

Original Article

Explaining the psychological symptoms in students based on Gray's Biological Models of Personality

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Abstract

Introduction: According to Gray's Reinforcement Sensitivity Theory (RST), individual differences in the sensitivity of basic brain systems are thought to underlie the personality dimensions and to have relevance for psychopathology. The present study aims at studying the relationship between BIS/BAS and psychological symptoms.

Methods: In this regard, 361 students (205 boys-156 girls) in Tabriz University were selected by cluster sampling method and then tested by symptom check list -90-R (SCL-90-R) and inventory of behaviour inhibition/activation systems. The data were analyzed via Pearson Correlation coefficient and hierarchical regression.

Results: The results show that behavioural inhibition system has a significant relationship ($p < 0.05$) with all the 9 symptoms. Also, regression results show that 1% of sensitivity and frequency of symptoms were explained by Behavioural inhibition system (BIS).

Conclusion: It seems that the behavioural inhibition/activation systems (BIS/BAS) are one of the important components in explaining psychological symptoms, especially in the youth.

Declaration of interest: None.

Key words: Psychopathology, Personality, Risk factors.

Introduction

Recently, the importance of understanding the intervening mechanisms between personality dimensions and psychopathology has been highlighted (1, 2). Only a small portion of the variance in mental health diagnoses can be accounted for by personality dimensions (3). In the current study, we investigated the relationship between personality dimensions and psychopathology.

The current conceptualization of reinforcement sensitivity theory (RST, 4, 5) suggests that three neurobiological subsystems (i.e., behavioral approach system [BAS], behavioral inhibition

system [BIS], and fight-flight-freeze system [FFFS]) are associated with variations in personality as function of motivational influences. Individual differences in the sensitivity of subsystems relate to variations in emotional reactivity and psychopathology. The BAS is activated in response to reward and negative reinforcement, resulting in approach behavior and positive emotional experiences. The FFFS is a defensive-avoidance system activated in response to aversive stimuli, promoting escape, avoidance, or confrontational behaviors associated with fear and panic. In response to conditioned punishment or the termination of reward, the

BIS inhibits behavior and punishment systems (e.g., between the BAS and FFFS). The activation of BIS and resolution of conflicts may result in anxiety reactions depending on nature or strength of the conflict and degree of sensitivity to the conflict between the BAS and FFFS (1).

In the current study, we used the original Carver & White BIS/BAS scales which, according to the revised RST (rRST, 4), assess a combination of BIS and FFFS sensitivity. Previous research supports the use of BIS scale as a combined measure of BIS and FFFS sensitivity (6).

RST assumes that individual at the far poles of the BIS and BAS dimensions are at increased risk for developing psychopathology and empirical evidence supports the association between extreme BIS/BAS scores and adjustment problems (7, 8).

In line with Gray's (1982) hypothesis, studies in both community samples and clinical groups have shown that anxiety symptoms generally show positive associations with BIS sensitivity and no or very weak associations with BAS sensitivity (10, 11, 3, 12, 13, 9, 14, 17, 18, 19). Taubitz, Pedersen & Larson (2015) indicated that reward responsiveness subscale uniquely predicts adaptive functioning across all domains. Reward responsiveness may be a more pure measure of BAS than other BAS traits and may be important resilience from maladaptive psychological functioning (15). Pickett et al. (2012) examined the associations between behavioral inhibition system (BIS) sensitivity, negative emotionality, anxiety sensitivity, and experiential avoidance to understand the role of personality dimensions and self-regulatory mechanisms in relation to anxiety disorder risk (16).

Yanzhang Li, Yun Xu, Zi Chen (2015) demonstrated that higher BIS activity, catastrophizing, rumination, and lower positive reappraisal predict depression after one year. However, after controlling for initial depression, these variables were indirectly related to subsequent depression (20). Tull et al. (2010) found positive association between BIS activity and maladaptive emotion regulation, such as rumination, catastrophizing, and self-blame (21). Clinical group of depressed patients have been found to report lower BAS levels in

compare to non-depressed controls (22, 23) and in community samples, negative associations between BAS sensitivity and depressive symptoms have been reported (10, 17, 24, 13).

Recent studies have also focused on the associations between RST systems and other forms of psychopathology than the prototypical internalizing and externalizing disorders, such as substance use problems, eating disorders, schizophrenia and personality disorders. Recent researches show that RST variables explain 27% of delinquency variance in teenagers (22) and BAS activity in substance abuser group was higher than control group (23). High BIS sensitivity has been often found in association with cluster C personality disorders. Caseras, Torrubia, and Farre (2001) and Fullana et al. (2004) found that sensitivity to punishment distinguished cluster C patients from patients with other personality disorders as well as from controls, even after concurrent Axis I anxiety or affective symptoms (19, 25).

One study investigated BIS/BAS sensitivity in relation to schizophrenia. Patients with schizophrenia reported higher levels of BIS sensitivity compared to controls and no differences in BAS sensitivity were found between these groups (1, 26).

According to literature, among the most likely possible factors in predicting psychopathology are biologically-based personality traits predisposing the individual to greater sensitivity and vulnerability to several psychological symptoms. While previous studies have measured the effect of BAS/BIS sensitivity on mental health in clinical populations of adults, very little is known about the relationship between BAS/BIS sensitivity and distress in normal populations. The present study examined the relationship between BAS/BIS sensitivity and measures of mental health in normally functioning adolescents. Therefore, this research investigates the possible differences in RST subsystems among different psychopathological symptoms. In this study, we investigated the influence of the different levels of BIS/BAS on the development of several mental disorders and examine their relationship with the severity and frequency of psychological symptoms in order to explore normal population's vulnerability to mental

disorders. Determining the fundamental and important factors in each of mental disorders and symptoms would lead us to constructive clinical implications for working with patients.

Methods

The design of present research is developmental in terms of objective, and descriptive-correlation in terms of data collection. The statistical population includes the Tabriz university students studying M.S. and B.S. and living in dormitory in 2011-2012 academic year. For sample selection, multi-stage cluster sampling was used. Hence, first Tabriz University was divided into two clusters based on the dormitory of girls and boys, then 3 dormitories were selected randomly of each cluster and in each dormitory 2 floors and 10 rooms were selected and finally in each room every volunteer students completed the questionnaires. Therefore, 361 students (205 boys-156 girls) completed questionnaires.

1. Behavioral inhibition system/behavioral activation system scales The BIS/BAS Scales are a 20-item self-report questionnaire developed in 1994 by Carver and White and designed to assess BIS reactivity and three types of BAS reactivity (Reward Responsiveness, Drive and Fun Seeking). All items are judged on a four-point scale ranging from 1 ("I strongly agree") to 4 ("I strongly disagree"). Cronbach's α for BIS, RR, DR, and FUN scales in the derivation sample were: 74, 73, 76, and 66, respectively (27). The BIS/BAS Scales have moderate internal consistency and good convergent and discriminant validity (11). Internal consistency for BIS and BAS and its subscales (RR, DR, FUN) were found in Iranian researches respectively: 0.47, 0.47, 0.73, 0.60, 0.18 (28). Abdollahi majarshin (2006) has reported 0.78 retest validity for BAS and 0.81 for BIS (29).

2. Symptom Check list-90 Revised (SCL-90-R) The SCL-90-R is a 90-item self-report system inventory developed in 1980s by Derogatis and designed to reflect the psychological symptoms observed in psychiatric and medical patients (27). The respondents rate the 90 symptoms of distress on a 5-point likert-scale (0= "not at all" to 4= "extremely") to measure the extent of

symptoms, which they have experienced during the last 7 days. The items are divided into 9 subscales. In SCL-90-R, higher scores indicate greater distress in psychological aspects (30). The Iranian version of SCL-90-R has been validated in several studies in different community samples in Iran. In 1995, Bagheri and his colleges estimated the validity of this scale to be 97% and sensitivity, specificity and reliability of which to be 94%, 98% and 96% respectively (31).

Results

Table 1 illustrate mean and standard deviation of research variables.

Table1. Mean and standard deviation of behavioral activation/behavioral inhibition systems and psychological symptoms

Scales	Mean	Standard deviation
(SOM)	9.2	7.9
(O-C)	10.4	7.2
(I-S)	8.5	6.4
(DEP)	13.6	10.2
(ANX)	8.6	6.7
(HOS)	4.8	4.1
(PHOB)	4.1	4.5
(PAR)	7.7	5.2
(PSY)	8.1	6.7
(GSI)	0.9	0.6
(PSDI)	81.2	54.1
(PST)	43.7	20.4
BAS	20.9	2.5
BIS	41.0	5.1

We used Person Correlation in this study the results of which are shown in table2.

Table2. Correlation coefficients between BAS/BIS, psychological symptoms and total suffering indexes of SCL-90-R

Psychological symptoms & indexes	BIS	BAS
(SOM)	0.8	0.004
(O-C)	0.11*	-0.016
(I-S)	0.12*	0.020
(DEP)	0.14**	0.008
(ANX)	0.14**	-0.008
(HOS)	0.06	0.030
(PHOB)	0.07	-0.026
(PAR)	0.12*	0.078
(PSY)	0.13**	0.026
GSI	0.13**	0.015
PST	0.11*	-0.029
PSDI	0.13**	0.015

**p<0.001 & *p<0.05

According to table 2, there is a positive significant correlation between BIS and every total suffering indexes of SCL-90-R and there is no significant correlation between BAS and SCL-90-R indexes.

As you can see none of psychological symptoms has a significant relationship with BAS. BIS has a higher significant correlation with depression and anxiety. However, somatization, phobia and hostility don't have a significant correlation with BIS.

We used regression model in order to find out how much of the variation of severity and frequency of psychological symptoms could be explained by BAS/BIS.

Table3. Summary of hierarchical regression model for predicting severity and frequency of psychological symptoms

	Frequency of symptoms (PST)			Severity of symptoms (PSDI)		
	Adjusted R^2	β	sig	Adjusted R^2	β	sig
BAS/BIS	0.014		0.028	0.015		0.025
BIS		0.150	0.009		0.155	0.007
BAS		-	0.117		-	0.405
		0.090			0.048	

a) Predictor variables: BAS/BIS

b) Dependent variable: severity (PSDI) and frequency (PST) of psychological symptoms

According to table 3, BIS predicts 1% of severity and frequency of psychological symptoms significantly ($p < 0.05$). Results show that BIS can significantly predict the variation of severity and frequency of psychological symptoms.

Conclusion

As detailed below, in the current study BIS showed a positive significant relationship with psychological symptoms (except somatization, phobia and hostility) and all three general distress indexes of SCL-90-R. However BAS had a significant relationship with none of them. Our results are inconsistent with those of Kimbrell, Nelson Gray & Mitchell's (2007). They found higher levels of BIS activation to have a stronger relationship with depression in compare to lower BAS activity (13). However in this study we found no significant relationship between BAS and psychological symptoms. Based on Gray's hypothesis (1982), studies on clinical and control samples show that anxiety symptoms have a positive correlation with BIS sensitivity and a weak

relationship or no relationship with BAS sensitivity (10,3,12,32,33,13,14). As can be seen, the findings of this study are consistent with these research's results, except that we didn't find any significant relationship between BIS and phobia. By reviewing these results, it seems that BIS may be one of the important risk factors increasing the person's vulnerability to anxiety.

Bijttebier, P et al. (2009) have reported a relationship between low BAS activity and depression and considered it as a representation of low motivation of this patients to desirable stimuli (6). This result have been confirmed in several studies (18,32,19,33,13) which are inconsistent with our study; we found no significant relationship between depression and BAS. Our findings are consistent with the results of Jorm, A.F. & et al. (1999), Johnson S. L. Turner R. J & Iwata (2003) and Muris, P & Ollenick (2005) study (3, 12, 34). They postulated that hypo activity of BAS is not only the predisposing factor to depression but it may also be useful in predicting the duration of disorder.

These negative findings may be due to the fact that no distinction was made between anhedonic depression and mixed anxiety-depression, which Gray (1991) hypothesized to differ in terms of BAS activity. Some recently published findings are consistent with this idea. Both Kimbrell et al. (2007) and Hundt, Nelson-Gray, Kimbrell, Mitchell, and Kwapil (2007) found that low BAS predicts the symptoms of anhedonic depression symptoms but not those of mixed anxiety-depression, underscoring the need to distinguish between these types of depression (31, 14). These findings emphasize the importance of the distinction between the two types of depression, which in the present study was not examined. Furthermore, in clinical groups, low BAS has been significantly associated with the persistence of depression over a 6 to 8-month interval (26, 11, 22, 33). In this study our sample included normal population and we used SCL-90 for testing them, so exploring BAS/BIS sensitivity to two types of depressive symptoms was not our research's goal.

Although initially BIS was thought to be a specific diathesis for anxiety and not explicitly linked to depression, many studies have

reported significant positive associations between BIS reactivity and depressive symptoms, which are consistent with the results of our study (e.g., 35, 3, 12, 33, 36, 11, 30, 10, 17, 34). While the BIS have been unitarily related to negative affect and anxiety, the BAS has been associated with numerous related but distinct, constructs. In this study we didn't find any significant relationship between psychological symptoms and BAS activity.

Inter personal sensitivity in SCL-90-R focuses on feelings of personal inadequacy and inferiority in comparisons with others. Self-deprecation, uneasiness, and discomfort during interpersonal interactions are included here. It seems that I-S is very common in cluster C personality disorders. In this study we found that I-S has a positive significant relationship with BIS, which is consistent with the results of Caseras, Torrubia, and Farre (2001) study. They found that sensitivity to punishment distinguishes cluster C patients from patients with other personality disorders as well as from controls, even after considering concurrent Axis I anxiety or affective symptoms. So our results are consistent with those of Fullana et al. (2004) study. They found that patients with obsessive compulsive personality disorder show higher sensitivity to punishment (i.e., higher BIS activation) in compare to the normal population but do not differ from controls in terms of sensitivity to reward (19, 25). Thus, we can say that high BIS sensitivity may be an important risk factor for feelings of personal inadequacy and inferiority in comparison with others and Self-deprecation, uneasiness, and discomfort interpersonal interactions.

Furthermore, we found a positive significant relationship between BIS and paranoid ideation and psychoticism dimensions of SCL-90-R, which is consistent with the result of Scholten, Van Honk, Aleman, & Kahn (2006) study (26). It seems that, high BIS activity can make individuals vulnerable to paranoid and other psychotic thoughts.

The results showed that behavioural inhibition system has a significant relationship with all the 9 symptoms ($p < 0.05$). Also, regression results showed that 1% of experience of symptoms could be explained by behavioural inhibition

system (BIS). In addition, our results indicated that specific combination of BIS/BAS sensitivity has a relationship with certain type of psychopathology. In general, RST framework has a potential to present differentiating passages for special types of psychopathology.

The current study had several limitations. First, it was cross-sectional due to which we cannot make any causal claims. Second, in this study we didn't make a distinction between the two types of depressive symptoms (anhedonic/mixed anxiety-depression) and therefore our results are to some extent confusing. Third, regarding the generalizability of findings, all participants are students, which may reflect different types of psychopathology and different BAS/BIS sensitivities the other populations.

We suggest using certain scales to make a distinction between two types of depression, repetition of this study with wider samples and longitudinal designs, considering the interaction between environmental stress factors (current stressors) and BAS/BIS, and exploring the role of BAS sensitivity in the psychological life of the normal population.

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