Structural Model of Brain-Behavioral Systems, Feeling of Loneliness, Emotion Regulation Difficulty, and Craving for Substance Use among Female Substance Abusers

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Abstract

Objective: Addiction is a complex social problem that has many negative consequences for the individuals and society. The aim of this study was to have an experimental evaluation of the fitness of the model in which the roles of brain-behavioral systems, difficulty in emotion regulation, and loneliness in the craving of female substance abusers were considered. **Method:** For this purpose, 580 addicted women in Kerman city were selected by voluntary sampling method and responded to Craving Beliefs Questionnaire, Jackson's Five Factor Questionnaire, revised UCLA Loneliness Scale, and Difficulties in Emotion Regulation Scale. **Results:** The results showed that although some of the paths are not statistically significant, the proposed model enjoys a good fit. The results also indicated that brain-behavioral systems contribute to the craving of women with substance abuse both directly and through the mediation of difficulty in emotion regulation, while these systems do not have a role in the craving of women with substance abuse through the mediation of loneliness. **Conclusion:** Accordingly, these variables can be targeted to prevent addiction, treat addiction, and reduce the possibility of relapse.

Keywords: brain-behavioral systems, difficulties in emotion regulation, loneliness, craving for substance use

Introduction

Today, women's addiction is more and more known as a problem that has involved individuals and communities with numerous dangers and harm. This problem has caused many experts in various fields to search in this area so that they can find the causes of this problem and the means to solve the problems associated with it. Evidence suggests that in the past, many drug-related studies considered drug use as a male problem, therefore, in these studies, more male subjects were applied (Tuchman, 2010). However, evidence has shown that the alcohol use and other drugs tendency is increasing considerably among women. The result of an international survey on women's drug use suggests that 10 percent of adult drug addicts in Asian countries, 20 percent in the former Soviet Union and Latin America, and 40 percent in North America and in several European countries are women. (Abbasi and Mohammad Khani, 2016). Also, in Iran, current statistics indicate that women account for 9 percent of drug users in the society, and the extent of dependence of Iranian women on drug use has increased in recent years. Drug addiction in Iran is not a new anomaly. But what is frightening is the spread of this fatal and destructive phenomenon (Qorbani, 2015). Probably one of the main reasons for increasing the rate of vulnerability and the growing trend of women's addiction has been the recent social changes. In Iran, social changes in recent decades have been occurred in social, economic, and cultural roles that have occurred throughout the society, and namely among the women's community (Kakoyidinky and Qavami, 2015). Women's addiction is a multifaceted problem and some factors such as individual, familial and social causes can play a role in its development and dissemination. In this regard, the results of studies indicate that addicted women experience more psychological problems (Dehghani Firoozabadi Ghasemi, Safari, Ebrahimi, and Etemadi, 2013). In general, women are still less likely to use alcohol and other drugs than men, but some studies have shown that drug use problems are more intense and quicker among women than men (Abbasi and Mohammad Khani, 2016). Also, in some studies, it seems that men tend to be less tempted to drugs than women (Saladin et al., 2012).

Evidence suggests that personality traits are among the most important predictors of drug use (Molaie, Abolqasemi and Aghababa'i, 2016). In this regard, the results have shown that Reinforcement Sensitivity Theory (RST) plays an important roleas one of the personality traits in drug use tendency. RST has been introduced as one of the most prominent personality theories (Corr, & McNaughton, 2012; Gray and McNaughton, 2000; McNaughton and Corr, 2008). This theory includes three systems named the Behavioral Inhibition System, Bbehavioral approach system and the fight-flight system.

In the original version of this theory, the behavioral inhibition system is responsible for reacting to conditioned stimuli of aversive/punishment giving rise to negative affect, especially anxiety. Behavioral approach system is

responsible for reacting to reward signs and lack of punishment and leads to stimulating positive affect. The fight-flight system is responsible for reacting to abnormal unconditioned cues, which leads to frustration or defensive aggression (Colder et al., 2011). The desire for addictive substance is an enticing motivational state (Depue, & Collins, 1999; Robinson, & Berridge, 1993), which can be explained by the activity of the behavioral approach system. Also, the behavioral approach systems cause that a person pursues an action with enthusiasm that its result can be reward, without considering its negative consequences. Therefore, the sensitivity of behavioral approach systems can contribute to increasing drug use problems (Bijttebier, Beck, Claes, & Vandereycken, 2009). Evidence suggests that there is a significant relationship between the sensitivity of behavioral approach systems and the estimation of drug abuse and alcohol abuse abnormalities duration with anxiety disorders (Johnson, Turner & Iwata, 2003).

Also, evidence has shown that there is a two-way relationship between deficits in emotion regulation and drug use. Emotion regulation deficit predicts the increase of drug use, and the increase in drug use predicts emotion regulation deficit (Shadur, & Lejuez, 2015). People with substance abuse disorders are having difficulty considering their emotional information, their correct perception, proper processing, and the proper emotions regulation in the heart of interpersonal relations. These difficulties cause that an individual is unable to decide, analyze and select the appropriate behavior when coping up with stressful conditions of life and is drawn to maladaptive behavior (Khodaei et al., 2011 ; Quoted by Ezhei, Lavasani and Erimi, 2015). Therefore, it can be said that the inability to properly manage emotions and the use of maladaptive strategies of emotion regulation can play a role in the drugs use tendency, and addressing this issue can be helpful. On the other hand, evidence suggests that individual differences in the sensitivity of behavioral inhibition system, fight/flight, freeze system and behavioral approach system are assumed as the basis of wide range of psychological problems such as anxiety, mood, drug use, eating, and personality disorders. Many of these predictions are proved by empirical studies. However, the mechanisms through which the risk for psychiatric pathology is increase, is not known clearly. The mechanism that may be based on the evidence in this regard is the emotion regulation (Tull, Gratz, Latzman, Kimbrel, & Lejuez, 2010). Considering these findings, it seems that emotion regulation difficulty can be considered as a mediating variable in this relation. In this regard, evidence has shown that individuals differences in sensitivity to reinforcement is important in the development of emotion regulation (Depue, & Iacono, 1989), and is effective on the methods that people respond to their emotions or regulate them (Tal et al., 2010). For example, the high sensitivity of the behavioral inhibition system may increase in emotional responding and emotional content when maladaptive emotion regulation strategies are used. Researches on personality dimensions and emotion

regulation difficulty suggest that the sensitivity of the behavioral inhibition system has a positive relationship with the emotion regulation difficulty (Pickett, Lodis, Parkhill, & Orcutt, 2012). While the relationship between sensitivity of the behavioral approach system seems to be less clear, the results show that there is a negative correlation between the behavioral-rewarding approach system and emotion regulation difficulty and there is a positive relationship between the behavioral-recreational approach system and emotion regulation difficulty. However, the relationship between the behavioral-drive approach system and difficulty emotion regulation is not clear (Tal et al., 2010). In addition, the results indicate that increasing the sensitivity of the behavioral inhibition system and reducing the sensitivity of the behavioral approach system leads to increased emotional responsiveness and negative affect, decreases the positive affect and emotion regulation difficulty is occurred (Pickett, Markarian, Deveson, & Kanona, 2013). Regarding the above items, although the relationship between brain-behavioral systems with emotion regulation difficulty and emotion regulation difficulty with substance abuse seems to be straightforward, the mediating role of difficulty in emotion regulation in the relationship between behavioral -brain systems and craving for substance abuse is not clear. Therefore, it is expected that the study of the mediating role of emotion regulation difficulty leads to new findings in this regard.

In addition to the abovementioned items, there is evidence that there is a positive relationship between loneliness and substance use (Nickmanesh, Kazemi and Khosravi, 2015). The results show that loneliness leads to increased mental health problems and has a negative impact on psychological well-being. Also, among students who feel lonely, substances use tendency is higher (Heinrich, & Gullone, 2006). The results indicate that the experience of loneliness is related to emotional problems and drug use (Rokach, 2002). On the other hand, the results indicate that there is a positive correlation between behavioral inhibition system and loneliness, while there is a negative relationship between behavioral approach system and loneliness. Evidence has shown that loneliness of individuals is associated with sensitivity to low reward and sensitivity to high punishment (Chang, Kahle, Yu, & Hirsch, 2014). Also, the results indicate that people who are more active in their fight / flight / freeze system feel more loneliness (Clark, Loxton, & Tobin, 2015). Considering that loneliness in some studies has been considered as a mediating variable (He, Zhou, Li, Cao, & Guan, 2014; O'Connell, O'Shea, & Gallagher, 2016), it is possible that loneliness is the mediator of the relationship between behavioral-brain systems and craving for substance use among addicted women, but according to the information of researcher, no studies have been made in this field. Therefore, it is expected that considering loneliness as a mediating variable in this regard can lead to new findings in this field.

As it was said, we can say that personality, emotion regulation difficulty and loneliness are effective factors on craving for drug use. As mentioned, reports have been presented on how these variables are influenced, and most studies have mentioned the direct role of these variables, but the examination of these variables together can lead to resolving some ambiguities in this field. Also, due to the kind of society's view regarding women's addiction, this topic has remained obscure compared to male addiction and has been less addressed, and the effect of the present research variables, either directly or indirectly, on the craving for women drug users is unclear. Regarding the above mentioned items, the present study seeks to find the relationships between these variables in craving for drug abuse among women, so that they may present some reports regarding the better understanding of these relationships. Also, while the direct relationship between the variables of this research has been discussed and is clear, it should be noted to investigate the method of placement of the mentioned variables on the organized model to explain the relationship between variables directly and indirectly and discuss the fitting of the assumed model with the real data.

Method

Population, sample and sampling method

The present research is a correlation research and since it examines fitting of structural equations with empirical data, structural equations modeling and path analysis are used. The study population consisted of addicted women in Kerman city who referred to clinics and medical centers during the period of 2016-2017 for quitting. Some researchers consider the minimum sample size for using structural equation modeling method to be 200, also they propose 5 to 10 participants should be estimated for each parameter. Accordingly, the number of parameters of the hypothesized model in this study was equal to 61 parameters. Therefore, the selected sample should be between 305 and 610 participants; hence with the consideration of this issue, 580 people were selected on the basis of voluntary sampling. After elimination of outliers, the data of 565 people were analyzed.

Instrument

1. The tempting belief scale: This scale was developed by Beck and Clark (1993). It is a self-assessment scale that measures the beliefs about the temptation to use substances, and consists of 20 items, each rated on a 1-to 7-point scale (from totally disagree to totally agree). To get the overall score, we sum up the total points of all the questions, so the score range from 20 to 140. Higher scores suggest more temptation and low scores suggest little temptation. This test has a good validity and reliability and Cronbach's alpha is 0.95. Also, its formal and content validity has been confirmed by the professors and relevant experts. In Iranian culture, Rahmanian, Mir-Jafari and Hasani (2006) reported Cronbach's alpha (0.84) and by split-half method (0.81), and the validity of this scale was determined through Pearson correlation coefficient -0.28.

2- Jackson's Five-factor Questionnaire: The 30-item questionnaire has been developed by Jackson (2009) for r-RST proper evaluation. The questionnaire consists of five subscales of behavioral approach system, behavioral inhibition system and fight, flight and freeze systems. For each r-RST subscale, 6 items are considered. Jackson developed an exploratory and confirmatory factor analysis to develop and test new scales (Jackson's 5 factors), which showed that the internal consistency and reliability of the construct were desirable. Participants rated on a five-point Likert scale, in which number 1 indicates total agree (always) and number 5 represents total disagree (never). In Iranian culture, Hassani, Salehi and Rasouli Azad (2012) reported the reliability of this test using Cronbach's alpha coefficients ranging from 0.72 to 0.88, and their re-test coefficients ranged from 0.64 to 0.78. Also, the internal correlation between the sets of items was desirable (0.11-0.53). Also, the existence of specific patterns of correlation coefficients between questionnaire scales with positive affect, negative affect, the scale of inhibition / activation systems, Aysenck personality dimensions and Bart's impulsivity dimensions indicated a good concurrent validity of the scale. In this research, Cronbach's alpha was obtained 0.74 to 0.83.

3- Difficulties in Emotion Regulation Scale: This scale has 36 items that are used to assess the emotion regulation difficulty by Gratz and Roemer (2004) in the form of six subscales (non-acceptance of emotional responses, difficulty of dealing with purposeful behavior, difficulty in controlling impulses, lack of emotional awareness, limited access to emotional regulation strategies, lack of emotional clarity. The response to each of the sub-scales is based on a Likert scale from 1 (never) to 5 (always). It should be noted that in this scale, items 34, 24, 22, 20, 17, 10, 8, 7, 6, 2, 1 are scored in reverse order. Higher scores represent more emotion regulation difficulty. Gratz and Romer (2004) reported the validity of this scale through test re-test of 0.88 and the internal consistency of the scale through the Cronbach's alpha for the total scale of 0.93 and for sub-scales above 80%. In Iranian culture, Azizi, Mirzaie and Shams (2009) reported the validity of this scale on the basis of Cronbach's alpha of 0.92. The scores of this scale have been confirmed by the generalized expectation scale of negative emotion regulation and confirmed the convergent validity of the questionnaire.

4- Russell's Loneliness Revised Scale: This scale was created by Russell, Pylva and Cortino (1980), which contains 20 questions, 10 negative sentences, and 10 positive sentences. The answer to each of the subscales is correct and false, in which score 1 is dedicated to false answer and score 2 is dedicated to true answer. But in questions 4-7-8-10-12-13-14-16-17, the scoring is inverse. In these questions, score 2 is given to false answer and score 1 is given to true answer. The validity of this test was reported in the revised version as 0.78. The test retest reliability has been reported by Russell, Pilawa and Ferguson (1998) as 0.89. In Iranian culture, Shekarkan and Mirderekond (1998) reported the concurrent validity of this test as 0.53. In a study done by Mirderekond (1999), the correlation between the new scale and the original scale was 0.91 showing

high degree of reliability for this scale. Cronbach's alpha coefficient was reported 0.81 (Zanjiran, Kiani, Zare and Shayeghian, 2015).

Findings

The descriptive statistics of the variables studied are presented in Table 1.

Table 1: Descriptive Statistics of the Studied Variables

Variables	*Min*	*Max*	*Mean*	*SD*	*Skewness*	*Kurtosis*
Behavioral approach system	6	30	19/41	4/74	-0/537	-0/011
Behavioral inhibition system	6	30	21/66	5/13	-0/810	0/301
Fight-flight-freeze system	6	29	18/55	3/87	-0/611	0/656
Difficulty in emotion regulation	49	164	108/57	19/80	-0/217	-0/165
Loneliness	20	39	28/98	3/71	0/123	-0/058
Craving	19	127	71/72	25/41	0/067	-0/769

Prior to analyzing, the preconditions related to structural equations modeling, which include the appropriate sample size, lost data management, identification of outliers, single-variable normality, multi-variable normality, and lack of multiple colinearity, were investigated to ensure the ability to perform analysis on the data.

In structural equations modeling, at least two variables are required for measuring each latent variable. In the present study, confirmatory factor analysis method was used for latent variables and 5 questions were selected as indicators for behavioral approach system variable and question 6 was deleted due to low factor load. In inhibition system variable, each of the six questions had a high factor load and all six questions were selected. In fight-flight and freeze system, three subscales that comprise 18 questions were selected. In emotion regulation difficulty, the subscales were used and two subscales of lack of emotional awareness ($\lambda = -0.26$) and lack of emotional clarity of ($\lambda = 0.15$) were eliminated due to low factor load, and the remaining four subscales were selected and the two variables of loneliness and temptation, due to the lack of a subscale in the relevant questionnaires and a large number of questions, only questions that had a high load factor (≥ 0.70) were selected as indicators for each variable. Then, the total confirmatory factor analysis was performed on all variables, and it was possible to select the competence of the measurement model by examining fit indices. The fitting indices of the measurement model presented in Table 2 show the suitable fit of this model. Therefore, observed variables have the ability to measure their own latent variables.

Table 2: Fit Indices of Measurement Model

Fit indices	*Acceptance range*	*Value*
Chi-square (χ^2)	-	824/65
Chi-square ratio to degree of freedom	Less than 5	3/17
Normed fit index (NFI)	Bigger than 0.90	0/94
Non-Normed fit index (NNFI)	Bigger than 0.90	0/95
Comparative fit index (CFI)	Bigger than 0.90	0/96
Incremental fit index (IFI)	Bigger than 0.90	0/96
Goodness of fit index (GFI)	Bigger than 0.90	0/90
Root Mean Square Error Approximation (RMSEA)	Less than 0.08	0/062

Standardized coefficients, standardized error and significance level for each of the variables shown in the measurement model are presented in Table 3. All coefficients are significant at the level 0.001.

Table 3: Standardized Coefficient, Standardized Error and Significance Level of Observed Variables

Variables **Observed variables of behavioral approach system (BAS)**	**Standard coefficient**	**Standard error**	**T statistics**
BAS_1	0/69	0/056	17/47
BAS_2	0/68	0/048	17/20
BAS_3	0/65	0/053	16/23
BAS_4	0/56	0/051	13/45
BAS_5	0/53	0/052	12/71
Observed variables of behavioral inhibition system (BIS)	-	-	-
BIS_1	0/64	0/052	16/29
BIS_2	0/58	0/050	14/23
BIS_3	0/67	0/046	17/06
BIS_4	0/57	0/052	14/07
BIS_5	0/58	0/051	14/48
BIS_6	0/55	0/050	13/42
Observed variables of fight-flight-freeze system (FFFS)	-	-	-
FIGHT	0/53	0/22	12/30
Flight	0/71	0/19	17/60
Freeze	0/83	0/18	21/48
Observed variables of difficulties in emotion regulation	-	-	-
Non-acceptance of emotional responses	0/69	0/22	17/86
Difficulties in goal-directed behavior	0/85	0/17	23/96
Difficulties in impulse control	0/86	0/20	24/50
Limited access to emotion regulation strategies	0/78	0/24	21/13
Observed variables of loneliness (UCLA)	-	-	-
UCLA_1	0/73	0/020	17/59
UCLA_2	0/78	0/020	18/85
UCLA_3	0/71	0/020	16/99
Observed variables of craving (CBQ)	-	-	-

Table 3: Standardized Coefficient, Standardized Error and Significance Level of Observed Variables

Variables Observed variables of behavioral approach system (BAS)	Standard coefficient	Standard error	T statistics
CBQ_1	0/71	0/085	17/93
CBQ_2	0/73	0/082	18/57
CBQ_3	0/74	0/082	18/93
CBQ_4	0/75	0/081	19/13

The fitting indicators of the structural model are presented in Table 4.

Table 4: Structural Model Fit Indices

Fit indices	*Acceptance range*	*Value*
Chi-square (χ^2)	-	1374/33
Chi-square ratio to degree of freedom	Less than 5	5/14
Normed fit index (NFI)	Bigger than 0.90	0/89
Non-Normed fit index (NNFI)	Bigger than 0.90	0/90
Comparative fit index (CFI)	Bigger than 0.90	0/91
Incremental fit index (IFI)	Bigger than 0.90	0/91
Goodness of fit index (GFI)	Bigger than 0.90	0/84
Root Mean Square Error Approximation (RMSEA)	Less than 0.08	0/086

As shown in Table 4, the fit indices of the hypothesized structural model indicate a relatively suitable fit of the model. Except for the GFI index, the values of the rest of the indicators are within the range of acceptance. Figure 1 presents a hypothetical structural model with standard coefficients.

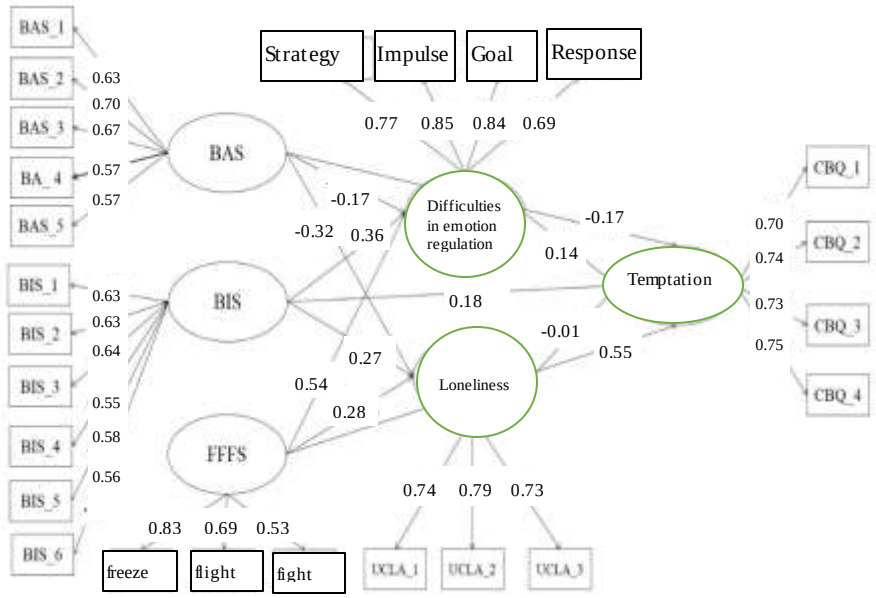

Figure 1: Structural Model of Research

As can be seen, behavioral approach system with a standard coefficient of 0.17 is effective on emotion regulation difficulty, and with the standard coefficient of -0.32 is effective on loneliness and with a standard coefficient of -0.17affects temptation. The behavioral inhibition system with a standard coefficient of 0.36 is effective on emotion regulation difficulty, with a standard coefficient of 0.27 on loneliness and a standard coefficient of 0.18, affected temptation. The fight / flight / freeze system also with a coefficient of 0.56 affects emotion regulation difficulty, with a standard coefficient of 0.28 on loneliness and with a coefficient of 0.55 affects temptation. On the other hand, emotion regulation difficulty and loneliness also affect the temptation, with the standard coefficients of 0.14 and -0.01, respectively. But, the effect of loneliness on temptation is not significant. As shown, the effect of emotion regulation difficulty on temptation is significant at the level 0.05, the remaining effects are also significant at the level 0.01.

Considering that the structural path of loneliness was to temptation not significant, this path was eliminated from the structural model and path coefficients and fit indices were calculated again. Figure 2 shows the final structural model and Table 5 shows the fitting indices of the final model. As seen, fit indices have not changed much from the original model.

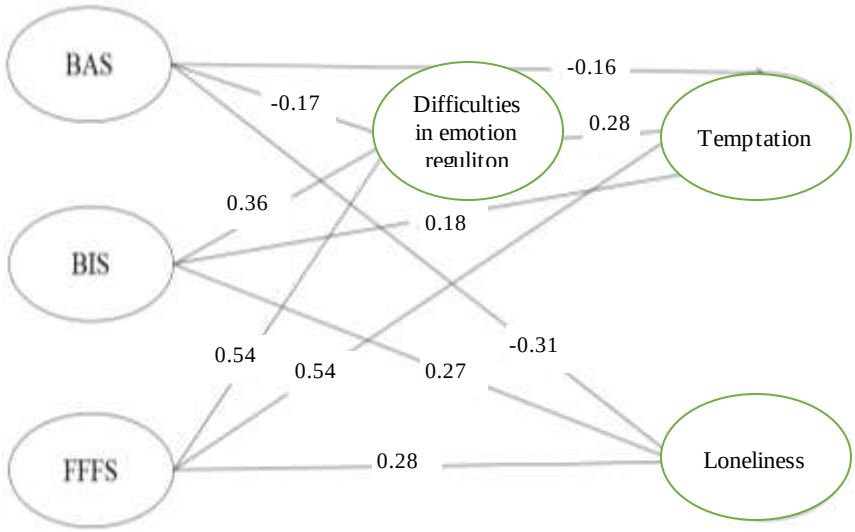

Figure 2: The Final Structural Model

The fit indices of the final model are presented in Table 5.

Table 5: Fit Indices of Final Model

Fit indices	Acceptable range	Value
Chi-square (χ^2)	-	1373/21
Chi-square ratio to degree of freedom	Less than 5	5/18
Normed fit index (NFI)	Bigger than 0.90	0/89
Non-Normed fit index (NNFI)	Bigger than 0.90	0/90
Comparative fit index (CFI)	Bigger than 0.90	0/91
Incremental fit index (IFI)	Bigger than 0.90	0/91
Goodness of fit index (GFI)	Bigger than 0.90	0/84
Root Mean Square Error Approximation (RMSEA)	Less than 0.08	0/086

In this study, we used Bootstrap test to evaluate the intermediate relationships. Bootstrap provides the most powerful and logical way to evaluate indirect effects. The significance evaluation of these relationships can be examined in two ways. The first method is by referring to the significance levels and the second method is evaluating confidence intervals.

Table 6: Bootstrap Test Results for Intermediate Effects

Mediating paths		*BAS* ↓ *Difficulties in emotion regulation* ↓ *Temptation*	*BIS* ↓ *Difficulties in emotion regulation* ↓ *Temptation*	*FFFS* ↓ *Difficulties in emotion regulation Temptation*
Non-standard coefficient		-0/056	0/114	0/030
Standard coefficient(effect size)		-0/024	0/051	0/077
Boot strap limit	**Upper limit**	-0/001	0/122	0/150
Confidence interval 95%	**Lower limit**	-0/074	0/009	0/0005
Standard error		0/016	0/028	0/039
Significance		0/039	0/025	0/048

As shown in Table 6, the path of the behavioral approach system to temptation with mediating role of difficulties in emotion regulation with the standard coefficient of -0.024 and the path of behavioral inhibition system on temptation with mediating role emotion regulation difficulty with the standard coefficient 0.051 and finally the path of fight / flight / freeze system on temptation with mediating role of emotion regulation difficulty with a standard coefficient of 0.077 are significant at the level of 0.05 .

Discussion and Conclusion

The aim of this study was to have an experimental evaluation of the fitness of the model in which the roles of brain-behavioral systems, difficulty in emotion regulation, and loneliness in the craving of female substance abusers were considered. The results of this study showed that although some of the paths were not statistically significant, the proposed model showed suitable fit. This fit seems to be significant for other model paths. In general, behavioral -brain

systems both directly and through emotion regulation difficulty are effective on craving of female substance abusers. The results showed that behavioral approach system has a negative effect on craving of women with substance abuse. This finding suggests that the behavioral approach system has a negative effect on craving of women with substance abuse, and this is inconsistent with previous studies (Franken, Muris, & Georgieva, 2007), which indicate that behavioral approach system has a positive effect on craving of women with substance abuse. Regarding the explanation of this finding, we can refer to studies that provide evidence of the multiple nature of the behavioral approach system (Corr, 2016). In this regard, the results of some studies indicate the three components of this system, which include reward reactivity, fun seeking and drive. Also, in another study, four components of this system are referred to as components of goal-drive persistence, impulsivity or fun seeking, reward interest and reward reactivity. In this study, the questionnaires used to measure the revised theory of reinforcement system sensitivity considering behavioral approach system as one-factor are criticized (Jackson, 2009; Reuter, Cooper, Smillie, Markett, & Montag, 2015), and it is shown that impulsivity is separated from other factors of behavioral approach system. The Jackson questionnaire, as mentioned, is a questionnaire that considers behavioral approach system as a one-factor, and Question 6 (I usually do things without thinking and contemplation) being consistent with the content of the elements of the fun seeking component is eliminated due to the low factor load, and the rest of the content of the subscales of the behavioral approach system seems to be consistent with the reward reactivity component. As in most studies, the reward reactivity component is not related to substance use behaviors (Franken, Muris, & Georgieva, 2007), and contrary to fun seeking component has a negative association with emotion regulation difficulty. The evidence suggests that behavioral approach system leads the individual towards a kind of coping, an attempt to remove obstacles and seek the desired consequences, and the activity of the behavioral approach system can be considered with hope and comfort (Azad Fallah, 2000). Also, the results of the study indicate that the behavioral approach system has a negative effect on emotion regulation difficulty , which is consistent with previous studies (Tal et al., 2010). Considering the above items, as well as the negative relationship between behavioral approach system and emotion regulation difficulty, it can be said that the high sensitivity of the behavioral approach system in this study does not imply impulsivity and probably means achieving reward, efforts to address barriers and a kind of coping and use of effective strategies in achieving goals. Since the relationship between behavioral approach system and emotion regulation difficulty is negative, it can be stated that people with high sensitivity of this system use adaptive strategies of emotion regulation in the face of negative emotions. Also, negative affect and lack of skills in emotion regulation play a key role in addiction tendency (MacPherson et al., 2012). Also, the results emphasize the

importance of this issue, and the emotion regulation difficulty can be seen as the cause and outcome of drug use. The bidirectional effects suggest that weakness in emotion regulation predicts increased drug use. On the other hand, increased drug use predicts poor emotion regulation (Kober, 2014). The results of this study confirmed that the emotion regulation difficulty has a positive effect on temptation. Therefore, it can not be expected that individuals who use adaptive and efficient strategies to regulate their emotion, tend to drug abuse. Considering the above items, in the current study, the positive effect of behavioral approach system on craving for substance use among female drug abusers seems to be unreasonable. The high sensitivity of this system doesn't mean just impulsivity, and it can include other components of the system that are not related to drug use and have a negative relationship with emotion regulation difficulty with its considerable role in drug addiction tendency. It can be said that the high sensitivity of the behavioral approach system leads to a reduction in emotion regulation difficulty, because their reward expectation is high and they are looking for positions incorporating reward for them. So, based on these items, we can say that these people are able to control their negative emotions and do not use inefficient methods such as drug use to control their emotion.

The results showed that behavioral inhibition system has a positive effect on temptation of women with substance abuse. This finding is inconsistent with the studies of Franken and Maurice (2006) and Kimbrel, Nelson-Gray, & Mitchell (2007) and is consistent with the studies by Heinz et al. (2003). In this regard, evidence suggests that the role of the inhibition system in addiction is less clear (Johnson et al., 2003). The behavioral inhibition system may have a complex relationship with drug use. For example, this system has a positive relationship with anxiety on the one hand, which can be an enticement for use and, on the other hand, is related to risk aversion (Caseras, Avila, & Torrubia, 2003). This complexity may be due to the fact that the effects of the behavioral inhibition system depend on the relative levels of behavioral approachsystem. In other words, there is evidence that the behavioral inhibition system and the behavioral approach system interact with each other, so that the behavioral approach system mitigates the negative relationship between behavioral inhibition system and marijuana use (Simons, & Arens, 2007). So considering the interaction between these two components is important. In aanother study by Taylor, Reeves, James, & Bobadilla (2006), cluster analysis method was applied to separately group women and men based on personality traits (sensitivity of the behavioral inhibition system / behavioral approach system) and seek ppersonality profiles related to drug use among students. As expected, one of the trait profiles appeared, the "disinhibitory" profile with weak BIS, and strong BAS as key features , was a key feature. Additionally, the second trait profile, which has a strong connection with drug use, is "high emotionality", as its key component is high behavioral inhibition system and negative emotionality. Therefore, it seems that the factor that plays a positive role in the positive relationship between

behavioral inhibition and addiction is the lack of emotion regulator. In this regard, the evidence suggests that the high behavioral inhibition system sensitivity with emotion regulation difficulty results in negative consequences. As a result, maladaptive strategies for emotion regulation increases psychiatric pathology (Piket et al., 2013; Workers, Freddie Senny, Jafarpour Rezaei, Mehdi Abbasi and Hashemi Nusrat-Dabadi, 2015; Karamizadeh and Nosrat Abadi, 2015). The findings of the present study indicate that the high behavioral inhibition system sensitivity has a positive effect on the difficulties in emotion regulation. Also, emotion regulation deficit is considered as one of the most important predictors of the drug use risk (Cheetham, Allen, Yucel, & Lubman, 2010). The findings indicated that the emotion regulation difficulty has a positive effect on temptation. Persons with high behavioral inhibition system sensitivity seem to be anxious and to regulate their emotion, tend to drug use due to lack of emotion regulation skills and use drugs as a strategy for to get rid of their unpleasant condition.

The results indicate that the fight/flight system has a positive effect on the temptation of women with substance abuse. In previous studies, as the author's knowledge permits, the relationship between the fight/flight system and the temptation of women with substance abuse has not been investigated. Therefore, in explaining this finding, it can be said that the flight/flight / freeze system is considered as a brain defensive avoidance system. This system is responsible for motivating avoidance and flight behaviors in response to unpleasant conditioned and non-conditioned stimuli. Also, this system is considered as a nervous foundation of fear emotion and panic. Evidence suggests that the hyperactivity of this system leads to horror and phobia disorder (Kimberl, 2008). The results indicate that panic attacks are associated with emotion regulation difficulty . Evidence suggests that people with panic disorder, in comparison to healthy people, significantly lessen and suppress their experience and expression of negative emotions. In addition, these individuals report significantly low empirical avoidance, emotional non-acceptance, and emotional clarity than healthy subjects (Tull, Rodman, & Roemer, 2008). Also, those who have high sensitivity in fight / flight / freeze / behavioral inhibition systems, when exposed to stressful experiences, show weak coping skills (Tal et al, 2010). The results showed that the fight / flight / freeze system has a positive effect on the difficulty of emotion regulation. Therefore, it is likely that addicted women will be drawn to the use of drugs to counter their fears. On the other hand, the results showed that ineffectiveness in emotion regulation and poor self-control are predictors of unsuccessful outcomes of drug use therapies, such as less sustained treatment and high rates of relapse (Hopwood, Schade, Matusiewicz, Daughters & Lejuez, 2015). Negative emotion and lack of emotion regulation play a key role in the emergence of addiction. In this regard, negative drug reinforcement models believe that the use of drugs regulates emotion in an inefficient way by eliminating unpleasant affective states, (McPherson et al., 2012). The findings

of this study confirmed these results, showing that the emotion regulation difficulty has a positive effect on temptation. Regarding the above items, it seems that people who have high sensitivity to fight / flight / freeze systems use their emotions to confront fear emotion of maladaptive and ineffective strategies. They regulate their emotions by inefficient strategies and passive behaviors. As a result, these inefficient strategies lead to more negative emotion and difficulties in emotion regulation. Therefore, it is possible to consider substance use as a kind of strategy to get rid of these unpleasant feelings.

In addition, although the results of the present study suggest that behavioral brain systems affect loneliness, they have no effect on temptation through loneliness. This finding is consistent with previous studies (Chang et al., 2014), which indicates that the behavioral approach system has a negative effect on loneliness. In this regard, evidence indicates that there is a negative relationship between behavioral approach system and loneliness. It has been shown that loneliness of individuals is associated with low reward sensitivity and high punishment sensitivity (Chang et al., 2014). Reward sensitivity may reduce loneliness through socialization. Socialization is defined as an incentive to interact with others. The behavioral approach system in the revised theory can be related to sociability because people with a higher behavioral approach system are more likely to be induced through potential rewards in social interactions (Cheek, & Busch, 1981). High reward sensitivity may reduce loneliness by high group direction. Group direction reflects the usefulness and concern regarding the welfare of others. Ultimately, reward sensitivity can affect loneliness through acceptance. Acceptance is the talent to accept thoughts and feelings instead of searching for changing or controlling them (Bond et al., 2011). Therefore, people with high reward sensitivity may receive more reinforcement effects of helping others. High reward sensitivity encourages tendency behavior, reduces empirical avoidance levels and increases admission levels. These behaviors, in turn, are effective on the reduction of loneliness. As a result, people with high sensitivity of behavioral approach system , consider social interactions rewarding and want high interaction to receive more rewards. Also, the results showed that behavioral inhibition system has a positive effect on loneliness. This finding is in line with previous studies (Chang et al., 2014). In this regard, the results indicate that there is a positive correlation between behavioral inhibition and loneliness. Also, evidence has shown that loneliness of individuals is associated with low reward sensitivity and high punishment sensitivity (Chang et al., 2014). In addition to the above items, high punishment sensitivity may increase loneliness through high levels of shyness, as individuals with high reward sensitivity may potentially look for potential threats in more social interactions. Avoiding social interactions is the characteristic of shy individuals. These people experience negative affect in social situations and have a great deterrent that make individuals susceptible to loneliness in the long run (Cheek, & Busch, 1981). High behavioral inhibition system sensitivity leads

to more attention being paid to the threatening aspects of social interactions and to avoid interacting with others and thus experience loneliness. In addition, the results showed that the fight/flight system has a positive effect on loneliness. This finding is consistent with previous studies (Clark et al., 2015). In this regard, the results indicate that people who are more active in their flight/flight / freeze system feel more lonely (Clark et al., 2015). Extreme fears in the flight/flight / freeze system encourage avoidance and reduce acceptance. Previous studies have shown that the flight/flight / freeze system predicts low acceptance levels (Clarke and Lackston, 2012). Low acceptance reduces interaction with people in the community, therefore, it leads to loneliness increase.

The results showed that behavioral brain systems do not have a significant effect on temptation via loneliness. This finding is inconsistent with the previous studies (Henrich and Gallon, 2006; Shargh, Shakibi, Nissari and Alylo, 2011). In explaining this finding, it can be argued that only the consideration of loneliness can not lead to an individual's tendency toward drug use. It is also possible that the duration for loneliness may also be involved. In this regard, evidence suggests that loneliness due to its negative emotional and cognitive load can lead to various types of compensatory responses such as walking, studying, exercising, watching movies and listening to music that temporarily reduces one's loneliness or, in people who have been immersed for a long time in loneliness, may cause reactions like substance abuse (Henrich and Gallon, 2006). Therefore, it seems that it is better to consider loneliness in future research.

Finally, the limitations of the present study include: First, only one self-measurement instrument was used to evaluate each of the variables. Using various measurement methods can help to better understand variables. Secondly, the present study was conducted on women with substance abuse in Kerman city, thus, this reduces the generalizability of the findings to some extent. It is better to conduct similar researches in the wider areas and with male samples in order to increase generalizability of results. In this study, the measurement of temptation in substance abusers was conducted regardless of the type of substance abuse. This issue can be effective on the results.

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