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BEHAVIORAL INHIBITION AND BEHAVIORAL ACTIVATION SYSTEM LEVELS, AND DSM-5 PSYCHOPATHOLOGICAL SYMPTOMS IN TURKISH ADOLESCENTS

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Abstract

This study tested the hypothesis derived from Gray's Reinforcement Sensitivity Theory that psychopathology results from high levels of activity in the Behavioral Inhibition System (BIS) related to punishment sensitivity and the Behavioral Activation System (BAS) related to reward sensitivity, based on Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) psychological disorders in a sample of Turkish adolescents. This study also draws attention to how the biological orientation of BIS and BAS can help predict psychological disorders. The original contribution of this study is to examine the relationship of BIS and BAS activity to almost all DSM-5 psychopathological disorders.

A random sample of 417 students between the ages of 15 and 18 (m=16, 40; sd=1,23) in Istanbul province was surveyed using the Behavioral Inhibition and Behavioral Activation Scales (BIS/BAS; Carver & White, 1994) and the Inventory of Psychologıcal Disorders For Adolescences (PDIA; Bilge & Kulaksızoğlu, 2017).

Pearson correlations of BIS and BAS scores with PDIA Subscales indicated that Attention-Deficit, Depression, Somatic Symptom Disorder, Separation Anxiety, Social Phobia, Generalized Anxiety Disorder, Avoidant Personality Disorder (PD) and Dependent PD were significantly correlated with increased BIS activity whereas Intermittent Explosive Disorder, Hyperactivity, Conduct Disorder, ADHD, Schizophrenia, Paranoid PD, Histrionic PD and Narcissistic PD were significantly correlated with increased BAS activity. Some PDIA subscales were related to both BIS and BAS: Anorexia Nervosa, Bulimia Nervosa, Hypersomnolence Disorder, Obsessive-Compulsive Disorder, Panic Attack, Borderline PD, Schizotypal PD and Obsessive-Compulsive PD. Regression analysis was applied to determine the extent to which these disorders were predicted by BIS and BAS.

The results confirmed that psycholopathology symptoms are related to increases in BAS and BIS activity. The results also confirm Gray's (1982) finding that high BIS activity levels are associated with anxiety.

Key Words: *Inventory of Psychological Disorders For Adolescences (PDIA), Behavioral Inhibition and Behavioral Activation Scales (BIS/BAS), Reinforcement sensitivity theory, psychological disorders, DSM-5.*

Introductıon

One of the main purposes of personality studies is to identify the biological variables that underlie the measured factor structure in behavior. Gray's (1970) Reinforcement Sensitivity Theory (RST), which emerged as an alternative to Eysenck's personality theory, is one of the most important theories explaining individual differences through a biological model. . The theory assumes that the brain system is sensitive to punishment and reward, which underlie personality properties in that relatively short-term emotions and behaviors lead to stable emotional and behavioral traits (Pickering & Corr, 2008). Gray's theory consists of two motivational systems of emotion that underlie motivated behaviour: the behavioural approach system (BAS) and the behavioural inhibition system (BIS). BAS mediates responses to appetitive stimuli whereas BIS mediates responses to conditional aversive stimuli. Anxiety and impulsivity, which are the main personality proporties in Gray's (1970, 1991) theory, are related to stable individual differences in BIS and BAS (Pickering, Corr & Gray, 1999). Regarding psychopathology formation, individuals at the extremes of BIS and BAS activity dimensions are at high risk (Pickering & Gray, 1999). Additionally, BIS and BAS not only play a role in normal behavior but also relate to different psychopathology types depending on high or low activity in both systems (Gray, 1982; Quay, 1988; Kimbrel et al., 2008). Broadly, the theory proposes that individuals with increased BAS activity are more likely to have externalizing disorders whereas individuals with increased BIS activity are more predisposed to internalizing disorders (Slobodskaya, 2007).

According to Fowles (2002), the BIS and BAS systems provide a theoretical bridge between biological concepts and the emotional and behavioral characteristics that define psychopathology. Fowles also claims that sensitivity to BIS and BAS explains a broad spectrum of psychopathology. For example, Gray (1982) suggested that high BIS levels are associated with anxiety while Quay (1993) suggested that high levels of BAS help explain conduct disorder and antisocial personality disorder. Gray's personality theory is one of the most researched and discussed theories in recent years (Dissabandara et al., 2012) while many studies have been conducted on the relationship between RST and psychopathology (Mellick, Sharp & Alfano, 2014). However, far fewer studies have been done with adolescents than with adults.

In Turkey, only one study had been conducted to examine the relationship between sensitivity to BIS and BAS and personality disorders on adults but not adolescents. Bilge (2017) used a community sample of 277 people. Bilge found that Cluster B and personality disorders were associated with high BAS activity whereas Cluster C and personality disorders were associated with high BIS activity. One cluster of personality disorders, Paranoid PD, correlated positively with both BAS and BIS while Schizoid PD had a negative relationship with BAS. Schizotipal PD was not related to either system. The present study examines the relationship between psychological disorders seen in adolescents with BIS and BAS.

Previous work elsewhere has studied adolescents. Vervoort et al. (2010) assessed BIS and BAS sensitivity in clinically anxious and unanxious young people (175 children and adolescents aged 8-18 years, of whom 70 were boys). They found that clinical anxiety is related to high BIS activity. Anxiety, panic disorder, separation anxiety, general anxiety disorder and major depression disorders were also positively correlated with BIS as predicted by theory. Whereas BIS scores were higher in girls than boys, there was no difference in BAS scores. Mellick, Sharp and Alfano (2014) measured BIS/BAS, despression and anxiety in 85 girls, of whom 17 had mothers with major depressive disorder, 34 had high depression risk and 34 were healthy controls. They found that BIS scores for girls with major depressed mothers were significantly higher than

both the high-risk group and the healthy control group. In addition, high BIS levels did not indicate a predisposition for Major Depressive Disorder but they distinguished depressed adolescents from healthy controls. Biuckians, Miklowitz, and Kim (2007) studied 25 Bipolar I and II adolescents, finding that, contrary to their hypotheses, adolescents with higher BAS levels exhibited less severe concurrent mania symptoms, and that BAS sensitivity levels were not associated with concurrent depression levels. Another study examined the relationship between BIS/BAS levels and lifetime depression, anxiety, drug abuse and dependence, alcohol dependence, attention deficit hyperactivity disorder and conduct disorder, in a community sample of 1,803 people aged 19-21 years old, using the International Diagnostic Interview (CIDI) and BIS/BAS Scale (Johnson, Turner & Iwata, 2003). They found that BIS is a vulnerability factor for depression and anxiety, and that BAS_{Fun} scoreshelped in diagnosis of alcohol and substance abuse. Slobodskaya et al. (2003) investigated the reactions of Russian adolescents to reward and punishment, and the relationship of these reinforcements with various psychological problems, using Gray-Wilson Personality Questionnaire (GWPQ) to measure sensitivity to reward and punishment. They found that various subscale scores were associated with with emotional problems, depression, attention deficit, behavioral problems, suicidal behaviors, aggressive behaviors and somatic complaints. Different combinations of these correlations, for example, with the passive avoidance and flight subscales of anxiety, supported hypotheses about psychopathology in positive-reinforcement sensitivity theory. Muris et al. (2005) investigated the relationship between BIS/BAS scale averages and extroversion, neuroticism and psychopathological symptoms in 284 students aged 8-12 years. They found a positive correlation between externalization disorders and BAS (hyperactivity, behavior problems and aggression) and extroversion, between BIS and internalization disorders (anxiety, depression and emotional problems) and introversion, and between neuroticism and both BAS and BIS.

Purpose

Almost all previous studies of the relationship between psychological disturbances seen in adolescents and sensitivity to BIS or BAS offer support for Gray's theory. However, this theory also needs to be tested in other cultures to strengthen it empirically and to assess whether there are any cross-cultural differences. Our study therefore aimed to examine the relationship between BIS and BAS and 17 psychological disorders and 9 personality disorders in DSM-5 (excluding antisocial personality disorder) in Turkish adolescents.

Method

Research Design

As our aim was to review the relationship between psychological disorders in adolescents and BIS/BAS sensitivity, a relational screening model was used.

Participants

A total of 417 students participated [224 female students (53.7%) and 193 male students (46.3%)], aged 15-18 (M=16.40 and SD=1.23) years, who were attending two state schools in Istanbul. In selecting the schools and locations, convenience and approachability were considered but the choice of classes and thus students was random. All students participated voluntarily. Furthermore Permission has been obtained from the Ministry of National Education for applications.

Data Collection

Behavioral Inhibition System / Behavioral Activation System Scale (BIS / BAS Scale)

The BIS⁄BAS scales were developed by Carver and White (1994) to quantify individual differences in sensitivity of BIS and BAS. The scales include 20 items, using 4-point Likert scales, including 1 BIS subscale and 3 BAS subscales: BIS scale (7 items), the Reward Responsiveness scale (5 items), the Drive scale (4 items), and the Fun Seeking scale (4 items). A reliability and validity study was conducted with 732 university students (374 women, 358 males). The Cronbach alpha reliability coefficient was .74 for the BIS subscale, .66 for the Fun Seeking subscale, .73 for the Drive subscale and .73 for the Reward Responsiveness subscale (Carver & White, 1994). In the same study, the scale was given to 113 university students for 8 weeks. Test-retest reliability was found to be .66 for the BIS subscale, .69 for the Fun Seeking subscale, .59 for the Reward Responsiveness subscale and .66 for the Drive subscale (Carver &White, 1994).

The Turkish reliability and validity studies used 371 university students aged 18-25 years old. For the test-retest reliability test, the BIS/BAS Scale was re-administered to 100 students (51 women, 49 men) over a 4-week interval. Test-retest correlation values were .69 for the BIS subscale, .59 for the Reward Responsiveness subscale, .58 for the Fun Seeking subscale and .80 for the Drive subscale. The Cronbach alpha reliability coefficients to determine the internal consistency reliabilities of the Turkish version of the BIS/BAS subscales were .69 for the BIS subscale, .57 for the Reward Responsiveness subscale, .63 for the Fun Seeking subscale and .63 for the Drive subscale. Factor analysis supported the four-factorial construct (BIS, Reward Responsiveness, Fun Seeking and Drive) from the original measure (Şişman, Ayçiçeği-Dinn & Dinn, 2008; Şişman, 2012).

Psychological Disorders Inventory for Adolescents (PDIA)

Developed by Bilge (2016), and consisting of 214 items, the Psychological Disorders Inventory for Adolescents (PDIA) is a DSM-5 (APA, 2013) based inventory that helps diagnose psychological disorders in adolescents in Turkey.

PDIA is a scale which assesses 17 psychological disorders (Attention-Deficit/Hyperactivity Disorder, Schizophrenia, Depressive Disorder, Separation Anxiety Disorder, Social Phobia, Panic Attack, Generalized Anxiety Disorder, Obsessive-Compulsive Disorder, Somatic Symptom Disorder, Anorexia Nervosa, Bulimia Nervosa, Insomnia Disorder, Hypersomnolence Disorder, Gender Dysphoria, Oppositional Defiant Disorder, Intermittent Explosive Disorder and Conduct Disorder) and 9 personality disorders (PD), excluding antisocial personality disorder because this can only be diagnosed after 18 years of age, (Paranoid PD, Schizoid PD, Schizotypal PD, Borderline PD, Histrionic PD, Narcissistic PD, Avoidant PD, Dependent PD and Obsessive-Compulsive PD), for a total of 26 disorders.

Cronbach Alpha coefficient reliability analysis was conducted with a sample of 1,953 students.The lowest coefficient was for the Insomnia Disorder subscale ($\alpha = .69$) and the highest was the Depression Disorder subscale ($\alpha = .91$), with an average coefficient from all subscales of .78. The reliability coefficients calculated for the other subscales were .82 for ADHD, .85 for Panic Attack Disorder, .79 for Generalized Anxiety Disorder, .78 for Schizophrenia, .76 for Separation Anxiety Disorder, .83 for Social Phobia, .74 for Obsessive-Compulsive Disorder, .74 for Somatic Symptom Disorder, .85 for Anorexia Nervosa, .75 for Bulimia Nervosa, .79 for Hyper somnolence Disorder, .80 for Gender Dysphoria , .78 for Oppositional Defiant Disorder,

.74 for Intermittent Explosive Disorder and .81 for Conduct Disorder. For the personality disorders, coefficients were .77 for Paranoid PD, .75 for Schizotypal PD, .71 for Borderline PD, .79 for Histrionic PD, .83 for Narcissistic PD, .82 for Avoidant PD, .77 for Dependent PD and .70 for Obsessive-Compulsive PD.

The test-retest correlation coefficients ranged between .54 and .86, with all correlation coefficients significant at $p < .001$ level.

In the analyses conducted for construct validity, each subscale was subjected to Exploratory Factor Analysis because our inventory was not a total score indexed scale but a profile scale like MMPI. The criterion level of the Kaiser-Meyer-Olkin (KMO) sample adequacy scale, which is designed to assess the suitability of the data set obtained from PDIA subscales for factor analysis, was at the "very good" level for all subscales. For the Bartlett test, significance levels for all subscales were found to be $p < .000$, based on the Kaiser normalized Varimax rotation. A Basic Component Analysis was also performed to determine how many factors were above the true value of each sub-scale and the percentage of the total variance explained.

Procedure

Both scales used in the research were administered in one session as a group activity in the classroom environment. Since four different classes were sampled in each school, a total of 8 sessions were conducted. After discarding invalid responses, the Pearson Correlation Coefficient was applied to the data from the remaining 417 individuals. Simple linear regression analysis was performed to determine the extent to which the disorders were predicted by BIS and BAS scores. SPSS v.20 was used for all analyses.

Results

The results from the Pearson Correlation Coefficient analysis to identify the relationships between the BIS, BAS, BAS_R, BAS_F and BAS_D subscale scores of the BIS/BAS scale and the PDIA subscale points average were as follows.

The PDIA Generalized Anxiety Disorder subscale only correlated positively with the BIS scale (r .37, p=.00), with no correlation with BAS, BAS_R, BAS_F or BAS_D. The Separation Anxiety Disorder subscale correlated positively with the BIS scale (r .42, p=.00), the BAS scale (r .12, p= .02), and the BAS_R scale (r .14, p= .00). However, there was no correlation with BAS_F and BAS_D. The Obsessive-Compulsive Disorder subscale correlated positively with the BIS (r .21, p=.00), BAS (r .16, p=.00), BAS_F (r .18, p= .00) BAS_D (r .14, p= .01), but there was no correlation with BAS_R. Panic Disorder correlated positively with BIS (r .25, p=.00), BAS (r .16, p=.00), BAS_F scale (r .20, p= .00) and BAS_D scale (r .13, p= .01), but there was no correlation with BAS_R. Social Phobia only correlated positively with BIS (r .41, p=.00), but it also correlated negatively with BAS (r -.15, p=.00), BAS_F (r -.12, p= .01) and BAS_D scale (r -.16, p= .01), although there was no correlation with BAS_R. Somatic Symptom Disorder correlated positively with BIS (r .24, p=.00), but there was no correlation with BAS, BAS_R, BAS_F or BAS_D. Depressive Disorder correlated positively with BIS (r .23, p=.00) and BAS_F (r .11, p= .03), but there was no correlation with BAS, BAS_R or BAS_D. Intermittent Explosive Disorder correlated positively with BAS (r .13, p=.01), BAS_F (r .22, p= .00) and BAS_D (r .13, p= .01), but there was no correlation with BIS and BAS_R. Conduct Disorder correlated negatively with BIS (r -.23, p=.00) and BAS_R scale (r -.17, p= .00), but positively with BAS (r .10, p= .04), BAS_F (r .18, p= .00) and BAS_D (r .20, p= .02). Oppositional Defiant Disorder correlated positively with BAS_F (r .15, p=.00), but there was no

correlation with BIS, BAS, BAS_R or BAS_D. Attention Deficit correlated positively with BIS (r .12, p= .01) and BAS_F (r .10, p= .05), but there was no correlation with BAS, BAS_R or BAS_D. Hiperactivity Disorder correlated positively with BAS (r .24, p= .00), BAS_F (r .28, p= .00) and BAS_D (r .22, p= .00), but there was no correlation with BIS and BAS_R. ADHD correlated positively with BAS scale (r .13, p= .01), BAS_F (r .21, p= .00) and BAS_D (r .10, p= .04), but there was no correlation with BIS and BAS_R. Schizophrenia correlated positively with BAS (r .14, p=.01), BAS_F (r .18, p= .00) and BAS_D (r .18, p= .00), but there was no correlation with BIS and BAS_R. Hypersomnolence Disorder correlated positively with BIS (r .12, p=.01) and BAS_F (r .15, p= .00), but there was no correlation with BAS, BAS_R or BAS_D. Anorexia Nervosa correlated positively with BIS (r .12, p= .02), BAS (r .10, p= .03), BAS_F (r .10, p= .05) and BAS_D (r .11, p= .02), but there was no correlation with BAS_R. Bulimia Nervosa correlated positively with BAS (r .15, p=.00), BAS_F (r .26, p= .00) and BAS_D (r .11, p= .02), but there was no correlation with BIS and BAS_R. Gender Dysphoria correlated positively with BAS_F (r .14, p=.00) and BAS_D (r .10, p= .04), but there was no correlation with BIS, BAS or BAS_R. Paranoid PD correlated positively with BAS (r .17, p=.00), BAS_F (r .16, p= .00) and BAS_D (r .18, p= .00), but there was no correlation with BIS and BAS_R. Schizoid PD correlated only negatively with BAS_R (r -.11, p=.03), with no correlation with BIS, BAS, BAS_F or BAS_D. Schizotypal PD only correlated negatively with BAS_R (r -.10, p=.04), but it correlated positively with BIS (r .18, p=.00) and tBAS_F (r .10, p= .03), but there was no correlation with BAS or BAS_D. Borderline PD correlated positively with BIS (r .16, p=.00), BAS (r .14, p=.00), BAS_F (r .20, p= .00) and BAS_D (r .13, p= .01), but there was no correlation with BAS_R. Histrionic PD correlated positively with BAS (r .29, p=.00), BAS_F (r .25, p= .00) and BAS_D (r .33, p= .00), but there was no correlation with BIS or BAS_R. Narcissistic PD correlated positively with BAS (r .32, p=.00), BAS_F (r .22, p= .00) and BAS_D (r .39, p= .00), but there was no correlation with BIS and BAS_R. Avoidant PD correlated positively with BIS (r .35, p=.00), but it correlated negatively with BAS (r -.11, p=.03) and BAS_D (r -.12, p= .00), while there was no correlation with BAS_R and BAS_F. Dependent PD correlated positively with BIS (r .38, p=.00) but negatively with BAS_D (r -.10, p= .04), while there was no correlation with BAS, BAS_R or BAS_F. Obsessive-Compulsive PD correlated positively with BIS (r .21, p=.00), BAS (r .23, p=.00), BAS_R (r .16, p= .00), BAS_F (r .09, p= .05) and BAS_D (r .25, p= .00). Table 1 shows the Pearson Correlation Coefficient results.

Table 1. Correlations between BIS/BAS scale points and points of psychological disorders of DSM-5

	BIS	**BAStotal**	**BASrew**	**BASfun**	**BASdrıve**
Generalized Anxiety Disorder	*0.37***	0.05	0.06	0.07	0.00
Separation Anxiety Disorder	*0.42***	*0.12***	*0.14***	0.09	0.05
Obsessive-Compulsive Disorder	*0.21***	*0.16***	0.07	*0.18***	*0.14***
Panic Attack	*0.25***	*0.16***	0.04	*0.20***	*0.13***
Social Phobia	*0.41***	*-0.15***	-0.07	*-0.12***	*-0.16***
Somatic Symptom Disorder	*0.24***	0.06	0.02	0.05	0.07
Depressive Disorder	*0.23***	0.03	-0.03	*0.11**	0.00
Intermittent Explosive Disorder	-0.04	*0.13***	-0.04	*0.22***	*0.13***
Conduct Disorder	*-0.23***	*0.10**	*-0.17***	*0.18***	*0.20***
Oppositional Defiant Disorder	0.01	0.07	-0.08	*0.15***	0.08
Attention-Deficit	*0.12***	0.01	-0.03	*0.10**	-0.02
Hyperactivity Disorder	-0.09	*0.24***	0.06	*0.28***	*0.22***
ADHD	0.04	*0.13***	0.01	*0.21***	*0.10**
Schizophrenia	-0.02	*0.14***	-0.06	*0.18***	*0.18***
Hypersomnolence Disorder	*0.12***	0.07	-0.01	*0.15***	0.03
Insomnia Disorder	0.04	0.03	-0.05	0.08	0.03

Anorexia Nervosa	*0.12***	*0.10***	0.03	*0.10**	*0.11***
Bulimia Nervosa	0.05	*0.15***	0.00	*0.26***	*0.11***
Gender Dysphoria	-0.08	0.09	-0.04	*0.14***	*0.10**
Paranoid PD	0.09	*0.17***	0.05	*0.16***	*0.18***
Schizoid PD	0.01	-0.03	*-0.11**	0.00	0.01
Schizotypal PD	*0.18***	0.02	*-0.10**	*0.10**	0.04
Borderline PD	*0.16***	*0.14***	0.01	*0.20***	*0.13***
Histrionic PD	-0.01	*0.29***	0.08	*0.25***	*0.33***
Narcissistic PD	-0.05	*0.32***	0.09	*0.22***	*0.39***
Avoidant PD	*0.35***	*-0.11**	-0.06	-0.07	*-0.12***
Dependent PD	*0.38***	-0.04	0.02	0.01	*-0.10**
Obsessive-Compulsive PD	*0.21***	*0.23***	*0.16***	*0.09**	*0.25***

* Correlation significant at 0.05 level (2-tailed).
** Correlation significant at 0.01 level (2-tailed).

The results of the regression analysis conducted to determine the level of BIS and BAS scores to predict psychological disorders are as follows. Disorders strongly predicted by BIS scores were Generalized Anxiety Disorder (14%), Separation Anxiety Disorder (18%), Social Phobia (17%), Avoidant PD (13%) and Dependent PD (15%). Disorders strongly predicted by BAS_F scores were only Hyperactivity Disorder (8%) and Bulimia Nervosa (7%). Disorders strongly predicted by BAS_D scores were only Histrionic PD (11%) and Narcissistic PD (15%). The results of the regression analysis are given in Table 2.

Cronbach alpha reliability coefficients for the BIS / BAS scale were calculated with the following results: .66 for the BIS subscale (M=20.13; SD=3.40), .81 for the BAS Total (M=42.47; SD=5.79), .56 for the Fun Seeking subscale (M=12.83; SD=2.18), .78 for the Drive subscale (M=11.48; SD=2.92) and .71 for the Reward Responsiveness subscale (M=18.17; SD=2.26).

Table 2. Regression Analysis for Predicting the Psychological Disorders of BIS and BAS Points

	BIS		**BASrew**		**BASfun**		**BASdrıve**				
	R^2	***β***	**R^2**	***β***	**R^2**	***β***	**R^2**	***β***	**ΔR^2**	**F**	**p**
Generalized Anxiety Disorder	.14	.857**							.14	67.498	.000
Separation Anxiety Disorder	.18	.673**			.01	.251*			.19	48.100	.000
Obsessive-Compulsive Disorder	.04	.423**			.04	.556**			.08	17.260	.000
Panic Attack	.06	.846**	.02	-.681	.05	1.168**			.13	20.494	.000
Social Phobia	.17	1.179**	.04	-.769**					.21	54.597	.000
Somatic Symptom Disorder	.06	.362**							.06	26.432	.000
Depressive Disorder	.06	1.253**	.03	1.263**	.01	1.282**			.10	15.326	.000
Intermittent Explosive Disorder					.05	.521**	.02	-.281**	.07	15.131	.000
Conduct Disorder	.05	-.216*	.04	-.720**	.03	.504**	.04	.400**	.16	18.468	.000
Oppositional Defiant Disorder			.03	-.381**	.02	.517**			.05	10.540	.000
Attention-Deficit	.02	.355**	.02	-.449**	.01	.509**			.05	6.074	.000

Hyperactivity Disorder					.08	.520**	.01	.183*	.09	19.704	.000
ADHD					.05	.926**			.05	19.443	.000
Schizophrenia			.02	-.529**	.03	.522**	.03	.338**	.08	11.245	.000
Hypersomnolence Disorder	.02	.298**	.02	-.381**	.02	.561**			.06	9.583	.002
Insomnia Disorder									0	0	0
Anorexia Nervosa	.02	.241*					.01	.192*	.03	5.749	.003
Bulimia Nervosa	.01	.136*	.02	.313**	.07	.600**			.10	14.052	.000
Gender Dysphoria			.01	-.232*	.02	.379**			.03	6.861	.001
Paranoid PD	.01	.173*					.03	.358**	.04	8.943	.000
Schizoid PD			.01	-.207*					.01	4.952	.03
Schizotypal PD	.03	.485**	.03	-.733**	.04	.634**			.10	13.286	.000
Borderline PD	.03	.405**	.02	-.456**	.04	.758**			.09	13.343	.000
Histrionic PD					.01	.455*	.11	.745**	.12	28.794	.000
Narcissistic PD							.15	1.230**	.15	74.623	.000
Avoidant PD	.13	1.145**	.03	-.733**					.16	38.140	.000
Dependent PD	.15	.892**	.01	-.338*					.16	38.968	.000
Obsessive-Compulsive PD	.05	.387**					.06	.521**	.11	25.323	.000

* Correlation significant at 0.05 level (2-tailed).
** Correlation significant at 0.01 level (2-tailed).

Discussion

The main purpose of this study was to test Gray's Reinforcement Sensitivity Theory by examining the ability of BIS and BAS scores to predict psychological disorders in adolescents in Turkey. From the literature, it can be seen that previous studies have examined the relationships between several disorders and BIS/BAS. In our study, however, the spectrum of the most comprehensive psychological disorders were evaluated together, unlike in previous studies. By including so many psychopathologies in one study, we were able to offer a more holistic test of the theory.

The age range of our study was 15-18. But the majority of studies in literature consist in youth (usually university students) or adults over 18 years of age. Therefore, when referring to studies that support our findings, the age criterion was not considered.

Considering the correlation and regression results, BIS scores strongly predicted internalization disorders, such as anxiety disorders (Separation Anxiety Disorder, Social Phobia, Generalized Anxiety Disorder, Somatic Symptom Disorder), depression, avoidant PD and dependent PD. Among BAS scores, BAS_F specifically predicted externalization disorders, such as Intermittent Explosive Disorder, Hyperactivity, ADHD and Bulimia Nervosa. Obsessive Compulsive Disorder and Panic Disorder were predicted by both BIS and BAS_F, while Conduct Disorder was predicted by all BIS and BAS subscales, although there was a negative relationship between BIS and BAS_R. These results are consistent with both Gray's theory (1987) and previous studies (Johnson, Turner & Iwata, 2003; Kasch et al., 2002; Muris et al., 2005; Park et al., 2013; Slobodskaya, 2007; Vervoort et al., 2010).

Considering personality disorders, Avoidant PD and dependent PD were predicted by BIS, and Histrionic PD and Narsisistic PD by BAS_D. Obsessive Compulsive PD, Schizotypal PD and Borderline PD were predicted by both BIS and BAS. BAS_F and BAS_R predicted Schizotipal PD although there was a negative relationship between Schizotipal PD and BAS_R. Previous studies also support these results (Farmer and Nelson-Gray, 1995; Fossati et al., 2007; Caseras, Torrubia, and Farré, 2001; Kimbrel et al., 2012; Ross et al., 2013).

In summary, the fact that this study in a new cultural context supports Gray's RST suggests that more research should be done within this framework. In particular, considering that there has been no previous study of RST in adolescents in Turkey, or concerning the relationship between BIS/BAS and psychopathology, more research is needed. Our work should lead to other research on this subject. This study is also one of only a few studies evaluating a large number of psychological disorders together, which is an important contribution to the international literature in this field. Studies such as ours can form the basis for preventive studies by determining the factors that help predictg psychological disorders, especially during childhood and adolescence.

REFERENCES

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

Bilge, Y. (2017). The Relationships Between Behavioral Inhibition And Behavioral Activation Systems with Personality Disorders In Cluster B And C. *Social Sciences Studies Journal.* 3 (12),ss, 1850-1866. Doi Number :http://dx.doi.org/10.26449/sssj.217

Bilge, Y. (2016). Ergenler İçin Psikolojik Bozukluklar Envanteri'nin (EPBE) Geliştirilmesi ve Ergenlerde Görülen Psikolojik Bozuklukların Sosyo-Ekonomik Düzey ve Cinsiyet Açısından İncelenmesi. Fatih Üniversitesi, Sosyal Bilimler Enstitüsü. Yayınlanmamış Doktora Tezi.

Bilge, Y. & Kulaksızoğlu, A. (2017). A New Scale: The Validity and Reliability of Inventory of Psychological Disorders for Adolescents. *The Journal of International Social Research*, 10 (53) Issn: 1307-9581 http://dx.doi.org/ 10.17719/jisr.20175334133

Biuckians, A., Miklowitz, D. J., & Kim, E. Y. (2007). Behavioral activation, inhibition and mood symptoms in early-onset bipolar disorder. *Journal of affective disorders*, *97*(1), 71-76.

Caseras, X., Torrubia, R., & Farré, J. M. (2001). Is the Behavioural Inhibition System the core vulnerability for cluster C personality disorders?. *Personality and Individual Differences*, *31*(3), 349-359.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of personality and social psychology*, *67*(2), 319.

Dissabandara, L. O., Loxton, N. J., Dias, S. R., Daglish, M., Stadlin, A. (2012). "Testing the Fear and Anxiety Distinction in the BIS/BAS Scales in Community and Heroin-dependent Samples", *Personality and Individual Differences,* 52, (8),888–892.

Farmer, R. F., & Nelson-Gray, R. O. (1995). Anxiety, impulsivity, and the anxious-fearful and erratic-dramatic personality disorders. *Journal of Research in Personality*, *29*(2), 189-207.

Fossati, A., Barratt, E. S., Borroni, S., Villa, D., Grazioli, F., & Maffei, C. (2007). Impulsivity, aggressiveness, and DSM-IV personality disorders. *Psychiatry research*, *149*(1), 157-167.

Fowles, D. C. (2002). Biological variables in psychopathology: A psychobiological perspective. In *Comprehensive handbook of psychopathology* (pp. 85-104). Springer US.

Gray, J. A. (1970).“The Psychophysiological Basis of Introversion–Extraversion” *Behavior Research and Therapy*, 8(3), 249–266.

Gray, J.A. (1982). The Neuropsychology of Anxiety: an Enquiry in To the Functions of the Septo-hippocampal System. Oxford University Press, Oxford.

Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of research in personality*, *21*(4), 493-509.

Johnson, S. L., Turner, R. J., & Iwata, N. (2003). BIS/BAS levels and psychiatric disorder: An epidemiological study. *Journal of psychopathology and behavioral assessment*, *25*(1), 25-36.

Kasch, K. L., Rottenberg, J., Arnow, B. A., & Gotlib, I. H. (2002). Behavioral activation and inhibition systems and the severity and course of depression. *Journal of abnormal psychology*, *111*(4), 589.

Kimbrel, N. A., Cobb, A. R., Mitchell, J. T., Hundt, N. E., Nelson-Gray, R. O. (2008). “Sensitivity to Punishment and Low Maternal Core Account for the Link Between Bulimic and Social Anxiety Symptomology”, Eating Behaviors, 9(2), 210-217.

Kimbrel, N. A., Mitchell, J. T., Hundt, N. E., Robertson, C. D., & Nelson-Gray, R. O. (2012). BIS and BAS interact with perceived parental affectionless control to predict personality disorder symptomatology. *Journal of personality disorders*, *26*(2), 203-212.

Mellick, W., Sharp, C., & Alfano, C. (2014). The role of BIS/BAS in the vulnerability for depression in adolescent girls. *Personality and Individual Differences*, *69*, 17-21.

Muris, P., Meesters, C., de Kanter, E., & Timmerman, P. E. (2005). Behavioural inhibition and behavioural activation system scales for children: relationships with Eysenck’s personality traits and psychopathological symptoms. *Personality and Individual Differences*, *38*(4), 831-841.

Park, S. M., Park, Y. A., Lee, H. W., Jung, H. Y., Lee, J. Y., & Choi, J. S. (2013). The effects of behavioral inhibition/approach system as predictors of Internet addiction in adolescents. *Personality and Individual Differences*, *54*(1), 7-11.

Pickering, A.D., Gray, J.A. (1999). "The Neuroscience of Personality", in L.A. Pervin, O.P. John (Eds.), Handbook of Personality: Theory and Research (2nd ed.), Guilford Press, New York, pp. 277–299.

Pickering, A. D., Corr, P. J., & Gray, J. A. (1999). Interactions and reinforcement sensitivity theory: A theoretical analysis of Rusting and Larsen (1997).*Personality and Individual Differences,* 26(2):357–365.

Ross, S. R., Keiser, H. N., Strong, J. V., & Webb, C. M. (2013). Reinforcement sensitivity theory and symptoms of personality disorder: Specificity of the BIS in Cluster C and BAS in Cluster B. *Personality and Individual Differences*, *54*(2), 289-293.

Quay, H. C. (1993). The psychobiology of undersocialized aggressive conduct disorder: A theoretical perspective. *Development and psychopathology*, *5*(1-2), 165-180.

Slobodskaya, H. R., Knyazev, G. G., Safronova, M. V., & Wilson, G. D. (2003). Development of a short form of the Gray–Wilson personality questionnaire: its use in measuring personality and adjustment among Russian adolescents. *Personality and Individual Differences*, *35*(5), 1049-1059.

Slobodskaya, H. R. (2007). The associations among the big five, behavioural inhibition and behavioural approach systems and child and adolescent adjustment in Russia. *Personality and Individual Differences*, *43*(4), 913-924.

Şişman S., Ayçiçeği-Dinn A. & Dinn W. M. (2008). Davranışsal İnhibisyon Sistemi / Davranışsal Aktivasyon Sistemi Ölçeği'nin Üniversite Öğrencileri için Güvenirlik ve Geçerlik Çalışması. 15. Ulusal Psikoloji Kongresi'nde sunulmuş poster, 3-5 Eylül 2008, İstanbul.

Şişman, S. (2012). Davranışsal İnhibisyon Sistemi/Davranışsal Aktivasyon Sistemi Ölçeği'nin Türkçeye Uyarlanması: Geçerlik ve Güvenirlik Çalışması. *Psikoloji Çalışmaları Dergisi*, *32*(2), 1-22.

Vervoort, L., Wolters, L. H., Hogendoorn, S. M., De Haan, E., Boer, F., & Prins, P. J. (2010). Sensitivity of Gray's behavioral inhibition system in clinically anxious and non-anxious children and adolescents. *Personality and Individual Differences*, *48*(5), 629-633.