

The Relationship Between Brain-Behavioral Systems and Negative and Positive Affect in Patients With Migraine

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Abstract

Background: Migraine is a chronic headache disorder that affects approximately 12% of the general population. Migraine is known as recurrent headache, pulsating, moderate with severe power, which lasts for 4 to 72 hours, aggravated by daily physical activity along with nausea, vomiting, photophobia or photophobia.

Objectives: The purpose of this study was to investigate the relationship between brain-behavioral systems and negative and positive affects in patients with migraine.

Patients and Methods: The research population included patients, who had referred to neurology clinics. One hundred and twenty cases were selected by accessible sampling based on the neurologist's diagnosis of migraine headaches. They completed the Gray-Wilson (1989) Personality Questionnaire as well as Watson, Clark and Telligent (1988) positive and negative affect scale. The data were analyzed using the SPSS 19 software, correlation and stepwise regression.

Results: The results showed that positive affect had a significant positive correlation with active avoidance parameters and negative significant correlation with passive avoidance and extinction parameters. The findings also indicated that negative affect had a positive and significant relationship with passive avoidance and extinction.

Conclusions: It can be concluded that brain-behavioral systems may be the foundation of behavioral and emotional tendencies in patients with migraine headaches.

Keywords: Migraine, Brain-Behavioral Systems, Negative and Positive Affect

1. Background

Migraine is a chronic headache disorder that affects approximately 12% of the general population. Migraine is a recurrent headache, pulsating, moderate with severe power which lasts for 4-72 hours aggravated by physical activity daily along with nausea, vomiting, photophobia or phonophobia (1). According to the World Health Organization, migraine has been ranked in nineteenth position among all disorders causing inability and the frequency of attacks have been reported 17% in women and 6% in men, annually (2). There are no reliable statistics of patients with migraine in Iran, but statistics on people with migraine in Turkey could be interesting due to racial and geographic proximity with Iran. According to studies conducted in this country, 11% of women, 3.7% of men and 2% of children are faced with this problem (3). The beginning of migraine is often associated with severe failure, stress, depression, suppressed anger and other emotional factors. The most important psycho-

logical traits that have been reported for patients with migraine are as follows, anxiety, depression, perfectionism, ambition, extreme discipline and accuracy in the way of life. In this regard, research findings show that people with migraine show a pattern of blame and radical fault-finding, wrath and aggressiveness (4). In general, personality characteristics, as one of the most important psychological factors, have gained a special place for creating psychosomatic disorders. The study of individual differences that affect health and disease duration is an integral part of psychosomatic medicine. The theory of Jeffrey Gray focuses on the expression of the relationship between personality traits and physical and psychological disorders. Gray, regarding different systems of reward and punishment in the brain and the issue of individual differences in sensitivity to various stimulants, detected three brain-behavioral systems underlying personality differences, while domination and

activation of these systems lead to different emotional states; these systems include: behavioral activation system, behavioral inhibition system and fight/flight system (5). Behavioral activation systems, despite danger or threat, activate reward-seeking behavior, feeling of pride and hope for reward. This system consists of two components: approach and active avoidance. The approach system determines behaviors that are actively seeking a reward and the active avoidance component represents behaviors that are performed in order to avoid punishment. Gray claims that mesolimbic dopamine system activity is a neurological basis of behavioral activation system (5). In contrast, the behavioral inhibition system leads to anxiety, passive avoidance in response to the signs of punishment and new stimulants, and is known as the anxiety system. Two components of the behavioral inhibition system are passive avoidance and extinction. The passive avoidance parameter indicates a lack of activity or surrender of a person to avoid punishment and the extinction component represents stopping behaviors that do not seek rewards. In terms of neurological viewpoint, neural basis of the behavioral inhibition system is located in the hippocampus and parietal system (6). Fight/flight system activates escape and avoidance behavior in response to conditioned and unconditioned unpleasant stimulus, and is known as the reason for emotion of fear. This system is structurally adjusted by amygdala and hypothalamic structures (7). Gray, in the theory of brain-behavioral systems puts forward the opinion that psychiatric disorders caused by dysfunction (hyperactive or less active) are one of their systems or interactions. Since the launch of Gray's model, the researchers suggest the hypothesis that abnormal sensitivity of these systems reveals susceptibility to various forms of psychopathology (6). Nowadays, another classification of emotional state called "affect" has attracted many fans; it is defined as oscillating reactions that is constantly under the influence of thinking and cognition. Affect in this classification is defined in two ways: positive and negative affect. Most researches in this area have been done on pain and have focused more on the relationship between stress, pain and negative mood (7). In general, psychological research has shown that pain is associated with emotional disorders (8). Accordingly, many researches today have focused on evaluation of brain-behavioral systems (leading to different emotional states) and positive and negative affect in abnormal groups in the physical and psychological field and compared them with normal and healthy groups. For example, researchers have compared brain-behavioral systems among patients with migraine and healthy people. The results showed that there was a significant difference between the two groups in the variables of extinction and passive avoidance systems. While there were no significant differences in other variables including fight/flight system, approach system and active avoidance (9). In researches on emotions, negative affect

is considered in psychological responses to pain. It has been observed that in the face of pain negative feelings occur in patients, and these cases are related to physical symptoms such as anxiety and neuroticism and a reduction in cardiovascular reactions (10). The results showed that people in chronic pain experienced more negative affect compared with people who do not suffer from chronic pain, and reciprocally by increasing the negative emotional states, people are more sensitive to painful stimulants (11). The basic research has been paid to the relationship between brain systems behavior and positive and negative affect, and in this regard, the current study intends to investigate this relationship in patients with migraine.

2. Objectives

The purpose of this study was to investigate the relationship between brain-behavioral systems and negative and positive affects in patients with migraine.

3. Patients and Methods

Based on the objectives, the present study was designed so that it was fundamental in nature and correlational according to the methods. The study sample consisted of 120 patients (male and female) diagnosed with chronic migraine headaches which selected based on diagnosis of neurologist and migraine questionnaire among patients referred to neurology clinics by accessible sampling method. At the time of answering the questionnaire, the patients were not in a migraine attack. The mean age of the sample was 32.03 years with the education level of high school to graduate and in terms of gender, 20% were male and 80% female. Entry criteria in the group of patients were as follows:

1. Not addicted to substance or drugs;
 2. Lack of approved mental and physical diseases associated with migraine based on interview with patients or their family;
 3. Avoiding the use of hormones and oral contraceptives.
- Data was collected using the Gray-Wilson Personality Questionnaire as well as Watson, Clark and Tellegen positive and negative affect scale. The data was analyzed using the SPSS 19 software, correlation and stepwise regression.

3.1. Gray-Wilson (1989) Personality Questionnaire

This questionnaire evaluates the activity of brain behavioral systems and their components; it is a self-assessment questionnaire of personality. The questionnaire contains 120 questions and there are three options for each question: "Yes", "No" and "Do not know". The test has acceptable validity and reliability (12). In the present study, the reliability was calculated by Cronbach's alpha, being 0.44, 0.37, 0.47, 0.56, 0.56 and 0.59, respectively, for components of approach, active avoidance, passive avoidance, extinction, fight and flight.

3.2. Positive and Negative Affect Scale (PANAS)

This scale has been prepared and presented by Watson, Clark and Tellegen in 1988 and measures 20 feelings (10 positive feelings and 10 negative feelings) in the form of words and is generally evaluated on a five-point scale (1 = not at all to 5 = very high). Reliability and validity of this test was confirmed by previous studies (13, 14). In the present study, the reliability was also calculated by Cronbach's alpha, being 0.73 for positive affect and 0.82 for negative affect.

4. Results

At first, descriptive results related to variables were investigated. Based on the results, the maximum mean among the components of brain-behavioral systems was associated with active avoidance (36.30), also in the field of positive and negative affects the highest average was related to positive affect (35.98). Then, to determine the correlation

between positive and negative affect and the components of brain-behavioral systems the Pearson correlation coefficient was used; the results are shown in Table 1.

As the results of Table 1 show, positive affect had a significant and positive relationship with active avoidance ($P < 0.01$ and $r = 0.271$), and there was a negative significant correlation with passive avoidance ($P < 0.01$ and $r = 0.274$) as well as extinction ($P < 0.05$ and $r = 0.227$). Also, negative affect had a significant and positive relationship with passive avoidance ($P < 0.01$ and $r = 0.365$) and extinction ($P < 0.01$ and $r = 0.264$). It should be noted that in this research, before performing the regression analysis, in order to evaluate the default normal distribution of data, Kolmogorov-Smirnov and Shapiro-Wilk tests were used and confirmed the assumption of normal distribution. For predicting the score of positive and negative affect based on the components of brain-behavioral systems stepwise regression was used, results of which are presented in Tables 2 - 5.

Table 1. The Correlation Coefficients Between Positive Affect, Negative Affect and the Components of Brain-Behavioral Systems

	Mean(SD)	Positive Affect	Negative Affect	Approach	Active	Passive	Extinction	Fight	Flight
Positive Affect	35.98 (5.29)								
Negative Affect	29.94 (7.56)	0.11							
Approach	14.83 (4.71)	0.08	0.07						
Active	36.30 (4.23)	0.27 ^a	0.08	0.24 ^a					
Passive	17.05 (5.33)	0.27 ^a	0.36 ^a	0.23 ^a	0.29 ^a				
Extinction	17.48 (5.55)	0.22 ^b	0.26 ^a	0.25 ^a	0.15	0.37 ^a			
Fight	14.82(5.55)	0.03	0.12	0.52 ^a	0.24 ^a	0.32 ^a	0.32 ^a		
Flight	22.03 (5.52)	0.11	0.13	0.15	0.01	0.46 ^a	0.43 ^a	0.31 ^a	

^a $P < 0.01$
^b $P < 0.05$

Table 2. The Results of Stepwise Regression of Positive Affect on the Basis of the Components of Brain-Behavioral Systems

R ²	R	P Value	F	Ms	df	SS	Variables
Passive Avoidance							
0.07	0.27	0.002	9.54	267.81	1	267.81	Regression
				28.05	118	3310.55	Residual
					119	3578.36	Total
Active Avoidance							
0.11	0.33	0.001	7.58	205.41	2	410.82	Regression
				27.07	117	3167.54	Residual
					119	3578.36	Total

Table 3. The Stepwise Regression Coefficients of Positive Affect on The Basis of the Components of Brain-Behavioral Systems

P Value	t	Standard Error	B	
0.001	8.11	3.98	32.33	Constant
0.021	2.34	0.21	0.22	Passive
0.023	2.29	0.20	0.27	Active

Table 4. The Results of Stepwise Regression of Negative Affect on the Basis of the Components of Brain-Behavioral Systems

R ²	R	P Value	F	Ms	df	SS	Variable
							Passive avoidance
0.13	0.36	0.001	18.10	892.38	1	892.36	Regression
				49.29	118	5816.40	Residual
					119	6708.79	Total

Table 5. The Stepwise Regression Coefficients of Negative Affect on the Basis of the Components of Brain-Behavioral Systems

P Value	t	Standard Error	B	
0.001	9.24	2.19	20.34	Constant
0.001	4.25	0.36	0.53	Passive

According to the analysis of variance, both obtained regression models were significant ($P < 0.01$) and the variables of passive and active avoidance represented a total of 11% of the positive affect changes in patients with migraine headaches ($R^2 = 0.115$). Regarding Table 3, the beta value for passive avoidance was 0.213 that was significant according to $t = 2.343$ ($P < 0.05$). In terms of active avoidance, the beta value was 0.209 that was significant according to $t = 2.298$ ($P < 0.05$). Therefore, these two variables of passive avoidance and active avoidance were the best predictors of positive affect in patients with migraine headaches. As the results of analysis of variance model in Table 4 shows, the regression model was significant ($P < 0.01$) and the passive avoidance variable predicted a total of 13% of the negative affect in patients with migraine headaches ($R^2 = 0.133$). Based on data in Table 5, only the variable of passive avoidance was able to predict negative affect and the beta value for this variable was 0.365 and was significant regarding $t = 4.255$ ($P < 0.01$).

5. Discussion

The purpose of the present study was to investigate of relationship between brain-behavioral systems and negative and positive affect in patients with migraine headaches. The results showed that positive affect had a positive and significant relationship with active avoidance and had a significant negative relationship with passive avoidance and extinction parameters. Also, the results indicated that negative affect had a positive and significant relationship with passive avoidance and extinction parameters. These findings were consistent with the results of other studies (5, 7, 8). In explaining these findings, we can say that behavioral activation system activities lead the person in order to confront and attempt to overcome obstacles and find positive outcomes (7). Therefore, behavioral activation system helps regulate behavior in the presence of reward symptoms and is sensitive to the signs of conditional reward and removal of punishment and its activity leads to approach behavior to these stimulants, for this reason the active avoidance parameter has a relationship with positive mood (5). Behavioral inhibi-

tion systems consist of two components of passive avoidance and extinction, regulate behavior in the presence of the signs of punishment that are sensitive to the signs of punishment, the elimination of reward and new stimulants and its activity leads to avoidance behavior of such stimulants, also is associated with negative mood (5). Also a study has pointed out that high sensitivity of behavioral inhibition system may predispose the person to emotional distress in a position of stressors and this distress is one of the factors causing migraine (9). As a result, these factors cause an increase in negative mood and a decrease in positive mood in patients with migraine; therefore, it can be expected for passive avoidance and extinction components to be negatively correlated with positive affect and positively correlated with negative affect; the findings of the present work were in line with these results. Another study has shown that people with migraine are worried and anxious in terms of personality and this leads to introversion (15). In fact, these people more readily look for stress and anxiety instead of seeking reward and relaxation. Most studies have confirmed the neuroticism of patients with migraine (16, 17). On the other hand, high scores in neuroticism personality dimensions lead to greater sensitivity of people to environmental stimulants and emotional imbalance and experience more negative emotions than others (5). Also according to Gray's personality theory, the experience of negative emotions, especially anxiety, is associated with behavioral inhibition system (5). Therefore, it is not unexpected that among the components of behavioral inhibition system including passive avoidance and extinction there are negative relationships with positive affect and positive relationships with negative affect. On the other hand, passive avoidance components, as a component of the behavioral inhibition system, indicate a lack of activity or surrender of a person to avoid punishment. Many migraine sufferers, after several attacks of migraine, conclude that they cannot defend themselves against attacks and in any case migraine attack occurs. As a result, these people in front of this punishment (occurring of attack) are surrendered (passive avoidance), so passive avoidance is high in these patients. Also studies have shown that

depression and negative mood are high among patients with migraine compared to healthy individuals (18) and this depression decreases negatively overall life satisfaction and on the other hand is often associated with distress that increases migraine-related disability (19). Also, according to Gray's personality theory, overcome and high sensitivity of behavioral inhibition system leads patients to distress and depression, which could be due to component function of passive avoidance and its distress (7). The characteristic of distress and depression is increased positive mood and decreased negative mood, and as noted earlier, occurs due to increase of passive avoidance in patients with migraine. According to the results of this research, it can be concluded that brain-behavioral systems may be underlying the behavioral and emotional tendencies, in people with migraine. This means that those who have a dominant inhibition system, experience more negative affect in their life and vice versa, and this issue predisposes people with migraine headaches to depression and anxiety. Therefore, it is recommended for therapists to use necessary psychological interventions in order to increase the active inhibition and reduce passive avoidance and extinction in patients with migraine headache.

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Footnote

Authors' Contribution: Reza Joharifard, Atefeh Bashirinejadian and Mohammad Babamiri drafted the manuscript. Azita Zahiri performed the analysis and coordination. Majid Barati edited the manuscript.

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