

Relationship of relapse with impulsivity, novelty seeking and craving in male alcohol-dependent inpatients

CUNEYT EVREN¹, MINE DURKAYA¹, BILGE EVREN², ERCAN DALBUDAK¹ & RABIA CETIN¹

¹Bakirkoy State Hospital for Mental Health and Neurological Disorders, Alcohol and Drug Research, Treatment and Training Center (AMATEM), Istanbul, Turkey, and ²Department of Psychiatry, Baltalimani State Hospital for Muskuloskeletal Disorders, Istanbul, Turkey

Abstract

Introduction and Aims. Aim of this study was to evaluate the relationship of relapse with impulsivity, novelty seeking (NS) and craving during 12 month follow up after inpatient treatment in male alcohol dependents. **Design and Methods.** Among 156 consecutively admitted male alcohol dependents, 102 were examined by face to face interview 12 months after discharge from hospital. Patients were investigated with the Barratt Impulsiveness Scale, version 11 (BIS-11), the NS dimension of the Temperament and Character Inventory, the Penn Alcohol Craving Scale (PACS) and Michigan Alcoholism Screening Test at the end of 12 months. **Results.** Among 102 alcohol-dependent inpatients 61.8% (n = 63) were considered as relapsed to alcohol use during 12 month follow up. Sociodemographic variables did not differ between relapsed and non-relapsed groups. Mean scores of BIS-11 and NS and subscales of these scales were higher in relapsed group than non-relapsed group. BIS-11 and NS and their subscales were positively correlated with each other. PACS was also positively correlated with these scales and their subscales. Only exception was 'exploratory excitability' (NS1) subscale of NS, which did not differ between groups and did not correlate with PACS or BIS-11. Extravagance (NS3) and BIS-11 non-planning impulsiveness (NPI) scores were associated with craving in Stepwise Linear Regression model. Only NS3 showed an association with relapse in the first Forward Wald logistic regression model. When severity of craving was included in the second model, as an independent variable, it was also associated with relapse additional to NS3. **Discussion and Conclusions.** Both impulsivity and NS seem to be related with craving and relapse. Particularly, NS3 may be related with relapse both directly and indirectly via craving, whereas NPI may be related with relapse only indirectly via craving. Thus severity of craving may be a final pathway to relapse in these relationships of NS3 and NPI with relapse. These findings suggest that impulsivity, NS and craving are important variables to predict outcome and also for the treatment plan. [Evren C, Durkaya M, Evren B, Dalbudak E, Cetin R. Relationship of relapse with impulsivity, novelty seeking and craving in male alcohol-dependent inpatients. *Drug Alcohol Rev* 2012;31:81–90]

Key words: alcohol dependence, craving, impulsivity, novelty seeking, relapse.

Introduction

Impulsivity was related to risk taking, lack of planning and quick decision making [1]. Definitions of impulsivity suggest that such behaviours tend to be committed without forethought or conscious judgment, and are characterised by acting on the spur of the moment, the inability to focus on a specific task and a lack of adequate planning [2,3]. Some authors include temperamental traits, such as sensation seeking and risk

taking, in the definition of impulsivity [1]. Cloninger [4] defines impulsive behaviour as the coexistence of four heritable temperamental traits: high novelty seeking (NS), low harm avoidance, low persistence and rarely, high reward dependence. Among these traits, high NS was consistently found to be related with impulsivity in different populations; that is, eating disordered subjects [5] and in subjects with generalised anxiety disorders [6]. Last but not least, when considering alcoholism, it was suggested that the most

Cuneyt Evren MD, Director, Mine Durkaya MD, Research Associate, Bilge Evren MD, Director, Ercan Dalbudak MD, Research Associate, Rabia Cetin MD, Research Associate. Correspondence to Associate Professor Cuneyt Evren, Icadiye Cad. Mentesh Sok., Selcuk Apt. 1/17 Kuzguncuk, 34674 Uskudar, Istanbul, Turkey. GSM: +90 (532) 6040946; Tel: +90 (216) 3410609; Fax: +90 (212) 6600026; E-mail: cuneytevren@yahoo.com; cuneytevren@hotmail.com

Received 5 September 2010; accepted for publication 11 January 2011.

vulnerable subjects to alcoholism may be those with high impulsivity/high NS [7].

Impulsivity has been consistently associated with alcohol or substance use and related problems [8–11]. In a review of Acton [12], it was argued that impulsivity is a temperamental risk factor for substance use. It is suggested that impulsivity may be a fundamental mechanism in both the onset of excessive substance use [13] and relapse to substance use [14]. Alcohol-dependent patients are more impulsive than healthy controls [15]. Impulsivity may also serve as a moderator on the relationship between alcohol use behaviour and alcohol use outcomes, such as alcohol use-related problems [16–18]. A recent study suggested that the paradigm related to delay of reward may be a factor associated with the use of alcohol and the incapacity to control inhibition as dependence develops [19]. High relative comorbidity is observed between alcohol use disorders and Axis I and Axis II psychiatric disorders from the impulse control spectrum; that is, antisocial personality disorder [20]. Indeed self-report measures of impulsivity were higher in alcohol dependents with cluster-B personality disorder than in those without personality disorder [21]. Also, impulsivity was found to be a characteristic of alcohol-dependent men with early-onset alcoholism (Type II), rather than late-onset alcoholism [9,22]. Dom *et al.* [22] even suggested further identification of alcoholism subtypes based on dimensions of impulsivity.

The existing literature suggests that impulsivity may be a multidimensional construct and individual differences may exist across the different dimensions of impulsiveness, which may be related to different patterns and severities of substance use [13]. Some instruments are specifically focused on the impulsivity construct [13]; others are part of a more global personality assessment that includes subscales that may correspond to impulsive personality traits, such as NS dimension of Temperament and Character Inventory (TCI) [23]. This personality trait impulsiveness may mediate the effects of alcohol on aggression [24], might contribute significantly to the risk of suicide attempts in alcohol-dependent patients [25] and may interrupt with their outpatient or inpatient treatment [26–28].

Novelty seeking is a temperament trait in the Cloninger's model of personality and is considered moderately heritable, normally distributed, developmentally and situationally stable [29]. Individuals with high NS tend to be quick-tempered, excitable, exploratory, curious, enthusiastic, ardent, easily bored, impulsive and disorderly [30]. There is considerable evidence that high novelty seekers are at increased risk for using drugs of abuse relative to low novelty seekers [31,32]. Researches suggest that NS represents a vulnerability factor for substance abuse in general [33,34], a risk

factor for dropping out of treatment [35], associated with craving scores [36–39] and a predictor of relapse in detoxified male alcohol dependents [40]. A recent study revealed that NS might also be related with impairments in mental component of life quality among this population [41]. Furthermore, NS predicts early-onset alcohol abuse [42] and is associated with the amount of drinking and severity of dependence [43,44].

One feature noted before relapse in some abstinent patients is craving for alcohol, which may contribute to the risk of relapse [45]. Higher levels of craving assessed in role play and cue reactivity are known as a risk factor for a worse outcome in alcoholism [46–48]. O'Connor *et al.* [49] have reported a higher dropout rate during alcohol withdrawal among outpatients with an increased craving. Among patients in outpatient treatment program, craving predicted relapse both during the treatment phase and 12 months after completion of the treatment [45]. Similarly severity of craving, together with factors that might increase craving (i.e. not changing risky environment, experiencing life stressor during remission or higher negative affect), was the main factor associated with relapse in 6 month follow up [50].

Related constructs NS and impulsivity are well known to be associated with craving and relapse, thus they also have negative effect on the course of alcohol dependence. Nevertheless, it is not well known which dimensions of these constructs have the main effect and whether their effects on relapse are direct or indirect via craving. Therefore, the aim of this study was to evaluate the relationship of impulsivity, NS and craving with relapse to alcohol use during 12 month follow up after inpatient treatment in male alcohol dependents. While evaluating these relationships, possible effects of age onset of regular alcohol use and severity of alcohol-related problems were controlled, because both of these variables are known to be related with severity of impulsivity [9,16,18,22] and NS [42–44].

Methods

Settings and sample

The study was conducted in Bakırköy Research and Training Hospital for Psychiatry, Neurology and Neurosurgery, Alcohol and Drug Research Treatment and Training Center (AMATEM) in Istanbul between January 2007 and January 2008. AMATEM is a specialised centre for substance use disorders with 84 inpatient beds, and accepts patients from all over Turkey. The study was approved by the Ethical Committee of the hospital and the written consent of the patients was obtained after the study protocol was thoroughly explained.

The detoxification process for alcohol-dependent inpatients is carried out in two different parts of AMATEM. The duration of the first part, which is called a 'medical treatment' phase, differs according to the patients' medical needs and usually takes approximately 2 weeks. The duration of the second part, 'the observation' phase, is standard and lasts approximately 2–3 weeks. In this phase, the treatment focuses mostly on education and the aim of this phase is to prepare patients for rehabilitation. Baseline interviews with the patients were done at the end of this phase. Although some instruments were used at these baseline interviews, none of them were included in analyses in the present study. Following this detoxification process, patients are included in a 28 day residential rehabilitation program. After being discharged from hospital, they are advised to participate in the Outpatient Treatment Program once a week for at least 1 year.

Baseline evaluation

One hundred and eighty consecutively admitted alcohol-dependent inpatients without history of any other substance abuse were considered for participation in the study. All participants fit the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnostic criteria for alcohol dependence. The excluding criteria were illiteracy, mental retardation or cognitive impairment and comorbid psychotic disorder. Thus, five patients were excluded because of illiteracy and three patients because of cognitive deficits. Although none of the patients refused to participate in the study, 16 patients were excluded as they left some parts of the scales unfilled, did not give the forms back or left the treatment program prematurely; that is, before filling the forms. Therefore, a total of 156 alcohol-dependent inpatients participated in the study. Baseline interviews with the study group were conducted after detoxification period, that is, 4–6 weeks after the last day of alcohol use. This was usually at the end of 'observation' phase of detoxification process of the inpatient treatment as mentioned previously (Figure 1). The drinking pattern of the patients before admission was established with respect to amount, frequency and drinking rhythm.

Follow-up evaluation

Twelve months later, each of these 156 participants were contacted by phone to invite them to the clinic for an interview. One hundred and thirty-six (87.2%) patients could be reached by phone, ninety of whom (66.2%) reported relapse during 12 months. Relapse was assessed by interviewing the patient and the family members and/or documents of Outpatient Treatment

Program when possible. All patients were invited to the clinic for a face to face interview. Relapsed patients were offered an immediate inpatient treatment ignoring the waiting list if they came to the clinic for an interview. Nevertheless, face to face interviews were achieved only with 102 (65.4%) patients. Among the remaining 34 patients that could not or did not want to come to the clinic for several reasons; 7 of them reported that they were sober for 12 months, whereas 27 reported that they had relapsed. Thirteen of them reported a reason for not coming as being busy at work, not being in town or economical reasons, 10 of them reported that they were using alcohol and did not want to come and 11 patients got an appointment but did not come for an interview (Figure 1). Only the patients that were eligible for a face to face interview at the end of the follow up are included in the study.

Definition of relapse

The measure used to assess relapse was the Timeline Follow Back procedure. The Timeline Follow Back[51] is essentially a diary where individuals can record the number of days in which they consume alcohol. This is carried out with an administrator who asks respondents to estimate their alcohol consumption retrospectively on a day-by-day basis. Within this study it was used to assess behaviour in 12 months (365 days) prior to the face to face interview at the end of 12 months.

For an alcohol-dependent person, remission means the continuous maintenance of sobriety. Thus, individuals were considered to be abstinent if they have had no intake of alcohol throughout the duration of the study. Relapse is defined as a return to drinking after a period of abstinence, usually accompanied by reinstatement of dependence symptoms. Some experts in the field additionally distinguish relapse and lapse (or slip), with the latter describing an isolated occasion of alcohol use. Although within the context of the current study relapse was defined as the return to drinking during 12 month follow up, those who relapsed during 12 months were consuming alcohol regularly at least in the amount of their prior use.

Measures

All patients were assessed by using a semi-structured sociodemographic form and some scales that are not used in the present study. The diagnosis of alcohol or drug dependence in each participating patient was based on the clinical examination, a screening interview based on the Structured Clinical Interview for DSM-IV [52], Turkish version [53], conducted by a trained interviewer (C. E.), both at the baseline and at the end of 12 months. Among 102 subjects interviewed face to face, 63 (61.8%) were diagnosed as 'alcohol depen-

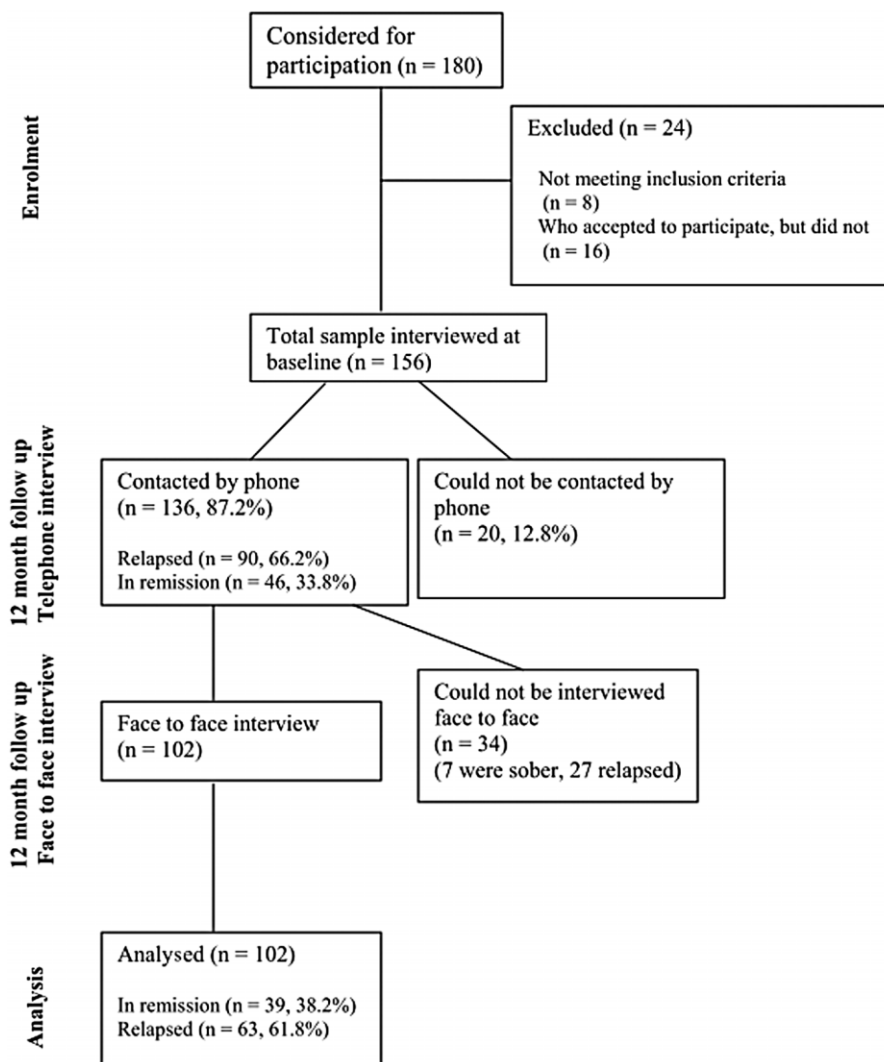


Figure 1. The CONSORT diagram showing the flow of participants through each stage of the present study.

dent', whereas 39 (38.2%) had diagnosis of 'life time alcohol dependent in remission'. During interviews at the end of 12 months, a sociodemographic form that was specially designed for evaluating variables that might be related with relapse during 12 months, and scales mentioned below were used.

The Barratt Impulsiveness Scale, version 11. The Barratt Impulsiveness Scale, version 11 (BIS-11) [2] provides a measure of trait impulsivity. The BIS-11 is a self-report questionnaire that asks participants to rate how often a series of statements applies to them. Cumulative scores range from 30 (low in trait impulsivity) to 120 (high in trait impulsivity). The BIS-11 has been shown to be reliable in both clinical and community samples, with Cronbach's alpha coefficients ranging from 0.79 to 0.83 [2]. The BIS-11 has been validated in general psychiatric and normal populations as well as a group

of male inmates from a maximum security prison unit [2]. The BIS-11 is structured to assess long-term patterns of behaviour and has been used to assess trait levels of impulsivity across a variety of populations, including substance-dependent individuals [54–56]. Research has shown that individuals who have heightened difficulty delaying gratification on laboratory measures of impulsivity tend to have elevated BIS-11 scores [57,58]. A final revised version was produced in 1995 (version 11) comprising three factors: motor (behaviour), attentional (cognitive) and non-planning. Evidence for these factors was found in samples of undergraduates, psychiatric inpatients and adult male prisoners [2]. In the present study Cronbach's alpha was 0.55, 0.65, 0.71.

Temperament and Character Inventory. For evaluation of NS, the TCI of Cloninger *et al.* [59] was used in the

Turkish version, forced-choice, self-report scale [60]. NS is a 40-item multifaceted higher order temperament trait that consist of the following four aspects of lower order traits: Exploratory Excitability versus Stoic Rigidity (NS1) (11 items), Impulsiveness versus Reflection (NS2) (10 items), Extravagance versus Reserve (NS3) (9 items) and Disorderliness versus Regimentation (NS4) (10 items). The reliability and validity of the Turkish version of the TCI were supported by its psychometric properties and construct validity [60]. In Turkish version Cronbach's alpha was 0.74 for NS (NS1 = 0.52, NS2 = 0.61, NS3 = 0.62, NS4 = 0.45) [60]. In the present study Cronbach's alpha was 0.84 (0.45, 0.75, 0.75 and 0.58 respectively).

Penn Alcohol Craving Scale. Craving of the individuals was evaluated with Penn Alcohol Craving Scale (PACS) [61]. PACS is a 5-item self-rating scale for evaluating severity of craving (frequency, intensity, duration, resistance and general craving) in the past week. For each item scores range from 0 to 6. Thus, the total score of craving is 30. PACS showed high validity and high reliability [61]. Turkish version of PACS was used in the present study, which was found to be valid and reliable among male inpatient alcohol dependents [62]. Cronbach's alpha was 0.96 in the present study.

Michigan Alcoholism Screening Test. The Michigan Alcoholism Screening Test (MAST) was used in assessment of the severity of dependence [63]. It was developed as a rapid and effective screening for lifetime alcohol-related problems and alcoholism for a variety of populations. Turkish version of the MAST is valid and reliable for screening severity of alcohol dependency [64]. The Cronbach's alpha was 0.74 in the present study.

Statistical methods

The statistical package SPSS 11.5 (SPSS Inc., Chicago, IL, USA) for Windows was used for all the analyses. Categorical variables were compared by means of the χ^2 statistics. We used Student's *t*-test to compare the groups on continuous variables, as these variables were normally distributed. Stepwise Linear Regression model was performed to evaluate variables that predict craving. Forward Wald logistic regression model was performed to evaluate variables that predict relapse. In both of these models, independent variables were age onset of regular alcohol use, subscale scores of BIS-11 and NS. In second Forward Wald logistic regression model, craving was included in regression analysis as independent variable additional to independent variables in previous model. As this study is cross-sectional, results of these regression analyses should be inter-

preted with caution. The term 'predictors' in present study is used as a more general term to classify all independent variables in regression analyses, rather than describing causal relationship.

Results

Among 156 alcohol-dependent inpatients, 102 (65.4%) were available for interview at the end of 1 year. Sixty-three (61.8%) of these patients were considered as relapsed to alcohol use during last 1 year, whereas 39 (38.2%) were still in remission. Among those who relapsed, mean number of days up to return drinking after a period of abstinence was 78.10 ± 67.18 (minimum = 1, maximum = 270). Mean age, duration of education, age at regular alcohol use, marital and employment status did not differ between the relapsed and remission groups (Table 1).

Mean scores of BIS-11 and NS and subscales of these scales were higher in the relapsed patients group than the remission group; on the other hand, exploratory excitability subscale of NS did not differ between the groups (Table 2).

The Barratt Impulsiveness Scale, version 11, NS and their subscale positively correlated with each other. PACS was also positively correlated with these scales and subscales. Only exception was NS1 subscale of NS, which did not correlate with PACS, BIS-11 or its subscale (Table 3).

Extravagance (NS3) and non-planning impulsiveness (BIS-NPI) scores predicted craving in Stepwise Linear Regression model, when age onset of regular alcohol use and subscale scores of BIS-11 and NS were taken as independent variables (Table 4). In the first Forward Wald logistic regression model, NS3 was the only variable associated with relapse, when age onset of regular alcohol use, severity of alcohol dependence measured with MAST and subscale scores of BIS-11 and NS were taken as independent variables (Model 1, Table 5). In the second Forward Wald logistic regression model, we included severity of craving (measured with PACS total score) as an independent variable additional to the independent variables used in the previous model. In this model severity of craving was associated with relapse, together with NS3 (Model 2, Table 5).

Discussion

Mean scores of BIS-11 and NS and subscales of these measures were higher in the relapsed group than the remission group. BIS-11 and NS and their subscales were positively correlated with severity of craving. Exploratory excitability (NS1) of NS was the only exception, which did not differ between groups and did

Table 1. Sociodemographic variables

	Remission		Relapse		χ^2	SD	P
	n = 39	%	n = 63	%			
Marital status					0.25	2	0.89
Married	25	64.1	41	65.1			
Divorced, widow, separate	4	10.3	8	12.7			
Single	10	25.6	14	22.2			
Employment status					5.65	3	0.13
Without employment	10	25.6	24	38.1			
With employment	20	51.3	18	28.6			
Part time	2	5.1	7	11.1			
Retired	7	17.9	14	22.2			
	(Mean \pm SD)		(Mean \pm SD)			t	P
Age	46.44 \pm 9.94		43.51 \pm 8.20			1.54	0.13
Duration of education	9.95 \pm 4.07		9.48 \pm 3.85			0.59	0.56
Age onset of regular alcohol use	27.03 \pm 9.39		25.97 \pm 8.54			0.59	0.56

Table 2. Scale scores among alcohol-dependent men according to the relapse status in 12 month follow up

Scale scores	Remission (n = 39)		Relapse (n = 63)		t	P
	Mean	SD	Mean	SD		
Attention impulsiveness (F1)	14.95	2.95	16.79	3.12	-2.96	0.004*
Motor impulsiveness (F2)	19.28	4.83	22.89	4.05	-4.06	<0.001*
Non-planning impulsiveness (F3)	23.54	4.84	26.89	5.37	-3.18	<0.001*
BIS-11 total score	57.77	10.78	66.57	10.42	-4.09	<0.001
Exploratory excitability (NS1)	5.56	2.37	5.59	1.87	-0.06	0.96**
Impulsiveness (NS2)	3.44	1.98	4.91	2.76	-3.12	0.002**
Extravagance (NS3)	4.00	2.04	6.22	2.27	-4.99	<0.001**
Disorderliness (NS4)	2.85	2.02	4.02	2.02	-2.84	0.005**
Novelty seeking (NS)	15.85	6.27	20.73	6.70	-3.66	<0.001**
Penn Alcohol Craving Scale	2.26	3.34	14.24	9.24	-9.34	<0.001

After Bonferroni correction differences were considered significant at * $P < 0.017$ and ** $P < 0.01$. BIS-11, Barratt Impulsiveness Scale, version 11.

not correlate with PACS or BIS-11. The main finding of the present study is that both impulsivity and NS seems to be related with craving and relapse. Particularly extravagance (NS3) of NS and NPI are associated with craving, whereas severity of craving and NS3 are associated with relapse. Thus, while both NS3 and NPI may be related with relapse indirectly via craving, NS3 may also be related with relapse directly. Another interesting finding was that early-onset alcoholism and severity of alcohol dependence had no effect on these relationships. These findings suggest that, besides being a risk for relapse itself, severity of craving may also be a final pathway to relapse in these relationships of NS3 and NPI with relapse.

Alcohol use is consistently associated with elevated trait impulsivity. Recent studies have reported that alcohol-dependent subjects have the tendency to act impulsively in response to negative events [28] and that their impulsivity scores are higher on traditional measures, such as the BIS [65]. In response to stress or environmental cues, an individual with substance abuse could use the substance in a rapid unplanned action without regard to the consequences. Once the substance has been used, craving and withdrawal may lead to continued use or dependence [66]. NS3 and NPI were related with craving, whereas NS3 was also related with relapse in the present study. Individuals who score high on the NS3 subscale tend to be

Table 3. Correlations between craving, novelty seeking and impulsivity dimensions

Impulsiveness	Exploratory excitability (NS1)	Impulsiveness (NS2)	Extravagance (NS3)	Disorderliness (NS4)	Novelty seeking (NS)	PACS
Attention	0.08	0.31**	0.37*	0.35*	0.37*	0.22***
Motor	0.12	0.56*	0.55*	0.40*	0.56*	0.40*
Non-planning	0.13	0.62*	0.59*	0.45*	0.61*	0.43*
BIS-11 total score	0.13	0.61*	0.61*	0.48*	0.62*	0.43*
PACS	-0.02	0.31**	0.44*	0.34*	0.37*	—

Correlation is significant at the * $P < 0.001$ level, at the ** $P < 0.01$ level and at the *** $P < 0.05$ level (two-tailed). BIS-11, Barratt Impulsiveness Scale, version 11; PACS, Penn Alcohol Craving Scale.

Table 4. Stepwise Linear Regression model when craving score was taken as a dependent variable

	B	SE	Beta	<i>t</i>	<i>P</i>
(Constant)	-8.185	4.083		-2.005	0.048
Extravagance (NS3)	1.148	0.424	0.293	2.704	0.008
Non-planning impulsiveness (BIS-NPI)	0.456	0.191	0.259	2.389	0.019

Age onset of regular alcohol use, NS and three BIS-11 subscales and MAST as independent variables. $F = 15.75$, d.f.: 1, 100, $P < 0.001$, adjusted $R^2 = 0.23$. BIS-11, Barratt Impulsiveness Scale, version 11; MAST, Michigan Alcoholism Screening Test; NS, novelty seeking.

Table 5. Forward Logistic regression models when relapse status was taken as dependent variable

	B	SE	Wald	d.f.	<i>P</i>	Exp(B)	95% CI for exp(B)	Nagelkerke R^2
Model 1								
Extravagance (NS3)	0.432	0.104	17.207	1	<0.001	1.540	1.256–1.888	0.26
Constant	-1.745	0.569	9.423	1	0.002	0.175		
Model 2								
Extravagance (NS3)	0.264	0.133	3.924	1	0.048	1.302	1.003–1.690	0.60
PACS total score	0.257	0.059	18.792	1	<0.001	1.293	1.151–1.452	
Constant	-2.530	0.750	11.365	1	0.001	0.080		

In Model 1, age onset of regular alcohol use, NS and three BIS-11 subscales and MAST were taken as independent variables. In Model 2, additional to independent variables in Model 1, craving score (measured with PACS) was included as an independent variable. BIS-11, Barratt Impulsiveness Scale, version 11; CI, confidence interval; MAST, Michigan Alcoholism Screening Test; NS, novelty seeking; PACS, Penn Alcohol Craving Scale.

extravagant with their money, energy and feelings. They like to live 'at the edge', that is pushing at the limits of their resources and financial capacities [23,67]. NS3 seems to have stronger effect on relapse among other dimensions of NS and relatively to impulsivity as it is related with relapse both directly and indirectly via craving.

The BIS-11 [2] measures three subtypes of impulsiveness: cognitive (attentional) impulsiveness (inattention and cognitive instability), motor impulsiveness (motor disinhibition) and NPI (lack of self-control and intolerance of cognitive complexity) [2]. Unlike motor and cognitive impulsiveness, NPI characterised

as a 'present orientation' or a lack of 'futuring' and measured by such items as 'I plan task carefully' and 'I plan for future' [2] appears conceptually related to the delay-of-gratification model. Accordingly, having a 'present orientation' and a lack of 'futuring' can undermine human ability to tolerate delay of gratification, possibly causing the tendency to select the small immediate rewarding outcomes in preference for larger delayed rewarding outcomes. In previous studies, delay discount rates were positively correlated with NPI, which reflects an emphasis on the present (e.g. I am more interested in the present than the future), and the total scores of BIS-11 [68,69]. These

findings are consistent with the result of the present study, which found NPI to be related with severity of alcohol craving.

Relapse is a multifaceted phenomenon and most likely to result from a combination of various factors [45]. Variables involved in relapse include the individual characteristics of the patient, the drug and environmental reinforcers [45,70]. One feature noted before relapse in some abstinent patients is craving for alcohol, which may contribute to the risk of relapse [45]. Craving can be defined as a 'compelling urge' intruding into the thoughts and altering both mood and behaviour of a drug user [71]. The theorised function of 'craving', both in the maintenance of alcohol dependence and in relapse following successful alcohol dependence treatment, is plentiful throughout the substance abuse literature [45,70,72]. Craving has been linked both to poorer outcomes following treatment and greater attrition during treatment [73]. Craving can occur spontaneously or by internal or external stimulants known as cues [74]. Research suggests that NS is associated with craving scores [36–39] and a predictor of relapse in detoxified male alcohol dependents [40]. Results of the present study supported these findings. It is suggested that impulsivity may be a fundamental mechanism in relapse to substance use [14]. Also impulsivity was discussed as potential mediator of craving's relationship to relapse [75]. Consistent with this, our findings suggested that the craving has mediator effect on relationship between at least NPI dimension of impulsivity and relapse.

Nevertheless, the present study had several limitations. First of all, this study is cross-sectional, thus the causal relationship between relapse and variables, such as NS, impulsivity, craving and factors that may mediate this relationships, can not be determined. Second, all measures used in the present study were self-reported. Although we evaluated urine samples of the patients for 'ethyl glucuronide' we have not examined biological markers (CDT or GGT). Nevertheless, we considered that the patients' self-reports and information from relatives would be valid. All patients were personally interviewed and all patients were well known by the same interviewer (M. D.). Several studies have shown a high validity and high reliability of self-report data of alcohol-dependent patients in treatment compared with toxicological analyses of blood or collateral informant reports [76]. Moreover, impulsivity may directly interfere with the completion of the questionnaires themselves, such that the impulsive subject may give less consideration to responses than the non-impulsive subject. Introspective ratings assume that individuals have sufficient insight to rate their personality accurately. Another limitation of the present study was that all the patients were male. Finally, the study

group was restricted to a treatment-seeking population, and it was not possible to generalise the present findings to non-treatment groups.

Both impulsivity and NS seem to be related with craving and relapse. Particularly, NS3 may be related with relapse both directly and indirectly via craving, whereas NPI may be related with relapse only indirectly via craving. Thus, severity of craving may be a final pathway to relapse in these relationships of NS3 and NPI with relapse. These findings suggest that impulsivity, NS and craving are important variables to predict outcome and also for the treatment plan.

References

- [1] Eysenck SB, Eysenck HJ. The place of impulsiveness in a dimensional system of personality description. *Br J Soc Clin Psychol* 1977;16:57–68.
- [2] Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt Impulsiveness Scale. *J Clin Psychol* 1995;51:768–74.
- [3] Moeller FG, Barratt FS, Dougherty DM, Schmitz JM, Swann AC. Psychiatric aspects of impulsivity. *Am J Psychiatry* 2001;158:1783–93.
- [4] Cloninger CR. Assessment of the impulsive-compulsive spectrum of behavior by the seven-factor model of temperament and character. In: Oldham JM, Hollander E, Skodol AE, eds. *Impulsivity and compulsivity*. Washington: American Psychiatric Press, 1996:59–95.
- [5] Favaro A, Zanetti T, Tenconi E, *et al.* The relationship between temperament and impulsive behaviors in eating disordered subjects. *Eat Disord* 2005;13:61–70.
- [6] Pierò A. Personality correlates of impulsivity in subjects with generalized anxiety disorders. *Compr Psychiatry* 2010; 51:538–45.
- [7] Mulder RT. Alcoholism and personality. *Aust NZ J Psychiatry* 2002;36:44–52.
- [8] Kısa C, Yıldırım SG, Göka E. Impulsivity and mental disorders. *Türk Psikiyatri Derg* 2005;16:46–54.
- [9] Bjork JM, Hommer DW, Grant SJ, Danube C. Impulsivity in abstinent alcohol-dependent patients: relation to control subjects and type 1/type 2-like traits. *Alcohol* 2004; 34:133–50.
- [10] Brady KT, Myrick H, McElroy S. The relationship between substance use disorders, impulse control disorders, and pathological aggression. *Am J Addict* 1998;7:221–30.
- [11] Vitaro F, Ferland F, Jacques C, Ladouceur R. Gambling, substance use, and impulsivity during adolescence. *Psychol Addict Behav* 1998;12:185–94.
- [12] Acton GS. Measurement of impulsivity in a hierarchical model of personality traits: implications for substance use. *Subst Use Misuse* 2003;38:67–83.
- [13] Lane SD, Cherek DR, Rhoades HM, Pietras CJ, Tcheremissine OV. Relationships among laboratory and psychometric measures of impulsivity: implications in substance abuse and dependence. *Addict Disord Their Treat* 2003; 2:33–40.
- [14] Miller L. Predicting relapse and recovery in alcoholism and addiction: neuropsychology, personality, and cognitive style. *J Subst Abuse Treat* 1991;8:277–91.
- [15] Petry NM. Delay discounting of money and alcohol in actively using alcoholics, currently abstinent alcoholics, and controls. *Psychopharmacology* 2001;154:243–50.

- [16] Simons JS. Differential prediction of alcohol use and problems: the role of biopsychological and social-environmental variables. *Am J Drug Alcohol Abuse* 2003;29:861–79.
- [17] Simons JS, Carey KB. Risk and vulnerability for marijuana use problems: the role of affect dysregulation. *Psychol Addict Behav* 2002;16:72–5.
- [18] Wills TA, Sandy JM, Yaeger AM. Moderators of the relation between substance use level and problems: test of a self-regulation model in middle adolescence. *J Abnorm Psychol* 2002;111:3–21.
- [19] Rubio G, Jiménez M, Rodríguez-Jiménez R, *et al.* The role of behavioral impulsivity in the development of alcohol dependence: a 4-year follow-up study. *Alcohol Clin Exp Res* 2008;32:1681–7.
- [20] Verheul R, van den Brink W. The role of personality pathology in the aetiology and treatment of substance use disorders. *Curr Opin Psychiatry* 2000;13:163–9.
- [21] Dom G, De Wilde B, Hulstijn W, van den Brink W, Sabbe B. Behavioural aspects of impulsivity in alcoholics with and without a cluster-B personality disorder. *Alcohol Alcohol* 2006;41:412–20.
- [22] Dom G, D'haene P, Hulstijn W, Sabbe B. Impulsivity in abstinent early- and late-onset alcoholics: differences in self-report measures and a discounting task. *Addiction* 2006;101:50–9.
- [23] Cloninger CR, Przybeck TR, Svrakic DM, Wetzel RD. The Temperament and Character Inventory (TCI): a guide to its development and use. St. Louis: Center for Psychobiology of Personality, 1994.
- [24] Fulwiler C, Eckstine J, Kalsy S. Impulsive-aggressive traits, serotonin function, and alcohol-enhanced aggression. *J Clin Pharmacol* 2005;45:94–100.
- [25] Koller G, Preuss UW, Bottlender M, Wenzel K, Soyka M. Impulsivity and aggression as predictors of suicide attempts in alcoholics. *Eur Arch Psychiatry Clin Neurosci* 2002;252:155–60.
- [26] Murray HW, Parkar AA, Mannelli P, DeMaria P, Desai AM, Vergare MJ. Relationship of aggression, sensation seeking, and impulsivity, with severity of cocaine use. *Addict Disord Their Treat* 2003;2:113–21.
- [27] Dom G, Hulstijn W, Sabbe B. Differences in impulsivity and sensation seeking between early- and late-onset alcoholics. *Addict Behav* 2006;31:298–308.
- [28] Whiteside SP, Lynam DR. Understanding the role of impulsivity and externalizing psychopathology in alcohol abuse: application of the UPPS impulsive behavior scale. *Exp Clin Psychopharmacol* 2003;11:210–17.
- [29] Cloninger CR. A unified biosocial theory of personality and its role in the development of anxiety states. *Psychiatr Dev* 1986;4:167–226.
- [30] Kose S. A psychobiological model of temperament and character: TCI. *New Symp* 2003;41:86–97.
- [31] Wills TA, Vaccaro D, McNamara G. Novelty seeking, risk taking, and related constructs as predictors of adolescent substance use: an application of Cloninger's theory. *J Subst Abuse* 1994;6:1–20.
- [32] Bardo MT, Donohew RL, Harrington NG. Psychobiology of novelty seeking and drug seeking behavior. *Behav Brain Res* 1996;77:23–43.
- [33] Gabel S, Stallings MC, Schmitz S, Young SE, Fulker DW. Personality dimensions and substance misuse: relationships in adolescents, mothers and fathers. *Am J Addict* 1999;8:101–13.
- [34] Hosak L, Preiss M, Halir M, Cermakova E, Csémy L. Temperament and character inventory (TCI) personality profile in metamphetamine abusers: a controlled study. *Eur Psychiatry* 2004;19:193–5.
- [35] Kravitz HM, Fawcett J, McGuire M, Kravitz GS, Whitney M. Treatment attrition among alcohol-dependent men: is it related to novelty seeking personality traits? *J Clin Psychopharmacol* 1999;19:51–6.
- [36] Zilberman ML, Tavares H, el-Guebaly N. Relationship between craving and personality in treatment-seeking women with substance-related disorders. *BMC Psychiatry* 2003;3:1.
- [37] Tavares H, Zilberman ML, Hodgins DC, el-Guebaly N. Comparison of craving between pathological gamblers and alcoholics. *Alcohol Clin Exp Res* 2005;29:1427–31.
- [38] Martinotti G, Cloninger CR, Janiri L. Temperament and character inventory dimensions and anhedonia in detoxified substance-dependent subjects. *Am J Drug Alcohol Abuse* 2008;34:177–83.
- [39] Evren C, Çelik R, Durkaya M, Dalbudak E, Çakmak D, Flannery B. Yatarak tedavi gören erkek alkol bağımlısı hastalarda Cloninger'in kişilik boyutlarının alkol aşırması ile ilişkisi. *Klinik Psikofarmakoloji Dergisi* 2009;19:373–81.
- [40] Meszaros K, Lenzinger E, Hornik K, *et al.* The Tridimensional Personality Questionnaire as a predictor of relapse in detoxified alcohol dependents. The European Fluvoxamine in Alcoholism Study Group. *Alcohol Clin Exp Res* 1999;23:483–6.
- [41] Evren C, Dalbudak E, Durkaya M, Cetin R, Evren B. Interaction of life quality with alexithymia, temperament and character in male alcohol dependent inpatients. *Drug Alcohol Rev* 2010;29:177–83.
- [42] Howard MO, Kivlahan D, Walker RD. Cloninger's tridimensional theory of personality and psychopathology: applications to substance use disorders. *J Stud Alcohol* 1997;58:48–66.
- [43] Galen LW, Henderson MJ, Whitman RD. The utility of novelty seeking, harm avoidance, and expectancy in the prediction of drinking. *Addict Behav* 1997;22:93–106.
- [44] Ball SA, Kranzler HR, Tennen H, Poling JC, Rounsaville BJ. Personality disorder and dimension differences between type A and type B substance abusers. *J Pers Disord* 1998;12:1–12.
- [45] Bottlender M, Soyka M. Impact of craving on alcohol relapse during, and 12 months following, outpatient treatment. *Alcohol Alcohol* 2004;39:357–61.
- [46] Miller WR, Westerberg VS, Harris RJ, Tonigan JS. What predicts relapse? Prospective testing of antecedent models. *Addiction* 1996;91:155–71.
- [47] Monti PM, Abrams DB, Binkoff JA, *et al.* Communication skills training, communication skills training with family, and cognitive behavioral mood management training for alcoholics. *J Stud Alcohol* 1990;51:263–70.
- [48] Cooney NL, Litt MD, Morse PA, Bauer LO, Gaupp L. Alcohol cue reactivity, negative-mood reactivity, and relapse in treated alcoholic men. *J Abnorm Psychol* 1997;106:243–50.
- [49] O'Connor PG, Gottlieb LD, Kraus ML, Segal SR, Horwitz RI. Social and clinical features as predictors of outcome in outpatient alcohol withdrawal. *J Gen Intern Med* 1991;6:312–16.
- [50] Evren C, Cetin R, Durkaya M, Dalbudak E. Clinical factors associated with relapse in male alcohol dependents during six-month follow-up. *Klinik Psikofarmakoloji Bülteni* 2010;20:14–22.

- [51] Sobell LC, Maisto SA, Sobell MB, Cooper AM. Reliability of alcohol abusers' self-reports of drinking behavior. *Behav Res Ther* 1979;17:157–60.
- [52] First MB, Spitzer RL, Gibbon M, Williams JBW. *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)*, Clinical Version. Washington and London: American Psychiatric Press, Inc, 1997.
- [53] Corapcioglu A, Aydemir O, Yildiz M, Esen A, Köroglu E. *DSM-IV Eksen I Bozuklukları (SCID-I) için Yapılandırılmış Klinik Görüşme, Klinik Versiyon*. Ankara: Hekimler Yayın Birliği, 1999.
- [54] Mitchell SH. Measures of impulsivity in cigarette smokers and non-smokers. *Psychopharmacology* 1999;146:455–64.
- [55] Moeller FG, Dougherty DM, Barratt ES, *et al*. Increased impulsivity in cocaine-dependent subjects independent of antisocial personality disorder and aggression. *Drug Alcohol Depend* 2002;68:105–11.
- [56] Stanford MS, Greve KW, Boudreaux JK, Mathias CW, Brumbelow JL. Impulsiveness and risk-taking behavior: comparison of high school and college students using the Barratt Impulsiveness Scale. *Pers Individ Dif* 1996;21:1073–5.
- [57] Allen TJ, Moeller FG, Rhoades HM, Cherek DR. Impulsivity and history of drug dependence. *Drug Alcohol Depend* 1998;50:137–45.
- [58] Cherek DR, Moeller FG, Dougherty DM, Rhoades H. Studies of violent and nonviolent male parolees: II. Laboratory and psychometric measures of impulsivity. *Biol Psychiatry* 1997;41:523–9.
- [59] Cloninger CR, Svrakic DM, Przybeck TR. A psychobiological model of temperament and character. *Arch Gen Psychiatry* 1993;50:975–90.
- [60] Kose S, Sayar K, Kalelioglu U, *et al*. Turkish version of the TCI: reliability, validity, and factorial structure. *Bull Clin Psychopharmacol* 2004;14:107–31.
- [61] Flannery BA, Volpicelli JR, Pettinati HM. Psychometric properties of the Penn Alcohol Craving Scale. *Alcohol Clin Exp Res* 1999;23:1289–95.
- [62] Evren C, Flannery B, Çelik R, Durkaya M, Dalbudak E. Penn Alkol Aşırme Ölçeği (PAAÖ) Türkçe Şeklinin Yatarak Tedavi Gören Erkek Alkol Bağımlısı Hastalarda Geçerliliği ve Güvenirliği. *Bağımlılık Dergisi* 2008;9:128–34.
- [63] Gibbs LE. Validity and reliability of the Michigan Alcoholism Screening Test: a review. *Drug Alcohol Depend* 1985;12:279–85.
- [64] Coskunol H, Bagdiken I, Sorias S, Saygılı R. Michigan Alkolizm Tarama Testinin Geçerliliği. *Ege Tıp Dergisi* 1995;34:15–18.
- [65] Mitchell JM, Fields HL, D'Esposito M, Boettiger CA. Impulsive responding in alcoholics. *Alcohol Clin Exp Res* 2005;29:2158–69.
- [66] Jentsch JD, Taylor JR. Impulsivity resulting from frontostriatal dysfunction in drug abuse: implications for the control of behavior by reward-related stimuli. *Psychopharmacology (Berl)* 1999;146:373–90.
- [67] Cloninger CR. A systematic method for clinical description and classification of personality variants. A proposal. *Arch Gen Psychiatry* 1987;44:573–88.
- [68] de Wit H, Flory JD, Acheson A, McCloskey M, Manuck SB. IQ and nonplanning impulsivity are independently associated with delay discounting in middle-aged adults. *Pers Individ Dif* 2007;42:111–21.
- [69] Swann AC, Bjork JM, Moeller FG, Dougherty DM. Two models of impulsivity: relationship to personality traits and psychopathology. *Biol Psychiatry* 2002;51:988–94.
- [70] de Buijn C, Korzec A, Koerselman F, van Den Brink W. Craving and withdrawal as core symptoms of alcohol dependence. *J Nerv Ment Dis* 2004;192:494–502.
- [71] Halikas JA. Craving. In: Lowinson JH, Ruiz P, Millman RB, Langrod JG, eds. *Substance abuse. A comprehensive textbook*, 3rd edn. Baltimore: Williams & Wilkins, 1997:85–90.
- [72] Flannery BA, Poole SA, Gallop RJ, Volpicelli JR. Alcohol craving predicts drinking during treatment: an analysis of three assessment instruments. *J Stud Alcohol* 2003;64:120–6.
- [73] Thomas SE, Deas D. The A-OCDS predicts both craving and alcohol cue reactivity in adolescent alcoholics. *Addict Behav* 2005;30:1638–48.
- [74] Tiffany ST, Carter BL, Singleton EG. Challenges in the manipulation, assessment and interpretation of craving relevant variables. *Addiction* 2000;95(Suppl. 2):177–87.
- [75] Tracy JL. Assessing the relationship between craving and relapse. *Drug Alcohol Rev* 1994;13:71–7.
- [76] Mundle G, Ackermann K, Günthner A, Munkes J, Mann K. Treatment outcome in alcoholism—a comparison of self-report and the biological markers carbohydrate-deficient transferrin and gamma-glutamyl transferase. *Eur Addict Res* 1999;5:91–6.