

The Relation of Brain Behavioral Systems, D Personality Type, Anger and Hostility in People with Gum Disease

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Article information	Abstract
<p>Article history: Received: 4 Dec 2011 Accepted: 22 Dec 2011 Available online: 12 Feb 2013 ZJRMS 2014; 16 (5): 31-36</p> <p>Keywords: Gingival disease Anger Hostility Psychosomatic Disorders</p> <p>*Corresponding author at: Department of Psychology, University of Tabriz, Tabriz, Iran. E-mail: e.akbari_psy@yahoo.com</p>	<p>Background: Gum disease is a chronic bacterial infection that affects the gum structures. Given the importance of psychological factors and their impact on physical condition such as gum disease, the aim of this study was to investigate D personality type, brain behavioral systems and anger and hostility in people with gum disease.</p> <p>Materials and Methods: In this causal-comparative study, 50 women with and 50 women without gum disease (age range from 14 to 37) were selected using purposive sampling method and completed the questionnaires of multidimensional anger (Sigel, 1986), D personality type scale, Behavioral inhibition/activation system. MANOVA was used for data analysis.</p> <p>Results: Data analysis showed that groups had significant differences in behavioral inhibition system, behavioral activation system and its components (response to drives, fun seeking, reward responsiveness), D personality type and its components (negative affectivity, social inhibition), anger-arousal, hostile attitude and anger-in ($p < 0.05$), but there were no differences in anger arousing situations and anger-out between them.</p> <p>Conclusion: People with gum disease score higher in BIS, and lower in BAS than normal people, and score higher in D personality type and its components, anger-arousal, hostile outlook, and anger-in. This suggests that psychological factors play a significant role in developing and continuing gum disease and possibly other psychosomatic disorders. So this study focuses on the decisive role of psychological treatments in prevention and promotion of physical and psychological health of people.</p> <p>Copyright © 2014 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Gum disease, is a chronic infectious disease that affects the gums and its structures [1]. People have different vulnerability to periodontal disease because it is associated to involved risk factors. Seven to fifteen percent of people around the world suffer from severe periodontal disease [2, 3]. Studies describe a multifactorial and complex etiology for periodontal disease, and often consider a contribution for psychosocial factors [4-9]. In a study, students who had more stress after a special event like a university test, had more gingivitis [10, 11]. In Dumitrescu's et al. study, stress was related to dental pain, bleeding gums, and gum problems [12-18]. According to evidences, psychosocial stress affects immune and endocrine system and increases probability of infection [19]. Defining predisposing factors of diseases requires the study of constant personality traits [11]. Given to personality structure, individuals show different behavior and emotions in dealing with stress [20]. So, D personality type is one of mediating factors in the relationship of health and stress. So in recent years, it is shown that D personality type is one of the factors that may have a moderator effect on relationship between stress and health. In Molloy's et al. study, D personality type in long-term was associated

with HPA (hypothalamic-pituitary-adrenal) axis dysfunction, and high cortisol mediated the relation of D personality type and the increased risk of heart and physical disorders [21].

Grande et al. described two components of D personality type: negative affectivity (the tendency to experience negative emotions such as depressed mood, anxiety, anger, and hostility), and social inhibition (avoidance from potentially dangers in social interactions such as disconfirming by others) [22- 24]. Emotion inhibition in D personality type exposes people to health problems, including over tension, cardiovascular disease and mental disorders. Type D individuals may predispose to unhealthy behaviors like smoking, alcoholism, physical inactivation, and emotional stresses such as anxiety, depression and anger [25]. Both dimensions of D personality type are associated with increased levels of cortisol in response to stress [21]. Individuals with high negative affectivity not only are easily under stress but also cope weakly with stress [26]. These Results are in line with Gray's formulation. Gray found three different brain-behavioral systems which lead to personality differences, and more activation of each system leads to different emotional states, and reactions. These systems

are: Behavioral Activation System (BIS) which is related to positive affectivity; Behavioral Inhibition System (BAS) that initiates anxiety, and fight flight system (FFS) which leads to anger, fear [27]. BIS and BAS are influenced by the sympathetic nervous system and act opposite of each other [28]. Gray and McNaughton argued that sensitivity of BIS predicts negative emotions in stressful situations and BAS predicts passive coping [29]. Dumitrescu's et al. study showed that individuals with high scores in BIS have more gum problems, use dental floss rarely and individuals with high BAS scores care more to their oral health [30]. Anger plays a determining role in personal and social life. If severity and duration of this emotion go beyond from adaptive state will be considered as a disorder [31, 32]. In Merchant's study, people who get angry every day had more periodontal diseases [33]. If periodontal disease is not treated, teeth supporting structures will be injured. Thus, identifying risk factors of this disease is important. So the aim of this study was to determine the relationship between D personality type, brain behavioral systems, anger and hostility with gum disease, if this link would be apparent, the risk of periodontal disease can be reduced by informing people who are prone to this disease and also clinical intervention such as training coping strategies, and changing their life style.

Materials and Methods

Statistical population of present causal-comparative study consisted of all women with and without periodontal disease of Mashhad City in 2012. Women were selected because prevalence of psychosomatic disorders is more in this gender [34] and the numbers of women referred to therapy institutions is more than men. The sample consisted of 50 women with periodontal disease from department of periodontics, faculty of Dentistry of Mashhad and 50 women without periodontal disease who were selected using purposive sampling. Participants aged between 14 and 37 years. The aim of purposive sampling is to select people who match with aim of studies, because the society of patients was not accessible, so we should go to a center patients referred to and have medical file there. Sample of non-patient people were selected from the family of patients and they hadn't a history of gum disease, and were matched with patient group in age, gender, education, and marital status. The inclusion criteria were: periodontal disease diagnosis, measuring gingival, debris and calculus indexes and periodontal parameters completed by a specialist dentist, having literacy to complete the questionnaire, no history of receiving psychological treatments for gum disease. Exclusion criteria were: diagnosis of any organic disease in relation to gum symptoms, smoking and using drugs, having acute mental disorder (due to the structured clinical interview) or severe physical disease. Considering that the aim of this study was to assess D personality type, brain behavioral systems and hostility and anger in people with gum disease, these factors were compared between people with and without gum disease. Therefore, we made

sure about no gum disease in normal group. For ethics in research, before completing questionnaires, participants were informed of the topic and aim of research insofar as it doesn't affect the research results; and they were told that they are free to participate in research and whenever they want, they can be removed from the sample. After completing testimonial for participating in study, questionnaires were read for participants and completed by researchers. Therefore, Siegel multidimensional anger questionnaire, Denollet D personality type scale, and Carver and White behavioral activation/ inhibition system questionnaire were performed. MANOVA and SPSS-17 were used for data analysis.

1. D personality type scale: This scale has been developed by Denollet in 1998 and consists of 14 items measuring negative affectivity (7 items) and social inhibition (7 items) [35]. Participants answer to each item on a 5-point Likert scale from 0 (false) to 4 (true). Scores range from 14 to 56. Cronbach's α for negative affectivity and social inhibition subscales were reported 0.88 and 0.86 respectively, and concurrent validity of this scale with type A personality scale has been reported 0.63 [36]. Ahmadpour Mobarake reported its reliability from 0.74 to 0.92 with 3 different methods [37]. Cronbach's α in Asadi Mojreh's study was 0.79 and 0.81 respectively [38].

2. The Behavioral Inhibition and Behavioral Approach System Questionnaire (BIS/ BAS): This 24-item questionnaire by Carver and White in 1994 consists of BIS scale (7 items), BAS scale (13 items) and 4 perverting items. Its scoring is on a 4-point Likert scale. Bas scale has 3 subscales: reward responsiveness (5 items), response to drives (4 items), and fun seeking (4 items). Internal consistency for, BIS, reward responsiveness, response to drives, and fun seeking was reported 0.73, 0.76, and 0.66 respectively [39]. In AtriFard's study, internal consistency has been reported 0.47 for BIS and 0.18 to 0.73 for BAS scales [40]. Test-retest reliability in Abdollahi' study has been reported 0.78 for BIS and 0.81 for BAS [41]. 3. Sigel Multidimensional anger inventory [30]: This 38 item questionnaire has been developed by Siegel in 1986 for evaluating anger as a multidimensional construct and measures 5 anger dimensions: anger-arousal (frequency, duration and magnitude of anger feelings that people experience in dealing with arousing stimulus), range of anger-eliciting (anger to situations that trigger it), hostile-outlook (a feedback structure specified with suspicion, aversion and selfish and harmful misbehave, and evaluates situations as threatening and negative.), anger-in (the way in which people suppress or inhibit their anger), and anger-out (expression of anger in verbally or physically aggressive behaviors towards others or objects). The answers are scored on a 5-point Likert scale. Psychometric analyses showed this questionnaire has a good validity and reliability. Siegel has standardized this test in a sample of 198 students and a sample of 288 male workers. Test-retest reliability was high in both samples and Cronbach's α was 0.83 and 0.89 respectively [42]. In Shokouhi Yekta's et al study, Cronbach's α for anger-arousal, range of anger-eliciting, hostile-outlook, anger-

in, and anger-out was 0.85, 0.82, 0.73, 0.54, and 0.33 respectively [43]. Besharat in a study on a sample of 180 students has reported Cronbach's α for 5 dimensions from 0.79 to 0.94 [44].

Results

Demographic characteristics of subjects are shown in table 1. As can be seen, there were no significant differences in age, education, and marital status between groups, so the two groups were matched in terms of these variables. Descriptive information of subjects on variables of study is shown in table 2. BOX and Levene tests were used for examination of equality of variances of studied variables, indicating that the variances of the variables were not significantly different. Therefore, MANOVA was used for data analysis. Wilks' lambda by $p=0.02$ showed that there are significant differences between two groups in behavioral inhibition system, behavioral activation system, response to drives, fun seeking, reward responsiveness, D personality type, negative affectivity, social inhibition, anger-arousal, hostile attitude and anger-in; so MANOVA was used to understand the differences in variables between groups. As can be seen in table 3, there are significant differences between groups in behavioral inhibition system, behavioral activation system, response to drives, fun seeking, reward responsiveness, D personality type, negative affectivity, social inhibition, anger-arousal, hostile attitude and anger-in. But groups do not show any differences in anger-out and range of anger-eliciting.

Table 1. Demographic characteristics of subjects

Characteristics	People with gum disease	Normal people
Age (Mean \pm SD)	29.86 \pm 9.18	28.48 \pm 8.76
	Frequency (%)	Frequency (%)
Education	primary school	3 (6)
	middle school	9 (18)
	diploma	18 (36)
	associate degree	9 (18)
	bachelor	11 (22)
Marital status	single	12 (24)
	married	38 (76)

Table 2. Descriptive information of subjects on variables of study (Mean \pm SD)

Variables	People with gum disease	Normal people
BIS	22.08 \pm 2.38	20.9 \pm 2.41
BAS	40.82 \pm 5.94	43.86 \pm 3.81
Response to drives	12.68 \pm 1.88	13.66 \pm 1.81
Fun seeking	10.92 \pm 2.20	11.92 \pm 2.008
Reward responsiveness	17.20 \pm 3.21	18.34 \pm 2.03
D personality type	21.86 \pm 7.28	18.26 \pm 6.26
Negative affectivity	12.20 \pm 4.15	10.30 \pm 4.59
Social inhibition	9.66 \pm 4.25	7.96 \pm 4.11
Anger-arousal	36.70 \pm 9.98	32.24 \pm 10.83
Range of anger-eliciting	28.96 \pm 7.001	28.80 \pm 8.88
Hostile-outlook	37.26 \pm 7.95	33.68 \pm 9.60
Anger-out	12.48 \pm 2.50	11.98 \pm 2.45
Anger-in	19.52 \pm 3.33	17 \pm 5.74

Table 3. Results of MANOVA for between group differences

Source of variance	Dependent variable	F	p-Value
group	BIS	6.04	0.016
	BAS	9.25	0.003
	Response to drives	7.001	0.009
	Fun seeking	5.62	0.02
	Reward responsiveness	4.48	0.037
	D personality type	7.01	0.009
	Negative affectivity	4.70	0.032
	Social inhibition	4.13	0.045
	Anger-arousal	4.58	0.035
	Range of anger-eliciting	0.01	0.921
	Hostile-outlook	4.12	0.045
	Anger-out	1.01	0.316
	Anger-in	7.18	0.009

Discussion

The present study was aimed to determine the differences between people with and without periodontal disease in behavioral inhibition system and behavioral activation system and its components (response to drives, reward responsiveness, fun seeking) and D personality type and its components (negative affectivity and social inhibition) and anger and hostility. This study showed that people with gum disease had higher BIS and lower BAS activity than normal people.

This finding is in line with a study by Dumitrescu's et al. study that showed people who score high in BIS, have more gum problems and rarely use dental floss, as well as individuals with high BAS scores compared with those with lower BAS scores care more to their oral health. Results obtained can be explained based on the Gray's reward sensitivity theory, because in this theory, BIS and BAS are the basis of anxious personality. Also in this theory, anxiety is based on two mechanisms of behavioral inhibition system, first, the high sensitivity of some areas, except the parietal-hippocampus system; increase the malicious innate inputs of aversion and leads to anxiety. Second, over activity of parietal-hippocampus systems or amygdala regions connected to the parietal-hippocampus system cause to evaluate environmental stimulants as excessive threat which can results in inhibition of predominant behaviors and negative evaluation of situation. Gray stated that cognitive action of behavioral inhibition system is consistent with anxiety; anxiety is related to BIS, and positive affect is associated with BAS. The findings of Jorm and Watson et al. have also shown that there is a significant relationship between negative affect and BIS, and between positive affect and BAS [45, 46]. Individuals with high negative affectivity not only are easily under stress but also cope with stress weakly [26]. Researchers have shown that negative life events such as stress and other psychological factors, may increase vulnerability to periodontal diseases [6]. These findings are in line with Gray's formulation of Psychopathology and anxiety disorders [27].

Other result of this study showed that there is a significant relationship between D personality type and its components with gum disease. In other words, people

with gum disease score higher in D personality type and its components than people without gum disease. This result suggests that tensions arising from D personality type affect health through behavioral and physiological changes.

People with high tension extremely tend to perform behaviors which increase illness and injury probability [47]. People with D personality type tend more to experience negative emotions such as anxiety, anger, hostility and depressed mood and emotion inhibition in social relationships. Situations that are associated with fear, anxiety, frustration and lack of control may increase cortisol [48]. HPA system contributes in metabolism, life balance, energy production and regulation of physiological responses to stress [23]. Both dimensions of D personality type are associated with increased levels of cortisol in response to stress [21].

Molloy et al. in a recent study showed changes in the daily profile of cortisol in patients with cardiovascular syndrome who had D personality type and concluded that this personality type is associated with HPA axis dysfunction in long term [21]. Researchers have shown that high levels of cortisol may be a mediating factor between D personality type and increased risk of cardiovascular disease and other physical disorders [21]. Consequently, it can be inferred that certain personality types such as D personality type can make people to take the actions and create conditions in which the risk of psychosomatic diseases such as gum disease increases in the long-term. Other result of present study showed significant relationship between gum disease, anger-arousal, hostile attitude and anger-in but there was no significant relationship in range of anger-eliciting and anger-out. In other words, people with gum disease, have more anger-arousal, hostile attitude and anger-in than normal people. This result was in line with Merchant's study which concluded that men who get angry every day, are more likely to be diagnosed with periodontal disease (43 % more); and 72% of people with high scores on anger had periodontal disease [33].

Negative emotions often do not end easily. It can be easy to fight with or run away from physical threats, but it isn't possible to fight or run away from negative emotions which make stress. Negative emotions stimulate the sympathetic nervous system and may stimulate body's stress system and keep the body in a state of emergency that sometimes is longer than what body can tolerate [49]. Hostile people tend to respond to new situations with some psychophysiological reactions including sympathetic nervous system activity; release of hormones associated with stress such as epinephrine, norepinephrine, cortisol, glucagon and increased hormones [50]. It can be said in explaining present results that psychophysiological disorders are disorders with real physical symptoms that psychological factors can produce or worsen them. DSM-IV-TR covers these disorders as "psychological factors affecting medical condition",

which may include almost any type of disease [49]. In summary, the findings of this study showed that brain-behavioral systems, D personality type and anger and hostility are the strongest risk factors for gum disease among Iranian population. People with gum disease had significant differences in these psychological factors than the normal subjects.

Overall, this study shows that psychological factors play a major role in creating and sustaining psychosomatic disorders and the studied factors in this research (brain - behavioral systems, D personality type and anger) may cause certain behaviors such as lack of hygiene behaviors and moreover, they may lead to gum disease by the effect they have on the immune system. Also psychological treatments can play a great role in prevention and treatment of such diseases. Therefore, to reducing the rate of gum disease, psychological and behavioral interventions are essential to modifying behavioral patterns, along with medical intervention.

Despite these results, this study also has some limitations like no considering gender differences. Also, this research has been done on a limited sample. Although 30 people is recommended for sample size in casual-comparative researches [51], but sample limit in this study, was mainly because of difficulty in satisfying patients to cooperate with investigators, so generalizing study results to other populations should be done cautiously. Another limitation of this study is the use of self-report tools (questionnaires).

The nature of present study design also leads to some limitations in explaining data and casual contributions which should be considered. It is recommended that besides solving these limitations, consider the role of other psychological factors (such as stress, anxiety and depression which their relations have been obtained in some studies) in future studies. Given the complexity of today's society, increased stressors and the prevalence of periodontal disease in communities, there is a need for more research to clarify the influential factors in development and persistence of psychosomatic disorders and to examine that to what extent psychological interventions can be instrumental for people with these disorders.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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References

- AmericanDentalAssociation.http://www.ada.org/public/topics/periodontal_diseases.asp. Accessed January 25.
- Genco RJ, Ho AW, Grossi SG, et al. Relationship of stress, distress and inadequate coping behaviors to periodontal disease. *J Periodontol* 1999; 70(7): 711-23.
- Bhat M. Periodontal health of 14-17-year-old US schoolchildren. *J Public Health Dent* 1991; 51(1): 5-11.
- Ramseier CA, Abramson ZR, Jin Q and Giannobile WV. Gene therapeutics for periodontal regenerative medicine. *Dent Clin North Am* 2006; 50(2): 245-63.
- Glicksman MA. Referral of the periodontal patient to the periodontist. *Periodontol* 2000; 25(1): 110-113.
- Peruzzo DC, Benatti BB, Ambrosano GM, et al. A systematic review of stress and psychological factors as possible risk factors for periodontal disease. *J Periodontol* 2007; 78(8): 1491-504.
- Hugoson A, Laurell L, Lungdren D. Frequency distribution of individuals aged 20-70 years according to severity of periodontal disease experience in 1973 and 1983. *J Clin Periodontol* 1992; 19(4): 227-232.
- Mengel R, Bacher M, Flores-de-Jacoby L. Interactions between stress, interleukin-1 β , interleukin-6 and cortisol in periodontally diseased patients. *J Clin Periodontol* 2002; 29(11): 1012-1022.
- LeResche L, Dworkin SF. The role of stress in inflammatory disease, including periodontal disease: Review of concepts and current findings. *J Clin Periodontol* 2001; 30: 91-103.
- Deinzer R, Hilpert D, Bach K, et al. Effects of academic stress on oral hygiene—a potential link between stress and plaque-associated disease? *J Clin Periodontol* 2001; 28(5): 459-464.
- Waschul B, Herforth A, Stiller-Winkler R, et al. Effects of plaque, psychological stress and gender on crevicular Il-1beta and Il-1ra secretion. *J Clin Periodontol* 2003; 30: 238-248.
- Vettore MV, Leao AT, Monteiro Da Silva AM, et al. The relationship of stress and anxiety with chronic periodontitis. *J Clin Periodontol* 2003; 30(5): 394-402.
- Vettore MV, Quintanilha RS, Monteiro Da Silva AM, et al. The influence of stress and anxiety on the response of non-surgical periodontal treatment. *J Clin Periodontol* 2005; 32(12): 1226-1235.
- Trombelli L, Scapoli C, Tatakis DN and Grassi L. Modulation of clinical expression of plaque-induced gingivitis: Effects of personality traits, social support and stress. *J Clin Periodontol* 2005; 32(11): 1143-1150.
- Solis AC, Lotufo RF, Pannuti CM, et al. Association of periodontal disease to anxiety and depression symptoms, and psychosocial stress factors. *J Clin Periodontol* 2004; 31(2): 633-638.
- Dolic M, Bailer J, Staehle HJ and Eickholz P. Psychosocial factors as risk indicators of periodontitis. *J Clin Periodontol* 2005; 32(11): 1134-1140.
- Klages U, Weber AG, Wehrbein H. Approximal plaque and gingival sulcus bleeding in routine dental care patients: Relations to life stress, somatization and depression. *J Clin Periodontol* 2005; 32(6): 575-582.
- Dumitrescu AL. Psychological perspectives on the pathogenesis of periodontal disease. *Rom J Intern Med* 2006; 44(3): 241-60.
- Locker D. Stress in dental practice. Introduction to behavioral science and dentistry. New York: Rutledge; 1989: 178-185.
- Denollet J, Conraads VM, Brutsaert DI, et al. Cytokines and immune activation in systolic heart failure: The role of type-D personality. *Brain Behav Immun* 2003; 17(4): 304-9.
- Molloy GJ, Perkins-Porras L, Strike PC and Steptoe A. Type-D personality and cortisol in survivors of acute coronary syndrome. *Psychosom Med* 2008; 70(8): 863-8.
- Denollet J. DS14: standard assessment of negative affectivity, social inhibition, and type D personality. *Psychosom Med* 2005; 67: 89-97.
- Habra ME, Linden W, Anderson JC and Weinberg J. Type D personality is related to cardiovascular and neuroendocrine reactivity to acute stress. *J Psychosom Res* 2003; 55(3): 235-245.
- Schiffer AA, Denollet J, Widdershoven JW, et al. Failure to consult for symptoms of heart failure in patients with a type-D personality. *Heart* 2007; 93(7): 814-818.
- Pedersen SS, Holkamp PG, Caliskan K, et al. Type D personality is associated with impaired health related quality of life 7 years following heart transplantation. *J Psychosom Res* 2006; 61(6): 791-795.
- Heponiemi T. [Psychological and emotional stress reactions: The effects of temperament and exhaustion] [dissertation]. Turku: Helsinki University; 2004: 38-43.
- Gray JA. Brain systems that mediate both emotion and cognition. *J Cogn and Emotion* 1994; 4(7): 269-288.
- Bauchaine TP. Vagal tone, development, and Gray's motivational theory: Toward an integrated model of autonomic nervous system functioning in psychopathology. *J Development Psychopathology* 2001; 13(1): 183-214.
- Gray JA, Mcnaughton N. The Psychology of anxiety and enquiry in to the functions of the septohippocampus system. 2nd ed. New York: Oxford University Press Inc 2000; 314-320.
- Dumitrescu AL, Toma C, Lascu V. Evaluation of interrelationship between behavioral inhibition, behavioral activation, avoidance, daily stressors and oral health. *Rom J Intern Med* 2010; 48(3): 281-290.
- Novaco RW. Anger as a risk factor for violence among the mentally disordered. In: Monahan J, Steadman H. Violence and mental disorder: Developments in risk assessment: University of Chicago Press 1994; 21-59.
- Buss AH. The psychology of aggression. New York: Wiley; 1961: 370.
- Merchant AT. Prospective study of social support, anger expression and risk of periodontitis in men. *J Am Dent Assoc* 2003; 134(12): 1591-1596.
- Sadock BJ, Sadock VA. Kaplan and Sadock's synopsis of psychiatry: Behavioral sciences/clinical psychiatry. 10th ed. Philadelphia: Lippincott Williams and Wilkins; 2007.
- Denollet J. Personality and coronary heart disease: The type-D scale (DS16). *Ann Behav Med* 1998; 20(2): 209-15.
- Jonge P, Denollet J, Van Melle J, et al. Association of type-D personality and depression with somatic health in myocardial infarction patients. *J Psychosom Res* 2007; 63(5): 477-89.
- Ahmad poor Mobarake A. The construction and validation of type D personality its relation with coronary heart disease. *J Sci Res Psychol* 2007; 32: 37-60.
- Asadi -Mojreh S. [Comparison of perceived stress, health locus of control and perceived social support in people with and without type D personality] Persian [dissertation]. Tabriz: Tabriz University; 2011.

39. Carver CS, White TL. Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *J Personality Soc Psychol* 1994; 67(2): 319- 333.
40. Choubdar M. [The relationship between brain behavioral systems and personality dimensions with heart coronary diseases.] Persian [dissertation] University of Tabriz; 2007.
41. Abdollahi R. [Related systems with behavioral inhibition and activation explicit memory bias in people with depression] Persian [dissertation]. Tabriz: Tabriz University; 2006.
42. Siegel JM. The Multidimensional Anger Inventory. *J Personality Soc Psychol* 1986; 51(1): 191-200.
43. Shokouhi-Yekta M, Zamani N, Pourkarimi J and Parand A. Anger in mothers of children with special needs. *Developmental psychol* 2009; 5(20): 289-296.
44. Besharat MA, Mohammad Mehr R. Psychometric Properties of the anger rumination scale. *J Nursing Midwifery* 2009; 19(65): 36-43.
45. Jorm AF, Christensen H, Henderson A, et al. Using the BIS/BAS to measure behavioral inhibition and behavioral activation: Factor structure. Validity and norm in large community sample. *J Personal Individ Diff* 1999; 26(1): 49- 58.
46. Watson D, Wiese D, Vaydia J and Tellegen A. The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *J Personality Soc Psychol* 1999; 76(5): 820-838.
47. Sarafino EP. *Health psychology*. 4th ed. Philadelphia: Wiley and Sons; 2002: 42-8.
48. Pedersen SS, Denollet J. Type D personality, cardiac events, and impaired quality of life: A review. *Eur J Cardiovasc Prev Rehabil* 2003; 10(4): 241-8.
49. Kring AM, Davison GC, Neale JM and Johnson SL. *Abnormal Psychology*. New York: John Wiley and Sons; 2007: 198-199.
50. Manuck SB, Marsland AL, Kaplan JR, and Williams JK. The pathogenicity of behavior and its neuroendocrine mediation: An example from coronary artery disease. *Psychosom Med* 1995; 57(3): 275-283.
51. Delavar A. *Research in educational and psychological*. Tehran: Virayesh; Press 2006: 99.

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