

Mediating Role of Mental Toughness between Behavioral Systems and Depression

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Abstract

Background: Mental toughness has extensively been studied in sports psychology and its implications are needed to be empirically explored in clinical psychology.

Objective: The objective was to investigate the mediating role of mental toughness between behavioral systems i.e. behavioral activation system (BAS), behavioral inhibition system (BIS) and fight-flight-freeze system (FFS) and depression among university undergraduates.

Study type, settings and duration: A cross sectional research conducted at University of Sargodha from January 2017 to December 2017.

Methodology: A purposive sample of 300 students from University of Sargodha was recruited. Using standard backward translation procedure, Behavioral Inhibition and Activation Systems Scales (BIS/BAS), and Mental Toughness Questionnaire (MTQ-48) were used. Urdu versions of these instruments and Urdu version of Beck Depression Inventory (BDI-II) were administered on sample.

Results: Path analysis through IBM SPSS Amos revealed excellent model fit to data ($\chi^2 = 0.25$, $df = 1$, $p = .61$). BIS ($\beta = -.31$, $p < .01$) and FFS ($\beta = -.09$, $p < .05$) had negative direct effects whereas BIS ($\beta = .43$, $p < .01$) had positive direct effect on mental toughness. BIS had positive direct effect whereas BAS, FFS, and mental toughness had negative direct effects on depression. Finally, both FFS ($\beta = .04$, $p < .05$) and BIS ($\beta = .11$, $p < .05$) had positive indirect effects whereas BAS had negative indirect effect ($\beta = -.16$, $p < .001$) on depression through mental toughness.

Conclusion: Mental toughness could be one of the causal link between behavioral systems and depression.

Key words: Behavioral activation system, behavioral inhibition system, mental toughness, depression.

Introduction

Mentally tough individuals are characterized by the beliefs that they can control outcomes in their competition and practice environment.¹ Mentally tough individuals keep their thoughts positive, practice constructive self-talk, and avoid such habits as may lead to negativity and unhealthy behavior. It is surprising to observe the dearth of empirical research on the association between mental toughness and mental health despite these plausible linkages between the two. The present

research proposed that mental toughness would be positively associated to behavioral activation system, which in turn may lead to improved mental health whereas it would be negatively related to behavioral inhibition system and fight-flight-freeze system.

Reinforcement sensitivity theory (RST) proposed the following three brain-behavioral systems that underlie individual differences in sensitivity to reward, punishment, and motivation.

Behavioral activation system (BAS) was hypothesized as sensitivity to conditioned appetitive stimuli, making a positive feedback loop which is activated by the presentation of positive and rewarding stimuli and terminated or omitted by presentation of negative stimuli or punishment. This system was linked with the emotions like pleasure, hope, joy and also the emotions to explore and approach interesting stimuli, and the personality dimension of impulsivity.^{2,3} It is responsive to all positive valence stimuli, conditioned and unconditioned pleasant stimulus.⁴

Behavioral inhibition system (BIS) was postulated as sensitivity to conditioned aversive stimuli (i.e., signals of both negative stimuli/punishment and the omission/cessation of reward),

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AA conceptualized the project & did the statistical analysis. NJ did the data collection & literature search. Drafting, revision & writing of manuscript was done by AA & AY.

and also to extreme uniqueness, high intensity stimuli, and innate fear stimuli (e.g. snakes, blood). The BIS was linked with the emotions of strain and nervousness, personality dimension of anxiety, and the motivation of caution and vigilance.³ BIS is associated with personality factors like worry and anxious rumination, which leads to obsessive-compulsive and generalized anxiety disorder.⁴

FFS was postulated as sensitivity to unconditioned negative/ aversive stimuli (i.e., naturally painful stimuli), and was related to the emotions of anger, anxiety, general negative effect and grief, the motivation to escape/flee (if the environment allowed) or fight (if flight was not possible), and the personality dimension of psychoticism.⁵ Generally, flight or freezing responses was elicited in threatening condition (quite distant or distal) but in aversive condition, fight was evoked when it was immediate or more proximal. FFS is associated with avoidance and fear proneness factors of personality which was clinically linked with such disorders as phobia and panic.⁴

Although original Gray's model² was related to anxiety, but Depue's study⁶ proposed that behavioral systems are also involved in depression. They hypothesized that depression is indicated through dysfunctions or deficiency in BAS (they called it as behavioral facilitation system) and sensitivity to BIS relating with threat, punishment and non-reward cues and confirmed relationship of depression to hypo-reactivity of reward systems, resulting low level of drive to pleasant stimuli.

Many researchers supported this hypothesis and demonstrated that depressed people reported low level of BAS compared to non-depressed controls in clinical sample.⁷ In case of community samples, negative relationship between depressive symptoms and BAS had been observed.⁸ Moreover, BAS has been found to affect the course and severity of depression symptoms, in different studies, low BAS has been significantly related with persistence of depression over a 6-8 months interval.⁹ Low BAS is associated with more negative emotions like loss of pleasure and interest in daily activities leading to depression and anhedonia.¹⁰

In a longitudinal study¹¹ authors found that higher BIS activity was positively associated with the development of depression in adolescents. In their high-risk study, Another study¹² found that BIS distinguished depressive adolescents from the healthy controls. Meyer¹³ found that BIS levels were associated with current levels of depression in a group of depressed bipolar patients admitted to an inpatient facility. Many researchers¹⁴ observed that relative to non-depressed controls, depressed participants reported lower BAS levels and higher BIS levels. In sum, research evidence suggests that

low BAS and, to a lesser extent, elevated BIS are implicated in depression. However, to the best of the authors' knowledge, no published research has confirmed the associations between behavioral systems and depression in Pakistani population. Therefore, one of the main objectives of the present study was to replicate the aforementioned findings in the western literature in the indigenous population. In this regard, the present study postulated the following hypotheses: Behavioral activation and fight and flight systems will be negatively and behavioral inhibition system will be positively related to depression.

A study¹⁵ defined mental toughness as a collection of values, attitudes, behaviors, and emotions that not only enables you to persevere and overcome any obstacle, adversity, or pressure experienced, but also to maintain concentration and motivation when things are not going well to consistently achieve your goals. The definition by Gucciardi et al. maintains that mental toughness is a construct that can be both innate and/ or acquired through experience. Mental toughness could be learned and acquired, therefore the mechanisms through which it can be capitalized should be explored.¹⁶

Another study¹⁷ identified that mental toughness consists of four components or the so-called C's, of control, commitment, challenge, and confidence. Individuals who are high on the control component of mental toughness feel themselves as in control of their work and of the environment in which they work. Commitment refers to the ability of an individual to continue their tasks successfully in spite of resistance or adversity that occur while achieving the goals. Mentally tough people see challenges, change, and difficulties as opportunities rather than pressures and threats and enjoy the chance to learn and grow in the new, unknown and strange situation. Finally, individuals with high score in confidence have the self-belief to successfully complete their responsibilities, while individuals with same abilities but low confidence considered these responsibilities too difficult.

Reinforcement sensitivity theory suggests neuro-psychological description of the goal-focused behavior and its maintenance while facing stressful stimuli and potentially, which constitutes the main strengths in mental toughness framework. Moreover, sensitivity to rewards (i.e. behavioral activation system) have been related with mild responses to extremely threatening orientations¹⁸ and high levels of performance in military combat tasks.¹⁹ On the other side, negative evaluations of the capacity to deal with pain has been associated with sensitivity to punishment²⁰ (i.e. behavioral inhibition system); orientation away from threatening situations¹⁸ (i.e. fight-flight system) and poor performance in military

combat tasks.¹⁹ Thus, behavioral activation system could be positively and behavioral inhibition and fight-flight systems could be negatively related to mental toughness. Research suggests that sensitivity to reward is associated with various behaviors and competencies, which are hallmarks of mental toughness, on the other hand, sensitivity to punishment is associated with those competencies and behaviors that may imply a lack of mental toughness. Despite these plausible theoretical linkages between sensitivity to reward/punishment and mental toughness, the authors could not find any published research that directly tested the relationships between behavioral systems and mental toughness. The present study is unique and novel as it has postulated and tested the following hypothesis on the associations between behavioral systems and mental toughness; therefore, it has not only expanded the nomological network of mental toughness but it also provided the new empirical evidence on the mechanisms that differentially link various behavioral systems with depression.

Behavioral activation system will be positively and behavioral inhibition and fight-flight systems will be negatively related to mental toughness.

A strong body of research found that mental toughness (MT) was inversely related with stress and depression. It can be explained by the fact that both stress and depression are negative in nature and linked with dysfunctional thoughts and maladaptive behavior, which include symptoms of rigidity, withdrawal, hopelessness, helplessness, and avoidance.²¹ All of these symptoms are inversely related to the characteristics of mental toughness which are control, confidence, challenge, and commitment. Gerber et al.²² found inverse relation of mental toughness with perceived stress and depressive symptoms. Furthermore, the negative relationships between MT, depressive symptoms, and stress are also evident in past research that described a close relationship between psychological resources and symptoms of psychopathology.²³ In lieu of the aforementioned research evidence, we hypothesized that mental toughness will be negatively related to depression.

The pattern of relationships hypothesized in the present study suggests behavioral activation systems as the correlates of depression and mental toughness, and the mental toughness as the predictor of depression. Such a model of associations warrants the investigation of the mediational role of mental toughness between behavioral systems and depression. It is quite plausible that student with higher BAS activation would have been more mentally tough owing to their persistent goal-oriented behavior, which in turn, may

reduce their vulnerability to depression symptoms. Conversely, students with higher degree of BIS activation might have been low on mental toughness due to their anxious avoidance motivation, which in turn, may increase their vulnerability to depressive symptoms. Therefore, the final hypothesis of the present study suggests:

Mental toughness will mediate between behavioral systems and depression.

Methodology

The present study employed a cross-sectional research design. All constructs were measured through Urdu translated versions of the psychometrically sound measures. Two of the scales including BIS and BAS Scale (BIS/BAS)²⁴ and Mental Toughness Questionnaire¹⁷ (MTQ-48) were translated into Urdu by following the procedure given by Brislin. The procedure of the translation was completed in four steps. In the first step, scales were translated from source language (English) to target language (Urdu) with the help of 5 bilinguals (2 psychologists and 3 faculty members from Department of English, University of Sargodha) who had proficiency in both languages, familiarity with the culture, and expertise in item writing. In the second step, Urdu translation was examined and evaluated by 6 experts. This committee comprised of 4 lecturers and one assistant professor of Department of Psychology (University of Sargodha). Committee approach was used to analyze the translation of each item critically and the best translation, which was conceptually equivalent in both the source and the target language was consensually selected. In the third step, the Urdu translated scales were back translated into English language as a check to identify the points of equivalence or difference between the two versions. Finally, a committee of experts reviewed the back translations and the original English versions of the scale and found that the two versions were equivalent. The back translations were sent to the original authors of the scales who approved them to be conceptually equivalent.

In order to achieve the aforementioned objectives, a purposive sample (N = 300) students from University of Sargodha was recruited in the present study. Sample was collected from different departments of the university. Their age ranged from 19 to 25 years (M = 21.57, SD = 1.16). Participants were approached in their classrooms. The sample comprised of equal number of boys and girls. The students enrolled in masters' program (1st semester to 4th semester) and those who were enrolled in BS programs (from 5th semester to 8th

semester) were selected. Students who were from sub-campus of university or affiliated colleges were not part of the study. Professionals, jobholders, post graduate students were also excluded from the sample.

All instruments used in the present study were self-reported, psychometrically sound and valid measures of their respective constructs. The details are as follows:

Behavioral Inhibition and Activation Systems Scales (BIS/BAS) is a 24-item scale (BIS/BAS)¹³ which was translated in Urdu language by the authors of the present study through standard process of backward translation and it provided the assessment of respondents' sensitivity to behavioral activation, behavioral inhibition, and fight-flight ($\alpha = .74, .73, .76$, for the three scales respectively¹³) behavioral systems on a 4-point Likert-type scale. The authors of the Behavioral Inhibition and Activation Systems Scales have provided strong evidence for its construct validity.¹³ Higher score on each scale demonstrated high sensitivity to the corresponding system.

Beck Depression Inventory²⁵ (BDI-II) comprising of 21 items was used to measure depression. Every item consisted of four statements with the rating of 0 to 3. All items were worded positively and there was no reverse scored item. In present study, BDI-II Urdu-translated version was used²⁶ and total score of a participant was calculated by adding the score of all the items. The BDI-II has been validated by Beck and colleagues²⁵ and it is one of the most widely used measure of depression. Higher total scores on the scale demonstrated more severe depressive symptoms.

Mental Toughness Questionnaire-48 (MTQ-48) a 48-item Mental Toughness Questionnaire¹⁷ (MTQ-48) was translated in Urdu language by the authors of the present study through standard process of backward translation and it provided the assessment of a person's ability to resist pressure in a range of environmental settings on a 5-point Likert type response format. Clough's study¹⁷ supported the criterion validity of the scale by demonstrating that individuals who reported high level of mental toughness perceive less exertion during a 30-minute cycling test (intensive physical activity) and when they received negative feedback, after completing a series of motor tests, mentally tough respondents performed better on a cognitive planning task. Total score of a participant was calculated by adding all the scores on 48 items and higher scores on the scale showed high mental toughness. The scale had high internal consistency of .91 and test-retest coefficient of .90.

After getting the formal permission for data collection from heads of various departments of University of Sargodha, participants of the present study were personally contacted in their classrooms. Written informed consent of the participants was taken and they were assured of the privacy and confidentiality of their responses. Strict compliance with the ethical guidelines of Helsinki Declaration was ensured by the research ethics committee of Department of Psychology, University of Sargodha. The participants were briefed about the research purpose and were provided guidelines regarding response format and completion of questionnaires. Personal information required for research purpose were gained through the demographic sheet including age, gender, and education etc. The average time to complete the questionnaire was approximately 40 minutes. Questionnaires were handed over to participants along with verbal and written instructions. The filled questionnaires were collected back personally. After collecting all questionnaires, participants of the study were acknowledged for their assistance and collaboration in the study. Five hundred copies of questionnaires were distributed among students from which three hundred were selected for analysis and 150 questionnaires were discarded due to incomplete and insufficient information. Fifty copies of questionnaires were not returned by students.

Results

The data were subjected to statistical analysis and the descriptive statistics, Pearson correlation, and Cronbach's coefficients of internal consistency were computed through IBM SPSS whereas the path analysis was undertaken in IBM SPSS Amos. Table-1 presents the frequency and percentage of various demographic characteristics of the sample of the present study in terms of gender, age, degree program, faculty, and family system.

Table-2 presents the descriptive statistics (i.e., arithmetic means and standard deviations) and alpha reliabilities of the scales of present study. The results showed that all scales of the present study were internally consistent as alpha coefficients of all scales were above .75. Since fight flight behavioral system was only measured with two items, therefore, split half reliability of fight flight system scale was computed, which was satisfactory. None of the values of skewness was aberrantly high, which showed the normal distribution of all scales.

Table-3 shows Pearson correlation among variables of the present study. Results showed significant positive correlation between BIS and depression. Mental toughness was significantly

Table 1: Demographic characteristics of the sample. (N = 300)

Demographics	Categories	f (%)
Gender	Boys	150 (50)
	Girls	150 (50)
Age (in years)	19-20	50 (16.67)
	20-21	49 (16.33)
	21-22	43 (14.33)
	22-23	48 (16.00)
	23-24	45 (15.00)
	24-25	65 (21.67)
MA/MSc	Semester I	50 (16.67)
	Semester II	30 (10)
	Semester III	40 (13.33)
	Semester IV	30 (10.00)
BS	Semester V	45 (15.00)
	Semester VI	35 (11.67)
	Semester VII	35 (11.67)
	Semester VIII	35 (11.67)
Faculty	Natural Sciences	150 (50)
	Arts and Social Sciences	150 (50)
Family System	Joint	189 (63)
	Nuclear	111 (37)

positively related with behavioral activation system and showed significant negative relationships with BIS, fight-flight- freeze system, and depression. BAS showed significant positive relationships with BIS whereas were negatively related with fight-flight-freeze system.

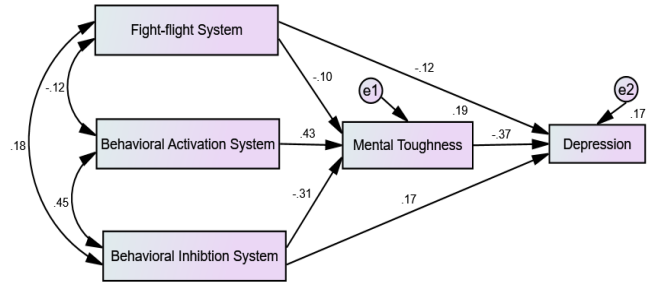


Figure: Path diagram of the model of the present study. All paths were significant.

Figure presents the path diagram produced by the Amos software. Standardized regression coefficients were given over each path (single-headed arrows) and correlations among the exogenous variables were presented along the loops (double-sided arrows). The fit indices of the model suggested that the model fitted well to the data ($\chi^2 = 0.25$, $df = 1$, $p = .61$; CFI = 1.00; GFI = 1.00; RMSEA = .00, $pclose = .78$).

Table 2: Descriptive Statistics and Psychometric Properties of Scales of Present Study. (N = 300)

Scales	Items	M	SD	α	Range		Sk ^a
					Actual	Potential	
MTQ-48	48	151.99	16.14	.80	109-201	48-240	.38
BAS	13	40.43	6.01	.79	24-52	13-52	-.17
BIS	5	15.58	2.60	.78	8-20	5-20	.26
FFFS	2	4.51	1.53	.69*** ^b	2-8	2-8	.33
BDI-II	20	13.94	8.98	.82	0-43	0-60	.72

Note. MTQ-48 = Mental Toughness Questionnaire-48; BAS = Behavioral Activation System Scale; BIS = Behavioral Inhibition System Scale; FFFS= Fight-Flight-Freeze System Scale; BDI-II = Beck Depression Inventory-II

^aStandard error of skewness = .14; ^bSplit half reliability coefficient,

*** $p < .001$

Table 3: Pearson Correlations among Variables of the Present Study. (N= 300)

Variables	MT	BAS	BIS	FFFS	Dep
Mental Toughness		.30***	-.13*	-.20***	-.37***
Behavioral Activation System		-	.45***	-.12*	-.04
Behavioral Inhibition System			-	.18**	.20***
Fight Flight System				-	-.11*
Depression					-

Note. MT = mental toughness; BAS = behavioral activation system; BIS = behavioral inhibition system; FFFS= fight-flight-freeze system; Dep = depression

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4: Direct and Indirect Effects of Behavioral Systems on Mental Toughness and Depression.

Paths	β	95% CI	
		LL	UL
Fight flight system → Mental toughness	-.09*	-.20	-.003
Behavioral inhibition system → Mental toughness	-.31**	-.42	-.20
Behavioral activation system → Mental toughness	.43**	.33	.51
Fight flight system → Depression	-.12*	-.23	-.01
Behavioral inhibition system → Depression	.18**	.07	.28
Mental Toughness → Depression	-.37**	-.45	-.28
Fight flight system → Mental toughness → Depression	.04*	.002	.07
Behavioral inhibition system → Mental toughness → Depression	.11*	.07	.17
Behavioral activation system → Mental toughness → Depression	-.16**	-.21	-.11

Note. 95% CI = 95% confidence interval for the standardized effect; LL= lower limit of the 95% confidence interval; UL = upper limit of the 95% confidence interval, * $p < .05$, ** $p < .01$.

Table-4 depicts the direct and indirect effects of behavioral systems on mental toughness and depression in the path analysis of the present study. Behavioral inhibition and fight and flight systems had negative direct effects whereas behavioral activation system had positive direct effect on mental toughness. Behavioral inhibition system had positive direct effect whereas BAS, fight and flight system, and mental toughness had negative direct effects on depression. Finally, both fight and flight system and BIS had positive indirect effect whereas BAS had negative direct effect on depression through mental toughness. Thus, mental toughness fully mediated between behavioral activation system and depression and partially mediated the associations of behavioral inhibition system and fight and flight system with depression.

Discussion

In the present study, behavioral inhibition and FFF systems demonstrated negative direct effects whereas BAS demonstrated positive direct effect on mental toughness. These findings provide support to our first hypothesis. To the best of the authors' knowledge, this is the first study that has empirically tested the relationships between behavioral systems and depression and have found theoretically consistent relationships between the two. Our results are quite in line with the speculations of Delaney et al.²⁷ who proposed the relationship of mental toughness to response sensitivity theory (RST) and assumed that mentally tough individuals were more sensitive to behavior activation system. On the other hand, mentally tough people were less sensitive to BIS. This suggested that BAS was positive predictor of mental toughness while BIS was the negative predictor of the same. In another research by King et al.²⁸ it was suggested that high BAS and low BIS individuals were the healthiest on a range of different outcome

measures as well, which is consistent with the hardness of the mentally tough.

Our findings indicated that the relationship between behavioral inhibition system and depression was mediated by mental toughness among university students, which supported our fourth hypothesis. Behavioral inhibition system had negative direct effect on mental toughness (which supported our second hypothesis), and mental toughness had negative direct effect on depression (which supported our third hypothesis). Behavioral inhibition system had positive direct effect on depression, however, behavioral inhibition system demonstrated significant positive indirect effect on depression through mental toughness, which suggests that increase in sensitivity to behavioral inhibition system leads to lowered mental toughness, which in turn, results in increased depression. Increased activation of BIS is less likely in mentally tough people, which make them less vulnerable to depression. This finding is in consonance with that of Alloy²⁹ who found that high behavioral inhibition system extended risk for major depressive episodes. Mentally tough individuals had the ability to face challenges, had a control on their emotions and lives, and had a confidence in their abilities. They handled threatening and tough situations and had a strong commitment with their goals regardless of all hurdles.¹⁷ However, behavioral inhibition system was associated with anxiety and was activated in conditions of conflict between avoidance and approach behaviors.⁴ Therefore, BIS is less likely to be activated in mentally tough people, and this mental toughness provides them a shield against depression.

Results of the present study further suggested that the relationship between BAS and depression was mediated by mental toughness among university students, which supported our fourth hypothesis. Behavioral activation system had positive direct effect on mental toughness (and

mental toughness had negative direct effect on depression. Behavioral activation system did not demonstrate any direct effect on depression, however, it demonstrated significant negative indirect effect on depression through mental toughness, which means that more stimulation in behavioral activation system may lead to higher mental toughness, which in turn, results in reduced depression. In other words, mental toughness is the causal link in the negative relationship between behavioral activation system and depression. According to Corr,³⁰ behavioral activation system was related to optimism, impulsiveness, and reward-orientation, and these attributes typically characterize mentally tough people. Therefore, people with higher degree of BAS activation are likely to be mentally tough. On the other hand, symptoms of depression comprised feelings of hopelessness and helplessness, recurrent thought of death, loss of interest and energy, sleep changes, anger and irritability, which are in sharp contrast with the committed, motivated and goal directed behaviors of mentally tough people. Thus, more frequent activation of BAS may lead to mental toughness, which may act as a protective factor against depressive symptoms.

Finally, our results indicated that the relationship between fight-flight-freeze system and depression was mediated by mental toughness among university students, which again supported our fourth hypothesis. Fight-flight-freeze system had negative direct effect on mental toughness, and mental toughness had negative direct effect on depression. Fight-flight-freeze system also demonstrated negative direct effect and positive indirect effect on depression. Increase in fight-flight-freeze system leads to lowered mental toughness, which in turn, may result in increased depression. According to Corr³⁰ FFFS was linked with behaviors that reduced the anticipated threat (e.g., escape or avoidance), personality dimension of psychoticism, and emotions of fear. Thus, its activation reduces person's mental toughness in response to threatening situations, which leads to depression.

The present study has several implications for research and practices. It makes important contribution to clinical, cognitive, positive, and counseling psychology by signifying the importance of practicing different positive behaviors in students. The present investigations provides some evidence and extended research regarding the relationship between various behavioral systems and their potential influence on depression. This study not only proposed and tested theoretical model of depression and behavioral systems but also spawned support for RST.⁴

There are several practical implications of the current study that can be capitalized in educational setting. The findings of the present study have shown significant importance of mental toughness and behavioral systems in relation to the mental health of students. These findings are helpful in identifying individuals with low levels of mental toughness; appropriate efforts can be made to support them to ensure successful rehabilitation outcomes. In educational settings, it would be important to note that students with low scores on mental toughness could potentially be vulnerable to poor health outcomes because of potentially high activation in behavioral inhibition system. Direct implications of these findings are that mentally tough individuals are better to deal with the challenges associated with behavioral activation system and are able to perform within demanding academic environments.

Similarly, measures of BIS/BAS²⁴ directly developed from Gray's model² do not seem to interpret the revised bio psychological theory now, which is called as RST.⁴ But findings of the present study demonstrated three behavioral systems (BAS, BIS, & FFFS) and provides some evidence. RST⁴ using the same measure (BIS/BAS).²⁴ This would be important contribution to existing literature on behavioral systems. Overall, this study provides a proficient literature for researchers to discover new dimensions and paths for further research. However, in future studies, larger and more heterogeneous samples, which could be better representatives of the general population should be recruited. Furthermore, longitudinal and experimental research is direly needed in this area in order to harvest more evidence for the causal interpretation of the hypotheses. Finally, constructs should be measured through multi-method approach and data should be obtained through repeated measurements over time.

Conflict of interest: None declared.

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