



# Determination of Anxiety Sensitivity and Investigation of its Association with Impulsivity in Adult Attention-Deficit/Hyperactivity Disorder Patients

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## Abstract

### Objectives

Anxiety sensitivity (AS) reflects an individual's belief that anxiety symptoms or arousal may lead to harmful results. In contrast, more impulsive behavior and anxiety disorders comorbidity is observed in adult Attention-Deficit/Hyperactivity Disorder (ADHD) patients. We aimed to determine AS levels in patients with ADHD and to investigate the relationship between AS and impulsive behavior.

### Methods

The study included 30 patients who were diagnosed with ADHD and 30 healthy controls matched by age, gender, education and marital status. Participants filled out the DSM-IV-based Adult ADD / ADHD Diagnosis and Assessment Inventory (A-ADHD). Those who scored at least six of nine questions in the first or second section of A-ADHD as 2 or 3 were clinically interviewed, an ADHD diagnosis was investigated, and participants were diagnosed with adult ADHD according to the DSM-IV-TR criteria. Participants who gave consent filled in the Barratt Impulsivity Scale and Anxiety Sensitivity Index (ASI).

### Results

Using the Barratt Impulsivity Scale's all subscale scores and total score, the ADHD group showed statistically significant differences when compared to the controls.

When the ASI was assessed in terms of the cognitive and social subscale scores and the total score, the ADHD group showed statistically significant differences when compared to the controls. In the ADHD group, a positive correlation was found between ASI scores and Barratt scale scores

### Conclusion

Anxiety sensitivity in the cognitive and, social sub scores and total scores was found to be higher in the ADHD group than in the control group and impulsivity seems much more by the

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people who have more AS. This situation must be addressed in larger scale operation could adversely affect the treatment process and functionality.

**Keywords:**

Anxiety sensitivity, Adult attention-deficit/hyperactivity disorder, Impulsivity

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**Introduction**

Anxiety Sensitivity (AS) is defined as the individual's belief that anxiety symptoms or arousal may lead to harmful results, or as the tendency to respond to symptoms of anxiety with fear that stems from an individual's catastrophic beliefs regarding anxiety [1,2]. AS was first described by Reiss and McNally [3]. When people with high levels of AS experience anxiety, they immediately go into an alarm state regarding their fears, further aggravating their anxiety and entering into a vicious cycle [3]. There is increasing evidence that indicates that AS is a distinct risk factor for anxiety disorders.

It has been shown that high AS precedes the development of panic disorder (PD) and other anxiety disorders [4-6]. It was also found that patients with PD have higher AS levels than both healthy individuals and patients with other anxiety disorders [7]. There may also be differences in the manifestation of AS between anxiety disorders. For example, patients with PD tend to score higher globally when evaluated via the Anxiety Sensitivity Index (ASI), while patients with generalized anxiety disorder and social anxiety disorder show lower global scores but distinct elevations in ASI subscales [8].

Attention-Deficit/Hyperactivity Disorder (ADHD) comorbidity for major depressive disorder has been reported at 35 – 50 %, 40 – 50 %, for anxiety disorders, and 27-50% for alcohol/substance use disorders [9-11]. Therefore, ADHD and anxiety disorder comorbidity is common.

Despite numerous reports of anxiety disorder comorbidity in adults with ADHD, reports on anxiety sensitivity and its effects are limited. Available data from pediatric populations suggests that AS may moderate the effects of disruptive behavior disorders in ADHD [12].

We have built up our study on the assumption that AS may also be common in adults with ADHD (i.e., where anxiety disorder comorbidity is common). Previous studies on adults with

ADHD, suggest that impulsive behaviors and their negative effects on functioning are common in this population [13,14]. Thus, we aimed to determine AS levels in patients who were diagnosed solely with ADHD and to investigate the relationship between AS and impulsive behavior.

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**Materials and Methods**

■ **Data**

This study has been carried out at the psychiatry department of a second-line treatment center in Istanbul between September 2015 and May 2016. The study included 30 patients who were admitted to the outpatient department for the first time within the specified time intervals, who didn't have previous psychiatric diagnosis/treatment history, and who were diagnosed with ADHD by being applied SCID-I (The Structured Clinical Interview for DSM-IV Axis I Disorders)[15] and 30 healthy controls matched in terms of age, gender, education and marital status. The exclusion criteria were being younger than eighteen or older than sixty, having psychiatric illness comorbidity, mental retardation or neurological disease, and being illiterate. Participants' demographic and clinical data were recorded. Participants filled in the DSM-IV-Based Adult ADD / ADHD Diagnosis and Assessment Inventory (A-ADHD) [16,17]. Those who scored at least six of nine questions in 1<sup>st</sup> or 2<sup>nd</sup> section of A-ADHD as 2 or 3 were clinically interviewed once again, and ADHD diagnosis was investigated, and they were diagnosed with adult ADHD according to the DSM-IV-TR criteria. Participants filled in Barratt Impulsivity Scale and Anxiety Sensitivity Index during the same session.

■ **Measures**

**Sociodemographic Data Form:** Through this data form prepared by the researchers, information about identity, age, gender, education, marital status, and diagnosis has been obtained.

**The Structured Clinical Interview for**

**DSM-IV Axis I Disorders (SCID-I):** It is a structured clinical interview scale developed for the determining the main DSM-IV axis I diagnoses [15,18]. It increases the reliability and validity of diagnoses by ensuring the standard implementation of the evaluation and systematic screening of DSM-IV diagnostic criteria. Adaptation and reliability of SCID-I for Turkey has been performed by Çorapçıoğlu, *et al.* [15].

**DSM-IV-Based Adult ADD/ADHD Diagnosis and Assessment Inventory (A-ADHD):** The standardization of the scale developed by Turgay [16] has been performed in 2004 by Günay, *et al.* [17]. While developing A-ADHD, 18 symptoms stated in DSM-IV diagnosis scale have been taken, and scale's first part, attention deficit (A-ADHD-AD), and second part, hyperactivity/impulsivity (A-ADHD-HA), has been created. While preparing the third part, symptoms not included in DSM-IV but mentioned in various publications regarding the subject have been evaluated and ADHD-related-features sub-scale (A-ADHD-RF) has been created. If the patient has scored 2 or 3 in at least 6 of 9 questions of the first part (A-ADHD-AD), it has been reported that "the patient may have attention deficit"; if the patient has scored 2 or 3 in at least 6 of 9 questions of the second part (A-ADHD-HA), it has been reported that "the patient may have hyperactivity/impulsivity". ADD/ADHD related features score is calculated by adding the scores in the third part (A-ADHD-RF).

**Barratt impulsivity scale 11th version (BIS-11):** It is a 30-item self-assessment scale developed to measure impulsivity [19]. The participant is asked to mark the most suitable expression: "rarely/never, occasionally, often, and almost always/always". Three sub-factors have been obtained by factor analysis: 1) Attention-

related impulsivity, 2) Motor impulsivity, 3) Unplanned impulsivity. High scores show high level of impulsivity. Turkish adaptation has been performed previously [20].

**Anxiety Sensitivity Index-3 (ASI-3):** Anxiety Sensitivity Index-3 [21] is a likert-type self-report for evaluating AS symptoms. It consists of three sub-scales (physical, cognitive, and social) and total 18 items. In our country, validity and reliability study has been conducted previously [22].

**Statistical Analysis**

SPSS (Statistics Package for Social Sciences) 15.0 program was used for statistical evaluation. Firstly, data was calculated as percentages and means, and presented as descriptive statistics. T test and Chi-square tests are used in evaluating the difference between the three groups' averages. A Pearson correlation test was used for correlation analysis. Statistical significance was set at  $p < 0.05$ , and all tests were two-tailed.

**Results**

A total of 60 subjects were included in the study. Of these, 30 were diagnosed with adult ADHD. The control group consisted of 30 healthy people. The mean age of the ADHD group was  $33.3 \pm 11.8$  years, and the mean age of the healthy controls was  $34.1 \pm 9.6$  years. In terms of gender, 56.6% (n= 17) of the ADHD group was female while 66.6% (n= 20) of the healthy controls was female. There were no statistically significant differences between the groups in terms of age, gender, marital status and education. Table 1 shows both groups' sociodemographic and

**Table 1: Sociodemographic features of the adults diagnosed with Attention Deficit Hyperactivity Disorder and the healthy controls.**

	ADHD (n=30)	Control (n=30)	F
Age (year) (Ort ± SD)	33.3± 11.8	34.1 ±9.6	>0.05 0.771
Gender (n, %)			>0.05
Male	13, %43.3	10, %33.3	0.317
Female	17, %56.6	20, %66.6	
Education (year) (Ort± SD)	13.2 ±2,1	13.3 ± 2	>0.05 0.882
Marital Status (n,%)			>0.05
Single	19, %63.3	18, %60.0	0.555
Married	11, %36.6	12, %40.0	

The Barratt Impulsivity scale (BIS-11) was used to assess attention impulsivity, motor impulsivity, and inability to plan (i.e., three subscale scores and a total score, the ADHD group showed statistically higher when compared to the controls. (F values according to the sub-scales were 0.000, 0.003, 0.008, 0.000; respectively).

**Table 2: Barratt Impulsivity scale (BIS-11) sub-group and total scores of the adults diagnosed with Attention Deficit Hyperactivity Disorder and the healthy controls.**

	ADHD (n=30)	Control (n=30)	p
Barratt Impulsivity Scale Attention Impulsivity Score	20.6 ± 5.4	14.2 ± 3.1	0.000
Barratt Impulsivity Scale Motor Impulsivity Score	21.8 ± 6.1	17.5 ± 4.0	0.003
Barratt Impulsivity Scale Inability to Plan	27.8 ± 5.5	24.2 ± 4.3	0.008
Barratt Impulsivity Scale Total Score	70.3 ± 3.0	81.0 ± 56.0	0.000

The Anxiety Sensitivity Index (ASI-3) includes a cognitive subscale, a social subscale, and a total score. The ADHD group showed statistically significantly higher when compared to the controls. (p values according to the sub-scales were 0.009, 0.000, 0.006 respectively). However, there were no significant differences between ADHD group and controls in terms of anxiety sensitivity index physical score.

**Table 3: Anxiety Sensitivity Index (ASI-3) subgroup and total scores of the adults diagnosed with Attention Deficit Hyperactivity Disorder and the healthy controls.**

	ADHD (n=30)	Control (n=30)	p
Anxiety Sensitivity Index Cognitive Score	9.7 ± 5.9	6.1 ± 3.9	0.009
Anxiety Sensitivity Index Social Score	8.4 ± 6.0	3.0 ± 2.4	0.000
Anxiety Sensitivity Index Physical Score	6.2 ± 5.3	5.4 ± 4.8	0.566
Anxiety Sensitivity Index Total Score	24.3 ± 15.5	14.6 ± 9.8	0.006

In the ADHD group, correlation analysis was applied between the BIS-11, ASI-3, and the DSM-IV-Based Adult ADD/ ADHD Diagnosis and Assessment Inventory (A-ADHD) scale scores.

**Table 4: Correlation between Barratt Impulsivity Scale (BIS-11) subgroup and Anxiety Sensitivity Index (ASI-3) subgroup.**

	A-ADHD-AD	A-ADHD-HA	A-ADHD-RF	A-ADHD-Total
BIS-11 Attention Impulsivity Score	p: 0.001 r: +0.573	p: 0.004 r: +0.513	p: 0.000 r: +0.650	p: 0.001 r: +0.692
BIS-11 Motor Impulsivity Score	p: 0.001 r: +0.566	p: 0.009 r: +0.479	p: 0.001 r: +0.575	p: 0.000 r: +0.636
BIS-11 Inability to Plan Score	p: 0.000 r: +0.745	p: 0.004 r: +0.373	p: 0.000 r: +0.624	p: 0.000 r: +0.691
BIS-11 Total Score	p: 0.000 r: +0.719	p: 0.004 r: +0.521	p: 0.000 r: +0.705	p: 0.000 r: +0.771

There was a positive correlation between the BIS-11 Attention Impulsivity Score, A-ADHD-AD, A-ADHD-HA, A-ADHD-RF and A-ADHD-Total. There was a positive correlation between the BIS-11 Motor Impulsivity Score, A-ADHD-AD, A-ADHD-HA, A-ADHD-RF and A-ADHD-Total. There was a positive correlation between the BIS-11 Inability to Plan Score, A-ADHD-AD, A-ADHD-HA, A-ADHD-RF and A-ADHD-Total. There was a positive correlation between BIS-11 Total Score, A-ADHD-AD, A-ADHD-HA, A-ADHD-RF and A-ADHD-Total.

**Table 5: Correlation between DSM-IV-Based Adult ADD/ ADHD Diagnosis and Assessment Inventory (A-ADHD) subgroup and Anxiety Sensitivity Index (ASI-3) subgroup.**

	A-ADHD-AD	A-ADHD-RF
ASI-3 Cognitive Score	p: 0.002 r: +0.405	-
ASI-3 Social Score	p: 0.000 r: +0.673	p: 0.027 r: +0.411
ASI-3 Physical Score	p: 0.028 r: +0.408	p: 0.006 r: +0.496
ASI-3 Total Score	p: 0.002 r: +0.552	p: 0.013 r: +0.454

There was a positive correlation between the A-ADHD-AD score, ASI-3 Cognitive Score, ASI-3 Social Score, ASI-3 Physical Score, and the ASI-3 Total Score. Similar correlations were not found between the A-ADHD-HA score, ASI-3 subgroup scores and total scores. There was a positive correlation between the A-ADHD-RF score, ASI-3 Social Score, ASI-3 Physical Score, and the ASI-3 Total Score.

A positive correlation was found in the correlation analysis between the Barratt scale scores and ASI scale scores in the ADHD group (r=0.3 p=0.05), however this. Correlation was not found in healthy control group (r=1, p=0.760).

clinical features (Tables 1-5).

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## Discussion

In this study, adult ADHD patients admitted to a psychiatry clinic were compared with healthy controls, and their BIS-11 scores were found to be significantly higher than the controls in all three subgroups. Also, scores of all subgroups of A-ADHD scale and all subgroups of the BIS-11 showed a positive correlation. While the study detected significantly higher impulsivity in ADHD patients than the control group, impulsivity tended to increase with increased severity of ADHD. Impulsivity in ADHD patients and its negative impact on their functionality has already been reported earlier [9,14]. The finding of this study is therefore consistent with the literature.

AS in the cognitive, social, and total scores was found to be higher in the ADHD group than in the control group. There was no difference between the two groups in the anxiety sensitivity physical sub-scale.

Previous studies have found a high prevalence of comorbidity of anxiety disorder with ADHD [10,11]. In the US National Comorbidity Survey, patients with ADHD were found to have a lifetime prevalence of any anxiety disorder of 59% [23,24]. Emerging cognitive deficits in ADHD may lead to anxiety which may lead to increased problems related to attention. In both cases, it has been reported that working memory-related problems may occur [25]. While many studies have been conducted on anxiety's negative impact on attention, there are few studies on the negative impacts of attention deficit on anxiety [26,27].

For these reasons, and as we found in our study, AS may be high in patients with ADHD. Additionally, all the ASI-3 sub-scales showed a positive correlation between the A-ADHD-AD score and A-ADHD-RF scores. ASI-3 was not correlated with the A-ADHD-HA scores. Increased attention deficit scores and related factors scores tend to increase with increased AS scores. Such correlation between AS and hyperactivity scores was not found. Therefore, in ADHD patients with predominant attention deficit, AS increases as attention deficit increases. As Buittelar and his colleagues pointed out [25], cognitive disorders in ADHD may cause anxiety

which may then lead to increased attention problems. Such a correlation has not been found with hyperactivity scores. Behavioral inhibition is a core hallmark of anxiety disorders. Although this may seem inconsistent with conventional "view" of impulsivity as increased behavioral activation [28,29].

The data revealed high rates of comorbidity between anxiety disorders and impulse control disorders. Better understanding of these relations would provide better interventions for patients.

In the ADHD group, a positive correlation was found between the ASI-3 scores and the BIS-3 scores ( $p=0.05$ ,  $r=0.3$ ). Impulsive behavior increases together with increased anxiety sensitivity. However, such a correlation was not found in the control group.

Although studies by Pliszka, *et al.* found that anxiety suppressed impulsivity, this result was not found in studies performed with a different methodology [30-34].

In ADHD patients, comorbid anxiety disorder has been found to increase impulsivity, which in turn causes decreased response to treatment [31].

This study showed that impulsive behavior increases with increased AS. This condition is an important factor influencing treatment response and functionality because of adherence to therapy. Therefore, we think that it is important to investigate comorbid anxiety disorders in ADHD patients, as well as AS and its impact on impulsive behavior.

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## Limitations

Limitation of this study includes its cross-sectional nature and the small number of patients. The use of structured diagnosis procedures, statistical power, and the use of valid and reliable scales are among the strengths of our study. Although AS is an issue open to research, and although anxiety disorder is common in patients with ADHD, AS has not in actuality been investigated, which has led us to plan this study. Our aim was to study the relation between hyperactivity and impulsivity that is commonly seen in ADHD patients and anxiety sensitivity.

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## Conclusion



Our study revealed that ADHD patients have higher AS rates than healthy controls, and that increased AS leads to increased impulsivity. AS, with or without the diagnosis of an anxiety disorder, needs to be better known and studied in both the literature and in clinical practice. Therefore, studies with larger samples are needed to determine the relationship between AS and impulsivity, and to address its relationship with

quality of life and functionality so as to improve our knowledge of this topic.

### Conflict of interest

The authors declared no conflict of interest.

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