



*Original Article*

## The role of attachment styles and brain-behavioral systems in substance abuse relapse of opiate addicts

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### Abstract

**Introduction:** The present study aimed to investigate the role of attachment styles and brain-behavioral systems in substance abuse relapse of opiate addicts.

**Materials and Methods:** In this causal-comparative research, 50 addicts with opiate relapse were selected randomly from among those admitted to Omid and Rahaei addiction treatment clinics and MMT government unit of Sabzevar city; 50 addicts with the purity of over one year from among the participants in NA groups and 50 individuals from among non-addicts in Sabzevar city in 2016 through convenience sampling. All the subjects completed Revised Adult Attachment Inventory (RAAI) and Gray-Wilson Personality Questionnaire (GWPQ). For data analysis, univariate and multivariate analysis of variance test, Kruskal Wallis test, and Mann-Whitney U test in SPSS-23 software were applied.

**Results:** The results demonstrated that people with substance abuse relapse compared to the non-affected group and individuals with the purity of over one year had greater insecure ambivalent attachment style ( $P=0.001$ ). Further, non-addicts relative to pure people suffer from less ambivalent attachment ( $P=0.012$ ). Although there was no significant difference between pure people and abusers in terms of brain-behavioral systems, the activity of the approach component in the behavioral activation system (BAS), the component of passive avoidance in the behavioral inhibition system (BIS) and the component of flight in the fight-flight system was higher in two groups of people with substance abuse relapse and pure people compared to non-addicts ( $P<0.05$ ).

**Conclusion:** It seems that the insecure attachment style and brain-behavioral systems have an important role in substance abuse relapse.

**Keywords:** Addiction, Attachment, Brain-behavioral system, Personality, Relapse.

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### Introduction

Substance dependence is one of the most important social damages of today's societies, and despite all the eliminating efforts, it has no definitive treatment (1). Unfortunately, due to the secrecy of dependent individuals, the exact number of abusers is not precise (2). According to the estimation of the United Nations Office on Drugs and Crime, 3.4% of the world population or 4.7% of the population over 15

years in the world suffers from substance abuse (3). The history of this phenomenon in Iran also dates back to several hundred years ago (4). Some Iranian reports have announced the number of substance abusers between 1.8 and 3.3 million (5).

According to Rabin and Gear, people who have low education or have abandoned their education, are single or have divorced are at greater risk (2).

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It seems that age and gender are also among the effective factors in this regard so that Hersen and Van Hasselt, in their research, concluded that young people are more likely to experience substance abuse and dependence, and studies reveal that men are at higher risk than women (2).

Since this problem is a physical, mental and social disorder, a wide range of pharmaceutical and psychological therapies and social interventions have been developed to control it. Investigations show that many people start abusing substance again after the end of the treatment (6,7) so that a visual or non-visual sign (for example, sound or smell in the outside environment) or intrapsychic fantasy can be a cause of inducing substance abuse craving (8) and make the patient under treatment suffer from a variety of thoughts and mental images about substances and a kind of internal tendency toward the desired substance. Since the patient has no control over these thoughts and images, he is preoccupied with the desired substance and its immediate use (9).

Although the harmful effects of the substance are known, its withdrawal is a challenging task, and because people experience the signs of substance withdrawal, including craving, relapse is common after a short time (10). Therefore, understanding the causes and factors that have a more effective role in substance abuse relapse can provide a preventive solution or more effective treatment to eliminate this social problem.

According to Gray (11), brain-behavioral systems are the basis of individual differences, and the activity of each of them leads to the evoking of different emotional responses. In reviewing his reinforcement sensitivity theory (RST) (11-13), Gray presented a biological model, including three brain-behavioral systems. The first system is the behavioral activation system (BAS) that responds to conditioned stimuli of reward and lack of punishment. Activity and increased BAS sensitivity lead to the evoking of positive emotions, approach behavior and active avoidance (14,15) and indicate the individual's impulsivity (13). The second system is the behavioral inhibition system (BIS) that responds to conditioned stimuli of punishment, lack of reward, new stimuli, and innate fear-evoking stimuli (14,15). BIS activity causes the evoking of the emotional state of anxiety and behavioral inhibition, passive avoidance,

extinction, and increased attention (16). The third system is the fight-flight system (FFS), which is sensitive to aversive stimuli. FFS behavioral components whose high activity is associated with psychoticism (16,17) are defensive aggression (fight) and rapid escape from the source of punishment (flight). Gray (13) and other researchers (18,19) have maintained that the abnormal sensitivity of these systems is indicative of the susceptibility to various forms of psychological pathology. Gray (12,13) acknowledged that neurotic anxiety and depression result from greater BIS activity whereas psychotic depression is caused by low BAS activity and substance abuse results from greater BAS activity.

Concerning addiction, the focus is on the behavioral activation system activity and most of the findings of the activity of this system in human beings are derived from the studies on dopamine neurotransmitters. Dopamine release in dopaminergic pathways associated with the behavioral activation system is accompanied by the flowing of motion plans of this system (20). Hyperactivity of the behavioral activation system causes that the individual seeks to achieve rewarding stimuli regardless of the action consequences. Multiple studies indicate that the hyperactivity of behavioral activation plays a significant role in the incidence and persistence of substance abuse behaviors and illicit use of illegal substances (21-23), tobacco use (24), and alcohol abuse (25,26). Fowles has also suggested that substance abuse results from the dominance of BAS over BIS (27). The role of the behavioral inhibition system and the fight-flight system in substance abuse craving are not clear and findings have had contradictory results. Some studies show that there is a significant negative relationship between the behavioral inhibition system and substance abuse (22,23,28). Some others have found no significant relationship between the behavioral inhibition systems of addict and non-addict individuals (24,25,29).

In Iran, findings of the research by Pourmohseni Koluri, Haghshenas, and Asadi demonstrated that in male addicts, both components of the behavioral activation system have higher activity. In female addicts, the component of approach in the behavioral activation system has higher activity compared to their non-addicted counterparts. In their research, the activity of the behavioral inhibition system of addicted men and women

was higher than that of their non-addicted counterparts and the sensitivity of the fight-flight system in female addicts was more than that of their non-addicted counterparts. In contrast, in male addicts and non-addicts, the activity of this system showed no significant difference (30).

Attachment theory provides clinicians and researchers with systematic concepts in order to test the impact of early childhood experiences on adjustment in a future life (31). In general, it can be mentioned that people who experience intimate and secure social relationships are happier and healthier than those who lack such attachments (32).

As a result of the experiments performed on one-year-old children, Ainsworth, Bleher, Waters, and Wall (33) managed to develop three types of attachment styles including secure, insecure avoidant, and insecure ambivalent (anxious) attachment styles. Secure attachment is formed when the child finds his attachment figure to be responsive, receptive and available. When the child does not experience his attachment figure as responsive, responsible and available, then insecure avoidant attachment style emerges. When the child's attachment figure takes on an unstable and unpredictable role toward him, insecure ambivalent attachment style is formed. Significant evidence suggests that attachment styles shaped early in life have a profound effect on behavior in adulthood (34).

Attachment style is capable of predicting the problems of intimacy and interpersonal and intrapersonal functions in substance abusers (35). Results of the study by Molnar and colleagues displayed that anxious attachment style is a risk factor for substance abuse (36). Findings of the research by Jones also disclosed that secure and insecure attachment styles can predict substance dependence and crime history in prisoners (37). Additionally, the study by Thorberg and colleagues uncovered that a significant relationship exists between risky behaviors such as substance and alcohol abuse with attachment style of individuals (38).

In this regard, Caspers et al. (39) state that there is a significant relationship between attachment representations and substance abuse reports in non-clinical samples. The amount of substance abuse among individuals classified as insecure attachment style is greater than the group with secure attachment style (40). Among insecure attachment styles, avoidant

attachment has the highest positive correlation with substance abuse (41).

Given what has been said about the possible role of brain-behavioral systems and attachment styles in the incidence of addiction and substance abuse relapse, the present study seeks to investigate the role of attachment styles and brain-behavioral systems in substance abuse relapse of opiate addicts through comparing three groups of subjects (people with relapse, pure people and non-addict individuals).

### Materials and Methods

The current research is a causal-comparative and case-control study in which researchers have attempted to examine the effect of the type of attachment style and brain-behavioral systems on the risk of substance abuse relapse through comparing attachment styles and brain-behavioral systems in people with substance abuse relapse, pure participants with the purity of over one year and non-addict individuals. Concerning the research inclusion and exclusion criteria, 50 subjects with relapse criteria based on DSM-5 (42) who had referred to Omid and Rahaei addiction treatment clinics and MMT government unit of Sabzevar city in the first six months of 2016 and 50 people from the participants in NA groups with the purity of at least over one year and 50 non-addict cases in Sabzevar city were selected. After expressing the project goals and assuring the subjects about the confidentiality of the information, they were asked to answer the research questionnaires. The research inclusion criteria for the affected group comprised a positive morphine test, having at least a diploma, and aged 20 to 40 years. The pure people and non-addict individuals were similar to addict group in terms of age and educational level and were chosen through purposive and convenience sampling. Accordingly, an advertisement was posted on the Narcotics Anonymous (NA) Association's official bulletin board, inviting addicts with the purity of over one year to participate in the study. Finally, 50 of the volunteers were selected after considering the research inclusion and exclusion criteria. As to ordinary people (non-addict), the relatives of addicts and pure people were asked to introduce the non-addicts who were willing to participate in the research. It should be noted that in the mentioned addiction treatment centers in Sabzevar, 65 people possessed the relapse criteria and were recognized eligible for

attending the study. Based on Morgan Table, a sample of 56 individuals was selected randomly and by excluding 6 cases (with distorted and incomplete questionnaires), the sample size of people with relapse eventually reached 50, and 50 subjects from the NA association and 50 subjects from non-addicts in Sabzevar were chosen through convenience sampling method and participated in the research. If someone answered the questionnaire incompletely, another person was replaced so that all three groups included 50 individuals. All people with organic or neurological problems were excluded from this research. In this study, the Revised Adult Attachment Inventory (RAAI) and Gray-Wilson Personality Questionnaire (GWPO) were applied.

#### Research instrument

*A) Revised Attachment Adult Scale (RAAS):* This scale was developed by Collins and Read (43) in 1990, and it is a self-report tool about how to establish attachment relationships with closed people. It consists of 18 items scored on a 5-point scale ranging from 0 (it is not true at all) to 4 (entirely true). In factor analysis, three subscales have been specified, each containing six items. These subscales include: 1) dependence: it measures the extent to which the subjects' trust and rely on others (considering that they are available whenever necessary); 2) closeness: it evaluates the amount of a person's comfort in a relationship with intimacy and emotional closeness and 3) anxiety: it measures fear of having relationships (44). Based on the description in Hazan and Shaver Adult Attachment Questionnaire about three attachment styles, Collins and Read have prepared the items of their questionnaire. The subscale of anxiety corresponds to insecure anxious-ambivalent attachment, and the subscale of closeness is a bipolar dimension that essentially puts secure, and avoidant descriptions against each other (45).

Hence, closeness is consistent with secure attachment, and the subscale of dependence can be considered as contrary to avoidant attachment (46). Collin and Read's research showed that the scores for all subscales remained stable over a period of 2 months or even eight months. They obtained Cronbach's alpha coefficients in two samples of 173 and 100 students as follows: 0.81 and 0.82 for the subscale of closeness, 0.78 and 0.80 for the subscale of dependence and 0.85, and 0.83 for the subscale of anxiety (43).

Pakdaman also measured its reliability in Iran using the test-retest method. The results of the study on 100 girls and boys in two runs with an interval of 1 month indicated that the subscale of anxiety has the highest reliability (0.75) and the subscale of dependence (0.47) is at the lowest level of reliability. By calculating Cronbach's alpha, it was also determined that the subscale of anxiety has the highest reliability (0.749), the subscale of dependence has the lowest reliability (0.285), and closeness is between these two (0.521) (47).

*B) Gray-Wilson Personality Questionnaire (GWPO):* Wilson, Barrett and Gary designed this questionnaire in 1989. It evaluates the dominance and sensitivity of brain-behavioral systems and their components and embraces 120 questions; 40 items for examining the activity of each behavioral activation system, behavioral inhibition system, and fight-flight system. Out of the 40 items related to the behavioral activation system activity, 20 items are related to the approach component, and 20 items are related to active avoidance. Of the 40 items associated with the behavioral inhibition system activity, 20 items indicate passive avoidance and 20 items indicate a component of extinction. Also, of the 40 items allocated to the fight-flight system activity, 20 items are for the component of the fight and 20 items for flight. For each of the questions in the questionnaire, there are three options: "Yes", "No" and "I do not know".

The subject chooses the option "I do not know" when he cannot choose one of the "yes" and "no" options at all. For each item with the + sign, "Yes" has two scores, "I do not know" has 1 score and "No" has no score and for each item with the - sign, "Yes" has no score, "I do not know" has one score and "No" has two scores. In the preparation of the questionnaire, attempt has been made that the specific content of the items of each component be diverse.

For example, the approach component has been expressed in different ways, such as a craving for money, food, substance addiction, public goods consumption, sex partners, enjoyable social events, attractive outfits, birthday gifts, dramatic experiences and career progression. Each component is composed of 20 items and to reduce the risk of agreeable response bias, each of the 10 items has become approximately correspondent to 10 reverse logical items (48). In connection with the validity of this questionnaire, Wilson, Barrett and Gray (48) have obtained the following

Cronbach's alpha coefficients for the components of the approach, active avoidance, passive avoidance, extinction, fight and flight respectively: 0.71, 0.61, 0.58, 0.61, 0.65, and 0.65 for men and 0.68, 0.35, 0.59, 0.63, 0.71, and 0.71 for women, which suggest good internal consistency of the test. About the validity of Persian version of this scale, Ashrafi obtained the Cronbach's alpha coefficients of 0.60, 0.54, 0.61, 0.66, 0.65, and 0.69 respectively for the components of approach, active avoidance, passive avoidance, extinction, fight and flight. He has also reported the internal consistency coefficients of 0.53, 0.57, 0.52, 0.62, 0.64, and

0.64 through the split-half method (49). After scoring the questionnaires, Kolmogorov-Smirnov test, univariate and multivariate analysis of variance, Tukey test, Kruskal Wallis test and Mann-Whitney U test were employed in SPSS-23 software to analyze the data.

### Results

Most of the participants in the study were married and had a diploma. In Table 1, the demographic characteristics of the subjects have been reported for each group.

**Table 1.** Sample demographic variables

Variable		Non-addicts		People with substance abuse relapse		Pure people	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Age (year)	20-30	20	40%	21	42%	19	38%
	30-40	30	60%	29	58%	31	62%
	Diploma	15	30%	15	30%	18	36%
Education	Associate degree	5	10%	7	14%	8	16%
	Bachelor degree and higher	30	60%	28	56%	24	48%
Marital status	Single	10	20%	10	20%	14	28%
	Married	40	80%	40	80%	36	72%

In Table 2, the mean and standard deviation of attachment styles and brain-behavioral systems along with the Kolmogorov-Smirnov test

results to verify the normal distribution of variables that have been provided.

**Table 2.** The scores attachment styles and brain-behavioral systems along with the Kolmogorov-Smirnov test results

Variable		Mean	SD	Kolmogorov-Smirnov Z test	Significance level
Attachment styles	Secure attachment	15.28	3.31	2.058	0.001
	Avoidant attachment	13.320	3.42	1.078	0.196
	Ambivalent attachment	14.49	4.38	1.77	0.004
Brain-behavioral systems	Approach	18.80	4.34	1.035	0.234
	Active avoidance	20.04	6.52	1.14	0.147
	Passive avoidance	18.78	5.02	0.99	0.275
	Extinction	15.14	5.46	1.26	0.083
	Fight	19.82	4.12	1.71	0.006
	Flight	18.19	5.57	0.95	0.317

The results of the above table show that the distribution of attachment styles is normal in the variable of avoidant attachment and abnormal in other variables.

Considering the normality of avoidant attachment in groups, to compare this variable between the three groups of normal people, pure people and addicts, univariate analysis of variance (ANOVA) was used, whose results

indicate no significant difference between the three groups ( $P=0.11$ ,  $F=2.21$ ).

Regarding the abnormal distribution of scores of secure and ambivalent attachment styles in the population, Kruskal Wallis test was applied to compare these variables in three groups.

As to both secure ( $\chi^2=19.42$ ,  $P=0.001$ ) and ambivalent ( $\chi^2=35.46$ ,  $P=0.001$ ) attachment styles, the difference between the three groups was significant and thus, for pairwise

comparison of groups in these two attachment styles, Mann-Whitney U test was employed, whose results have been presented in Table 3.

**Table 3.** Mann-Whitney U test for secure and ambivalent attachment styles

Variable	Comparison between groups	Mann-Whitney U test	Z score	Significance level
Secure attachment style	Normal people and people with the purity of over one year	1040.000	-1.46	0.144
	Normal people and substance abusers	616.00	- 4.42	0.001
	People with the purity of over one year and substance abusers	856.50	- 2.73	0.006
Ambivalent attachment style	Normal people and people with the purity of over one year	889.50	- 2.50	0.012
	Normal people and substance abusers	482.00	- 5.31	0.001
	People with the purity of over one year and substance abusers	613.50	- 4.40	0.001

As shown in the above table, except for the secure attachment style in which there is no difference between the normal group and pure people, other groups are completely different in terms of secure and ambivalent attachment styles. That is, normal people and pure people compared to substance abusers have a more secure attachment style and less ambivalent

attachment style. Besides, pure people have more ambivalent attachment than normal cases.

Given the normal distribution of variables in the components of approach, active avoidance, passive avoidance, extinction and flight, multivariate analysis of variance test was used to analyze the difference between groups, whose results have been displayed in Table 4.

**Table 4.** Multivariate analysis of variance for the brain-behavioral system components

Brain-behavioral system	Source of changes	Sum of squares	Degree of freedom	Mean Square	F ratio	Significance level
Approach	Between groups	1257.240	2	628.620	19.88	0.001
Active avoidance	Between groups	75.720	2	37.86	1.48	0.231
Passive avoidance	Between groups	333.053	2	166.527	5.21	0.006
Extinction	Between groups	226.493	2	113.247	2.96	0.055
Flight	Between groups	292.413	2	146.207	4.83	0.009

As can be observed in the above table, in brain-behavioral systems of the approach, passive avoidance and flight, there is a significant difference between the three groups. However, the difference between groups is not significant in active avoidance and extinction.

Tukey post hoc test was applied to determine which two groups are different in terms of brain-behavioral systems of approach, passive avoidance, and flight. The results have been presented in Table 5.

**Table 5.** Tukey test to examine the difference between groups in brain-behavioral systems of approach, passive avoidance and flight

Brain-behavioral system	Group 1	Group 2	Mean difference (1-2)	Significance level
Approach	Normal	Pure	4.38	0.001
		Abusers	7.02	0.001
Passive avoidance	Normal	Pure	2.63	0.052
		Abusers	3.54	0.006

	Pure	Abusers	1.50	0.651
Flight	Normal	Pure	2.90	0.025
		Abusers	3.02	0.018
	Pure	Abusers	0.12	0.993

According to Table 5, the scores of the brain-behavioral system of the approach and flight in the normal group are significantly lower than those of the other two groups. Moreover, the scores of the brain-behavioral system of passive avoidance in the normal group are significantly lower than those of the abusers. No significant difference was found between pure people and abusers in the brain-behavioral systems of approach, passive avoidance and flight.

Concerning the brain-behavioral system of fight, with respect to its abnormal distribution (Table 2), Kruskal Wallis test was used to compare the scores of the three groups of normal people, pure people and substance abusers. The obtained results indicated no significant difference between the three groups ( $\chi^2=2.42$ ,  $P=0.021$ ).

### Discussion

The present study aimed to investigate the role of attachment styles and brain-behavioral systems in substance abuse relapse of opiate addicts. The results demonstrated that people with substance abuse relapse compared to the non-affected and pure groups have a more insecure (ambivalent) attachment style. Further, normal people relative to pure people suffer from less ambivalent attachment. Although there was no significant difference between pure people and substance abusers in brain-behavioral systems, the activity of the approach component in the behavioral activation system (BAS), the component of passive avoidance in the behavioral inhibition system (BIS) and the component of flight in the fight-flight system in substance abusers and pure people was greater than that of the normal group (non-addicts). Therefore, it seems that insecure attachment styles and brain-behavioral systems play an important role in addiction and substance abuse relapse. Results of the current research indicating greater insecure (anxious/ambivalent) attachment in pure people (who have previously experienced addiction) than non-addicts and also greater insecure attachment in people with substance abuse relapse compared to pure and normal people. It suggests that the securer the attachment or the more the attachment becomes

secure as a result of treatment, the less the risk of addiction or substance abuse relapse will be. Since in substance addiction, we usually witness turbulent relationships in the family and communication deficiencies (50), the present research results are congruent with Bowlby attachment theory (51) and also the studies by Thorberg and Lyvers (35,38), Molnar et al. (36), Jones (37) and Bargh and Gollwitzer (40).

Studies have shown that among insecure attachment patterns, avoidant attachment has the highest positive correlation with substance abuse (41). However, the present research results are inconsistent with this claim since in this study, no difference was observed between the three groups in avoidant attachment style, but normal people compared to other two groups and pure subjects relative to people with substance abuse relapse had less anxious (ambivalent) attachment style. In the research by Andersen (41) conducted on 72 patients referred for pain management, in addition to determining that the rate of substance abuse was higher among those with an avoidant attachment style, the results revealed that both attachment styles are correlated with anxiety and depression and the pain management program is equally useful for patients with secure and insecure attachment styles. The differences in the samples (addicted people in the present study but people referred for pain management in Andersen's research) and the small sample size of the current research may be the cause of this inconsistency. However, more detailed studies with experimental methods can achieve more definitive results in this regard.

According to the attachment theory, it is determined that anxious attachment style with a tendency to seeking support for an attachment object, concern about being rejected, considerable doubt about self-efficacy, low self-esteem, a strong need for attention and intimacy, sense of vulnerability and desperation and having a negative self-model have a role in drug addiction (34).

Kohut (52) observes that addiction often occurs when a person has not received or internalized the capacities related to his basic attachment features. One of the basic attachment functions

is the regulation of emotional experiences in interpersonal relationships. When dealing with emotional stress, people with a secure attachment style seek social support, whereas people with an insecure attachment style resort to other ways such as substance or alcohol abuse for emotional self-regulation. Accordingly, emotional stress coping can be used as one of the mechanisms influencing the severity of substance abuse to explain this finding (53). Moreover, individuals with a secure attachment style have a positive and supportive image of the attachment figure. This positive image increases a sense of self-worth and self-efficacy in these individuals and enables them to adjust their negative emotions in a constructive manner (54).

Another explanation in this respect can be based on cognitive-behavioral views. This view states that insecure attachment can be a cause of substance abuse disorder through negative emotion regulation (e.g., reduced the severity of emotional disturbance) and deficiencies in socialization and communication with deviant parents (55).

Considering the research literature, it can be stated that insecure attachment styles in the individual are likely to create psychological disturbances, such as low self-esteem (56) and anxiety and depression (57,58), which prepares the way for people to turn to substance abuse compared to individuals with secure attachment styles (59).

Results of this study about the higher activity of the approach component of the behavioral activation system in people who have experienced substance abuse are consistent with Gray's theory (12) and the studies by Franken et al. (21), Hundt et al. (22) and Kimbrel et al. (23). Franken et al. (21), for the first time, compared brain-behavioral systems in a clinical sample of substance and alcohol addicts with a normal group. The results demonstrated that addict individuals have higher scores in BAS, especially in the dimensions of drive and fun-seeking, relative to normal people, but there is no difference between alcohol addicts and other two groups (substance abusers and normal subjects) in brain-behavioral systems. It seems that the more sensitive the behavioral activation system, the greater the people's craving for substance abuse and attempt to achieve it (26). The personality dimension of the behavioral activation system is in Eysenck's personality

dimensions of introversion-psychoticism, and the consequence of the behavioral activation system activity includes two personality traits of "impulsive fun seeking" and "psychoticism" which are underlying features in addictive behaviors (60).

Although the results of the present research indicating the greater activity of passive avoidance in people who have experienced substance addiction are incongruent with some studies (23-25,29), they are consistent with the findings achieved in the research by Taylor, Reeves, James and Bobadilla (60), Pourmohseni Koluri et al. (30) and Heinz et al. (61) who demonstrated that for substance abuse, there are two distinct and different motivational paths: The first path is related to the behavioral activation system sensitivity and the rewarding and uncontrollable craving for substance abuse and the second is the uncontrollable craving for substance abuse after withdrawal (substance abuse relapse) which is associated with the behavioral inhibition system sensitivity. In the study by Pourmohseni Koluri et al. (30), the activity of the approach component in the behavioral activation system, behavioral inhibition system and fight-flight system in female addicts was higher than that of their non-addicted counterparts, and male addicts had more active behavioral inhibition system and approach compared to male non-addicts. Results of the present study, suggesting that the activity of the component of passive avoidance in the normal group had no difference with that of the pure group but the activity of this system in people with substance abuse relapse was greater than the normal group, approximately confirm the findings of the research by Heinz et al. (61) although more accurate conclusions about the role of this brain-behavioral system in addiction and relapse require extensive research in the future. It should be noted that the research carried out by Heinz et al. (61), unlike the current study that was conducted on patients with substance abuse relapse, was performed on 38 alcohol addicts to investigate the reasons for alcohol craving.

Based on the present research findings, the fight-flight system activity is higher in people who have experienced substance addiction. Few studies have been conducted in this field, including the research by Pourmohseni Koluri et al. (30) in which brain-behavioral systems have been compared in 60 addicts and 60 non-

addicts. They concluded that the fight-flight system activity in addict women (n=30) is higher than normal women (n=30) but did not provide a similar result for addict men. Hence, the present research results, regardless of the gender component, can be similar to what has been obtained about the fight-flight system in female addicts in the study by Pourmohseni Koluri et al. (30) while it should be remembered that in the current research, unlike the study by Pourmohseni Koluri et al., brain-behavioral systems were compared between 50 addicts with substance abuse relapse with 50 cases without relapse and 50 normal individuals. In explaining the result obtained from the present study, it should be mentioned that seemingly, the fight-flight system is a defensive system against fears, stressors and psychological pressures and, in other words, a sort of coping strategy in the form of escaping or fighting stress- or fear-evoking factors. Addiction and substance reuse have also been proven as a kind of emotion-focused coping strategy, namely, escape from problems and difficulties (62,63). Thus, it seems that the activity of the flight component (rapid escape from the source of punishment and pressure) in people with substance abuse and relapse is higher than that of normal people.

This study has some limitations. For example, cases were selected only from those who

referred to the addiction treatment centers. Thus, no information is available about the attachment style and brain-behavioral systems of those who have not referred to these centers. Furthermore, the low sample size limits the generalizability of the results while the use of the causal-comparative method does not allow for drawing causal conclusions. Research on wider samples through applying longitudinal or experimental methods can help the generalization and confirmation of these results. Also, it is suggested that attachment styles and brain-behavioral systems be investigated and compared in people with opiate addiction to other substances.

### Conclusion

Based on the results, people with substance abuse relapse compared to individuals without substance abuse history and pure groups and also the pure subjects relative to normal people have greater ambivalent attachment style. Besides, the activity of the approach component in BAS, the component of passive avoidance in BIS and the component of flight in the fight-flight system in the two groups of people with substance abuse relapse and pure subjects was higher than that of the normal group. Therefore, attachment styles and brain-behavioral systems play a crucial role in substance addiction and relapse.

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