# *The Correlations of Nicotine Addiction with the Levels of Impulsiveness, Depression and Anxiety in Obsessive-Compulsive Patients*

*Obsesif Kompulsif Bozukluk Hastalarında Nikotin Bağımlılığı ile Dürtüsellik, Depresyon ve Anksiyete Düzeyi İlişkisi*

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## ABSTRACT

**Objective:** Few studies comparing smoking and non-smoking obsessive compulsive disorder (OCD) patients have found results contradicting research on other anxiety disorders. OCD is a disorder with compulsive and impulsive features. Investigating the relationships among addiction, compulsivity and impulsiveness might contribute to the understanding of the interaction of those concepts.

**Method:** This study compared impulsiveness in smoking and non-smoking OCD patients. Then, we measured the correlations among the severities of impulsiveness, OCD and addiction. Depressive symptoms and anxiety were also included in the analysis since they are frequently accompanied by OCD, addictive disorders and pathological conditions characterized by high impulsiveness. Patients with OCD (n=121) were given Yale-Brown Obsessive Compulsive Scale (Y-BOCS), Barratt Impulsiveness Scale-Version 11 (BIS-11), Fagerström Test for Nicotine Dependence (FTND), Hamilton Depression Rating Scale-17 Item (HDRS-17) and Beck Anxiety Inventory (BAI).

**Results:** The prevalence of smoking was 42.14 %. The current and never-smokers did not show any statistically significant differences regarding the scores of the Y-BOCS, HDRS-17, and BAI. The BIS-11 total and non-planning subscales were significantly higher in the current smokers. The Y-BOCS scores showed a positive correlation with the BIS total, cognitive, and non-planning scores only in the current smokers. Only in the smokers, the compulsion scores showed a positive correlation with the BIS-11 total and cognitive impulsiveness subscale. The FTND scores were correlated with the scores of the BIS-11 total and of the subscales of behavioral impulsiveness and non-planning. The FTND scores were also correlated with the scores of the Y-BOCS and BAI but not with the HDRS-17.

**Conclusion:** More severe OCD in more impulsive smokers is related to higher compulsivity rather than obsessiveness, supporting the relationship among compulsivity, impulsiveness, and addiction.

**Key Words:** Obsessive-compulsive disorder; nicotine addiction; impulsiveness; anxiety; depressive symptoms.

## ÖZET

**Amaç:** Sigara içen ve içmeyen obsesif kompulsif bozukluk (OKB) hastalarını karşılaştıran az sayıdaki çalışma, anksiyete bozuklukları ile ilgili çalışmalardan daha farklı sonuçlara ulaşmıştır. OKB kompulsif ve impulsif özellikleri olan bir bozukluktur. Bağımlılık, kompulsivite ve dürtüsellik arasındaki ilişkinin incelenmesi, bu kavramların anlaşılmasına katkıda bulunacaktır.

**Yöntem:** Bu araştırmada sigara içen ve içmeyen OKB hastalarında dürtüsellik karşılaştırıldı. Daha sonra dürtüsellik, OKB ve bağımlılık şiddetleri ilişkisi incelendi. OKB, bağımlılık ve yüksek dürtüsellik izlenen diğer patolojik durumlara sıklıkla eşlik etmeleri nedeniyle depresyon ve anksiyete belirtileri de değerlendirildi. OKB tanısı alan 121 hastaya Yale-Brown Obsesyon Kompulsiyon Derecelendirme Ölçeği (Y-BOCS), Barratt Dürtüsellik Ölçeği-Versiyon 11 (BIS-11), Fagerström Nikotin Bağımlılık Testi (FTND), Hamilton Depresyon Derecelendirme Ölçeği-17 Madde (HDRS-17) ve Beck Anksiyete Ölçeği (BAI) uygulandı.

**Bulgular:** Hasta grubunda sigara içme yaygınlığı %42.14 olarak bulundu. Sigara içenler ve içmeyenler Y-BOCS, HDRS-17 ve BAI skorlarında farklılık göstermediler. BIS-11 toplam puanı ve plan yapmama alt ölçek puanı sigara içen grupta anlamlı biçimde yüksek bulundu. Sigara içen grupta Y-BOCS puanları, BIS toplam, kognitif ve plan yapmama puanları ile pozitif bağıntı gösterdi. Kompulsiyon puanı ise sadece sigara içen grupta BIS toplam, kognitif ve plan yapmama alt ölçek puanları ile pozitif bağıntılı bulundu. FTND puanları ise BIS-11 toplam puanı, BIS-11 davranışsal dürtüsellik ve plan yapmama alt ölçek puanları, Y-BOCS ve BAI puanları ile bağıntılıyken, HDRS-17 puanı ile bağıntı bulunmadı.

**Sonuç:** Dürtüselliği fazla nikotin bağımlılarında daha şiddetli OKB, kompulsivitenin yüksek olması nedeniyledir. Bu sonuç kompulsivite, dürtüsellik ve bağımlılık ilişkisini desteklemektedir.

**Anahtar Kelimeler:** Obsesif kompulsif bozukluk; nikotin bağımlılığı; dürtüsellik; anksiyete; depresif belirtiler

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## INTRODUCTION

Although traditional viewpoint has located compulsivity and impulsiveness on the opposite ends of a spectrum, later research suggests that they frequently co-occur and share several common features, including a preoccupation with the same theme, repetitive behaviors, high comorbidity rates, overlapping neurobiology (i.e. Orbitofrontal cortex and front striatal system), and response to selective serotonin reuptake inhibitors. (1, 2) On the other hand, they differ on several points. Compulsivity is associated with an increased sense of danger and harm-avoidance whereas impulsiveness is characterized by an underestimation of risk and by pleasure-seeking. (3) Therefore, the term compulsive-impulsive spectrum has been suggested. (4)

Obsessive-compulsive disorder (OCD), impulse control disorders (ICDs), attention deficit and hyperactivity disorder (ADHD), and substance use disorders (SUDs) that share characteristics regarding the phenomenology, comorbidity, neuroanatomy, neurocognition, neurochemistry, and family history can be referred as the examples of compulsive-impulsive spectrum. (5) ICDs that are mainly characterized by impulsiveness have recently been understood to harbor some features of compulsivity. As is the case with OCD, patients having ICDs such as pathological gambling, trichotillomania or kleptomania cannot resist the urge to perform repetitive behaviors although they want to inhibit. Compulsivity and impulsiveness may co-occur in the same disorder and simultaneously or at different times. The research on ICDs and OCD has shown that a complex overlapping exists between impulsiveness and compulsivity. (6)

Impulsiveness is one of the significant behavioral derangements blamed for the development of SUDs, including nicotine use and dependence. (7-10) On the other hand, recent data have increasingly supported that SUD is basically a compulsive behavior. (11) It has been suggested that disruption in the neural networks involved in the control of behavior, namely, the orbitofrontal cortex, may lead to the conclusion of "addiction is a disease of compulsion and drive". (12) It has also been suggested that certain conditioning and learning processes convert action into the habit and, in turn, into compulsion, representing a transition from prefrontal cortical involvement to the striatal one. (13)

Despite the well-known high comorbidity of anxiety disorders and SUDs, the comorbidity of OCD and SUDs has remained surprisingly unknown to a great extent. (14) Although a high comorbidity has been found in the general population, individuals treated at OCD clinics have exhibited rates of SUDs similar to or even slightly lower than those of the normal population. (15) More vigorous research on SUDs in people with OCD can further illuminate the relationship among compulsivity, impulsiveness and addiction. In this study, we selected nicotine, which is a highly addictive and commonly used substance.

OCD is a unique mental illness in that it is associated with the lowest prevalence of smoking when compared to other mental illnesses, including anxiety disorders. (14, 16) Low prevalence of smoking in OCD suggests that smokers with OCD might have different characteristics when compared to non-smokers with OCD. (17) High levels of impulsiveness and frequent co-occurrence of ICDs with OCD suggest that impulsiveness may be one of the major features distinguishing smokers and non-smokers with OCD. (18)

We hypothesized that, inspired by research on compulsive-impulsive spectrum, some patients with OCD have impulsive features, and they are more prone to addiction. We also hypothesized that the severity of addiction would be related to that of obsessive-compulsiveness. The primary aim of the current study was to compare impulsiveness between smokers and non-smokers with OCD. A secondary aim was to estimate the correlations among the severity of impulsiveness, addiction and obsessive-compulsiveness. We also added the levels of depressive symptoms and anxiety in the analysis to investigate several other features of smoking and non-smoking OCD patients. That may make a contribution to shed some further light on the complex relationship among compulsivity, impulsiveness and addiction, enabling to tailor pharmacological and psychotherapeutic approach to patients with OCD.

## METHODS

### *Patients:*

Between January and April of 2013, 121 consecutive follow-up OCD patients (who identified OCD as the major mental problem of their life according to the DSM-IV criteria) between 18 and 72 years visiting Uskudar University

Neuropsychiatry Health Practice and Research Center Feneryolu Outpatient Department were enrolled in the study. The study coordinator explains the study and answers the questions that the patient may have. If the patient decides to participate, written informed consent obtained. All the patients accepted to enroll in the study. All the patients were on a treatment regimen of serotonin reuptake inhibitors or clomipramine for at least 3 months with a diagnosis of OCD. The patients were not any other medication for any systemic diseases. The Ethics Committee of the Uskudar University approved of the project. Exclusion criteria included a history of traumatic head injury, current use of any drugs other than SSRI or clomipramine, lifetime diagnosis of attention deficit hyperactivity disorder (ADHD), other psychiatric disorders and substance use disorders (with the exception of nicotine dependence) or any neurological disorder (such as epilepsy or multiple sclerosis) because these may affect impulsive behavior, confounding the results.

All participants attending the personal interview were evaluated by a psychiatrist according the DSM IV criteria for OCD and other psychiatric disorders. The Structured Clinical Interview for DSM–IV Axis I disorders–Patient version (SCID-I / P) was administered to establish DSM–IV diagnosis of OCD as well as lack of lifetime attention deficit hyperactivity disorder (ADHD), other psychiatric disorders and substance use disorders (with the exception of nicotine dependence). Another interviewer blind to the smoking state administered the scales.

***Measures:***

The severity of OCD was assessed by the Turkish version (19) of the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) consisting of 19 questions, only 10 of which are taken into account when estimating the total score that may vary 0 to 40. (20)

Impulsiveness was measured by the Turkish version (21) of the Barratt Impulsiveness Scale-11 (Patton et al. 1995), a 30-item questionnaire, assessing the cognitive (attentional), behavioral (motor), and non-planning aspects of impulsiveness. (22) The total score may vary 30 to 120 since the items are measured on 4-point Likert scale (1=rarely/never; 2=occasionally; 3=often; 4=almost always/always). It has been the most widely used tool to measure impulsiveness in various patient groups including those with OCD. (23)

Information about smoking was obtained by partially modified questions in the National Health Interview Survey (NHIS) to identify the smoking situation (http://www.cdc.gov/nchs/nhis.htm). Non-smoking was defined as a lifetime smoking less than 100 cigarettes; whereas current smoking is defined as cigarette use every day or on some certain days. Those who smoked a cigar or pipe were not included in the study.

The Fagerström Nicotine Dependence Test (FTND), a 6-item questionnaire, is the most frequently used instruments in identifying the severity of nicotine dependence. (24, 25) The FTND examines the number of cigarettes smoked per day and the duration that a smoker can endure without smoking.

The Hamilton Depression Rating Scale-17 (HDRS-17) is a 17-item instrument to measure the severity of depression. (25, 26) Its total score may vary 0 to 51.

The Beck Anxiety Inventory (BAI) is a 21-item self-report questionnaire to measure the severity of psychic and somatic symptoms of anxiety, the total scores of which range from 0 to 63. (27, 28)

***Statistics:***

Statistical analysis was performed using the statistical package SPSS Version 20. For each of the continuous variables, the normality assumption was checked by Kolmogorov Smirnov and Shapiro-Wilk tests. All numerical data were expressed as median values (min-max) or as proportions. Since a difference between groups existed, comparisons were applied using the Post Hoc tests and Mann-Whitney U test. Correlations between parameters were tested by Spearman's rank correlation test. Spearman's correlation coefficients were interpreted as $r \geq 0.91$ very strong; r=0.71-0.90 strong; r=0.51-0.70 moderate; r=0.31-0.50 mild; r=0.30 or less weak to none. p value of 0.05 was taken as the level of significance.

## RESULTS

The prevalence of smoking was 42.14% (n=51) in the whole group. The study group (n=121) consisted of 68 women (56,2%) and 53 men (43,8%). Only the current smokers and never smokers were included in the analyses. The former smokers were excluded for two reasons: 1) The non-smokers who used to be smokers in the past might confound the sensitivity of results, 2) The former smokers con-

stituted a sample too small (n=11) to allow statistically significant estimations. The current and never-smokers did not show any significant statistical difference with regard to age, years of education, and the scores of the Y-BOCS total, obsession and compulsion subscales, the HDRS-17, and the BAI (Table 1). A remarkable finding was the low prevalence of SUDs (n=5, 4.13%) in the whole group. That number was too small to make any significant statistical analysis; however, the fact that all patients with SUDs were also current smokers was notable.

### *BIS-11 and Its Subscales: Comparison between the Smokers and Nonsmokers*

The BIS total score was significantly higher in the current smokers than in the never-smokers (p=0.008). (see Table 1) The non-planning subscale scores were found to be significantly higher in the current smokers than in the never-smokers (p=0.002). The cognitive impulsiveness scores showed a modest difference between the current and never-smokers (p=0.031). The behavioral impulsiveness scores did not show significant differences between the groups. Age did have a significant effect neither on the BIS total nor on the subscale scores.

### *The Y-BOCS: Comparison between the Smokers and Nonsmokers and Correlations with the Impulsiveness Scales*

Although the Y-BOCS scores did not differ significantly between the smokers and never-smokers (Table 1), the Y-BOCS scores were positively correlated with the BIS total (p=0. 0001, rho=0.49), cognitive (p=0.001, rho=0.44), and non-planning scores (p=0.007, rho=0.37) only among the smokers (Table 2). In the smokers, the compulsion scores showed a significant correlation with the BIS total (p<0.001, rho=0.50) and cognitive impulsiveness (p=0.001, rho=0.48) scores, a moderate statistically significant correlation with the non-planning (p=0.013, rho=0.346), but no correlation with the behavioral impulsiveness. Compared to the compulsion scores, the obsession scores showed a weaker correlation with the BIS total scores (p=0.02, rho=0.325) and no correlation with the subscale scores. In the never-smokers, neither obsession nor compulsion scores showed correlation with the BIS total or subscale scores.

**Table 1: Distribution of variables in the whole sample, current smokers and never-smokers**

| | Total (n=121) | Never Smoker (n=70) | Current Smoker (n=51) | |
|---|---|---|---|---|
| | Mean±SD | Med(Min-Max) | Med(Min-Max) | p |
| **Age** | 32,19±10,5 | 29,5(18-72) | 29(18-55) | 0,943 |
| **Education (Years)** | 13,3±2,63 | 15(5-17) | 13(5-16) | 0,340 |
| **Y-BOCS** | 21,95±7,26 | 21,5(10-38) | 23(8-35) | 0,875 |
| **Obsession Score** | 11,52±4,17 | 12(3-20) | 12(0-19) | 0,554 |
| **Compulsion Score** | 10,42±4,64 | 10(0-20) | 11(0-18) | 0,598 |
| **HDRS-17** | 16,54±7,64 | 18,5(2-36) | 16(3-31) | 0,449 |
| **BAI** | 20,11±13,5 | 19(0-59) | 18(3-51) | 0,807 |
| **BIS-11** | 61,69±10,6 | 59,5(40-85) | 64(47-93) | **0,008** |
| **Cognitive Impulsiveness** | 17,28±4,23 | 17(10-26) | 18(10-31) | **0,031** |
| **Behavioral Impulsiveness** | 18,43±4,41 | 17(11-33) | 19(13-33) | 0,164 |
| **Non-Planning** | 25,96±4,74 | 25(15-33) | 27(17-36) | **0,002** |
| **FTND** | 1,42±2,6 | 0(0-0) | 3(0-10) | **0,001** |

Y-BOCS: The Yale-Brown Obsessive Compulsive Scale, HDRS-17: The Hamilton Depression Rating Scale-17 Item, BAI: The Beck Anxiety Inventory, BIS-11: The Barratt Impulsiveness Scale-Version 11, FTND: The Fagerström Test for Nicotine Dependence.
p values that were found less than 0.05 are shown bold.

**Table 2: The correlations between the severity of impulsiveness and age, the severity of OCD (including its subscales of obsession and compulsion), addiction, and the symptoms of depression and anxiety**

| | Current Smokers (n=51) | | | | | | | | Never-smokers (n=70) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BIS-11 | | CI | | BI | | NP | | BIS-11 | | CI | | BI | | NP | |
| | rho | p | rho | p | rho | p | rho | p | rho | p | rho | p | rho | p | rho | p |
| Age | -0,08 | 0,563 | -0,2 | 0,160 | 0,19 | 0,178 | -0,037 | 0,795 | -0,20 | 0,096 | **-0,29** | **0,013** | -0,02 | 0,851 | -0,131 | 0,280 |
| Y-BOCS | **0,49** | **0,001** | **0,44** | **0,001** | 0,24 | 0,083 | **0,37** | **0,007** | -0,16 | 0,173 | -0,08 | 0,507 | -0,14 | 0,229 | -0,19 | 0,103 |
| Y-BOCS | **0,32** | **0,02** | 0,26 | 0,065 | 0,17 | 0,226 | 0,273 | 0,053 | -0,14 | 0,255 | -0,02 | 0,836 | -0,12 | 0,323 | -0,21 | 0,081 |
| Obsession | **0,50** | **0,001** | **0,48** | **0,001** | 0,265 | 0,06 | **0,346** | **0,013** | -0,10 | 0,415 | -0,07 | 0,579 | -0,08 | 0,49 | -0,09 | 0,431 |
| Compulsion | 0,27 | 0,052 | **0,42** | **0,002** | 0,07 | 0,618 | 0,106 | 0,459 | -0,01 | 0,996 | 0,16 | 0,181 | -0,07 | 0,581 | -0,09 | 0,457 |
| HDRS-17 | 0,24 | 0,089 | **0,326** | **0,019** | 0,12 | 0,379 | 0,132 | 0,354 | -0,06 | 0,604 | 0,08 | 0,505 | -0,03 | 0,788 | -0,16 | 0,187 |
| BAI | -0,08 | 0,563 | -0,2 | 0,160 | 0,19 | 0,178 | -0,037 | 0,795 | -0,20 | 0,096 | **-0,29** | **0,013** | -0,02 | 0,851 | -0,13 | 0,280 |

BIS-11: The Barratt Impulsiveness Scale-Version 11, CI = cognitive impulsiveness, BI = behavioral impulsiveness, NP: Non-planning, Y-BOCS: The Yale-Brown Obsessive Compulsive Scale, HDRS-17: The Hamilton Depression Rating Scale-17 Item, BAI: The Beck Anxiety Inventory.
P values that were found less than 0.05 are shown bold.

### *Correlations of the FTND*

The FTND scores showed significant positive correlations with the BIS-11 total (p=0.016, rho=0.336), behavioral impulsiveness (p=0.006, rho=0.378) and non-planning scores (p=0.002, rho=0.325) (Table 3). The FTND scores were positively correlated with age (p=0.02, rho=0.33), the Y-BOCS scores (p=0.027, rho=0.31), and BAI scores (p=0.036, rho=0.29), but not correlated with the HDRS-17 scores.

### *Correlations of the HDRS-17 and BAI in the Smokers and Nonsmokers*

The Y-BOCS total scores were positively correlated with the HDRS-17 scores both in the current (p=0.002, rho=0.43) and never-smokers (p=0.001, rho=0.386) (Table 4). In the never-smokers, the HDRS-17 scores were correlated with the obsession (p<0.001, rho=0.53), but not with the compulsion (p=0.402, rho=0.102) scores. The BAI scores were correlated with the scores of neither the Y-BOCS and nor its subscales, with the only exception of the never smokers who showed a correlation between the obsession and the BAI scores (p=0.017, rho=0.285) (Table 4). The BIS-11 total scores showed a correlation with neither the HDRS-17 nor BAI scores regardless of smoking status; nevertheless, the cognitive impulsiveness scores were correlated both with the HDRS-17 (p=0.002, rho=0.42) and the BAI (p=0.019, rho=0.326) scores only in the smokers (Table 4).

**Table 3: Correlations between the severity of addiction and age, the severity of impulsiveness (including its subscales), OCD (including its subscales of obsession and compulsion) and the symptoms of depression and anxiety**

| | **Fagerström Nicotine Dependence Test** | | | | | |
|---|---|---|---|---|---|---|
| | **Total (n=51)** | | **Female (n=27)** | | **Male (n=24)** | |
| | rho | p | rho | p | rho | p |
| Age | **0,33** | **0,020** | 0,16 | 0,409 | 0,38 | 0,063 |
| BIS-11 | **0,34** | **0,016** | 0,29 | 0,133 | 0,39 | 0,06 |
| CI | 0,18 | 0,217 | 0,19 | 0,341 | 0,24 | 0,246 |
| BI | **0,38** | **0,006** | **0,38** | **0,049** | 0,39 | 0,056 |
| NP | **0,32** | **0,002** | 0,11 | 0,586 | **0,56** | **0,004** |
| Y-BOCS | **0,31** | **0,027** | 0,29 | 0,147 | 0,24 | 0,262 |
| Obsession score | 0,25 | 0,075 | 0,29 | 0,143 | 0,38 | 0,063 |
| Compulsion score | 0,24 | 0,087 | 0,21 | 0,295 | 0,12 | 0,576 |
| HDRS-17 | 0,16 | 0,266 | 0,14 | 0,496 | 0,10 | 0,648 |
| BAI | **0,29** | **0,036** | 0,09 | 0,640 | **0,45** | **0,028** |

1) Spearman's non-parametric correlations are used for female and male data.
2) p values that were found less than 0.05 are shown bold
BIS-11: The Barratt Impulsiveness Scale-Version 11, CI = cognitive impulsiveness, BI = behavioral impulsiveness, NP: Non-planning, Y-BOCS: The Yale-Brown Obsessive Compulsive Scale, HDRS-17: The Hamilton Depression Rating Scale-17 Item, BAI: The Beck Anxiety Inventory..

**Table 4: Correlations of the severity of OCD and impulsiveness with the severity and depressive and anxiety symptoms**

| | | | HDRS-17 | BAI |
|---|---|---|---|---|
| **Y-BOCS** | *Never-smokers* | rho | **0,386** | 0,201 |
| | | p | **0,001** | 0,095 |
| | *Current Smokers* | rho | **0,432** | 0,263 |
| | | p | **0,002** | 0,062 |
| **Obsession score** | *Never smokers* | rho | **0,53** | **0,285** |
| | | p | **0,000** | **0,017** |
| | *Current Smokers* | rho | **0,349** | 0,261 |
| | | p | **0,012** | 0,064 |
| **Compulsion score** | *Never-smokers* | rho | 0,102 | 0,033 |
| | | p | 0,402 | 0,787 |
| | *Current Smokers* | rho | **0,365** | 0,175 |
| | | p | **0,008** | 0,218 |
| **BIS-11** | *Never-smokers* | rho | -0,001 | -0,063 |
| | | p | 0,996 | 0,604 |
| | *Current Smokers* | rho | 0,274 | 0,240 |
| | | p | 0,052 | 0,089 |

Y-BOCS: The Yale-Brown Obsessive Compulsive Scale, HDRS-17: The Hamilton Depression Rating Scale-17 Item, BAI: The Beck Anxiety Inventory. p values that were found less than 0.05 are shown bold.

## DISCUSSION

The principal aim of the present study was to inquire the relationship among impulsiveness, compulsivity and nicotine addiction. For this purpose, we first compared impulsiveness in smoking and non-smoking OCD patients. Then, we measured the correlations among the severities of impulsiveness, OCD and nicotine addiction. Depressive symptoms and anxiety were also included in the analysis since they are frequently accompanied by OCD, addictive disorders and pathological conditions characterized by high impulsiveness.

### *Impulsiveness in Smokers and Never-Smokers*

Some studies, none of which evaluated smoking, used the BIS-11 to measure impulsiveness in OCD. Although some previous studies reported higher impulsiveness scores in OCD patients (29, 30), our results are comparable to the studies by Ettelt et al. (31) and Boisseau et al. (23) Our findings showed that the current smokers had high BIS-11 total scores, compared to the never-smokers significantly. Non-planning was the subscale showing the most significant difference between the current and never-smokers.

Non-planning assesses the inability to take the future orientation into account and is related to a person's attention to detail. It is also a measure of self-control and cognitive complexity. For example, a lack of planning tasks or trips carefully or of regular saving, disregarding job security, dislike thinking about complex problems, being interested in the present more than the future are the manifestations of non-planning. Skinner et al. found that non-planning was the most significant impulsiveness dimension differentiating smoking and non-smoking alcoholics. (32) Filomensky et al. compared impulsiveness among patients with OCD, bipolar disorder and compulsive buying, and reported that the BIS-11 subscale differentiating compulsive buyers most significantly from the others was non-planning. (29) Therefore, non-planning might have a major influence not only on substance addiction but also on "behavioral" addiction. Although people with OCD are frequently characterized by traits such as careful planning, harm-avoiding tendency, intolerance of uncertainty, predilection to take time in making decisions and exaggerated sense of responsibility, some obsessive-compulsive patients exhibit high impulsiveness, are afflicted with non-planning and prone to addiction. Therefore, the inability to consider the future consequences of behaviors is a major risk factor triggering smoking in OCD.

While cognitive impulsiveness was modestly higher in the current smokers than in the never-smokers, behavioral impulsiveness showed no significant difference between the groups. Cognitive

impulsiveness measures the ability to focus on the task at hand and is an indication of cognitive instability or lack of future-oriented thinking and coping abilities. The subscale for cognitive impulsiveness includes questions about intrusive or racing thoughts, the ability to concentrate, changing hobbies, restlessness at the theatre or lectures. Behavioral impulsiveness is a tendency to act on the spur of the moment without thinking and to lead an inconsistent lifestyle. Those with high behavioral impulsiveness, for example, find it hard to sit still for long periods, do things without thinking, buy things on impulse, make their decisions quickly and change jobs or residences. Slightly higher cognitive impulsiveness in the smokers might perhaps be explained by the propensity to enhance cognitive functioning by smoking, as is the case with schizophrenics. (33, 34)

### *Relationship among the Severities Impulsiveness, OCD and Nicotine Addiction*

Although the scores of compulsion are correlated with those of impulsiveness, the severity of OCD and of its subscales of obsessions and compulsions did not differ between the smokers and never-smokers. Of two studies comparing smoking and non-smoking patients with OCD, one found no difference in the severity of OCD (17) while the other (18) did not report that finding. In spite of the fact that smoking is closely linked to other anxiety disorders, mood disorders and schizophrenia (35), OCD lacks such an intimate association. On the other hand, the analysis showed a significant correlation between the severity of nicotine addiction and the severity of OCD. This finding, when considered together with other findings of the present study, may support the intricate relationship among compulsivity, impulsiveness, and nicotine addiction.

In contrast, the strong correlation between the scores of impulsiveness and the scores of compulsion in the smokers might be explained by the fact that impulsive patients are more compulsive and more prone to smoking. Considering the well-established relationship between impulsiveness and SUDs, our findings are congruent with research suggesting that the addiction is at least partly a compulsive behavior. (36) In the smokers, the compulsion scores were most significantly correlated with cognitive impulsiveness; non-planning showed a lower and behavioral impulsiveness no correlation with the compulsion scores. Perhaps a stronger association between compulsivity and behavioral impulsiveness might be expected in nicotine addiction; though, Stein et al. (1994) also reported that compulsivity was correlated with cognitive impulsiveness rather than with behavioral impulsiveness. (37)

As might be expected, the severity of nicotine addiction was correlated with impulsiveness, with the exception of cognitive impulsiveness. Non-planning was correlated with the severity of OCD as was the case with behavioral impulsiveness, which showed no significant difference between the smokers and non-smokers. It may be thought that although behavioral impulsiveness is not associated with starting to smoke it could be a factor in aggravating nicotine addiction. In contrast, cognitive impulsiveness that was higher in smokers was not correlated with nicotine addiction severity, perhaps reflecting the cognitive enhancer effect of nicotine. (38)

### *Depressive Symptoms and Anxiety*

We found that, disregarding smoking status, the severity of OCD was correlated with that of depressive symptoms but not anxiety. In the never smokers, the severity of depressive symptoms showed a strong correlation with the obsession scores but no correlation with the compulsion scores. This may again reflect that more compulsive patients who are also more severely addicted to nicotine may benefit from its antidepressant action.

The severity of anxiety and depressive symptoms was also comparable between the smokers and non-smokers; however, the severity of nicotine addiction measured by the FTND was positively correlated with the severity of anxiety rather than that of depressive symptoms. The finding that the severity of nicotine addiction was related to the severity of anxiety but not depression might reflect the possible antidepressant effect of nicotine (39) although the reciprocal relationship between smoking and anxiety is well-known. (14)

### *Prevalence of Smoking and SUD in OCD*

Low prevalence of smoking (42.14 %) in the whole OCD group, compared to the prevalence of 60.3 % in Istanbul (40) and 45-70 % in Turkey in various surveys (41) is consistent with the studies reporting a low prevalence of smoking among OCD patients. (16) Low rates of SUDs (4.13%) in our sample are congruent with some studies (30,

42), suggesting that OCD patients have a low predisposition to SUDs in contrast to the previous research (43) On the other hand, that figure may result from the fact that: a) Individuals with SUDs having comorbid OCD may tend to visit substance use clinics, b) They may attribute more dangerous roles to substance or alcohol than to nicotine, c) We have excluded bipolar and psychotic patients.

**Limitations:**

One of the main shortcomings of our study is that we did not screen personality disorders, some of which are closely related to impulsiveness. If the age at the onset of OCD and of smoking had been included in the analysis, it would of course be valuable; however, since recall bias might impair the accuracy of results, we preferred the age of onset to keep out of the study. One of the other shortcomings of the study is the use of a self-report questionnaire; it will be highly beneficial to employ behavioral paradigms to assess impulsivity in future studies. Since we aimed at comparing OCD patients to those who smoke and do not, we did not recruit healthy controls, the inclusion of whom will contribute to our understanding in further investigations. We did not divide the participants into smoking categories (light, moderate or heavy smokers) in contrast to other studies on smoking because those categories did not reach sample sizes sufficient for statistical analysis; instead, we evaluated the severity of nicotine addiction. Similarly, former smokers, who are not of adequate sample size, were not included in the analyses; they may constitute a group worth inquiring.

Although we excluded the subjects with a diagnosis of substance use disorders other than nicotine, numerous studies have shown that individuals with substance use disorders tend to be more impulsive than individuals with no substance use disorder history. Individuals dependent on opiates (44), cocaine (45) methamphetamine (46), alcohol (47) and heterogeneous groups of substance abusers (48). In addition, several studies have shown that approximately 80% of individuals with substance use disorders also smoke. (35, 49) Thus, it is possible that the effect of smoking may confound the relation between other substance use disorders and impulsivity. Recent work has shown that there are differing aspects of impulsivity in typical impulsive populations (50), illicit substance users (51), alcohol use disorders (52), and cigarette smoking (53). Given the high comorbidity of smoking with other substance use disorders, and the need of considering the influence of concurrent cigarette smoking, we exclude the subjects with a lifetime history of substance use disorders. Because impulsivity is a contributing factor to both substance use disorders and cigarette smoking, it is important to understand the exact role impulsivity plays in behavioral and neurological responses in different types of substance use disorders.

## CONCLUSION

Smoking patients with OCD are generally more impulsive than those who do not smoke. The inability to consider the future consequences of actions is the principal aspect of impulsiveness related to nicotine use. Neither smoking nor impulsiveness alone is associated with the severity of OCD, depression or anxiety; however, the combination of smoking and impulsiveness is associated with worse OCD. Although lack of data for personality matrix limits the precise interpretation of the findings, our results suggest that more severe OCD in more impulsive smokers is related to higher compulsivity rather than obsessiveness, supporting the relationship among compulsivity, impulsiveness, and nicotine addiction.

## REFERENCES

1- Allen A, King A, Hollander E. Obsessive-compulsive spectrum disorders. Dialogues Clin Neurosci 2003; 5(3): 259-271.
2- Fontenelle LF, Mendlowicz MV, Versiani M. Impulse control disorders in patients with obsessive-compulsive disorder. Psychiatry Clin Neurosci 2005; 59(1): 30-37.
3- Stein DJ, Hollander E. Obsessive-compulsive spectrum disorders. J Clin Psychiatry 1995; 56(6): 265-266.
4- Phillips KA, Stein DJ, Rauch SL, et al. Should an obsessive-compulsive spectrum grouping of disorders be included in DSM-V? Depress Anxiety 2010; 27(6): 528-555.
5- Fontenelle LF, Oostermeijer S, Harrison BJ, et al. Obsessive-compulsive disorder, impulse control disorders and drug addiction: common features and potential treatments. Drugs 2011; 71(7): 827-840.

6- Grant JE, Potenza MN. Compulsive aspects of impulse-control disorders. Psychiatr Clin North Am 2006; 29(2): 539-551.
7- Verdejo-Garcia A, Lawrence AJ, Clark L. Impulsivity as a vulnerability marker for substance-use disorders: review of findings from high-risk research, problem gamblers and genetic association studies. Neurosci Biobehav Rev 2008; 32(4): 777-810.
8- Chase HW, Hogarth L. Impulsivity and symptoms of nicotine dependence in a young adult population. Nicotine Tob. Res 2011; 13(12): 1321-1325.
9- Doran N, McChargue D, Cohen L. Impulsivity and the reinforcing value of cigarette smoking. Addict Behav 2007; 32(1): 90-98.
10- Evren C, Dalbudak, E. Relationship of personality trait impulsivity with clinical variables in male alcohol-dependent inpatients. Klin Psikofarmakol B 2009; 19: 15-23.
11- Chassin L, Presson CC, Rose J, Sherman SJ. What is addiction? Age-related differences in the meaning of addiction. Drug Alcohol Depen 2007; 87(1): 30-38.
12- Volkow ND, Fowler JS. Addiction, a disease of compulsion and drive: involvement of the orbitofrontal cortex. Cereb Cortex 2000; 10(3): 318-325.
13- Everitt BJ, Robbins TW. Neural systems of reinforcement for drug addiction: from actions to habits to compulsion. Nature Neurosci 2005; 8(11): 1481-1489.
14- Moylan S, Jacka FN, Pasco JA, Berk M. Cigarette smoking, nicotine dependence and anxiety disorders: a systematic review of population-based, epidemiological studies. BMC Medicine 2012; 10: 123.
15- Kessler RC, Berglund P, Demler O, et al. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 2005; 62(6): 593-602.
16- McCabe RE, Chudzik SM, Antony MM, et al. Smoking behaviors across anxiety disorders. J Anxiety Disord 2004; 18(1): 7-18.
17- Morissette SB, Gulliver SB, Kamholz BW, et al. Differences between daily smokers, chippers, and nonsmokers with co-occurring anxiety and alcohol-use disorders. Addict Behav 2008; 33(11): 1425-1431.
18- Bejerot S, von Knorring L, Ekselius L. Personality traits and smoking in patients with obsessive-compulsive disorder. Eur Psychiatry 2000; 15(7): 395-401.
19- Karamustafalıoğlu KO, Üçışık AM, Ulusoy M, Erkmen H. Yale-Brown Obsesyon Kompülsiyon Derecelendirme Ölçeği'nin geçerlik ve güvenilirlik çalışması. Bursa: 29 Ulusal Psikiyatri Kongresi; Savaş Ofset, 1993, s. 86.
20- Goodman WK, Price LH, Rasmussen SA, et al. The Yale-Brown Obsessive Compulsive Scale. I. Development, use, and reliability. Arch Gen Psychiatry 1989; 46(11): 1006-1011.
21- Güleç H, Tamam L, Güleç MY, et al. Barratt dürtüsellik ölçeği-11 (BIS-11)'nin Türkçe uyarlamasının psikometrik özellikleri. Klin Psikofarmakol B 2008; 18(4): 251-258.
22- Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt impulsiveness scale. J Clin Psychol 1995; 51(6): 768-774.
23- Boisseau CL, Thompson-Brenner H, Caldwell-Harris C, et al. Behavioral and cognitive impulsivity in obsessive-compulsive disorder and eating disorders. Psychiatry Res 2012; 200(2-3): 1062-1066.
24- Fagerstrom KO, Schneider NG. Measuring nicotine dependence: a review of the Fagerstrom Tolerance Questionnaire. J Behav Med 1989; 12(2): 159-182.
25- Uysal MA, Kadakal F, Karsidag C, et al. Fagerstrom test for nicotine dependence: reliability in a Turkish sample and factor analysis. Tuberkuloz ve Toraks 2004; 52(2): 115-121.
26- Akdemir A, Turkcapar MH, Orsel SD, et al. Reliability and validity of the Turkish version of the Hamilton Depression Rating Scale. Compr Psychiat 2001; 42(2): 161-165.
27- Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol 1988; 56(6): 893-897.
28- Ulusoy M, Şahin, N., Erkmen, H. Turkish version of the Beck Anxiety Inventory: psychometric properties. J Cognit Psychother 1998; 12: 28-35.
29- Filomensky TZ, Almeida KM, Castro Nogueira MC, et al. Neither bipolar nor obsessive-compulsive disorder: compulsive buyers are impulsive acquirers. Compr Psychiat 2012; 53(5): 554-561.
30- Tavares H, Gentil V. Pathological gambling and obsessive-compulsive disorder: towards a spectrum of disorders of volition. Rev Bras Psiquiatr 2007; 29(2): 107-117.

31- Ettelt S, Ruhrmann S, Barnow S, et al. Impulsiveness in obsessive-compulsive disorder: results from a family study. Acta Psychiatr Scand 2007; 115(1): 41-47.
32- Skinner MD, Aubin HJ, Berlin I. Impulsivity in smoking, nonsmoking, and ex-smoking alcoholics. Addict Behav 2004; 29(5): 973-978.
33- Esterlis I, Ranganathan M, Bois F, et al. In vivo evidence for beta nicotinic acetylcholine receptor subunit upregulation in smokers as compared with nonsmokers with schizophrenia. Biol Psychiatry 2013. Epub 2013/12/24. doi: 10.1016 / j.biopsych. 2013.11.001. PubMed PMID: 24360979.
34- Turan T, Dolu N, Ozsoy S, et al. Effects of smoking on P50 waveform in schizophrenic patients. Klin Psikofarmakol B 2009; 19: 227-235.
35- Kalman D, Morissette SB, George TP. Comorbidity of smoking in patients with psychiatric and substance use disorders. Am J Addict 2005; 14(2): 106-123.
36- Koob GF. Neurobiological substrates for the dark side of compulsivity in addiction. Neuropharmacology 2009; 56: 18-31.
37- Stein DJ, Hollander E, Simeon D, Cohen L. Impulsivity scores in patients with obsessive-compulsive disorder. J Nerv Ment Dis 1994; 182(4):240-241.
38- Devito EE, Herman AI, Waters AJ, et al. Subjective, physiological and cognitive responses to intravenous nicotine: effects of sex and menstrual cycle phase. Neuropsychopharmacology 2013. Epub 2013/12/19. doi: 10.1038/npp.2013.339.
39- Salin-Pascual RJ, Rosas M, Jimenez-Genchi A, et al. Antidepressant effect of transdermal nicotine patches in nonsmoking patients with major depression. J Clin Psychiatry 1996; 57(9): 387-389.
40- Ögel K, Tamar D, Özmen E, et al. Prevalence of cigarette use in Istanbul. Journal of Dependence 2003; 4(3): 105-118.
41- Ögel K. Sigara, alkol ve madde kullanım bozuklukları: tanı, tedavi ve önleme. İstanbul: Yeniden Yayınları, 2010.
42- Kashyap H, Fontenelle LF, Miguel EC, et al. 'Impulsive compulsivity' in obsessive-compulsive disorder: a phenotypic marker of patients with poor clinical outcome. J Psychiatr Res 2012; 46(9): 1146-1152.
43- Mancebo MC, Grant JE, Pinto A, et al. Substance use disorders in an obsessive compulsive disorder clinical sample. J Anxiety Disord 2009; 23(4): 429-435.
44- Kirby KN, Petry N, Bickel W. Heroin addicts discount delayed rewards at higher rates than non-drug using controls. J Exp Child Psychol 1999; 128:78-87.
45- Heil S, Johnson M, Higgins S, Bickel WK. Delay discounting in currently using and currently abstinent cocaine-dependent outpatients and non-drug-using matched controls. Addict Behav 2006; 31: 1290-1294.
46- Hoffman WF, Schwartz DL, Huckans MS, et al. Cortical activation during delay discounting in abstinent methamphetamine dependent individuals. Psychopharmacology 2008; 201: 183-193.
47- Curran MF, Fuertes JN, Alfonso VC, Hennessy JJ. The association of sensation seeking and impulsivity to driving while under the influence of alcohol. J Addict Offender Couns 2010; 30(2): 84–98.
48- Businelle MS, McVay MA, Kendzor D, Copeland A. A comparison of delay discounting among smokers, substance abusers, and non-dependent controls. Drug Alcohol Depen 2010; 122(3): 247-250.
49- Batel P, Pessione F, Maitre C, Rueff B. Relationship between alcohol and tobacco dependencies among alcoholics who smoke. Addiction 1995; 90: 977-980.
50- Reid RC, Cyders MA, Moghaddam JF, Fong TW. Psychometric properties of the Barratt Impulsiveness Scale in patients with gambling disorders, hypersexuality, and methamphetamine dependence. Addict Behav 2013; 39(11): 1640-1645.
51- Vassileva J, Paxton J, Moeller FG, et al. Heroin and amphetamine users display opposite relationships between trait and neurobehavioral dimensions of impulsivity. Addict Behav 2014; 39(3): 652–659.
52- Littlefield AK, Stevens AK, Sher KJ. Impulsivity and alcohol involvement: Multiple, distinct constructs and processes. Curr Addict Rep 2014; 1(1): 33-40.
53- Bloom EL, Matsko SV, Cimino CR. The relationship between cigarette smoking and impulsivity: A review of personality, behavioral, and neurobiological assessment. Addict Res Theory 2013; 18: 1–12.