organization. Global status report on alcohol and health - 2014 [Internet]. 2014 ed. Geneva: World Health Organization; 2014 [cited 2022 Feb 2]. Available from: https://apps.who.int/iris/handle/10665/112736
4. Hingson RW, Heeren T, Winter MR. Age at Drinking Onset and Alcohol Dependence: Age at Onset, Duration, and Severity. Archives of Pediatrics & Adolescent Medicine. 2006;160(7):739–46.
5. Kranzler HR, Soyka M. Diagnosis and Pharmacotherapy of Alcohol Use Disorder: A Review. JAMA. 2018;320(8):815–24.
6. Castillo-Carniglia A, Keyes KM, Hasin DS, Cerdá M. Psychiatric comorbidities in alcohol use disorder. Lancet Psychiatry. 2019;6(12):1068–80.
7. Norström T, Pape H. Alcohol, suppressed anger and violence. Addiction. 2010;105(9):1580–6.

8. Spielberger CD, Reheiser EC. Assessment of Emotions: Anxiety, Anger, Depression, and Curiosity. Applied Psychology: Health and Well-Being. 2009;1(3):271–302.
9. Liu J. Concept Analysis: Aggression. Issues in Mental Health Nursing. 2004;25(7):693–714.
10. Buss AH, Perry M. The Aggression Questionnaire. Journal of Personality and Social Psychology. 1992;63(3):452–9.
11. Massa AA, Subramani OS, Eckhardt CI, Parrott DJ. Problematic Alcohol Use and Acute Intoxication Predict Anger-Related Attentional Biases: A Test of the Alcohol Myopia Theory. Psychol Addict Behav. 2019;33(2):139–43.
12. Bertsch K, Böhnke R, Kruk MR, Naumann E. Influence of aggression on information processing in the emotional Stroop task—An event-related potential study. Frontiers in Behavioral Neuroscience. 2009;3.
13. Caselli G, Offredi A, Martino F, Varalli D, Ruggiero GM, Sassaroli S, et al. Metacognitive beliefs and rumination as predictors of anger: A prospective study. Aggress Behav. 2017;43(5):421–9.
14. Papageorgiou C, Wells A. Metacognitive beliefs about rumination in recurrent major depression. Cognitive and Behavioral Practice. 2001;8(2):160–4.
15. Schraw G, Dennison RS. Assessing Metacognitive Awareness. Contemporary Educational Psychology. 1994;19(4):460–75.
16. Wells A, Cartwright-Hatton S. A short form of the metacognitions questionnaire: Properties of the MCQ-30. Behaviour Research and Therapy. 2004;42(4):385–96.
17. Spada MM, Wells A. Metacognitions, emotion and alcohol use. Clinical Psychology & Psychotherapy. 2005;12(2):150–5.
18. Caselli G, Spada MM. Metacognitions in desire thinking: a preliminary investigation. Behav Cogn Psychother. 2010;38(5):629–37.
19. Spada MM, Moneta GB, Wells A. The relative contribution of metacognitive beliefs and expectancies to drinking behaviour. Alcohol and Alcoholism. 2007;42(6):567–74.
20. Dragan M. Difficulties in emotion regulation and problem drinking in young women: the mediating effect of metacognitions about alcohol use. Addict Behav. 2015;48:30–5.
21. Delonca D, Trouillet R, Alarcon R, Nalpas B, Perney P. Relationships between Attentional Bias and craving in Alcohol Use Disorder: Role of metacognitions. Addict Behav. 2021;117:106846.
22. Ogel K, Sarp N, Gurol D, Ermagan E. Investigation of mindfulness and affecting factors of mindfulness among substance users and non users. Anatolian Journal of Psychiatry. 2014;15:282.
23. Yılmaz S, İzci F, Mermi O, Atmaca M. Metacognitive functions in patients who has obsessive compulsive disorder and major depressive disorder: A controlled study. Anadolu Psikiyatri Dergisi. 2016;17.
24. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. Original: English Distribution: General. 2001;41.
25. Saatçioğlu Ö, Evren C, Çakmak D. Alkol kullanım bozuklukları tanıma testinin geçerliği ve güvenirliği. Türkiye'de Psikiyatri. 2002;4(2-3):107-113.
26. Cartwright-Hatton S, Wells A. Beliefs about worry and intrusions: the Meta-Cognitions Questionnaire and its correlates. J Anxiety Disord. 1997;11(3):279–96.
27. Tosun, A. ve Irak, M. Üstbiliş Ölçeği-30'un Türkçe uyarlaması, geçerliği, güvenirliği, kaygı ve obsesif-kompülsif belirtilerle İlişkisi. Türk Psikiyatri Dergisi. 2008;19(1):67-80.
28. Spielberger CD, Sydeman SJ. State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In: The use of psychological testing for treatment planning and outcome assessment. Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc;1994; 292–321.
29. Ozer AK. Surekli Ofke ve Ofke Ifade Tarzi Olçekleri ön çalismasi. Turk Psikoloji Dergisi. 1994;9(31):26-35.
30. Evren C, Çınar Ö, Güleç H, Çelik S, & Evren B. The validity and reliability of the Turkish version of the Buss-Perry's Aggression Questionnaire in male substance dependent inpatients. Dusunen Adam The Journal of Psychiatry and Neurological Sciences. 2011;24(4):283.
31. Hingson RW, Heeren T, Edwards EM. Age at drinking onset, alcohol dependence, and their relation to drug use and dependence, driving under the influence of drugs, and motor-vehicle crash involvement because of drugs. J Stud Alcohol Drugs. 2008;69(2):192–201.
32. Foster KT, Hicks BM, Iacono WG, McGue M. Gender differences in the structure of risk for alcohol use disorder in adolescence and young adulthood. Psychol Med. 2015;45(14):3047–58.
33. Peltier MR, Verplaetse TL, Mineur YS, Petrakis IL, Cosgrove KP, Picciotto MR, et al. Sex differences in stress-related alcohol use. Neurobiol Stress. 2019;10:100149.
34. Blakey SM, Campbell SB, Simpson TL. Associations Between Lifetime Panic Attacks, Posttraumatic Stress Disorder, and Substance Use Disorders in a Nationally Representative Sample. J Dual Diagn. 2021;1–12.
35. Gregoire TK, Burke AC. The relationship of legal coercion to readiness to change among adults with alcohol and other drug problems. Journal of Substance Abuse Treatment. 2004;26(1):35–41.
36. Khan MR, Ban K, Caniglia EC, Edelman JE, Gaither J, Crystal S, et al. Brief original report: Does smoking status provide information relevant to screening for other substance use among US adults? Preventive Medicine Reports. 2021;23:101483.

37. Liu X, Zhao W, Hu F, Hao Q, Hou L, Sun X, et al. Comorbid anxiety and depression, depression, and anxiety in comparison in multi-ethnic community of west China: prevalence, metabolic profile, and related factors. J Affect Disord. 2022;298(Pt A):381–7.
38. Miller M, Anderson-Luxford D, Mojica-Perez Y, Sjödin L, Room R, Jiang H. A time-series analysis of the association between alcohol and suicide in Australia. Drug Alcohol Depend. 2022;231:109203.
39. Spada MM, Wells A. A metacognitive model of problem drinking. Clinical Psychology & Psychotherapy. 2009;16(5):383–93.
40. Torselli E, Ottonello M, Franceschina E, Palagi E, Bertolotti G, Fiabane E. Cognitive and metacognitive factors among alcohol-dependent patients during a residential rehabilitation program: a pilot study. Neuropsychiatr Dis Treat. 2018;14:1907–17.
41. Canham SL, Mauro PM, Kaufmann CN, Sixsmith A. Association of Alcohol Use and Loneliness Frequency Among Middle-Aged and Older Adult Drinkers. J Aging Health. 2016;28(2):267–84.
42. Czermainski FR, Lopes FM, Ornell F, Pinto Guimarães LS, Von Diemen L, Kessler F, et al. Concurrent Use of Alcohol and Crack Cocaine is Associated with High Levels of Anger and Liability to Aggression. Substance Use & Misuse. 2020;55(10):1660–6.
43. Bácskai E, Czobor P, Gerevich J. Gender differences in trait aggression in young adults with drug and alcohol dependence compared to the general population. Prog Neuropsychopharmacol Biol Psychiatry. 2011;35(5):1333–40.
44. Skara S, Pokhrel P, Weiner MD, Sun P, Dent CW, Sussman S. Physical and relational aggression as predictors of drug use: Gender differences among high school students. Addictive Behaviors. 2008;33(12):1507–15.
45. Candini V, Ghisi M, Bianconi G, Bulgari V, Carcione A, Cavalera C, et al. Aggressive behavior and metacognitive functions: A longitudinal study on patients with mental disorders. Annals of General Psychiatry. 2020;19(1):36.
46. José M. S, García-Sancho E, Ramos-Cejudo J, Kannis-Dymand L. Individual differences in anger and displaced aggression: The role of metacognitive beliefs and anger rumination. Aggressive Behavior. 2020;46.
47. Hamonniere T, Varescon I. Metacognitive beliefs in addictive behaviours: A systematic review. Addict Behav. 2018;85:51–63.
48. Badawy AA. Alcohol, aggression and serotonin: metabolic aspects. Alcohol Alcohol. 1998 Feb;33(1):66–72.
49. Naranjo CA, Knoke DM. The role of selective serotonin reuptake inhibitors in reducing alcohol consumption. J Clin Psychiatry. 2001;62 Suppl 20:18–25.
50. Besiroglu L, Çetinkaya N, Selvi Y, Atli A. Effects of selective serotonin reuptake inhibitors on thought-action fusion, metacognitions, and thought suppression in obsessive-compulsive disorder. Compr Psychiatry. 2011;52(5):556–61.
51. Jager A, Amiri H, Bielczyk N, van Heukelum S, Heerschap A, Aschrafi A, et al. Cortical control of aggression: GABA signalling in the anterior cingulate cortex. Eur Neuropsychopharmacol. 2020;30:5–16.
52. Maccioni P, Colombo G. Role of the GABAB receptor in alcohol-seeking and drinking behavior. Alcohol. 2009;43(7):555–8.
53. Schmitz TW, Correia MM, Ferreira CS, Prescot AP, Anderson MC. Hippocampal GABA enables inhibitory control over unwanted thoughts. Nat Commun. 2017;8(1):1311.